Operation Manual

Goodrive300-01A-RT Series
Single–VFD Integrated Machine
for Air Compressor

SHENZHEN INVT ELECTRIC CO., LTD.

No.	Change description	Version	Release date
1	First release	V1.0	January 2021
2	…	…	…

Preface

Goodrive300-01A-RT series single-VFD integrated machine for air compressor is designed and developed by INVT, which can be applied in the control of synchronous/asynchronous air compressor.

Goodrive300-01A-RT series single-VFD integrated machine carries the air compressor-specific control logic to connect to various signals of the air compressor directly e.g. emergency-stop, pressure, temperature, and fault signals. It can provide 24V power to the touch screen. It also carries Modbus communication interface to fit the touch screen without external controller or PLC, simplifying the electrical design while realizing excellent variable-frequency control.

Goodrive300-01A-RT series single-VFD integrated machine has undergone compatibility test with multiple mainstream motor or master manufacturers based on the application features and actual needs of air compressor industry. It adopts dedicated PID and unique flux-weakening design to enable the air compressor to start quickly and run smoothly. Through high-power density design and compact structure, it simplifies commissioning procedures and downgrades product size. It adopts independent air duct, heavy-load and high power factor design to cope with challenging field and grid environment.

Goodrive300-01A-RT series single-VFD integrated machine covers the power range of 7.5–37kW, with built-in power-frequency fan output for controlling relay packages and 15W power-frequency transformer, supporting power-frequency fan output and providing 220V power supply to solenoid valve, which can be used as a small power expansion application of Goodrive300-21 dual-VFD integrated machine to meet diversified integrated machine application requirements.

Read this manual carefully before installation to ensure Goodrive300-01A-RT series single-VFD integrated machine can be installed and operated correctly to give full play to its excellent performance.

If the product is ultimately used for military affairs or weapon manufacture, comply with the export control regulations in the Foreign Trade Law of the People's Republic of China and complete related formalities.

Our company reserves the right to update the information of our products without prior notice.

Contents

1 Safety precautions

1.1 What this chapter contains

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

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

1.2 Safety definition

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

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

Note: Actions taken to ensure proper running.

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

1.3 Warning

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

Symbol	Name	Description	Abbreviation
 Danger	Danger	Severe personal injury or even death can result if related requirements are not followed.	
 Warning	Warning	Personal injury or equipment damage can result if related requirements are not followed.	
 Forbid	Electrostatic discharge	PCBA board damage can result if related requirements are not followed.	
 Hot sides	Note Hot sides	The equipment base may become hot. Do not touch it.	
Note	Note	Actions taken to ensure proper running.	**Note**

1.4 Safety guidelines

✧ Only trained and qualified professionals are allowed to carry out related operations.

✧ Do not perform wiring, inspection or component replacement when power supply is applied. Ensure that all the input power supplies are disconnected before wiring and inspection, 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 is shown as below.

VFD model		Minimum waiting time
380V	7.5kW－37kW	5 minutes

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

✧ 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 sensitive. Take measurements to prevent electrostatic discharge when performing related operations.

1.4.1 Delivery and installation

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

✧ Connect the optional brake parts (brake resistors, brake units or feedback units) 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. To ensure personal safety, the installer must take mechanical protective measures, such as wearing exposure shoes and working uniforms.

✧ Ensure the VFD suffers no physical impact or vibration during moving and installation.

✧ Do not carry the VFD by its front cover only as the cover may fall off.

✧ Installation site must be away from children and other public places.

✧ The application environment should be proper and appropriate.

✧ Prevent the screws, cables and other conductive objects from falling into the VFD.

✧ The leakage current of the VFD may be above 3.5mA during operation. Ground with proper

techniques and ensure the grounding resistor is less than 10Ω. The conductivity of PE grounding conductor is the same as that of the phase conductor (with the same cross sectional area). For models of higher than 30 kW, the cross sectional area of the PE grounding conductor can be slightly less than the recommended area.

✧ R, S and T are the power supply input terminals, while U, V and W are the output motor terminals. Connect the input power cables and motor cables correctly; otherwise, damage to the VFD may occur.

1.4.2 Commissioning and running

✧ Disconnect all power supplies of the VFD before 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 on the VFD except for 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 brake the motor suddenly. A mechanical brake device must be installed.

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 pilot run first before actual application.

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

1.4.3 Maintenance and component replacement

✧ Only well-trained and qualified professionals are allowed to carry out maintenance, inspection, and component replacement of the VFD.
✧ Disconnect all power supplies of the VFD before terminal wiring and wait for at least the designated time after disconnecting the power supply.
✧ Take proper measures to prevent screws, cables and other conductive objects from falling into the VFD during maintenance and component replacement.

Note:

✧ Use proper torque to tighten screws.

✧ Keep the VFD and its parts and components away from combustible materials during maintenance and component replacement.

✧ Do not carry out any insulation voltage-endurance test on the VFD or measure the control circuit of the VFD by megameter.

✧ Take anti-static measures on the VFD and internal parts during maintenance and component replacement.

1.4.4 Scrap treatment

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

2 Product overview

2.1 Product specification

Category	Function	Specification
Power input	Input voltage of the VFD (V)	3PH 380V (-15%)–440V (+10%)
	Rated input current (A)	Refer to section 2.4 “Rated specifications”.
	Rated input frequency (Hz)	50Hz or 60Hz; allowed range: 47–63Hz
Frequency-conversion power output	Output voltage (V)	Equal to input voltage, error ratio: less than 5%
	Rated output current (A)	Refer to section 2.4 “Rated specifications”.
	Rated output power (kW)	Refer to section 2.4 “Rated specifications”.
	Output frequency (Hz)	0–400Hz
Power–frequency fan output (single VFD integrated machine)	Output voltage (V)	Equal to input voltage, error ratio: less than 1%
	Rated output current (A)	Refer to section 2.4 “Rated specifications”.
	Rated output power (kW)	Refer to section 2.4 “Rated specifications”.
	Output frequency (Hz)	Equal to input frequency, error ratio: less than 1%
Power supply output	24VDC	24W
	220VAC	15W
Running control performance	Control mode	Open loop vector, SVPWM
	Speed ratio	Asynchronous motor: 1:200 (SVC); Synchronous motor: 1:20 (SVC)
	Speed control precision	±0.2% (SVC)
	Speed fluctuation	±0.3% (SVC)
	Torque response	<20ms (SVC)
	Starting torque	Asynchronous motor: 0.25Hz 150% (SVC) Synchronous motor: 2.5Hz 150% (SVC)
	Frequency reference mode	PID control, Modbus communication, P1-analog input, keypad digits.
	Overload capacity	Long-term running at 120%

Category	Function	Specification
	Analog pressure input	One 4–20mA/0–1.6MPa input
	Analog temperature input	Two PT100 analog temperature inputs; resolution rate: 1°C; temperature range: -20°C–150°C; precision error: 3°C
	Digital input	Three normal inputs, max frequency: 1kHz One PTC digital input
	Digital output	One Y terminal output
	Relay output	One relay output (NO) 250VAC/3A 1 solenoid valve output
	Fault protection function	Over 30 kinds of fault protection functions: overcurrent, overvoltage, undervoltage, overtemperature, phase loss, overload, fan current imbalance, etc.
	Fan protection function	Overload protection: 60s at 120% overload; 48s at 130% overload; 24s at 150% overload; 8s at 160% overload; 5s at 200% overload; 1s at 300% overload
		Current imbalance protection: when any two phases differ from each other by 60–75%, stop at fault, action time ≤5s
		Output short-circuit protection: the protection can be implemented by using the internal fuse.
		Output short-to-ground protection: the protection can be implemented by using the internal fuse.
	Solenoid valve port protection	220V output short-circuit protection
	RS485 communication	One RS485 communication
Others	Installation mode	Wall installation, flange installation
	Temperature of running environment	-10–+50°C; derating is required if the ambient temperature exceeds 40°C; derate by 1% for every increased 1°C
	Ingress protection rating	IP20
	Pollution degree	Degree 2
	Cooling mode	Forced air cooling

Category	Function	Specification
	EMC filter	Users can choose the optional external filter which fulfills the requirements of IEC61800-3 C2.

Note:

✧ Max. output current of 7.5kW VFD model is 500mA.

✧ When the input voltage exceeds 440VAC, the power-frequency transformer inside the single VFD integrated machine will need to be customized.

2.2 Product nameplate

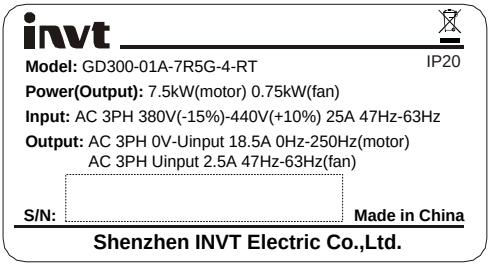


Figure 2-1 Product nameplate

Note: This is a nameplate example of a standard model. CE, TUV, and IP20 are marked according to the actual certification condition.

2.3 Model description

The model code contains product information. Users can find the model code on the VFD nameplate or simple nameplate.

GD300-01A – **7R5G** – **4** – **RT**

① ② ③ ④

Figure 2-2 Product model

Field	Symbol	Description	Content
Abbreviation of product series	①	Abbreviation of product series	GD300-01A: Goodrive300-01A VFD for air compressor
Rated power	②	Power class + Load type	7R5: 7.5kW G: Constant torque load
Voltage class	③	Voltage class	4: AC 3PH 380V(-15%)–440V(+10%)
Power-frequency fan/Built-in transformer	④	Power-frequency fan/Built-in transformer	Single-VFD air compressor integrated machine R: Built-in relay unit, supporting

Field	Symbol	Description	Content
			power-frequency fan output T: Built-in power-frequency transformer, providing 220V power supply

2.4 Rated specifications

Product model	Rated input current of the integrated machine (A)	Frequency conversion of main motor		Power frequency of the fan	
		Rated output power (kW)	Rated output current (A)	Rated output power (kW)	Rated output current (A)
GD300-01A-7R5G-4-RT	25	7.5	18.5	0.75	2.5
GD300-01A-011G-4-RT	32	11	25	0.75	2.5
GD300-01A-015G-4-RT	40	15	32	0.75	2.5
GD300-01A-022G-4-RT	56	22	45	1	3
GD300-01A-030G-4-RT	59	30	60	1.5	3.7
GD300-01A-037G-4-RT	68	37	75	1.5	3.7

Note:

✧ Rated input current is the actually measured result under 380V input voltage.

✧ The VFD models of 30kW and 37kW are equipped with built-in DC reactors.

✧ Rated output current is defined as the output current under 380V output voltage.

3 Wiring instruction

3.1 Main circuit wiring and terminal description

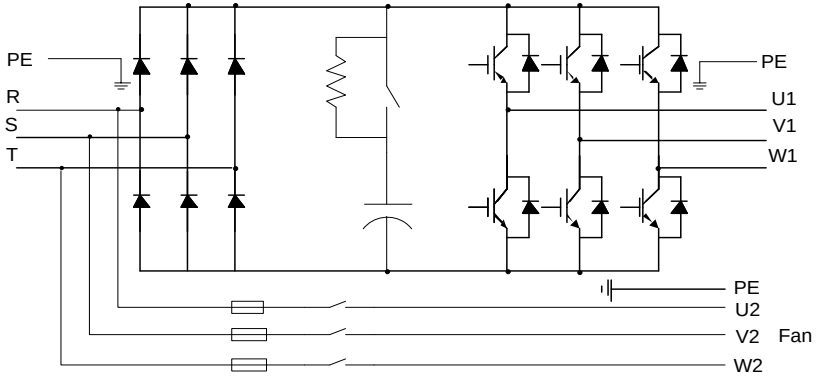


Figure 3-1 Main circuit wiring diagram

Table 3-1 Main circuit terminal description

Terminal sign		Terminal function
Power input	R, S, T	3PH AC input terminals, connected to the grid
Main motor	U1, V1, W1	3PH AC output terminals, connected to the main motor of the air compressor
Fan	U2, V2, W2	3PH AC output terminals, connected to the fan
⏚		Each machine must be grounded. The grounding is implemented through the two PE terminals on the machine, and the grounding resistance is less than 10Ω.

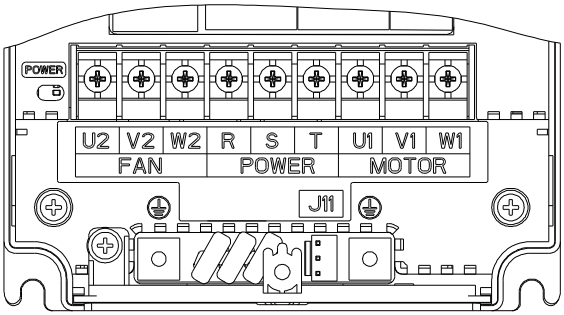


Figure 3-2 Main circuit terminal diagram for 7.5kW VFD models

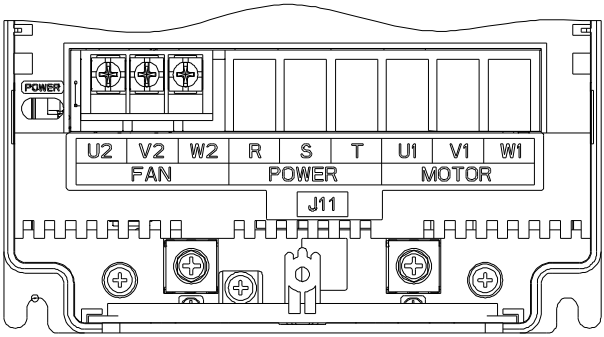


Figure 3-3 Main circuit terminal diagram for 11–15kW VFD models

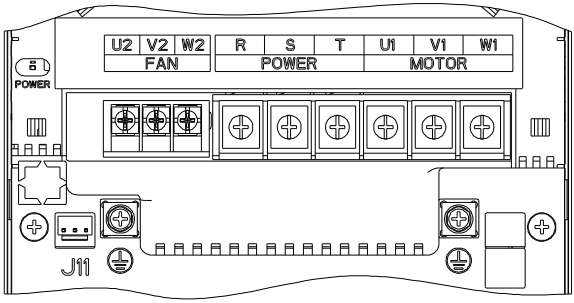


Figure 3-4 Main circuit terminal diagram for 22kW VFD models

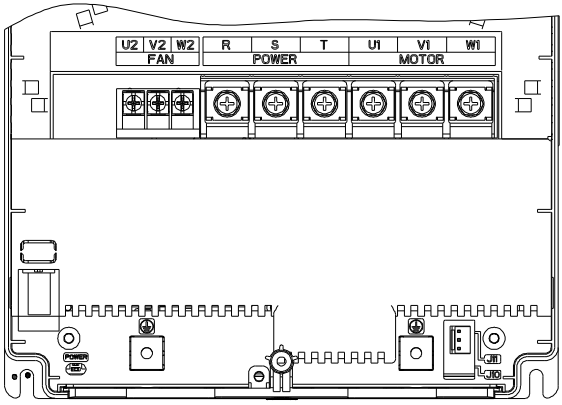


Figure 3-5 Main circuit terminal diagram for 30–37kW VFD models

Table 3-2 Screw specification and torque of main circuit terminals

Power	Main circuit terminal		Fan terminal	
	Screw specification	Torque of torque driver (N•m)	Screw specification	Torque of torque driver (N•m)
7.5kW	M4	1.2	M4	1.2
11kW－15kW	M5	2.5	M4	1.2
22kW	M6	3.5	M4	1.2
30kW－37kW	M6	3.5	M4	1.2

3.2 Control circuit wiring and terminal description

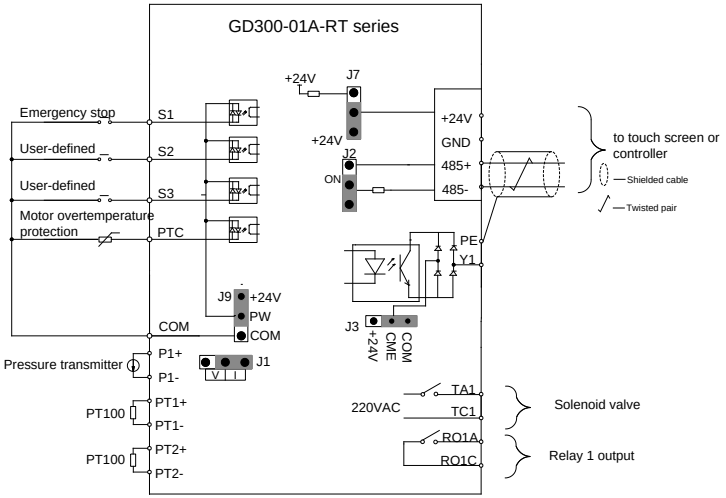


Figure 3-6 Control circuit wiring diagram

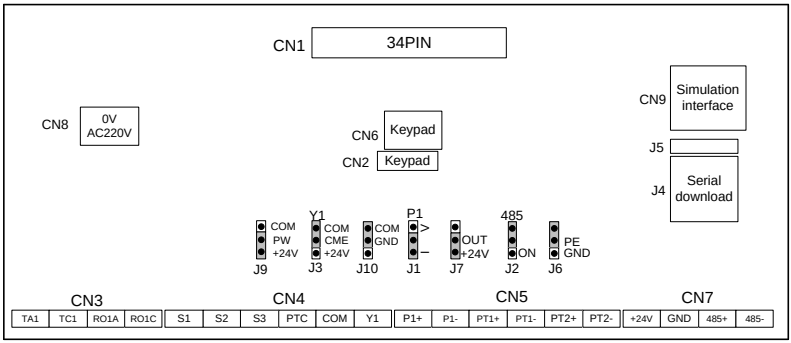


Figure 3-7 Control circuit terminal diagram

Table 3-3 User terminal description of control circuit

Category	Sign	Name	Terminal function
Power supply	+24V	+24V power supply	Provide 24V*(95%–110%) power to the external, max. output current of 7.5kW VFD models: 500mA, max. output current of other VFD models: 1A. Can be used to power up GPRS and touch screen. You can select +24V output or +24V and 1.1Ω resistor series connection output through the jumper J7. By default, +24V output is selected in factory.
	GND	+24V and AO reference ground	+24V reference ground Short connecting GND to COM through the jumper J10. Short connection is by default.
PT100 signal input	PT1+	Analog temperature signal 1	1. Resolution: 1°C 2. Range: -20°C–150°C 3. Detection precision: 3°C
	PT1-		
	PT2+	Analog temperature signal 2	
	PT2-		
Pressure signal input	P1+	Analog pressure signal 1	1. Input range: current/voltage is optional, 4–20mA/2–10V corresponds to 0–1.6MPa; of which P1 is switched via the jumper J1, and the default is current type. 2. Input impedance: 20kΩ during voltage input; 500Ω during current input 3. Resolution: 5mV (minimum value)
	P1-		

Category	Sign	Name	Terminal function
			4. Error: ±1%, 25°C
Digital input/output	S1-COM	Digital input 1	1. Internal impedance: 3.3kΩ 2. 12–30V voltage input is acceptable 3. Max. input frequency: 1kHz You can select internal power (NPN mode) or external power (PNP mode) through J9. The default is internal power (NPN mode).
	S2-COM	Digital input 2	
	S3-COM	Digital input 3	
	PTC-COM	Motor overtemperature protection	External PTC temperature switch signal input, PTC resistance acts at 2.5kΩ.
	Y1-COM	Digital reference ground	1. Switch capacity: 50mA/30V 2. Output frequency range: 0–1kHz 3. Select whether Y1 output is low electrical level or OC output through the jumper J3. OC output is by default.
Communication	485+	RS485 communication	RS485 communication terminal, adopting the Modbus protocol. You can select the matching terminal resistor through J2.
	485-		
Relay output	RO1A	NO contact of relay 1	1. Contact capacity: 3A/AC250V, 1A/DC30V. 2. Cannot be used as high-frequency switch output.
	RO1C	Common contact of relay 1	
Solenoid valve	TA1	Solenoid valve coil A	AC 220V/15W output terminals, connected to solenoid valve coils.
	TC1	Solenoid valve coil C	
Jumper terminal	J9	Internal/external power selection terminal	You can select internal power (NPN mode) or external power (PNP mode) through J9. The default is internal power (NPN mode).
	J3	Digital output CME selection terminal	Select whether Y1 output is low electrical level or OC output through the jumper J3. OC output is by default.
	J10	COM/GND terminal	Short connection is by default.
	J1	P1- analog signal selection terminal	I corresponds to current signal, V corresponds to voltage signal, and the default is current input signal.
	J7	+24V power output terminal	You can select +24V output or 24V and 1.1Ω resistor series connection output through the jumper J7. By default, +24V output is selected in factory.

Category	Sign	Name	Terminal function
	J2	Terminal for connecting RS485 communication terminal resistors	ON corresponds to the connection of terminal resistors. No terminal resistor is connected by default.
	J6	Terminal for short connecting PE to GND	No short connection is by default.

Note: When the solenoid valve coil power exceeds 15W, the power frequency transformer inside the integrated machine needs to be customized or independently connected with an external 220VAC power supply.

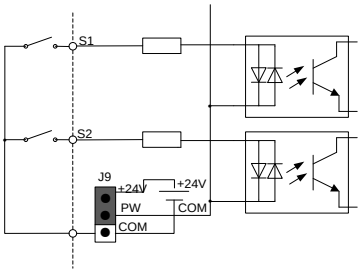


Figure 3-8 Internal power (NPN mode)

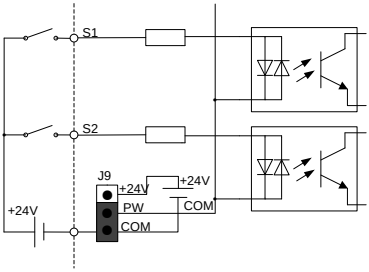


Figure 3-9 External power (PNP mode)

When digital input uses internal +24V, set J9 according to Figure 3-8, and short connect +24V to PW.

When digital input uses external +24V, set J9 according to Figure 3-9, and short connect COM to PW.

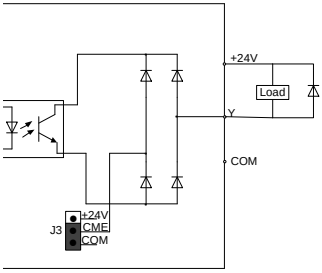


Figure 3-10 Y terminal output (OC output)

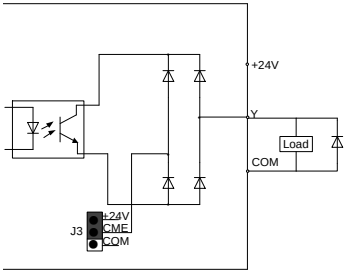


Figure 3-11 Y terminal output (electrical level by default)

When digital output uses OC output, set J3 according to Figure 3-10 and short connect CME to COM.

When digital output uses low electrical level output, set J3 according to Figure 3-11, and short connect CME to +24V.

When the type of load to be driven by the digital output terminal is a relay, absorber diodes shall be configured at both ends of the relay coil. Ensure that polarities of the diodes are connected properly, otherwise the damage to the 24V DC power supply may occur.

Note: The driving capability of this terminal is no more than 50mA current.

4 Commissioning instruction

4.1 HMI commissioning

4.1.1 System wiring

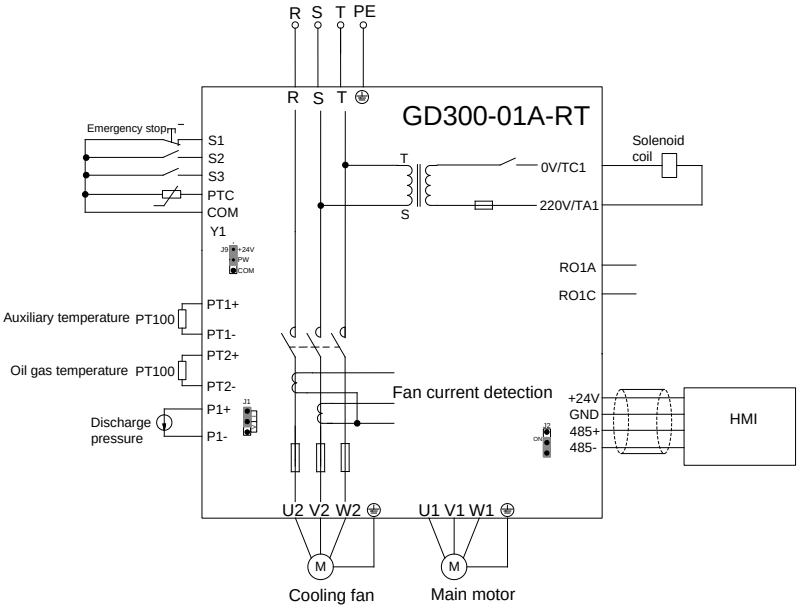


Figure 4-1 Wiring diagram for HMI + GD300-01A-RT VFD

4.1.2 Commissioning steps for HMI

It is recommended to use HMI special for Goodrive300-01A-RT series VFDs to display and commission.

Note: All the parameters displayed in the interfaces are subject to actual displayed content.

1. Perform wiring according to Figure 4-1 and ensure that the VFD for air compressor and the housing of the air compressor are grounded properly.

2. After power up, the following interface is displayed.

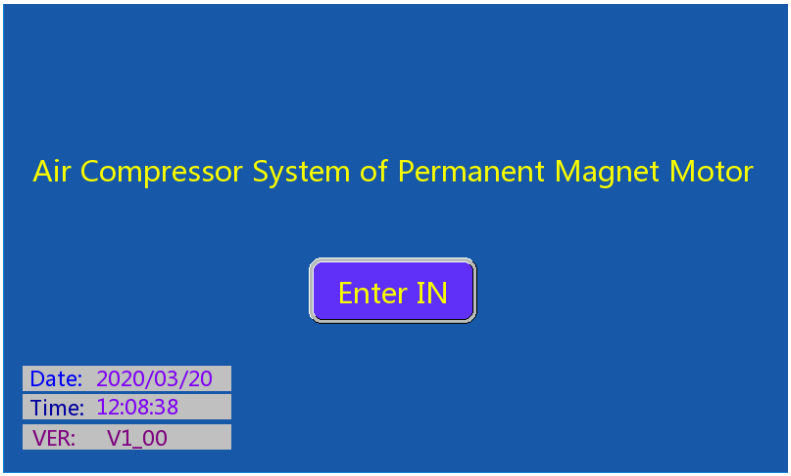


Figure 4-2 Login interface

3. Click **Enter IN** to enter the working environment interface.

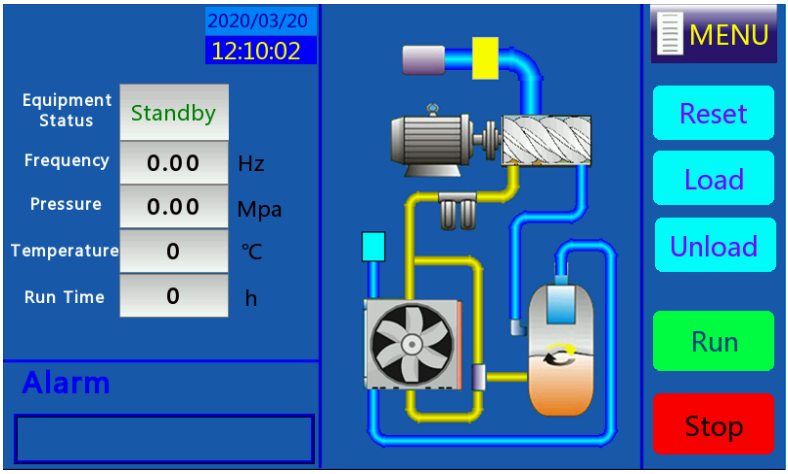


Figure 4-3 Working interface

4. Click **Menu** on the user interface.

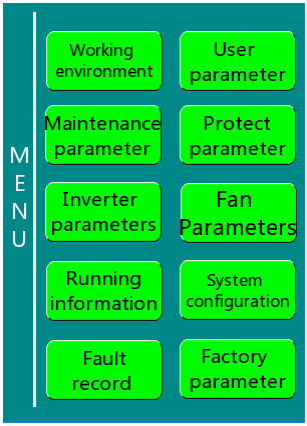


Figure 4-4 Menu interface

5. Click **System config** on the touch screen to enter the system configuration interface.

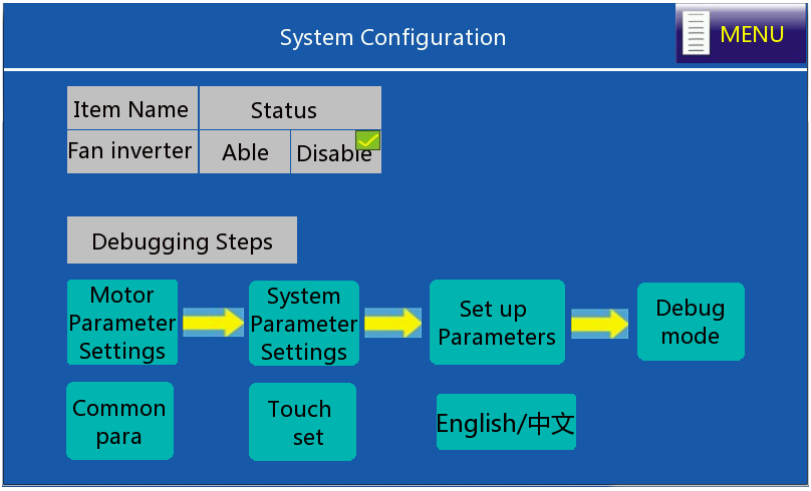


Figure 4-5 System configuration interface

Click **Disable** for the fan VFD, and perform commissioning according to the factory commissioning guide.

Step 1 In the system configuration interface, click **Motor Parameter Settings** to select the motor type.

✧ If you select **SM** (synchronous motor), you need to set the max frequency, rated frequency, rated power, rated voltage, rated current, pole pairs, and carrier frequency.

✧ If you select **AM** (asynchronous motor), you need to set the max frequency, rated frequency, rated power, rated voltage, rated current, rated rotational speed, and carrier frequency.

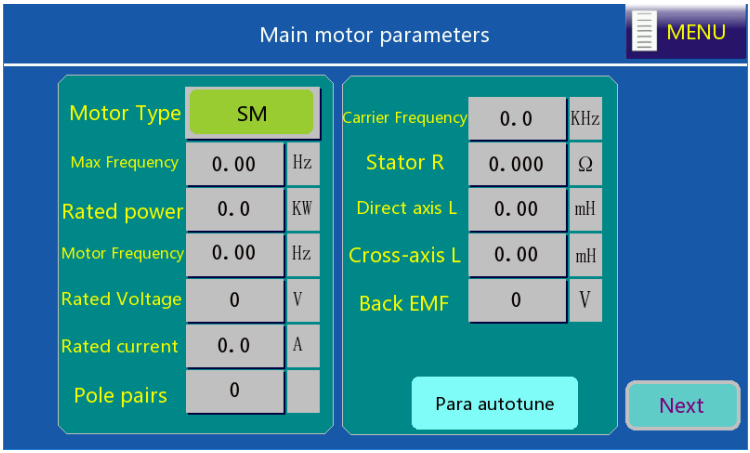


Figure 4-6 Main motor parameter setting interface

Set motor parameters according to the actual motor nameplate parameters, click **Para autotune**.

Step 2 On the system configuration interface, click **Set up Parameters**. The VFD completes the related parameter configuration automatically. See appendix C.6 for setting parameters.

Step 3 On the system configuration interface, click **Debug mode**.

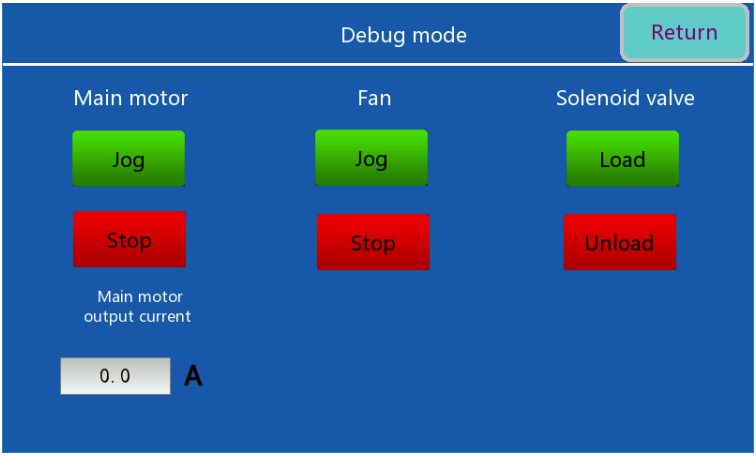


Figure 4-7 Debug mode interface

Click **Jog** for the main motor to determine the motor rotation direction; click **Load** or **Unload** to test the action of solenoid valve. Click **Return** to enter system configuration, then, click **Menu** to return to the menu interface.

Note: If the motor rotates reversely, adjust the wiring sequence of the motor cable.

6. Return to the menu interface after you complete the commissioning on the "**System config**" page according to the factory commissioning guide.

7. Click **Fan Parameters** in the menu.

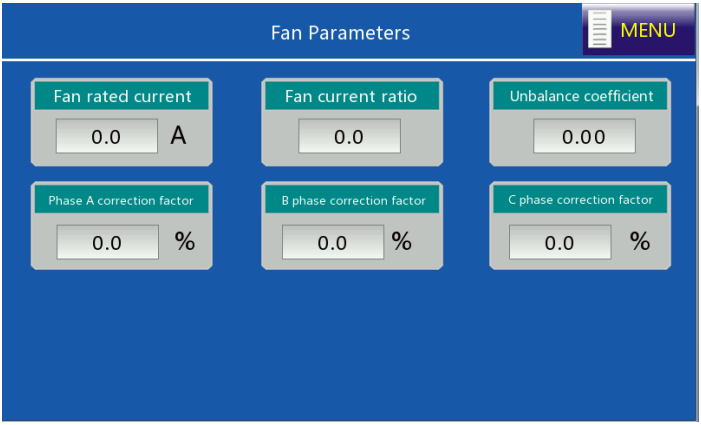


Figure 4-8 Fan parameters interface

Set the fan rated current according to the fan nameplate.

8. Click **User parameter** in the menu.

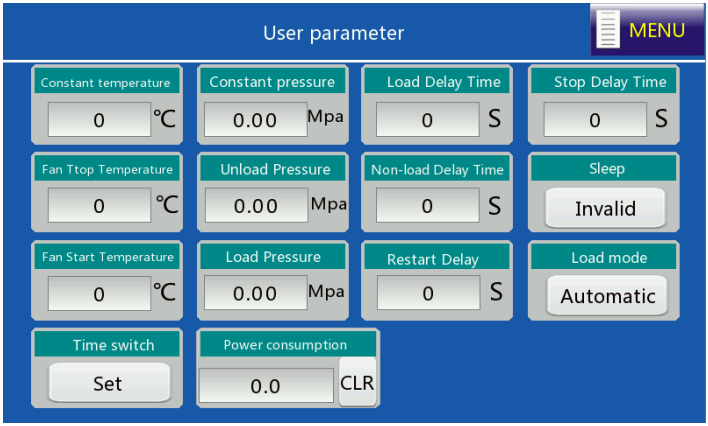


Figure 4-9 User parameter interface

9. Click **Maintenance parameter** in the menu.

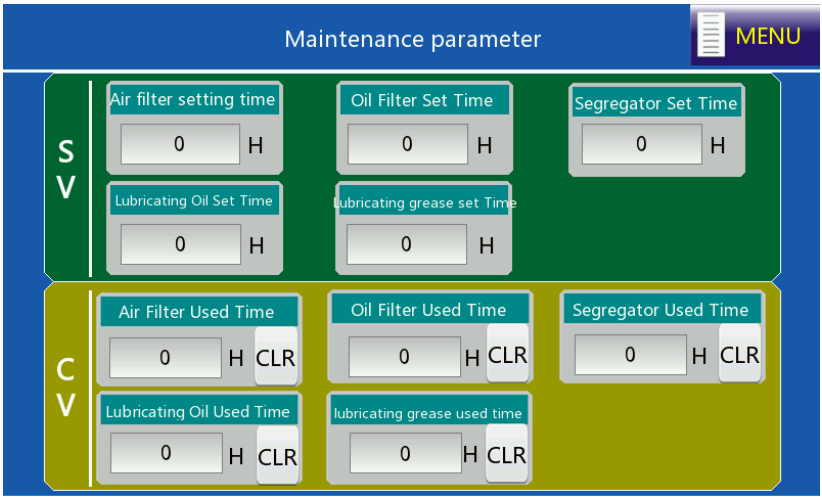


Figure 4-10 Maintenance parameter interface

10. Click **Protect parameter** in the menu.

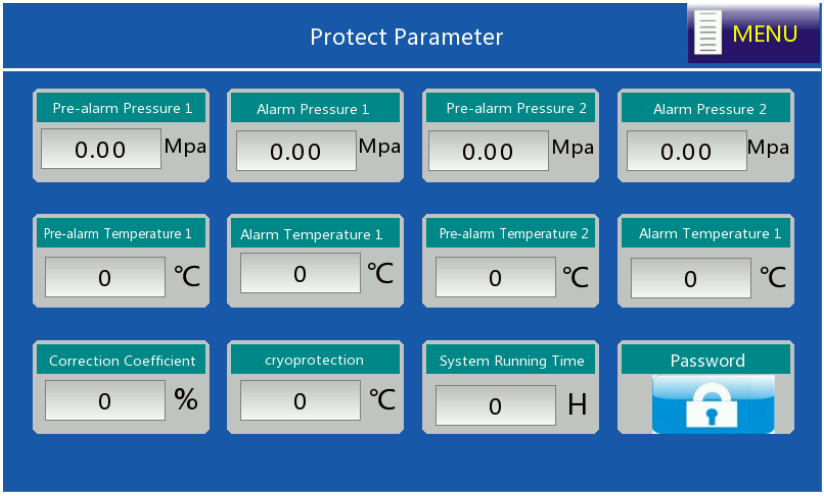


Figure 4-11 Protection parameter interface

11. Click **Running Info** in the menu.

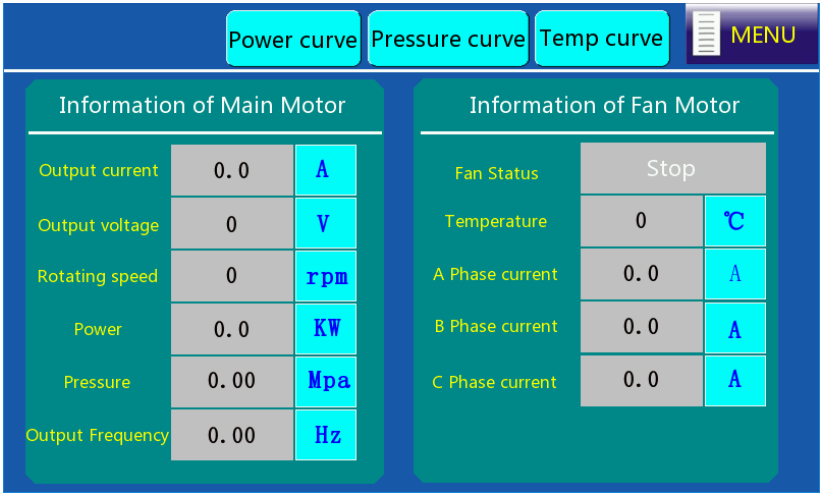


Figure 4-12 Running information interface

12. After adjusting user parameters, factory parameters and maintenance parameters according to the manual, return to **Workspace** interface and click **Start** to run.

4.2 Plot controller adaptation commissioning

4.2.1 System wiring

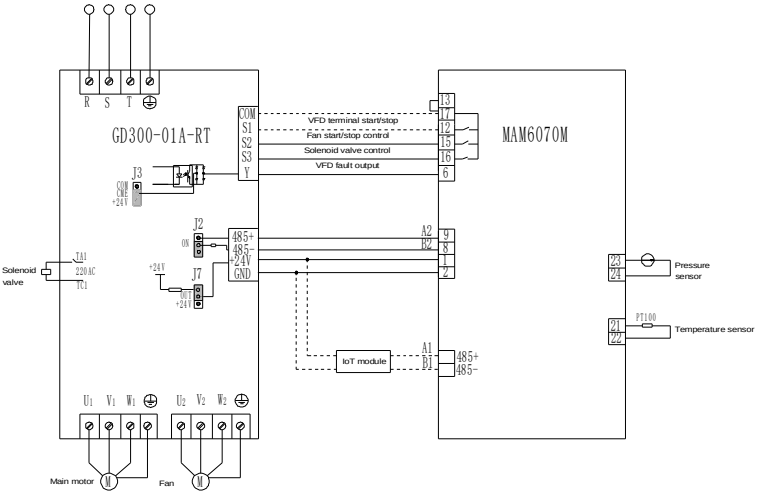


Figure 4-13 Wiring diagram for Plot controller 6070M + GD300-01A-RT VFD

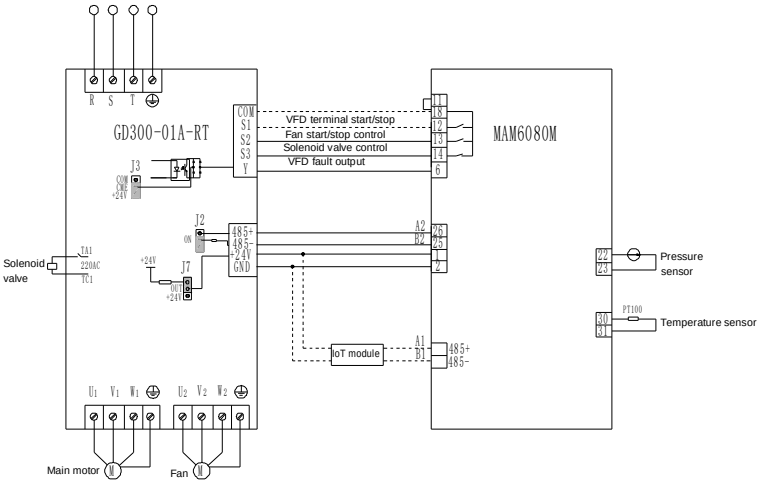


Figure 4-14 Wiring diagram for Plot controller 6080M + GD300-01A-RT VFD

4.2.2 Commissioning steps

Goodrive300-01A-RT series VFD can be used with Plot controller. The commissioning procedures are as follows.

1. Perform wiring according to the wiring diagram based on onsite needs. Generally, start and stop the master in communication control. It is recommended to use the terminal to control start and stop of the main motor when the interference on the sire is strong. To start and stop the main motor in terminal control, it is necessary to connect COM to S1 in accordance with the dotted line, ensure that the VFD and air compressor shell are grounded.

2. Set jumpers according to Figure 4-13. Set P06.01=5, set the calibration parameter of Plot controller (**Phase sequence protection value**) to 0 and block **Phase sequence error 1**, as shown in Figure 4-20. Set the hardware parameter of Plot controller pin 6 to **Main motor VFD fault NO**, as shown in Figure 4-19. After these parameters are set completely, main motor VFD fault output is available.

3. Set P00.18=1 to restore to default value, and configure the system parameters sequentially according to Table 4-1.

Table 4-1 System parameter configuration

Function code	Name	Parameter setting	Remarks
P00.00	Speed control mode	0	0: SVC mode 0
P00.03	Max. output frequency	Model depended	P00.04–400.00Hz
P00.04	Upper limit of running frequency	Model depended	P00.05–P00.03 (max. output frequency)

Function code	Name	Parameter setting	Remarks
P00.05	Lower limit of running frequency	Model depended	0.00Hz–P00.04 (upper limit of running frequency)
P00.14	Carrier frequency setting	Model depended	4KHz (default value)
P00.18	Function parameter restore	1	1: Restore to default value

4. Set the motor parameters according to the nameplate.

Table 4-2 Motor parameter configuration

Function code	Name	Parameter setting	Remarks
P00.15	Motor parameter autotuning	1, 2	1: Rotary autotuning 2: Static autotuning 1 (comprehensive autotuning)
P02.00	Motor type	1	Motor type: synchronous motor (SM)
P02.15	Rated power of SM 1	Model depended	0.1–3000.0kW
P02.16	Rated frequency of SM 1	Model depended	0.01Hz–P00.03 (max. output frequency)
P02.17	Number of pole pairs of SM 1	Model depended	1–50
P02.18	Rated voltage of SM 1	Model depended	0–1200V
P02.19	Rated current of SM 1	Model depended	0.8–6000.0A
P02.23	Counter-emf constant of SM 1	Model depended	0–10000

Note:

✧ It's a must to perform motor parameter autotuning after motor parameters are set completely.

✧ If the motor is already loaded on the site, it is recommended to perform static autotuning 1 (comprehensive autotuning).

✧ Start jogging after parameters are identified.

5. Configure parameters with one click

Start/stop the VFD with one click in communication mode when P00.18=3. The details of parameter configuration are shown in Table 4-3.

Table 4-3 Parameters for starting/stopping the main motor through communication

Function code	Name	Parameter setting	Remarks
P00.01	Channel of running commands	2	2: Communication (LED on)
P00.06	Setting channel of A frequency command	8	8: Modbus communication
P00.11	ACC time 1	20	0.0–3600.0s
P00.12	DEC time 1	20	0.0–3600.0s
P00.18	Function parameter restore	3	3: Start/stop the VFD with one click in communication mode 4: Start/stop the VFD with one click in terminal mode
P05.01	Function of S1	0	No function
P05.02	Function of S2	48	48: Fan running control signal
P05.03	Function of S3	49	49: Solenoid valve control signal
P06.01	Y1 output	5	5: VFD in fault
P06.03	Solenoid valve output	28	28: Solenoid valve control output
P14.00	Local communication address	1	1–247; 0 indicates a broadcast address
P14.01	Communication baud rate	3	3: 9600BPS
P14.02	Data bit check	0	0: No parity check (N, 8, 1) for RTU
P14.04	Communication timeout time	40.0	0.0 (invalid); 0.1–60.0s
P14.05	Transmission error processing	4	4: Alarm and coast to stop, and automatic fault reset after communication is restored
P18.43	Fan control mode	1	1: Terminal, the power-frequency fan starts/stops via terminals
P21.00	Rated current of the fan	Modifiable	7.5 kW/11 kW/15kW, fan 0.75kW 2.5A 22kW, fan 1kW 3A 30kW/37kW, fan 1.5kW 3.7A

Note:

✧ The size of the rated fan current will be selected automatically according to the power stage of the VFD.

✧ Fan parameters can be changed according to actual conditions.

Start/stop the VFD with one click in terminal mode when P00.18=4. It is required to connect S1 and COM to the Plot controller. The details of parameter configuration are shown in Table 4-4.

Table 4-4 Parameters for starting/stopping the main motor through terminal

Function code	Name	Parameter setting	Remarks
P00.01	Channel of running commands	1	1: Terminal (LED blinks) 1: Terminal (LED blinks)
P00.06	Setting channel of A frequency command	8	8: Modbus communication
P00.11	ACC time 1	20	0.0–3600.0s
P00.12	DEC time 1	20	0.0–3600.0s
P00.18	Function parameter restore	4	3: Start/stop the VFD with one click in communication mode 4: Start/stop the VFD with one click in terminal mode
P05.01	Function of S1	1	1: Run forward
P05.02	Function of S2	48	48: Fan running control signal
P05.03	Function of S3	49	49: Solenoid valve control signal
P06.01	Y1 output	5	5: VFD in fault
P06.03	Solenoid valve output	28	28: Solenoid valve control output
P14.00	Local communication address	1	1–247; 0 indicates a broadcast address
P14.01	Communication baud rate	3	3: 9600BPS
P14.02	Data bit check	0	0: No parity check (N, 8, 1) for RTU
P14.04	Communication timeout time	40.0	0.0 (invalid); 0.1–60.0s
P14.05	Transmission error processing	4	4: Alarm and coast to stop, and automatic fault reset after communication is restored
P18.43	Fan control mode	1	1: Terminal, the power-frequency fan starts/stops via terminals
P21.00	Rated current of the fan	Modifiable	7.5 kW /11 kW /15kW, fan 0.75kW 2.5A 22kW, fan 1kW 3A 30kW/37kW, fan 1.5kW 3.7A

After above steps are set completely, the VFD can be used with the Plot controller.

The Plot controller can display the current running state of the air compressor, and you can set the common parameters through the touch screen.

The operation method is shown as follows.

Figure 4-15 Main working interface of the Plot controller

Click the **Menu** button to enter the menu selection interface.

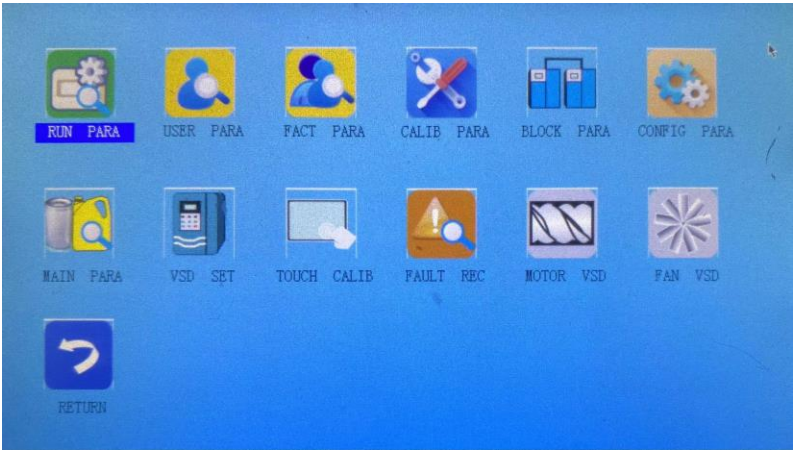


Figure 4-16 Menu selection interface

You can click an icon to enter the corresponding interface and use common functions, such as user parameter configuration and running state viewing. The following figure shows the common icons and corresponding function features.

Running parameters: Oil filter running time, air filter running time, and fan/main motor phase current.

User parameters: Set the air-supply loading pressure, air-supply unloading pressure, fan start/stop temperature, delay, and other common parameters.

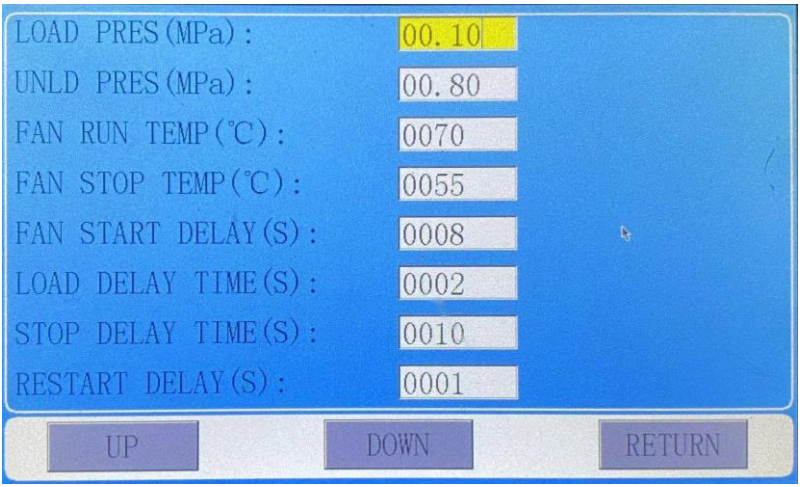


Figure 4-17 User parameter interface

Main motor frequency conversion: Set the frequency conversion pressure, start frequency, power, and ACC/DEC time.

Figure 4-18 Main motor frequency conversion interface

Hardware parameter: Set the terminal functions of the controller.

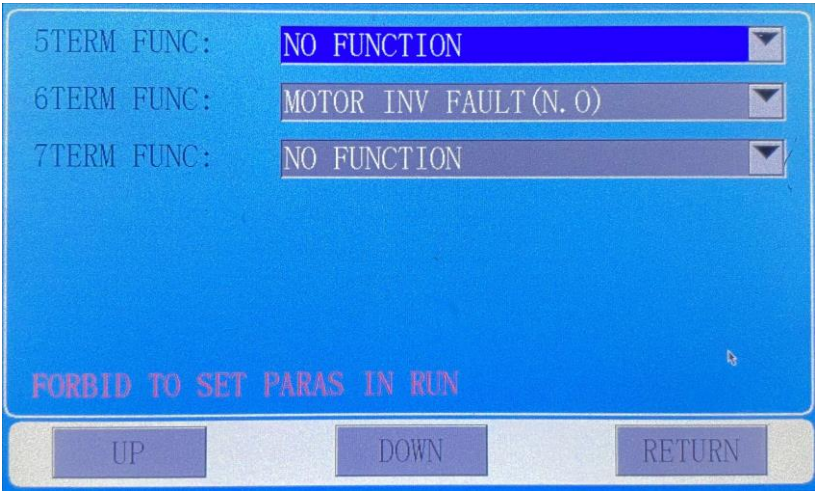


Figure 4-19 Hardware parameter setting interface

Calibration parameter: Set relevant data of the controller.

Figure 4-20 Calibration parameter setting interface

Factory parameters: Set unloading pressure, rated fan current, pre-alarm temperature, and alarm stop temperature.

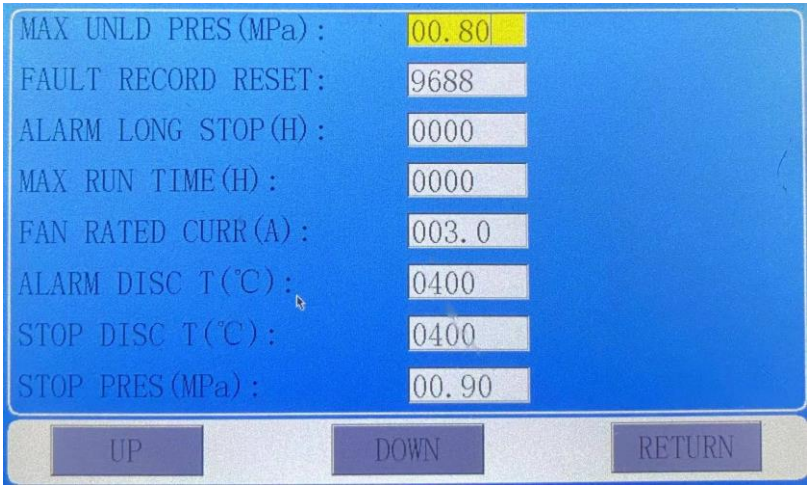


Figure 4-21 Factory parameter interface

After parameters are set completely, return to **Workspace** interface and click **Start** to run.

5 Function description

5.1 Function parameter list

"○" 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 the actually detected value which cannot be modified.

(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, SM) 1: SVC mode 1(applicable to AM) 2: V/F control **Note:** AM: Asynchronous Motor; SM: Synchronous Motor; If vector mode is adopted, it is a must to carry out motor parameter autotuning on the VFD first.	0	◎
P00.01	Channel of running commands	0: Keypad (LED off) 1: Terminal (LED blinks) 2: Communication (LED on)	0	○
P00.02	Communication mode of running commands	0: Modbus communication 1–3: Reserved	0	○
P00.03	Max. output frequency	P00.04–400.00Hz	50.00Hz	◎
P00.04	Upper limit of running frequency	P00.05–P00.03 (max. output frequency)	50.00Hz	○
P00.05	Lower limit of running frequency	0.00Hz–P00.04 (upper limit of running frequency)	0.00Hz	○
P00.06	Setting channel of A frequency command	0: Keypad 1: Analog P1- 2–6: Reserved 7: PID control setting 8: Modbus communication 9–11: Reserved	0	○

Function code	Name	Description	Default	Modify
P00.10	Frequency set through keypad	0.00 Hz–P00.03 (max. output frequency)	50.00Hz	○
P00.11	ACC time 1	0.0–3600.0s	Model depended	○
P00.12	DEC time 1	0.0–3600.0s	Model depended	○
P00.13	Running direction	0: Run at the default direction. 1: Run at the opposite direction. 2: Disable reverse running	2	○
P00.14	Carrier frequency setting	1.0–8.0kHz	4	○
P00.15	Motor parameter autotuning	0: No operation 1: Rotary autotuning 2: Static autotuning 1 (comprehensive autotuning)	0	◎
P00.16	AVR function selection	0: Disable 1: Valid during the whole procedure	1	○
P00.17	VFD type	0: G type	0	◎
P00.18	Function parameter restore	0: No operation 1: Restore to default value 2: Clear fault history 3: Start/stop the VFD with one click in communication mode (compatible with the Plot controller) 4: Start/stop the VFD with one click in terminal mode (compatible with the Plot controller) **Note:** Though restoring to default values is enabled, the motor parameters in P02 group remain unchanged; P18.04, P18.28, P18.29, P18.32, P18.33, P21.04, P21.05, and P21.06 also remain unchanged.	0	◎

P01 group Start and stop control

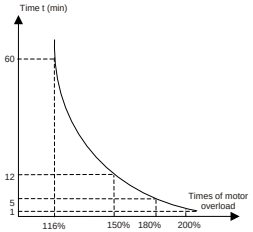
Function code	Name	Description	Default	Modify
P01.00	Start mode	0: Direct start	0	◎
P01.01	Starting frequency of direct start	0.00–50.00Hz	0.50Hz	◎
P01.02	Starting frequency hold time	0.00–50.00s	0.00s	◎
P01.03	Braking current before start	0.0–150.0%	0.0%	◎
P01.04	Braking time before start	0.00–50.00s	0.00s	◎
P01.05	ACC and DEC mode	0: Linear	0	○
P01.08	Stop mode	0: Decelerate to stop 1: Coast to stop	0	○
P01.09	Starting frequency of DC braking for stop	0.00–P00.03 (max. output frequency)	0.00Hz	○
P01.10	Wait time before DC braking for stop	0.00–50.00s	0.00s	○
P01.11	DC braking current for stop	0.0–150.0%	0.0%	○
P01.12	DC braking time for stop	0.00–50.00s	0.00s	○
P01.13	FWD/REV running deadzone time	0.0–3600.0s	0.0s	○
P01.14	FWD/REV running switching mode	0: Switch at zero frequency 1: Switch at the starting frequency 2: Switch after the speed reaches the stop speed with a delay	0	◎
P01.15	Stop speed	0.00–100.00Hz	5.00Hz	◎
P01.16	Stop speed detection mode	0: Detect as per the set speed value (judge the ramp frequency) 1: Detect as per the speed feedback value (valid for vector control only)	1	◎
P01.17	Feedback speed detection time	0.00–100.00s (valid only when P01.16=1)	0.50s	◎
P01.18	Terminal-based running command protection at power-on	0: The terminal running command is invalid at power-on 1: The terminal running command is valid at power-on	0	○

Function code	Name	Description	Default	Modify
P01.19	Action selected when running frequency less than frequency lower limit (valid when frequency lower limit greater than 0)	0: Run at the frequency lower limit	0	◎
P01.21	Power-off restart selection	0: Disable 1: Enable	0	○
P01.22	Wait time for restart after power-off	0.0–3600.0s (valid when P01.21=1)	1.0s	○
P01.23	Start delay	0.0–60.0s	0.0s	○
P01.24	Stop speed delay	0.0–100.0 s	0.0s	○
P01.25	0Hz output	0: Output without voltage 1: Output with voltage 2: Reserved	0	○

P02 group Motor 1 parameters

Function code	Name	Description	Default	Modify
P02.00	Type of motor 1	0: Asynchronous motor (AM)	0	◎
P02.01	Rated power of AM 1	0.1–3000.0kW	Model depended	◎
P02.02	Rated frequency of AM 1	0.01Hz–P00.03 (max. output frequency)	50.00Hz	◎
P02.03	Rated speed of AM 1	1–36000rpm	Model depended	◎
P02.04	Rated voltage of AM 1	0–1200V	Model depended	◎
P02.05	Rated current of AM 1	0.8–6000.0A	Model depended	◎
P02.06	Stator resistance of AM 1	0.001–65.535Ω	Model depended	○
P02.07	Rotor resistance of AM 1	0.001–65.535Ω	Model depended	○
P02.08	Leakage inductance of AM 1	0.1–6553.5mH	Model depended	○

Function code	Name	Description	Default	Modify
P02.09	Mutual inductance of AM 1	0.1–6553.5mH	Model depended	○
P02.10	No-load current of AM 1	0.1–6553.5A	Model depended	○
P02.11	Magnetic saturation coefficient 1 of iron core of AM 1	0.0–100.0%	80.0%	◎
P02.12	Magnetic saturation coefficient 2 of iron core of AM 1	0.0–100.0%	68.0%	◎
P02.13	Magnetic saturation coefficient 3 of iron core of AM 1	0.0–100.0%	57.0%	◎
P02.14	Magnetic saturation coefficient 4 of iron core of AM 1	0.0–100.0%	40.0%	◎
P02.15	Rated power of SM 1	0.1–3000.0kW	Model depended	◎
P02.16	Rated frequency of SM 1	0.01Hz–P00.03 (max. 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	◎
P02.20	Stator resistance of SM 1	0.001–65.535Ω	Model depended	○
P02.21	Direct-axis inductance of SM 1	0.01–655.35mH	Model depended	○
P02.22	Quadrature-axis inductance of SM 1	0.01–655.35mH	Model depended	○
P02.23	Counter-emf constant of SM 1	0–10000	350	○
P02.26	Overload protection selection of motor 1	0: No protection 1: Normal motor (with low speed compensation)	2	◎

Function code	Name	Description	Default	Modify
		2: Variable-frequency motor (without low speed compensation)		
P02.27	Overload protection coefficient of motor 1	Motor overload multiple 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 1 minute; and when M ⩾ 400%, protection is performed immediately.  Setting range: 20.0%–120.0%	100.0%	○
P02.28	Power calibration coefficient of motor 1	0.00–3.00	1.00	○
P02.29	Parameter display selection of motor 1	0: Displayed according to the motor type 1: All displayed	0	○

P03 group Vector control

Function code	Name	Description	Default	Modify
P03.00	Speed-loop proportional gain 1	0–200.0	20.0	○
P03.01	Speed-loop integral time 1	0.000–10.000s	0.200s	○

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th><th>Modify</th></tr>
<tr><td>P03.02</td><td>Low-point frequency for switching</td><td>0.00Hz–P03.05</td><td>5.00Hz</td><td>○</td></tr>
<tr><td>P03.03</td><td>Speed-loop proportional gain 2</td><td>0–200.0</td><td>10.0</td><td>○</td></tr>
<tr><td>P03.04</td><td>Speed-loop integral time 2</td><td>0.000–10.000s</td><td>1.000s</td><td>○</td></tr>
<tr><td>P03.05</td><td>High-point frequency for switching</td><td>P03.02–P00.03 (max. output frequency)</td><td>10.00Hz</td><td>○</td></tr>
<tr><td>P03.06</td><td>Speed-loop output filter</td><td>0–8 (corresponding to 0–2^8/10ms)</td><td>0</td><td>○</td></tr>
<tr><td>P03.07</td><td>Electromotive slip compensation coefficient of vector control</td><td>50%–200%</td><td>100%</td><td>○</td></tr>
<tr><td>P03.08</td><td>Power generation slip compensation coefficient of vector control</td><td>50%–200%</td><td>100%</td><td>○</td></tr>
<tr><td>P03.09</td><td>ACR proportional coefficient P</td><td>0–65535</td><td>1000</td><td>○</td></tr>
<tr><td>P03.10</td><td>ACR integral coefficient I</td><td>Refer to the commissioning empirical parameters:
<table>
<tr><th>P03.09 value (reference)</th><th>P03.10 value (reference)</th><th>Motor power</th></tr>
<tr><td>2000</td><td>1000</td><td>7.5–22kW</td></tr>
<tr><td>2500</td><td>1500</td><td>30–37kW</td></tr>
</table></td><td>1000</td><td>○</td></tr>
<tr><td>P03.11</td><td>Torque setting method</td><td>0: Torque control is invalid
1: Keypad (P03.12)
2: P1- (100% corresponding to three times the motor rated current)
3–6: Reserved
7: Modbus communication (same as the above)
8–10: Reserved</td><td>0</td><td>○</td></tr>
<tr><td>P03.12</td><td>Torque set through keypad</td><td>-300.0%–300.0% (of the motor rated current)</td><td>50.0%</td><td>○</td></tr>
<tr><td>P03.13</td><td>Torque reference filter time</td><td>0.000–10.000s</td><td>0.010s</td><td>○</td></tr>
</table>

Function code	Name	Description	Default	Modify
P03.14	Setting source of forward rotation upper-limit frequency in torque control	0: Keypad (P03.16) 1: P1- (100% corresponding to the max. frequency) 2–5: Reserved 6: Modbus communication (same as the above) 7–9: Reserved	0	○
P03.15	Setting source of reverse rotation upper-limit frequency in torque control	0: Keypad (P03.17) 1: P1- (100% corresponding to the max. frequency) 2–5: Reserved 6: Modbus communication (same as the above) 7–9: Reserved	0	○
P03.16	Forward rotation upper-limit frequency set through keypad in torque control	0.00Hz–P00.03	50.00Hz	○
P03.17	Reverse rotation upper-limit frequency set through keypad in torque control	0.00 Hz–P00.03	50.00Hz	○
P03.18	Setting source of electromotive torque upper limit	0: Keypad (P03.20) 1: P1- (100% corresponding to three times the motor rated current) 2–4: Reserved 5: Modbus communication (same as the above) 6–8: Reserved	0	○
P03.19	Setting source of braking torque upper limit	0: Keypad (P03.21) 1: P1- (100% corresponding to three times the motor rated current) 2–4: Reserved 5: Modbus communication (same as the above) 6–8: Reserved	0	○

Function code	Name	Description	Default	Modify
P03.20	Electromotive torque upper limit set through keypad	0.0–300.0% (of the motor rated current)	180.0%	○
P03.21	Braking torque upper limit set through keypad	0.0–300.0% (of the motor rated current)	180.0%	○
P03.22	Weakening coefficient in constant power zone	0.1–2.0	0.3	○
P03.23	Lowest weakening point in constant power zone	10%–100%	20%	○
P03.24	Max. voltage limit	0.0–120.0%	100.0%	○
P03.25	Pre-exciting time	0.000–10.000s	0.300s	○
P03.26	Flux-weakening proportional gain	0–8000	300	○
P03.27	Speed display selection in vector control	0: Display the actual value 1: Display the set value	0	○

P04 group SVPWM control

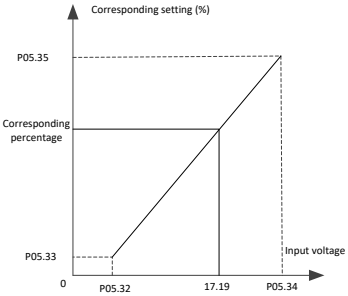
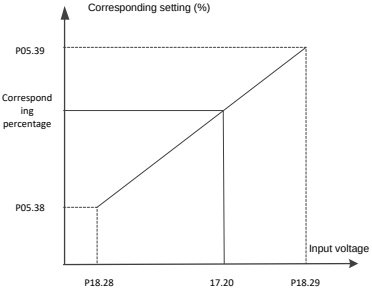
Function code	Name	Description	Default	Modify
P04.00	V/F curve setting of motor 1	0: Straight-line V/F curve	0	◎
P04.01	Torque boost of motor 1	0.0%: (automatic); 0.1%–10.0%	0.0%	○
P04.02	Torque boost cut-off of motor 1	0.0%–50.0% (relative to rated frequency of motor 1)	20.0%	○
P04.03	V/F frequency point 1 of motor 1	0.00Hz–P04.05	0.00Hz	○
P04.04	V/F voltage point 1 of motor 1	0.0%–110.0% (of the rated voltage of motor 1)	00.0%	○
P04.05	V/F frequency point 2 of motor 1	P04.03– P04.07	00.00Hz	○
P04.06	V/F voltage point 2 of motor 1	0.0%–110.0% (of the rated voltage of motor 1)	00.0%	○

Function code	Name	Description	Default	Modify
P04.07	V/F frequency point 3 of motor 1	P04.05–P02.02 (rated frequency of AM 1) /P04.05–P02.16 (rated frequency of SM 1)	00.00Hz	○
P04.08	V/F voltage point 3 of motor 1	0.0%–110.0% (of the rated voltage of motor 1)	00.0%	○
P04.09	V/F slip compensation gain of motor 1	0.0–200.0%	100.0%	○
P04.10	Low-frequency oscillation control factor of motor 1	0–100	10	○
P04.11	High-frequency oscillation control factor of motor 1	0–100	10	○
P04.12	Oscillation control threshold of motor 1	0.00Hz–P00.03 (max. output frequency)	30.00Hz	○
P04.26	Energy-saving run	0: Disable 1: Automatic energy-saving run	0	◎
P04.33	Weakening coefficient in constant power zone	1.00–1.30	1.00	○
P04.34	Reactive closed-loop proportional coefficient	0–3000 When the SM V/F control mode is enabled, the function code is used to set the proportional coefficient of the reactive current closed-loop control.	100	○
P04.35	Reactive closed-loop integral coefficient	0–3000 When the SM V/F control mode is enabled, the function code is used to set the integral coefficient of the reactive current closed-loop control.	20	○

P05 group Input terminals

Function code	Name	Description	Default	Modify
P05.01	Function of S1	0: No function 1: Run forward 2: Run reversely 3: Three-wire running control 4: Jog forward 5: Jog reversely 6: Coast to stop 7: Reset faults 8: Pause running 9: External fault input 10–11: Reserved 12: Clear frequency increase/decrease setting 13–15: Reserved 16: Multi-step speed terminal 1 17: Multi-step speed terminal 2 18: Multi-step speed terminal 3 19: Multi-step speed terminal 4 20: Multi-step speed pause 21: ACC/DEC time selection 1 22: ACC/DEC time selection 2 23–24: Reserved 25: Pause PID control 26–29: Reserved 30: ACC/DEC disabled 31–32: Reserved 33: Clear frequency increase/decrease setting temporarily 34: DC braking for stop 35: Reserved 36: Command switches to keypad 37: Command switches to terminal 38: Command switches to communication 39: Pre-exciting command 40: Clear electricity consumption 41: Keep electricity consumption 42: Air filter blockage signal	0	◎
P05.02	Function of S2		0	◎
P05.03	Function of S3		0	◎
P05.04	PTC signal input		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>43: Oil filter blockage signal
44: Separator blockage signal
45: Precision splitter blockage signal
46: External fault 1 (motor overtemperature)
47: External fault 2
48: Fan running control signal (valid when P18.43=1)
49: Solenoid valve control signal
50: Cooling fan control signal of main motor
51: PTC signal (valid when P18.00=1)
52–63: 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><th></th><th>BIT8</th><th>BIT7</th><th>BIT6</th><th>BIT5</th></tr>
<tr><td></td><td>Reserved</td><td>Reserved</td><td>Reserved</td><td>Reserved</td></tr>
<tr><th>BIT4</th><th>BIT3</th><th>BIT2</th><th>BIT1</th><th>BIT0</th></tr>
<tr><td>Reserved</td><td>PTC</td><td>S3</td><td>S2</td><td>S1</td></tr>
</table>
Setting range: 0x000–0x1FF</td><td>0x008</td><td>○</td></tr>
<tr><td>P05.11</td><td>Digital input filter time</td><td>0.000–1.000s</td><td>0.200s</td><td>○</td></tr>
<tr><td>P05.12</td><td>Virtual terminal setting</td><td>0: Virtual terminals are invalid
1: Modbus communication virtual terminals are valid
2–4: Reserved</td><td>0</td><td>◎</td></tr>
<tr><td>P05.13</td><td>Terminal control mode</td><td>0: 2-wire control 1
1: 2-wire control 2
2: 3-wire control 1
3: 3-wire control 2</td><td>0</td><td>◎</td></tr>
<tr><td>P05.14</td><td>S1 switch-on delay</td><td rowspan="6">0.000–50.000s</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>
<tr><td>P05.16</td><td>S2 switch-on delay</td><td>0.000s</td><td>○</td></tr>
<tr><td>P05.17</td><td>S2 switch-off delay</td><td>0.000s</td><td>○</td></tr>
<tr><td>P05.18</td><td>S3 switch-on delay</td><td>0.000s</td><td>○</td></tr>
<tr><td>P05.19</td><td>S3 switch-off delay</td><td>0.000s</td><td>○</td></tr>
</table>

Function code	Name	Description	Default	Modify
P05.32	P1 lower limit	 The corresponding percentage is obtained based on the relationship between the upper and lower limits and their corresponding settings, shown in the following figure. Present pressure = corresponding percentage × pressure sensor P1 upper limit	2.00V	○
P05.33	Corresponding setting of P1 lower limit	Setting range of P05.32: 0.00V–P05.34 Setting range of P05.33: -100.0%–100.0%	0.0%	○
P05.34	P1 upper limit	Setting range of P05.34: P05.32–10.00V	10.00V	○
P05.35	Corresponding setting of P1 upper limit	Setting range of P05.35: -100.0%–100.0%	100.0%	○
P05.36	P1 input filter time	0.000s–10.000s	0.200s	○
P05.37	PT1 lower limit	 Corresponding setting of the upper and lower limits are set as a percentage that temperature calibration point accounts for total range, and analog percentage corresponding to input voltage can be	0.00V	○
P05.38	Corresponding setting of PT1 lower limit		12.5%	○
P05.39	PT1 upper limit		10.00V	○
P05.40	Corresponding setting of PT1 upper limit		75.0%	○

Function code	Name	Description	Default	Modify
		obtained by the linear relationship between the upper and lower limits and their corresponding settings. Present temperature = corresponding percentage × 160℃ Setting range of P05.37: 0.00V–P05.39 Setting range of P05.38: -100.0%–100.0% Setting range of P05.39: P05.37–10.00V Setting range of P05.40: -100.0%–100.0%		
P05.41	PT1 input filter time	0.000s–10.000s	0.300s	○
P05.47	PT2 lower limit	0.00V–P05.49	0.00V	○
P05.48	Corresponding setting of PT2 lower limit	-100.0%–100.0%	12.5%	○
P05.49	PT2 upper limit	P05.47–10.00V	10.00V	○
P05.50	Corresponding setting of PT2 upper limit	-100.0%–100.0%	75.0%	○
P05.51	PT2 input filter time	0.000s–10.000s	0.300s	○

P06 group Output terminals

Function code	Name	Description	Default	Modify
P06.01	Y1 output	0: Disable 1: Running 2: Running forward 3: Running reversely 4: Jogging 5: VFD in fault 6–11: Reserved 12: Ready for running 13: Pre-exciting 14–19: Reserved 20: External fault is valid 21–22: Reserved 23: Modbus communication virtual terminal output 24–26: Reserved 27: Fan start/stop control	0	○
P06.02	RO1 output		0	○
P06.03	Solenoid valve output (TA1-TC1)		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>28: Solenoid valve control output
29: Cooling fan control of main motor
30: System fault (used for air compressor)</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><th>BIT3</th><th>BIT2</th><th>BIT1</th><th>BIT0</th></tr><tr><td>Reserved</td><td>TA1-TC1</td><td>RO1</td><td>Y1</td></tr></table>Setting range: 0–0xF</td><td>0</td><td>○</td></tr>
<tr><td>P06.06</td><td>Y1 switch-on delay</td><td rowspan="6">0.000–50.000s</td><td>0.000s</td><td>○</td></tr>
<tr><td>P06.07</td><td>Y1 switch-off delay</td><td>0.000s</td><td>○</td></tr>
<tr><td>P06.10</td><td>Solenoid valve (TA1-TC1) switch-on delay</td><td>0.000s</td><td>○</td></tr>
<tr><td>P06.11</td><td>Solenoid valve (TA1-TC1) switch-off delay</td><td>0.000s</td><td>○</td></tr>
<tr><td>P06.12</td><td>RO1 switch-on delay</td><td>0.000s</td><td>○</td></tr>
<tr><td>P06.13</td><td>RO1 switch-off delay</td><td>0.000s</td><td>○</td></tr>
</table>

P07 group HMI

Function code	Name	Description	Default	Modify
P07.00	User password	0–65535	0	○
P07.01	Function parameter copy	0: No operation 1: Uploading function parameters from the machine to keypad 2: Downloading function parameters (including the motor parameters) from the keypad to machine 3: Downloading function parameters (excluding motor parameters of the P02 and P12 groups) from the keypad to machine 4: Downloading function parameters (only motor parameters of the P02 and P12	0	◎

Function code	Name	Description	Default	Modify
		groups) from the keypad to machine **Note:** After the parameter is set to 1, 2, 3 or 4, and the operation is executed, the parameter is automatically restored to 0.		
P07.02	Function of QUICK/JOG	0: No function 1: Jogging 2: Switch display status through the shifting key 3: Forward/reverse running switching 4: Clear the setting of UP/DOWN 5: Coast to stop 6: Switch running-command giving methods in sequence 7: Quick debugging mode (non-factory parameter debugging)	1	◎
P07.03	Sequence of switching running-command channels by pressing QUICK	0: Keypad→Terminal→Communication 1: Keypad←→Terminal 2: Keypad←→Communication 3: Terminal←→Communication	0	○
P07.04	Stop function selection of STOP/RST	0: Valid only for keypad control 1: Valid both for keypad and terminal control 2: Valid both for keypad and communication control 3: Valid for all control modes	0	○
P07.05	Selection 1 of parameters displayed in running state	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)	0x03FF	○

Function code	Name	Description	Default	Modify
		BIT13–BIT15: Reserved		
P07.06	Selection 2 of parameters displayed in running state	0x0000–0xFFFF BIT0: Analog P1- value (V on) BIT1–BIT3: Reserved BIT4: Motor overload percentage (% on) BIT5: VFD overload percentage (% on) BIT6: Ramp frequency reference value (Hz on) BIT7: Linear speed BIT8: AC incoming current BIT9–15: 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: Analog P1- value (V on) BIT8–BIT15: Reserved	0x00FF	○
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	0–100.0℃		●
P07.12	Temperature of inverter module	0–100.0℃		●

Function code	Name	Description	Default	Modify
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	0–65535 kWh (*1000)		●
P07.16	Low bit of power consumption of the VFD	0.0–999.9 kWh		●
P07.17	VFD model	0: G type 1: P type		●
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 barcode 1	0x0000–0xFFFF		●
P07.22	Factory barcode 2	0x0000–0xFFFF		●
P07.23	Factory barcode 3	0x0000–0xFFFF		●
P07.24	Factory barcode 4	0x0000–0xFFFF		●
P07.25	Factory barcode 5	0x0000–0xFFFF		●
P07.26	Factory barcode 6	0x0000–0xFFFF		●
P07.27	Present fault type	0: No fault		●
P07.28	Last fault type	1–3: Reserved		●
P07.29	2nd-last fault type	4: Overcurrent at acceleration (OC1)		●
P07.30	3rd-last fault type	5: Overcurrent at deceleration (OC2)		●
P07.31	4th-last fault type	6: Overcurrent at constant speed (OC3)		●
P07.32	5th-last fault type	7: Overvoltage at acceleration (OV1) 8: Overvoltage at deceleration (OV2) 9: Overvoltage at constant speed (OV3) 10: Bus undervoltage fault (UV) 11: Motor overload (OL1) 12: VFD overload (OL2) 13: Phase loss on input side (SPI) 14: Phase loss on output side (SPO) 15: Rectifier module overheating (OH1) 16: Inverter module overheating (OH2) 17: External fault (EF) 18: RS485 communication fault (CE)		●

Function code	Name	Description	Default	Modify
		19: Current detection fault (ItE) 20: Motor autotuning fault (tE) 21: EEPROM operation fault (EEP) 22: PID feedback offline fault (PIDE) 23: Reserved 24: Running time reached (END) 25: Electronic overload (OL3) 26: Panel 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) 37: Reserved 38: Phase sequence fault (PSF) 39: 3PH current imbalance of the fan (SPOF) 40: Fan overload (OLF) 41: Solenoid valve overcurrent (TOC)		
P07.33	Running frequency at present fault		0.00	●
P07.34	Ramp reference frequency at present fault		0.00	●
P07.35	Output voltage at present fault		0	●
P07.36	Output current at present fault		0.0	●
P07.37	Bus voltage at present fault		0.0	●
P07.38	Max. temperature at present fault		0.0	●
P07.39	Input terminal status at present fault		0	●
P07.40	Output terminal status at present fault		0	●

Function code	Name	Description	Default	Modify
P07.41	Running frequency at last fault		0.00	●
P07.42	Ramp reference frequency at last fault		0.00	●
P07.43	Output voltage at last fault		0	●
P07.44	Output current at last fault		0.0	●
P07.45	Bus voltage at last fault		0.0	●
P07.46	Max. temperature at last fault		0.0	●
P07.47	Input terminal status at last fault		0.0	●
P07.48	Output terminal status at last fault		0	●
P07.49	Running frequency at last fault		0	●
P07.50	Ramp reference frequency at 2nd-last fault		0.00	●
P07.51	Output voltage at 2nd-last fault		0	●
P07.52	Output current at 2nd-last fault		0	●
P07.53	Bus voltage at 2nd-last fault		0.0	●
P07.54	Max. temperature at 2nd-last fault		0.0	●
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	0.0–3600.0s	Model depended	○
P08.01	DEC time 2	0.0–3600.0s	Model depended	○
P08.02	ACC time 3	0.0–3600.0s	Model depended	○
P08.03	DEC time 3	0.0–3600.0s	Model depended	○
P08.04	ACC time 4	0.0–3600.0s	Model depended	○
P08.05	DEC time 4	0.0–3600.0s	Model depended	○
P08.06	Running frequency of jog	0.0–3600.0s	10.00Hz	○
P08.07	ACC time for jogging	0.0–3600.0s	Model depended	○
P08.08	DEC time for jogging	0.0–3600.0s	Model depended	○
P08.09	Jump frequency 1	0.00–P00.03 (max. output frequency)	0.00Hz	○
P08.10	Jump frequency amplitude 1	0.00–P00.03 (max. output frequency)	0.00Hz	○
P08.11	Jump frequency 2	0.00–P00.03 (max. output frequency)	0.00Hz	○
P08.12	Jump frequency amplitude 2	0.00–P00.03 (max. output frequency)	0.00Hz	○
P08.13	Jump frequency 3	0.00–P00.03 (max. output frequency)	0.00Hz	○
P08.14	Jump frequency amplitude 3	0.00–P00.03 (max. output frequency)	0.00Hz	○
P08.15	Bus voltage pre-protection function	0–0x11 Ones: Bus protection function Tens: Low-frequency current protection function	0x10	○
P08.16	Low-voltage protection threshold	0.0V–2000.0V	300.0V	○
P08.17	Overvoltage pre-protection threshold	0.0V–2000.0V	780.0V	○

Function code	Name	Description	Default	Modify
P08.18	Automatic restart delay	0.0–6000.0s	60.0s	○
P08.19	Low-voltage frequency limit running time	0.0–6000.0s	60.0s	○
P08.24	Fan protection	0x00–0x11 LED ones: 0: Disable the fan 3PH current imbalance protection 1: Enable the fan 3PH current imbalance protection LED tens: 0: Disable the fan overload protection 1: Enable the fan overload protection	0x11	○
P08.25	Keypad lock enable	0: Do not lock keypad 1: Allow to lock keypad Lock: Press PRG key+ DATA key simultaneously Unlock: Keep DATA key pressed down and then click V key by three times.	0	○
P08.26	Maintenance timing mode	0: No timing during sleep 1: Timing during sleep	0	○
P08.27	Optimization mode	0x00–0x11 LED ones: SM inductance optimization 0: Disable It is applicable to the surface-mounted synchronous motors. P02.21 (Direct-axis inductance of SM 1) and P02.22 (Quadrature-axis inductance of SM 1) are used in the calculation. 1: Enable It is applicable to the embedded/ surface-mounted synchronous motors. P02.21 (Direct-axis inductance of SM 1) is used in the calculation. **Note:** You can disable or enable the optimization mode according to the motor at the scene. LED tens: Bus voltage detection optimization 0: Disable	01	○

Function code	Name	Description	Default	Modify
		1: Enable		
P08.28	Auto fault reset count	During the automatic reset period, the fault will not be reported externally, only the keypad TRIP indicator blinks, and P17.39 shows the warning code. The automatic fault reset function is enabled for these faults, such as OUt1, OUt2, Out3, OL1, OL2, OH1, OH2, EF, CE, ItE, tE, EEP, END, PCE, UPE, DNE, ETH1, ETH2, PSF, etc. Fault codes will be reported immediately when these types of faults occur. Setting range of P08.28: 0–10 Setting range of P08.29: 0.1–3600.0s	5	○
P08.29	Auto fault reset interval setting		5.0s	○
P08.30	Frequency decrease ratio in drop control	0.00–50.00Hz	0.00Hz	○
P08.32	FDT1 electrical level detection value	0.00–P00.03 (max. output frequency)	50.00Hz	○
P08.33	FDT1 lagging detection value	-100.0–100.0% (FDT1 electrical level)	5.0%	○
P08.34	FDT2 electrical level detection value	0.00–P00.03 (max. output frequency)	50.00Hz	○
P08.35	FDT2 lagging detection value	-100.0–100.0% (FDT2 electrical level)	5.0%	○
P08.36	Detection value for frequency being reached	0.0–P00.03 (max. output frequency)	0.00Hz	○
P08.39	Running mode of cooling fan	0: Common running mode: Do not run during sleep. 1: The fan keeps running after power-on 2: Temperature control: The fan turns on when IGBT temperature is higher than 50℃ and turns off when it is lower than 45℃.	0	○
P08.40	PWM selection	0x00–0x21 LED ones: PWM mode selection 0: PWM mode 1, 3PH modulation and 2PH modulation 1: PWM mode 2, 3PH modulation	01	◎

Function code	Name	Description	Default	Modify
		LED tens: PWM low-speed carrier limit 0: Low-speed carrier limit mode 1 1: Low-speed carrier limit mode 2 2: No limit LED hundreds: Reserved		
P08.41	Overmodulation selection	0x00–0x11 LED ones: 0: Disable overmodulation 1: Enable overmodulation LED tens: 0: Mild overmodulation 1: Deepened overmodulation	01	◎
P08.42	Keypad data control setting	0x000–0x1223 LED ones: Frequency enabling selection 0: Both [∧/∨] key and digital potentiometer adjustments are valid 1: Only [∧/∨] keys adjustment is valid 2: Only digital potentiometer adjustment is valid 3: Neither [∧/∨] key nor digital potentiometer adjustment are valid LED tens: Frequency control selection 0: Valid only when P00.06 =0 1: Valid for all frequency setting methods 2: Invalid for multi-step speed running when multi-step speed running has the priority LED hundreds: Action selection for stop 0: Setting is valid. 1: Valid during running, cleared after stop 2: Valid during running, cleared after a stop command is received LED thousands: [∧/∨] keys and digital potentiometer integral function 0: The integral function is valid 1: The integral function is invalid	0x000	○
P08.43	Integral time of digital potentiometer	0.01–10.00s	0.10s	○

Function code	Name	Description	Default	Modify
P08.44	UP/DOWN terminal control setup	0x00–0x221 LED ones: Frequency enabling selection 0: UP/DOWN terminal setup is valid 1: UP/DOWN terminal setup is invalid LED tens: Frequency control selection 0: Valid only when P00.06 =0 1: All frequency modes are valid 2: Invalid for multi-step speed when multi-step speed takes priority LED hundreds: Action selection during stop 0: Setting is valid. 1: Valid during running, cleared after stop 2: Valid during running, cleared after a stop command is received	0x000	○
P08.45	UP terminal frequency incremental change rate	0.01–50.00Hz/s	0.50Hz/s	○
P08.46	DOWN terminal frequency decremental change rate	0.01–50.00Hz/s	0.50Hz/s	○
P08.47	Action selection for frequency setup during power down	0x000–0x111 LED ones: Action selection at power-off during frequency adjusting through digitals. 0: Save the setting at power-off. 1: Clear the setting at power-off. LED tens: Action selection at power-off during frequency adjusting through Modbus communication 0: Save the setting at power-off. 1: Clear the setting at power-off. LED hundreds: Action selection at power-off during frequency adjusting through other communication 0: Save the setting at power-off. 1: Clear the setting at power-off.	0x000	○
P08.48	High bit of initial value of power consumption	0–59999°(k)	0°	○

Function code	Name	Description	Default	Modify
P08.49	Low bit of initial value of power consumption	0.0–999.9°	0.0°	○
P08.50	Flux braking coefficient	0: Disable 100–150: A larger coefficient indicates a stronger brake intensity.	0	○
P08.51	VFD input power factor	0.00–1.00	0.56	○

P09 group PID control

Function code	Name	Description	Default	Modify
P09.00	PID reference source	0: Keypad digits (P09.01) 1: Analog P1- 2–4: Reserved 5: Multi-step running 6: Modbus communication 7–9: Reserved 10: Pressure setting of dedicated function of air compressor	0	○
P09.01	PID reference preset through keypad	-100.0%–100.0%	0.0%	○
P09.02	PID feedback source	0: Analog P1- 1–3: Reserved 4: Modbus communication 5–7: Reserved 8: Pressure feedback of dedicated function of air compressor	0	○
P09.03	PID output characteristics selection	0: PID output characteristic is positive: the feedback signal is larger than PID reference, which requires the VFD output frequency to decrease to balance PID, e.g. tension PID control of winding. 1: PID output characteristic is negative: feedback signal is larger than PID reference, which requires the VFD output frequency to increase to balance PID, e.g. tension PID control of unwinding.	0	○
P09.04	Proportional gain (Kp)	It determines the regulation intensity of the whole PID regulator, the larger the P is, the	10.00	○

Function code	Name	Description	Default	Modify
		stronger the regulation intensity is. If this parameter is 100, it means the regulation amplitude made on output frequency command by the proportional regulator (ignoring integral and differential actions) is the max. output frequency (P00.03) when the deviation between PID feedback quantity and reference quantity is 100%. Setting range: 0.00–100.00		
P09.05	Integral time (Ti)	It determines the speed of integral regulation made on the deviation between PID feedback quantity and reference quantity by PID regulator. When the deviation between PID feedback quantity and reference quantity is 100%, the regulation quantity (ignoring proportional and differential actions) of integral regulator can reach max. output frequency (P00.03) through continuous regulation in the time set by P09.05. The shorter the integral time, the stronger the regulation intensity. Setting range: 0.00–10.00s	2.00s	○
P09.06	Differential time (Td)	It determines the intensity of variation regulation made on the deviation between PID feedback quantity and reference quantity by PID regulator. If the feedback quantity changes by 100% during the time set by P09.06, the regulation quantity of differential regulator (ignoring proportional and integral actions) is the max. output frequency (P00.03). The longer the differential time, the stronger the regulation intensity. Setting range: 0.00–10.00s	1.00s	○
P09.07	Sampling cycle (T)	It means the sampling cycle of feedback quantity. The regulator calculates once during each sampling cycle. The longer the	0.100s	○

Function code	Name	Description	Default	Modify
		sampling cycle, the slower the response speed. Setting range: 0.001–10.000s		
P09.08	Final limit of PID control deviation	It means the max. allowed deviation quantity of the PID system feedback value relative to closed-loop reference value. Within the deviation limit, PID regulator stops regulating, this parameter can be used to regulate the precision and stability of PID system. Setting range: 0.0–100.0%	0.1%	○
P09.09	Upper limit value of PID output	P09.10 (lower limit value of PID output) –100.0%	100.0%	○
P09.10	Lower limit value of PID output	-100.0%–P09.09 (upper limit value of PID output)	0.0%	○
P09.11	Feedback offline detection value	0.0–100.0%	0.0%	○
P09.12	Feedback offline detection time	0.0–3600.0s	1.0s	○
P09.13	PID regulation selection	0x00–0x11 LED ones: 0: Continue integral regulation when the frequency reaches upper/lower limit 1: Stop integral regulation when the frequency reaches upper/lower limit LED tens: 0: The same with the set direction 1: Contrary to the set direction	0x01	○
P09.14	Differential filter times	0–60	2	○

P11 group Protection parameters

Function code	Name	Description	Default	Modify
P11.00	Phase loss protection	0x0000–0x1111 LED ones: 0: Disable input phase loss software protection	0x0110	○

Function code	Name	Description	Default	Modify
		1: Enable input phase loss software protection LED tens: 0: Disable output phase loss protection 1: Enable output phase loss protection LED hundreds: 0: Reserved 1: Reserved LED thousands: 0: Disable phase sequence protection 1: Enable phase sequence protection		
P11.03	Overvoltage stall protection	0: Disable 1: Enable	1	○
P11.04	Overvoltage stall protection voltage	120–150% (standard bus voltage) (380V)	140%	○
P11.05	Current limit selection	0x00–0x11 Ones: Current-limit action selection 0: Current-limit action is invalid 1: Current-limit action is always valid Tens: Reserved	1	◎
P11.06	Automatic current-limit level	50.0–200.0%	150.0%	◎
P11.07	Frequency drop rate at current limit	0.00–50.00Hz/s	10.00Hz/s	◎
P11.08	Pre-alarm selection for VFD/motor overload/underload	0x000–0x131 LED ones: 0: Motor overload/underload pre-alarm, relative to the motor rated current 1: VFD overload/underload pre-alarm, relative to the VFD rated current LED tens: 0: The VFD keeps running after reporting an overload/underload alarm. 1: The VFD keeps running after reporting an underload alarm, but it stops running after reporting an overload alarm. 2: The VFD keeps running after reporting an overload alarm, but it stops running after	0x000	○

Function code	Name	Description	Default	Modify
		reporting an underload alarm. 3: The VFD stops running after reporting an overload/underload alarm. LED hundreds: 0: Always detect 1: Detect only in constant speed running		
P11.09	Overload pre-alarm detection level	P11.11–200%	G type: 150%	○
P11.10	Overload pre-alarm detection time	0.1–3600.00s	1.0s	○
P11.11	Underload pre-alarm detection level	0%–P11.09	50%	○
P11.12	Underload pre-alarm detection time	0.1–3600.0s	1.0s	○
P11.13	Fault output terminal action during fault	0x00–0x11 LED ones: 0: Act during undervoltage fault 1: Do not act during undervoltage fault LED tens: 0: Act during automatic reset period 1: Do not act during automatic reset period	0x00	○
P11.14	Speed deviation detection value	0.0–50.0%	10.0%	○
P11.15	Speed deviation detection time	0.0–10.0s (Speed deviation protection is disabled when P11.15 is set to 0.0.)	0.5s	○
P11.16	Automatic frequency reduction during voltage drop	0: Invalid 1: Valid	1	○

P13 group Synchronous motor control parameters

Function code	Name	Description	Default	Modify
P13.00	Pull-in current reduction coefficient	0.0–100.0% SM injection current drop rate is used to set the reduction rate of the injection reactive current. When the active current increases to some extent, the injection reactive current	50.0%	○

Function code	Name	Description	Default	Modify
		can be reduced to improve the power factor of the motor.		
P13.02	Pull-in current 1	0.0%–100.0% (of the rated current of the motor) Pull-in current 1 is the pole positioning current which is used to increase the torque.	20.0%	○
P13.03	Pull-in current 2	0.0%–100.0% (of the rated current of the motor)	10.0%	○
P13.04	Switching frequency of pull-in current	0.00Hz–P00.03 (max. output frequency)	30.00Hz	○
P13.05	High-frequency superposing frequency (reserved)	200Hz–1000Hz	500Hz	◎
P13.06	High--frequency superposing voltage	0.0–300.0% (of the rated voltage of the motor)	40.0%	◎
P13.08	Control parameter 1	0–FFFF	0x120	○
P13.09	Control parameter 2	0–300.00	5.00	○
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 P13.11 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 this parameter properly. Setting range: 0.0–100.0%	50.0%	○
P13.14	Hold time of short-circuit braking for start	0.00–50.00s	0.00	○
P13.15	Hold time of short-circuit braking for stop	0.00–50.00s	0.00	○

P14 group Serial communication

Function code	Name	Description	Default	Modify
P14.00	Local communication address	1–247; 0 indicates a broadcast address	2	○
P14.01	Communication baud rate	0: 1200BPS 1: 2400BPS 2: 4800BPS 3: 9600BPS 4: 19200BPS 5: 38400BPS	4	○
P14.02	Data bit check	0: No parity check (N, 8, 1) for RTU 1: Even parity (E, 8, 1) for RTU 2: Odd parity (O, 8, 1) for RTU 3: No parity check (N, 8, 2) for RTU 4: Even parity (E, 8, 2) for RTU 5: Odd parity (O, 8, 2) for RTU	1	○
P14.03	Communication response delay	0–200ms	5ms	○
P14.04	Communication timeout time	0.0 (invalid); 0.1–60.0s	0.0s	○
P14.05	Transmission error processing	0: Alarm and coast to stop 1: Do not alarm and continue running 2: Do not alarm and stop as per stop mode (under communication control mode only) 3: Do not alarm and stop as per stop mode (under all control modes) 4: Alarm and coast to stop, and automatic fault reset after communication is restored	0	○
P14.06	Communication processing action	0x000–0x111 LED ones: write operation action 0: Respond to write operations 1: Not respond to write operations LED tens: Communication encryption processing 0: Communication encryption setting is invalid 1: Communication encryption setting is valid LED hundreds: Communication CRC check failure handling	0x000	○

Function code	Name	Description	Default	Modify
		0: Return error type 06 1: Do not return any data		

P17 group Status viewing

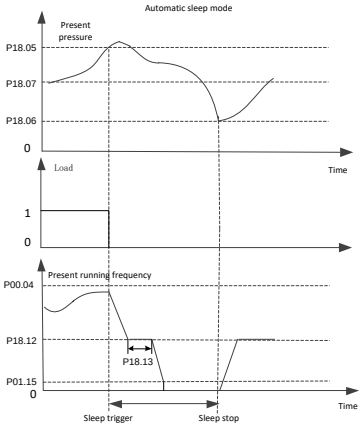
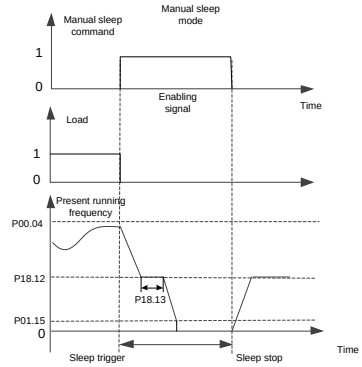
Function code	Name	Description	Default	Modify
P17.00	Set frequency	0.00Hz–P00.03	0.00Hz	●
P17.01	Output frequency	0.00Hz–P00.03	0.00Hz	●
P17.02	Ramp reference frequency	0.00Hz–P00.03	0.00Hz	●
P17.03	Output voltage	0–1200V	0V	●
P17.04	Output current	0.0–3000.0A	0.0A	●
P17.05	Motor speed	0–65535RPM	0 RPM	●
P17.06	Torque current	-3000.0–3000.0A	0.0A	●
P17.07	Excitation current	-3000.0–3000.0A	0.0A	●
P17.08	Motor power	-300.0%–300.0% (relative to rated motor power)	0.0%	●
P17.09	Output torque	-250.0–250.0%	0.0%	●
P17.10	Estimated motor frequency	0.00–P00.03	0.00Hz	●
P17.11	DC bus voltage	0.0–2000.0V	0V	●
P17.12	Digital input terminal status	0000–00FF	0	●
P17.13	Digital output terminal status	0000–000F	0	●
P17.16	Master fault code	0–43 (see P07.27–P07.32 for details)	0	●
P17.17	Automatic reset count of hardware overcurrent	0–3	0	
P17.18	Accumulative automatic reset count of hardware overcurrent	0-65535	0	●
P17.19	P1- input voltage	Display analog input voltage value of P1-channel, 2.00V–10.00V corresponds to 4–20mA; P05.32–P05.34 correspond to	0.00V	●

Function code	Name	Description	Default	Modify
		pressure 0.0–P18.04. If P1- input voltage is larger than 9.8V or less than 1V, it indicates pressure signal fault occurs. Range: 0.00–10.00V		
P17.20	PT1 input voltage	Display analog input voltage value of PT1 channel. Under air-compressor mode, connect to PT100 thermal resistor temperature sensor, different temperature generates different resistor value, and different resistor value corresponds to different input voltages, therefore, the input voltage value can correspond to corresponding detection temperature. Input voltage P18.28–P18.29 corresponds to 20°C to 120°C. Setting range: 0.00–10.00V	0.00V	●
P17.22	PT2 input voltage	Display analog input voltage value of PT2 channel. Under air-compressor mode, connect to PT100 thermal resistor temperature sensor, different temperature generates corresponding resistor value, and different resistor value corresponds to corresponding input voltage, therefore, input voltage value can correspond to corresponding detection temperature. Input voltage P18.32–P18.33 corresponds to 20°C to 120°C. Setting range: 0.00–10.00V	0.00V	●
P17.23	PID reference value	Display the set value of discharge pressure signal. 100% corresponds to the upper limit value of discharge pressure sensor (P18.04). Setting range: -100.0–100.0%	0.0%	●
P17.24	PID feedback value	Display the detection value of discharge pressure signal. Setting range: -100.0–100.0%	0.0%	●
P17.25	Motor power factor	-1.00–1.00	0.0	●

Function code	Name	Description	Default	Modify
P17.26	Current running time	0–65535m	0m	●
P17.28	ASR controller output	-300.0%–300.0% (of the motor rated current)	0.0%	●
P17.29	Magnetic pole angle of SM	0.0–360.0	0.0	●
P17.30	Phase compensation quantity of SM	-180.0–180.0	0.0	●
P17.31	High-frequency superposition current of SM	0.0%–200.0%	0.0	●
P17.32	Flux linkage	0.0%–200.0%	0.0	●
P17.33	Exciting current reference	-3000.0–3000.0A	0.0	●
P17.34	Torque current reference	-3000.0–3000.0A	0.0	●
P17.35	AC incoming current	0.0–5000.0A	0.0	●
P17.36	Output torque	-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	Display the output value of PID control of discharge pressure signal; 100% corresponds to max. output frequency P00.03. Setting range: -100.00–100.00%	0.00%	●
P17.39	Warning code	0–41 Refer to the function description of P07.27.	0	●

P18 group Functions for air compressors

Function code	Name	Description	Default	Modify
P18.00	Air compressor control mode	0: Normal VFD mode 1: Air-compressor control mode **Note:** When P18.00 is set to 1, P19 group (Air compressor status viewing) is valid.	0	◎

Function code	Name	Description	Default	Modify
P18.01	Sleep function selection	  0: Invalid 1: Automatic sleep mode 2: Manual sleep mode **Note:** When automatic sleep function is valid and unloading conditions are fulfilled, the VFD decelerates to P18.12 [no-load running frequency], and then, if discharge pressure is larger than P18.06 [loading pressure] during the time set by P18.13 [no-load delay], the VFD will decelerate to P01.15 [stop speed] and then coast to stop to enter sleep stage. If the discharge pressure is less than loading	1	◎

Function code	Name	Description	Default	Modify
		pressure during P18.13, the VFD will perform loaded running again, and pressure PID will regulate accordingly. **Manual sleep:** Conduct manual sleep through the touch screen or other communication methods.		
P18.02	Loading/unloading mode	0: Automatic; 1: Manual When it is set to manual state, after air compressor starts, it is required to conduct loading/unloading manually through the touch screen or other communication methods. When it is set to automatic mode, the air compressor loads/unloads automatically after starting, as shown in Figure 5-2.	0	○
P18.03	Temperature sensor channel	0: Machine head temperature PT1, auxiliary temperature PT2 1: Machine head temperature PT2, auxiliary temperature PT1 2: Temperature display in normal VFD mode (P18.00=0) (machine head temperature PT1, auxiliary temperature PT2)	1	◎
P18.04	Upper limit of pressure sensor P1	0.00–20.00 Mpa Related to the actual range of pressure sensor, the corresponding voltage of P18.04 is P05.34. **Note:** When restoring to default value, this value stays in currently set value.	1.60Mpa	◎
P18.05	Unloading pressure	Under automatic loading/unloading mode, when air compressor control is valid and the air compressor supplies air as normal, if the discharge pressure is higher than P18.05, unloading automatically. If sleep function is valid (P18.01=1), the VFD enters sleep state; if the discharge pressure is lower than P18.06, loading automatically. P18.07 is used to set the air-supply pressure when the	0.80Mpa	○
P18.06	Loading pressure		0.60Mpa	○
P18.07	Set pressure		0.70Mpa	○

Function code	Name	Description	Default	Modify
		air compressor runs stably. During load-carrying running, the motor speed is controlled by pressure PID, and the system keeps the discharge pressure constant via adjusting master speed. Setting range: 0.00–P18.04		
P18.08	Starting temperature of the fan	When the machine head temperature is higher than P18.08, the fan starts.	75℃	○
P18.09	Stopping temperature of the fan	When the machine head temperature is lower than P18.09, the fan stops. Setting range: -20–150	65℃	○
P18.11	Lower-limit frequency at load-carrying running	P18.12–P00.04 (upper limit of running frequency) During the pressure PID regulating, the allowed min. working frequency is P18.11.	40.00Hz	○
P18.12	No-load running frequency	P01.15–P18.11 (lower-limit frequency of load-carrying running) The output working frequency allowed during no-load of air compressor.	38.00 Hz	○
P18.13	No-load delay	When sleep function is valid, after unloading, the VFD runs at no-load frequency in the time set by P18.13, and then enters sleep state. When air consumption quantity is small, users can enable sleep function; if sleep function is valid, it is necessary to lower down P18.13 to make the device enter sleep state quicker. Setting range: 0–3600s	300s	○
P18.14	Stopping delay	After the stopping command becomes valid, the VFD will first run at no-load frequency in the time set by P18.14, and then stops. Setting range: 0–3600s	0s	○
P18.15	Loading delay	Loading operation is available only after the motor runs at no-load frequency in the time set by P18.15. Setting range: 0–3600s	10s	○

Function code	Name	Description	Default	Modify
P18.16	Restarting delay	After the system stops, it is necessary to wait until the time set by P18.16 elapsed before restart. Setting range: 0–3600s	30s	○
P18.17	Pre-alarm pressure	When current discharge pressure is higher than P18.17, the system indicates pressure pre-alarm by setting BIT8 of P19.13 to 1. When current discharge pressure is higher than P18.18, the system indicates pressure alarm by setting BIT10 of P19.13 to 1, and emergency-stop will be applied. Setting range: 0.00–P18.04	0.90Mpa	○
P18.18	Alarm pressure		1.00Mpa	○
P18.19	Pre-alarm temperature	When machine head temperature is higher than P18.19, the system indicates temperature pre-alarm by setting BIT9 of P19.13 to 1. When the machine head temperature is higher than P18.20, the system indicates temperature alarm by setting BIT11 of P19.13 to 1, and emergency-stop will be applied. When machine head temperature is lower than P18.21, the system indicates low-temperature pre-alarm by setting BIT14 of P19.13 to 1, and air compressor cannot start. Setting range: -20–150	105℃	○
P18.20	Alarm temperature		110℃	○
P18.21	Low-temperature protection threshold		-10℃	○
P18.22	Power calibration coefficient	It is used to calibrate the displayed value of P19.10 [actual motor output power]. Setting range: 0%–200%	100%	○
P18.24	Gain coefficient (kp)	It determines the regulation intensity of temperature PID regulator, the larger the value of kp, the stronger the regulation intensity, however, if it is too large, temperature oscillation may occur, users can fine-tune based on the default value. Setting range: 0.0–100.0	18.0	○

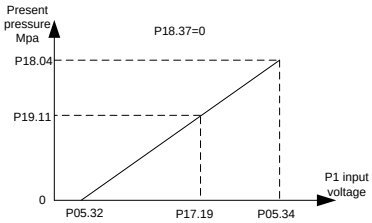
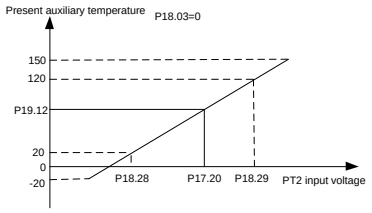
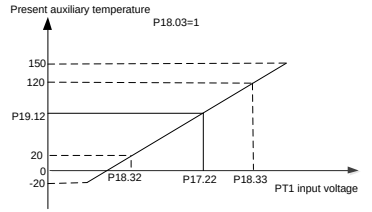
Function code	Name	Description	Default	Modify
P18.25	Convergence coefficient (K)	It determines the converging speed of temperature PID regulator, the larger the value of K, the stronger the converging intensity, however, if it is too large, temperature oscillation may occur, users can fine-tune based on the default value. Setting range: 0.00–1.00	0.12	○
P18.28	PT1 calibration voltage 1 (20℃)	It is used to calibrate temperature detection circuit before shipment. Connect to the resistor whose resistance is the same with that of PT100 at 20°C, read the voltage value of P17.20 and input it to P18.28.	3.41V	○
P18.29	PT1 calibration voltage 2 (120℃)	Connect to the resistor whose resistance is the same with that of PT100 at 120°C, read the voltage value of P17.20 and input it to P18.29. Setting range: 0.00–10.00V **Note:** This value will stay in currently set value when restoring to default values.	7.42V	○
P18.30	Pressure drop value of upper limit frequency	0.00–P18.04 When current pressure is larger than this pressure value, decrease the upper limit frequency as per the set value of P18.31, otherwise upper limit of running frequency (P00.04) keeps unchanged.	0.70Mpa	○
P18.31	Drop rate of upper limit frequency	0.00Hz–10.00Hz When current pressure is larger than the pressure drop value of upper limit frequency, this value is the reduction quantity of the corresponding upper limit frequency at every additional 0.01Mpa.	0.00Hz	○
P18.32	PT2 calibration voltage 1 (20℃)	It is used to calibrate temperature detection circuit before shipment.	3.41V	○

Function code	Name	Description	Default	Modify
P18.33	PT2 calibration voltage 2 (120℃)	Connect to the resistor whose resistance is the same with that of PT100 at 20°C, read the voltage value of P17.22 and input it to P18.32. Connect to the resistor whose resistance is the same with that of PT100 at 120°C, read the voltage value of P17.22 and input it to P18.33. Setting range: 0.00–10.00V **Note:** This value will stay in currently set value when restoring to default values.	7.42V	○
P18.34	Auxiliary temperature protection enabling	0: Disable 1: Enable	0	◎
P18.35	Auxiliary temperature pre-alarm	-20–150 When P18.34 is enabled and auxiliary temperature is higher than P18.35, the system indicates auxiliary temperature pre-alarm by setting BIT8 of P19.14 to 1.	105℃	○
P18.36	Auxiliary temperature alarm	-20–150 When P18.34 is enabled and auxiliary temperature is higher than P18.36, the system indicates auxiliary temperature alarm by setting BIT10 of P19.14 to 1, and emergency-stop will be applied.	110℃	○
P18.37	Pressure sensor channel	0: Discharge pressure P1 1: Auxiliary pressure P1 2: Pressure display in normal VFD mode (P18.00=0)	0	◎
P18.43	Fan control mode	0: Air compressor mode, the power-frequency fan starts/stops as per the temperature; 1: Terminal, the power-frequency fan starts/stops via terminals; 2: RS485 communication (address 0X201B, write 1 to start, write 3 to stop)	0	◎
P18.44	Automatic frequency reduction threshold	0–120% Add automatic frequency reduction function.	120%	○

Function code	Name	Description	Default	Modify
		When the output current is larger than automatic frequency reduction threshold, it will adjust the output frequency via regulator to ensure the running current of the master is below the automatic frequency reduction threshold.		
P18.45	Maintenance timeout time	0–8000h When it is set to “0”, maintenance timeout function will be invalid. When it is set to a non-zero value, after parts maintenance pre-alarm is reported, if the VFD continues working until exceeding the value set by P18.45, the system will report maintenance timeout pre-alarm, and BIT11 of P19.14 will be set to “1”.	0	○

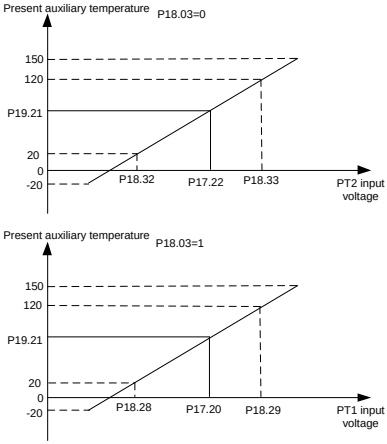
P19 group Air compressor status viewing

Function code	Name	Description	Default	Modify
P19.00	The set time of maintenance on part 1	P19.00–P19.04 displays the set time of maintenance on five kinds of parts. If the accumulated running time of the part exceeds the corresponding set value, the BIT of P19.14 will be set to 1 to indicate pre-alarms; if it is set to “0”, the running time pre-alarm will be invalid. P19.05–P19.09 displays the running time of corresponding parts. Range: 0–65535h	0	●
P19.01	The set time of maintenance on part 2		0	●
P19.02	The set time of maintenance on part 3		0	●
P19.03	The set time of maintenance on part 4		0	●
P19.04	The set time of maintenance on part 5		0	●
P19.05	Running time of part 1		0	●
P19.06	Running time of part 2		0	●
P19.07	Running time of part 3		0	●
P19.08	Running time of part 4		0	●
P19.09	Running time of part 5		0	●

Function code	Name	Description	Default	Modify
P19.10	Actual output power of the motor	Display output power of the motor, it can be calibrated by P18.22. Range: 0.0–6553.5kW	0.0kW	●
P19.11	Present pressure	Display the discharge pressure value detected currently.  Range: 0.00–655.35Mpa	0.00Mpa	●
P19.12	Present temperature	Display the machine head temperature detected currently.   Range: -20–150℃	0℃	●
P19.13	Signal state 1	0000–0xFFFF 0000–0xFFFF BIT0: Air filter blockage signal 1: Fault; 0: Normal BIT1: Oil filter blockage signal 1: Fault; 0: Normal	0	●

Function code	Name	Description	Default	Modify
		BIT2: Separator blockage signal 1: Fault; 0: Normal BIT3: Precision splitter blockage signal 1: Fault; 0: Normal BIT4: External fault signal 1 1: Fault; 0: Normal BIT5: External fault signal 2 1: Fault; 0: Normal BIT6: Solenoid valve signal state 1: Load; 0: Unload BIT7: Fan state 1: Run; 0: Stop BIT8: Pressure pre-alarm signal 1: Pressure pre-alarm; 0: Normal BIT9: Temperature pre-alarm signal 1: Temperature pre-alarm; 0: Normal BIT10: Pressure alarm signal 1: Pressure alarm; 0: Normal BIT11: Temperature alarm signal 1: Temperature alarm; 0: Normal BIT12: Pressure signal 1: Pressure signal fault; 0: Normal BIT13: Temperature signal 1: Temperature signal fault; 0: Normal BIT14: Low-temperature protection 1: Low-temperature alarm; 0: Normal BIT15: Master state 1: Run; 0: Stop		
P19.14	Signal state 2	0–0xFFFF BIT0: Maintenance reminder of part 1 1: Maintenance required; 0: Normal BIT1: Maintenance reminder of part 2 1: Maintenance required; 0: Normal BIT2: Maintenance reminder of part 3 1: Maintenance required; 0: Normal BIT3: Maintenance reminder of part 4 1: Maintenance required; 0: Normal BIT4: Maintenance reminder of part 5	0	●

Function code	Name	Description	Default	Modify
		1: Maintenance required; 0: Normal BIT5: Reserved BIT6: Auxiliary temperature signal 1: Auxiliary temperature signal fault; 0: Normal BIT7: Reserved BIT8: Auxiliary temperature pre-alarm signal 1: Temperature pre-alarm; 0: Normal BIT9: Reserved BIT10: Auxiliary temperature alarm signal 1: Temperature alarm; 0: Normal BIT11: Maintenance timeout remainder 1: Maintenance timeout remainder; 0: Normal BIT12: Phase sequence remainder 1: Fault; 0: Normal BIT13: Solenoid valve overcurrent signal 1: Solenoid valve alarm, 0: Normal BIT14: PTC overtemperature signal 1: PTC overtemperature alarm; 0: Normal BIT15: Emergency stop signal 1: Emergency stop signal alarm, 0: Normal		
P19.15	Device state	0: Standby 1: Run 2: Fault 3: Emergency stop 4: Undervoltage 5: Alarm 6: Sleep 7: In stopping 8: Restart delay	0	●
P19.16	Accumulated running time	Display range: 0–65535h	0	●
P19.17	Accumulated load-carrying running time		0	●
P19.18	Restart count-down	Display the remaining time of restart delay (P18.16). After the system stops, it will enter	0s	●

Function code	Name	Description	Default	Modify
		restart delay state and restart count-down to prevent immediate restart. After restart delay time is up, the system enters standby state. Under standby state, start command can be received. Setting range: 0–3600s		
P19.19	Output value of temperature PID	Display the output value of temperature PID regulation of machine head, 100% corresponds to max. output frequency (P00.03) of the fan. Setting range: 0.00–100.00%	0.00%	●
P19.21	Present auxiliary temperature	Display the auxiliary temperature value detected at present.  Range: -20–150℃	0℃	●
P19.22	Input power phase sequence state	0: Positive sequence 1: Negative sequence 2: Phase loss	0	●
P19.23	RST input power voltage	0–2000V	0	●

P21 group Power-frequency fan protection

Function code	Name	Description	Default	Modify
P21.00	Rated current of the fan	0.0–40.0A This function code is related to current detection and overload protection function of power-frequency fan. If P21.00 is set to a non-zero value, this function is enabled. If P21.00 is set to 0, this function is disabled.	0.0A	○
P21.01	Current transformation ratio of the fan	1.0–4000.0	200.0	○
P21.03	Current imbalance coefficient	1.00–5.00 Among the current of three phases of the fan, if the ratio between max. current and min. current is larger than P21.03, the VFD displays fan current imbalance fault.	3.00	○
P21.04	Calibration coefficient of A phase current of the fan	0.0–150.0% Actual current = Displayed current * current calibration coefficient **Note:** When restoring to default values, this value will stay in currently set value.	100.0%	○
P21.05	Calibration coefficient of B phase current of the fan		100.0%	○
P21.06	Calibration coefficient of C phase current of the fan		100.0%	○
P21.07	User-defined fault action selection 1	Ones: Motor overload (OL1) 0: Coast to stop 1: Runs at alternative frequency of P21.10 Tens: Electronic overload (OL3) 0: Process as per P11.08 1: Run at alternative frequency of P21.10 Hundreds: Rectifier module overheat (OH1) 0: Coast to stop 1: Run at alternative frequency of P21.10 Thousands: Inverter module overheat fault (OH2) 0: Coast to stop 1: Run at alternative frequency of P21.10	0x0000	○
P21.08	User-defined fault action selection 2	Ones: Underload (LL) 0: Process as per P11.08	0x0000	○

Function code	Name	Description	Default	Modify
		1: Run at alternative frequency of P21.10 2: Normal running Tens: External fault 1 signal 0: Coast to stop 1: Run at alternative frequency of P21.10 Hundreds: PTC overtemperature signal 0: Coast to stop 1: Run at alternative frequency of P21.10 2: Normal running Thousands: Solenoid valve overcurrent signal 0: Coast to stop 1: Run at alternative frequency of P21.10 2: Normal running		
P21.09	User-defined fault action selection 3	Ones: RS485 communication fault (CE) 0: Coast to stop 1: Run at alternative frequency of P21.10 Tens: EEPROM operation fault (EEP) 0: Coast to stop 1: Run at alternative frequency of P21.10 Hundreds: Current overload of power-frequency fan (OLF) 0: Coast to stop 1: Run at alternative frequency of P21.10 Thousands: 3PH current imbalance of power-frequency fan (SPOF) 0: Coast to stop 1: Run at alternative frequency of P21.10	0x0000	○
P21.10	Alternative frequency	0.0–100.0% (max. output frequency)	50.0%	○
P21.11	Running time of alternative frequency	0.0–6000.0s **Note:** When a user-defined fault occurs to the VFD and the VFD continues running at alternative frequency (P21.10), if the fault persists for more than the time set by P21.11, the VFD coasts to stop. If the fault no longer occurs within the time set by P21.11, the VFD restores to normal mode.	60.0s	○

Function code	Name	Description	Default	Modify
P21.12	VFD overload type selection	0: Light load (run for a long time at below 120% load) 1: Heavy load The basic method is to calculate the VFD overload starting point according to the relationship between rated current of this power section and that of next power section. The VFD can run for a long time below the overload starting point.	0	○
P21.13	Display current of A phase of the fan	0.0–40.0A	0.0A	●
P21.14	Display current of B phase of the fan	0.0–40.0A	0.0A	●
P21.15	Display current of C phase of the fan	0.0–40.0A	0.0A	●
P21.16	Sampling value of A phase current zero drift	0–4096	0	●
P21.17	Sampling value of B phase current zero drift	0–4096	0	●
P21.18	Sampling value of C phase current zero drift	0–4096	0	●
P21.19	Output current	0.0–40.0A	0.0A	●
P21.20	Fan state	0X0000–0XFFFF Bit0: When it is 1, it indicates that power-frequency fan is started.	0x0000	●

5.2 Control logic of the air compressor

(1) The following figure shows the control logic of the air compressor.

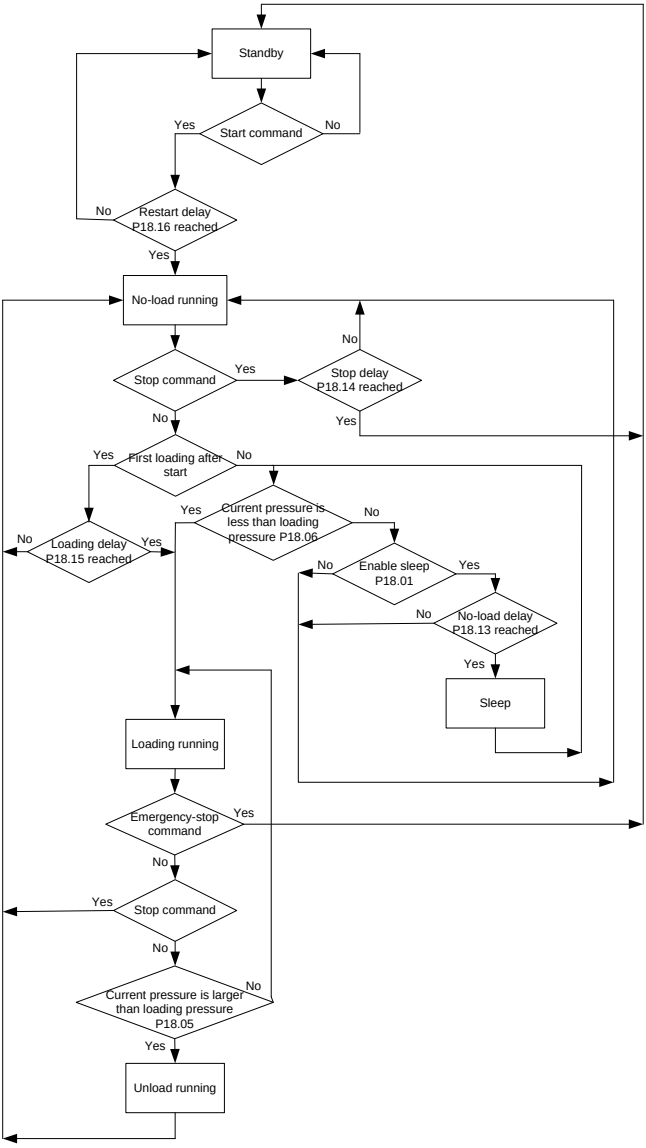


Figure 5-1 Control logic of the air compressor

(2) The following figure shows the pressure & running frequency control during running of the air compressor, and loading.

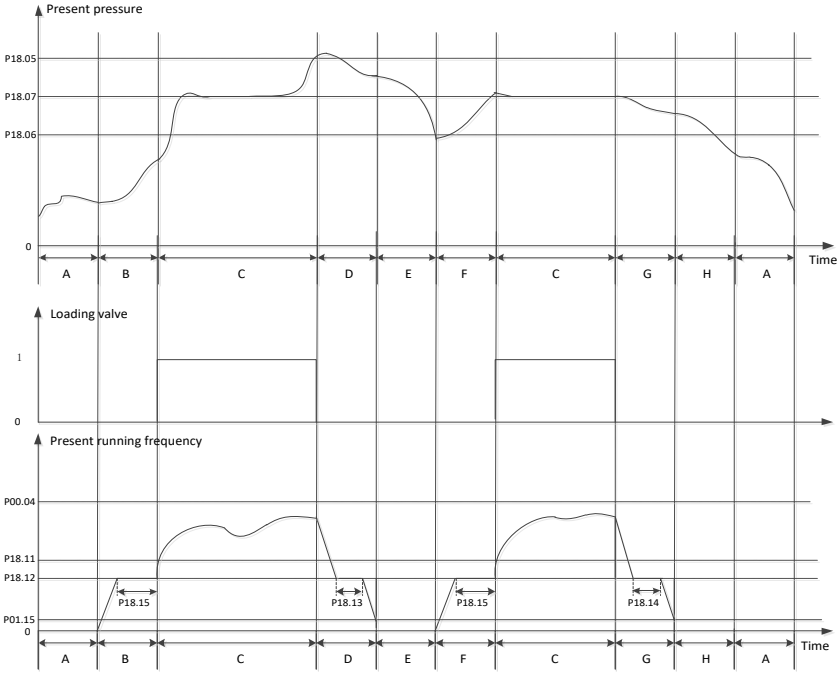


Figure 5-2 Air compressor pressure & running frequency control and loading

In above figure, P18.05 is unloading pressure; P18.06 is loading pressure; P18.07 is the set pressure. P00.04 is upper limit frequency, P18.11 is lower limit value of load-carrying running frequency, P18.12 is no-load frequency, P01.15 is stop speed. Description of A-H stage control process is shown below:

A: Standby state

B: Starting stage of startup, duration is P18.15 (including part of the acceleration time P00.11);

C: Constant discharge stage of loading, pressure PID regulation is valid;

D: Unloading stage, duration includes part of deceleration time P00.12 and P18.13;

E: Sleep stage, the VFD does not run;

F: Starting stage of wake-up, duration is P18.15 (including part of the acceleration time P00.11);

G: Starting stage of stop, duration includes part of deceleration time P00.12 and P18.14;

H: Restart delay stage after stop, duration is P18.16.

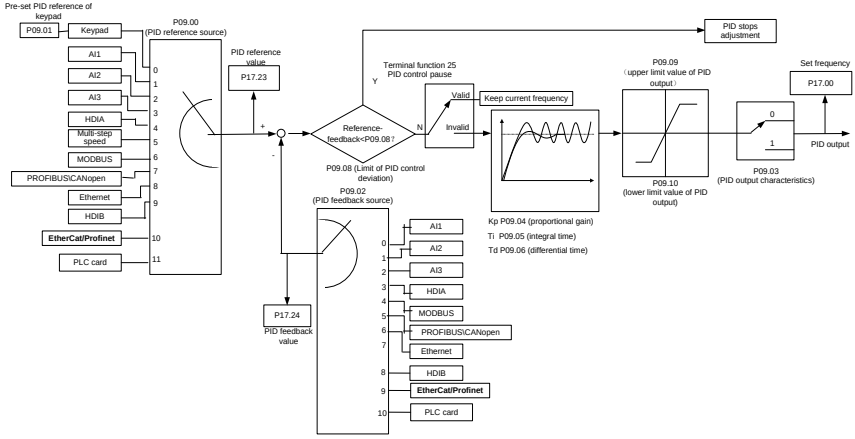
When air compressor control is valid and under automatic loading/unloading mode, the air compressor enters normal air supply state after starts. When the discharge pressure is higher than P18.05, automatic unloading will be applied, and the VFD enters sleep state. If sleep function is invalid, the VFD will continue running at no-load frequency P18.12. When the discharge pressure is lower than P18.06, automatic loading will be applied, and during load-carrying running, the master speed is controlled by pressure PID. P18.07 is used to set the air supply pressure when the air compressor runs stably. The VFD keeps the discharge pressure constant by regulating the master speed. Constant-pressure control adopts PID algorithm, and the frequency reference source of the master is set by P00.06=7, the PID reference source selects P09.00 = 10, reference pressure is set via P18.07. The feedback source of PID P09.02 = 8, which is obtained by detecting the pressure signal. PID parameter P9.04, P9.05 and P9.06 adopts system default values.

Note: In above figure, the VFD stops as per P01.08, default setting is decelerate to stop.

Normal stop command and unloading stage are deceleration process; the VFD will change to coast to stop during emergency-stop operation and faults.

5.3 PID commissioning

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



Introduction to the working principles and control methods for PID control:

Proportional control (Kp): When the feedback deviates from the reference, the output will be proportional to the deviation, if such deviation is constant, the regulating variable will also be constant.

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

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

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

5.3.1 General procedures for PID parameter settings

a. Determining proportional gain P

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

b. Determine integral time Ti

After proportional gain P is determined, set the initial value of a larger integral time Ti, and decrease Ti gradually until system oscillation occurred, and then in turn, increase Ti until system oscillation disappears, record the Ti at this point, and set the integral time constant Ti of PID to 150%–180% of current value. This is the commissioning process of integral time constant Ti.

c. Determining derivative time Td

The derivative time Td is generally set to 0.

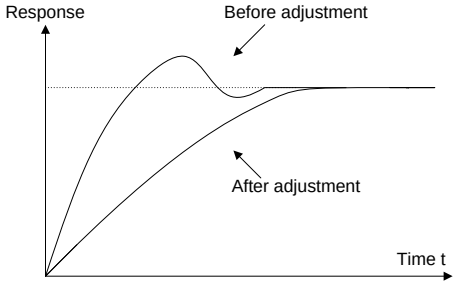
If you need to set Td to another value, set in the same way with P and Ti, namely set Td to 30% of the value when there is no oscillation.

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

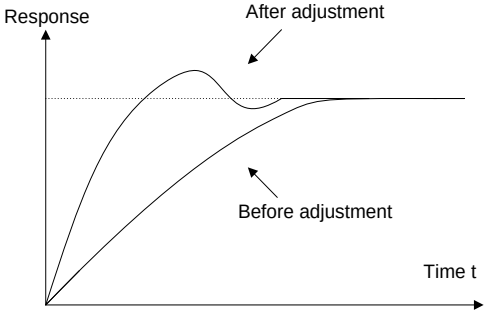
5.3.2 PID adjusting methods

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

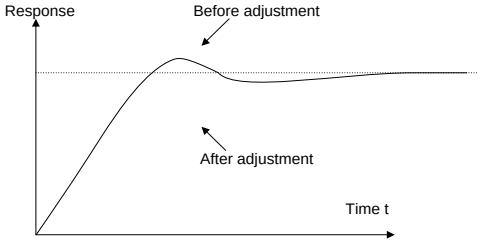
Control overshoot: When overshoot occurred, shorten the derivative time (Td) and prolong integral time (Ti).



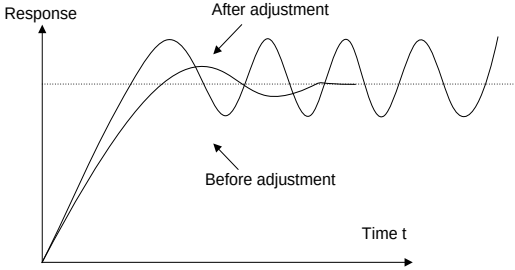
Stabilize the feedback value as fast as possible: When overshoot occurred, shorten integral time (Ti) and prolong derivative time (Td) to stabilize control as fast as possible.



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



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



Related parameter list:

Function code	Name	Description	Default
P09.00	PID reference source	0: Keypad digits (P09.01) 1: Analog P1- 2: Reserved 3: Analog P2- 4–5: Reserved 6: Modbus communication 7–9: Reserved 10: Pressure setting of dedicated function of air compressor	0
P09.01	PID reference preset through keypad	-100.0%–100.0%	0.0%
P09.02	PID feedback source	0: Analog P1- 1: Reserved 2: Analog P2-	0

Function code	Name	Description	Default
		3: Reserved 4: Modbus communication 5–7: Reserved 8: Pressure feedback of dedicated function of air compressor	
P09.03	PID output characteristics selection	0: PID output characteristic is positive: the feedback signal is larger than PID reference, which requires the VFD output frequency to decrease to balance PID, e.g. tension PID control of winding. 1: PID output characteristic is negative: feedback signal is larger than PID reference, which requires the VFD output frequency to increase to balance PID, e.g. tension PID control of unwinding.	0
P09.04	Proportional gain (Kp)	It determines the regulation intensity of the whole PID regulator, the larger the P is, the stronger the regulation intensity is. If this parameter is 100, it means the regulation amplitude made on output frequency command by the proportional regulator (ignoring integral and differential actions) is the max. output frequency (P00.03) when the deviation between PID feedback quantity and reference quantity is 100%. Setting range: 0.00–100.00	10.00
P09.05	Integral time (Ti)	It determines the speed of integral regulation made on the deviation between PID feedback quantity and reference quantity by PID regulator. When the deviation between PID feedback quantity and reference quantity is 100%, the regulation quantity (ignoring proportional and differential actions) of integral regulator can reach max. output frequency (P00.03) through continuous regulation in the time set by P09.05. The shorter the integral time, the stronger the regulation intensity.	2.00s

Function code	Name	Description	Default
		Setting range: 0.01–10.00s	
P09.06	Differential time (Td)	It determines the intensity of variation regulation made on the deviation between PID feedback quantity and reference quantity by PID regulator. If the feedback quantity changes by 100% during the time set by P09.06, the regulation quantity of differential regulator (ignoring proportional and integral actions) is the max. output frequency (P00.03). The longer the differential time, the stronger the regulation intensity. Setting range: 0.00–10.00s	1.00s
P09.07	Sampling cycle (T)	0.000–10.000s	0.100s
P09.08	Final limit of PID control deviation	It means the max. allowed deviation quantity of the PID system feedback value relative to closed-loop reference value. Within the deviation limit, PID regulator stops regulating, this parameter can be used to regulate the precision and stability of PID system. Setting range: 0.0–100.0%	0.1%
P09.09	Upper limit value of PID output	P09.10–100.0% (max. frequency or voltage)	100.0%
P09.10	Lower limit value of PID output	-100.0%–P09.09 (max. frequency or voltage)	0.0%
P09.11	Feedback offline detection value	0.0–100.0%	0.0%
P09.12	Feedback offline detection time	0.0–3600.0s	1.0s
P09.13	PID regulation selection	0x0000–0x1111 LED ones: 0: Continue integral regulation when the frequency reaches upper/lower limit 1: Stop integral regulation when the frequency reaches upper/lower limit LED tens: 0: The same with the main set direction 1: Contrary to the main set direction	0x0001

Function code	Name	Description	Default
		LED hundreds: 0: Limit as per the max. frequency 1: Limit as per A frequency LED thousands: 0: A+B frequency, acceleration/deceleration of main reference A frequency source buffering is invalid 1: A+B frequency, acceleration/deceleration of main reference A frequency source buffering is valid, acceleration/deceleration is determined by P08.04 (ACC time 4).	
P17.00	Set frequency	0.00Hz–P00.03 (max. output frequency)	0.00Hz
P17.23	PID reference value	-100.0–100.0%	0.0%
P17.24	PID feedback value	-100.0–100.0%	0.0%

6 Fault handling and product maintenance

6.1 VFD faults and solutions

Fault code	Fault type	Possible cause	Solution
OV1	Overvoltage at acceleration	• Input voltage is abnormal. • There is large energy feedback.	• Check the input power. • Check if the deceleration time of the load is too short or the motor starts during the rotating, or dynamic brake units needs to be installed.
OV2	Overvoltage at deceleration		
OV3	Overvoltage at constant speed		
OC1	Overcurrent at acceleration	• Acceleration or deceleration is too fast. • Grid voltage is too low. • VFD power is too low. • Load transients or is abnormal. • Short-circuited to ground, output phase loss. • There is strong external interference.	• Increase acceleration /deceleration time. • Check the input power. • Adopt the VFD with a larger power. • Check if the load is short circuited (short circuited to ground or between wires) or stall occurs. • Check the output wiring. • Check if there is strong interference.
OC2	Overcurrent at deceleration		
OC3	Overcurrent at constant speed		
UV	Bus undervoltage fault	Grid voltage is too low.	Check the grid input power.
OL1	Motor overload	• Grid voltage is too low. • Rated current of the motor is set improperly. • Motor stalls or load transients.	• Check grid voltage. • Reset rated current of the motor. • Check load and adjust torque boost quantity.
OL2	VFD overload	• Acceleration is too fast. • The motor is restarted during rotating. • Grid voltage is too low. • The load is too large.	• Increase acceleration time. • Avoid restart after stop. • Check grid voltage. • Adopt the VFD with a larger power. • Select a proper motor.
SPI	Phase loss on input side	Phase loss or fluctuation occurs to input R, S and T.	• Check input power. • Check installation wiring.

Fault code	Fault type	Possible cause	Solution
SPO	Phase loss on output side	Phase loss output occurs to U, V and W (or serious 3PH imbalance occurs to the load).	• Check the output wiring. • Check the motor and cable.
OH1	Rectifier module overheating	• Air duct blocked or fan is damaged. • Ambient temperature is too high. • Long-time overload running.	• Ventilate the air duct or replace the fan. • Lower down the ambient temperature.
OH2	Inverter module overheating		
EF	External fault	S external fault input terminal acts.	Check external equipment input.
CE	RS485 communication fault	• Baud rate is set improperly. • Communication line fault. • Communication address error. • Communication suffers strong interference.	• Set proper baud rate. • Check the wiring of communication interfaces. • Set correct communication address. • Replace or change the wiring to improve anti-interference capacity.
ItE	Current detection fault	• Poor contact of controller board connector. • Hall components are damaged. • Amplifying circuit is abnormal.	• Check the connector and re-plug wires. • Replace the hall. • Replace the main control board.
tE	Motor autotuning fault	• Motor capacity does not match VFD capacity. • Motor parameters are set improperly. • The deviation between the parameters obtained from autotuning and the standard parameter is huge. • Autotuning timeout.	• Change the VFD model. • Set motor type and nameplate parameters correctly. • Empty the motor load and identify again. • Check the motor wiring and parameter setup. • Check whether upper limit frequency is larger than 2/3 of the rated frequency.
EEP	EEPROM operation error	• Error occurred to the writing/reading of control parameters. • EEPROM is damaged.	• Press STOP/RST to reset. • Replace the main control board.

Fault code	Fault type	Possible cause	Solution
PIDE	PID feedback offline fault	• PID feedback offline. • PID feedback source disappears.	• Check PID feedback signal wire. • Check PID feedback source.
END	Running time reached	The actual running time of the VFD is larger than the internally set time.	• Ask supplier for help. • Adjust the set running time.
OL3	Electronic overload fault	The VFD reports overload pre-alarm according to the set value.	Check the load and overload pre-alarm threshold.
PCE	Keypad communication fault	• The keypad wire is poorly contacted or disconnected. • The keypad wire is too long and suffers strong interference. • Circuit fault occurred to the keypad or communication part of the main board.	• Check the keypad wires to confirm whether fault exists. • Check the surroundings to rule out interference source. • Replace the hardware and ask for maintenance service.
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.
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 circuited to ground. • Current detection circuit is	• Check whether motor wiring is normal/motor is short circuited to ground.

Fault code	Fault type	Possible cause	Solution
ETH2	To-ground short-circuit fault 2	faulty. • Actual motor power setup differs sharply from the VFD power.	• Replace the hall. • Replace main control board/drive board. • Reset correct motor parameters.
dEu	Speed deviation fault	Load is too heavy or stall.	• Check the load and ensure it is normal, increase the detection time. • Check whether control parameters are proper.
STo	Mal-adjustment fault	• Control parameters of synchronous motor are set improperly. • Autotuning parameters are inaccurate. • The VFD is not connected to the motor.	• Check the load and ensure the load is normal. • Check whether control parameters are set correctly. • Increase maladjustment detection time.
LL	Electronic underload fault	The VFD reports underload pre-alarm according to the set value.	Detect the load and underload pre-alarm threshold.
PSF	Phase sequence fault	The phase sequence on power input side is negative.	Swop any two of the power input cables.
OLF	Power-frequency fan current overload	• Rated fan current is set improperly. • Fan power is too small. • Fan stalls.	• Check whether the set value of P21.00 is the same with the rated current of the fan nameplate, and whether the current transformation ratio (P21.01) is the same with current transformer nameplate. • Actually detected fan current is too large, it is recommended to increase the power. • Check whether the fan stalls.
SPOF	3PH current imbalance of the power-frequency fan	• Phase loss occurs to the connection of three phases of the fan. • Stator winding of three phases of the fan is	• Check whether the fan wiring is disconnected or poorly contacted. • Measure whether the impedance of the three-phase

Fault code	Fault type	Possible cause	Solution
		abnormal. • The quality of the power grid is poor.	winding of the fan is balanced. • Increase the set value properly in P21.03 to reduce the sensitivity of the imbalance judgment.
TOC	Solenoid valve overcurrent	Solenoid valve is damaged.	Replace the solenoid valve.
	Touch screen communication interrupted	RS485 communication port is disconnected.	Check whether communication line is loosened.

6.2 Fault contents and solutions of air compressor equipment

P19.13	State type	Possible cause	Solution
BIT0=1	Air filter blocked	Air filter is abnormal.	Check air filter after stop.
BIT1=1	Oil filter blocked	Oil filter is abnormal.	Check oil filter after stop.
BIT2=1	Separator blocked	Separator is abnormal.	Check the separator after stop.
BIT3=1	Precision splitter blocked	Precision splitter is abnormal.	Check the precision splitter after stop.
BIT8=1	Pressure pre-alarm	Actual pressure is detected by P1 to be larger than the pre-alarm pressure set by P18.17.	• Check whether solenoid valve is normal. • Check whether pressure control parameters are set correctly.
BIT9=1	Temperature pre-alarm	Actual temperature detected by PT1 is higher than the pre-alarm temperature set by P18.19.	• Check whether fan control parameters are set correctly. • Whether the fan operates normally. • Fan power is too small to dissipate heat effectively. • Check whether there is lubricating oil.
BIT10=1	Pressure alarm	Actual voltage detected by P1 is larger than the alarm voltage set by P18.18.	• Check whether solenoid valve is normal. • Check whether pressure control parameters are set correctly.

P19.13	State type	Possible cause	Solution
BIT11=1	Temperature alarm	Actual temperature detected by PT1 is higher than the alarm temperature set by P18.20.	• Check whether fan control parameters are correct. • Whether fan operates normally. • Fan power is too small to dissipate heat effectively. • Check whether there is lubricating oil.
BIT12=1	Pressure signal fault	The actual voltage is detected by P1 to be less than 1V.	• Pressure detection sensor is abnormal. • Pressure detection input P1 signal wire is disconnected. • Pressure signal interface does not select current signal.
BIT13=1	Temperature signal fault	PT100 sensor is disconnected.	• Check whether the wiring of PT100 is normal. • Check whether temperature detection sensor is abnormal. • Temperature detection input circuit is abnormal.
BIT14=1	Low-temperature protection pre-alarm	The actual temperature detected by PT1 is less than the low temperature protection threshold set by P18.21.	• Temperature detection sensor is abnormal. • Temperature detection input circuit is abnormal, if not calibrated. • Actual temperature is too low, and low temperature pre-alarm is reported accordingly, and therefore the air compressor cannot start.

P19.14	State type	Possible cause	Solution
BIT0=1	Part 1 needs maintenance	The running time of part 1 exceeds the time set by P19.00.	Carry out maintenance after stop
BIT1=1	Part 2 needs maintenance	The running time of part 2 exceeds the time set by P19.01.	Carry out maintenance after stop

P19.14	State type	Possible cause	Solution
BIT2=1	Part 3 needs maintenance	The running time of part 3 exceeds the time set by P19.02.	Carry out maintenance after stop
BIT3=1	Part 4 needs maintenance	The running time of part 4 exceeds the time set by P19.03.	Carry out maintenance after stop
BIT4=1	Part 5 needs maintenance	The running time of part 5 exceeds the time set by P19.04.	Carry out maintenance after stop
BIT6=1	Auxiliary temperature signal fault	PT100 sensor is disconnected.	• Check whether the wiring of PT100 is normal. • Temperature detection sensor is abnormal. • Temperature detection input circuit is abnormal.
BIT8=1	Auxiliary temperature pre-alarm	The actual temperature detected by PT2 is larger than the pre-alarm temperature set by P18.19.	• Temperature detection sensor is abnormal. • Temperature detection input circuit is abnormal, if not calibrated. • The starting temperature of the fan is set to a too high value. • The temperature of the fan is set to a too high value. • Fan power is too small to dissipate heat effectively.
BIT10=1	Auxiliary temperature alarm	The actual temperature detected by PT2 is higher than the alarm temperature set by P18.20.	• Temperature detection sensor is abnormal. • Temperature detection input circuit is abnormal, if not calibrated. • The starting temperature of the fan is set to a too high value. • The temperature of the fan is set to a too high value. • The fan power is too small to dissipate heat effectively.

P19.14	State type	Possible cause	Solution
BIT11=1	Maintenance timeout alarm	Any part whose running time exceeds the set value will enter overtime maintenance stage, and hereafter, if the running time exceeds the time set by P18.45 again, maintenance timeout alarm will be reported.	Carry out maintenance on the timeout parts after stop.

6.3 Transformer maintenance instruction

✧ 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. Disassemble the VFD and turn it over 180 degrees, and separate the base plate from the body of the VFD with a screwdriver, as shown in Figure 6-2.

3. Remove the countersunk head screws fixing the power-frequency transformer.

4. After replacing the power-frequency transformer, install the power-frequency transformer and the base plate back to the VFD in the opposite order, as shown in Figure 6-3.

5. Power on the VFD.

Take a 7.5kW VFD as an example, and the operations are shown in the following figures.

Remove the combination screws with a screwdriver, and the base plate together with the transformer can be separated from the VFD body.

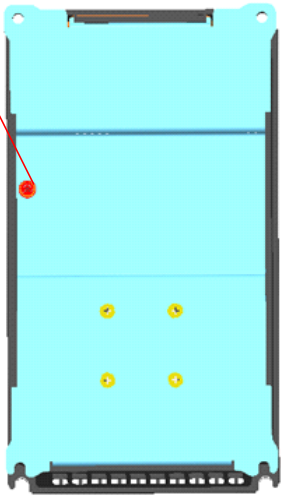


Figure 6-1 Diagram for removing combination screws

Separate the transformer cable from the VFD body by hand, and the transformer and base plate can be disassembled.
Note: It is required to plug in connectors during installation.

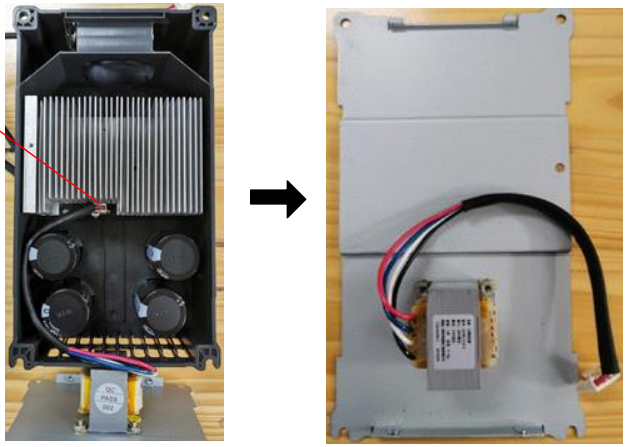


Figure 6-2 Diagram for disassembling the power-frequency transformer

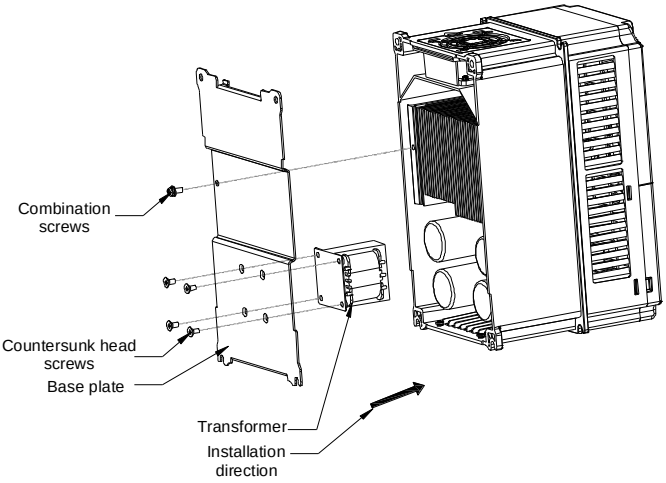


Figure 6-3 Transformer assembly diagram

Appendix A Product dimensions

A.1 LED keypad diagram

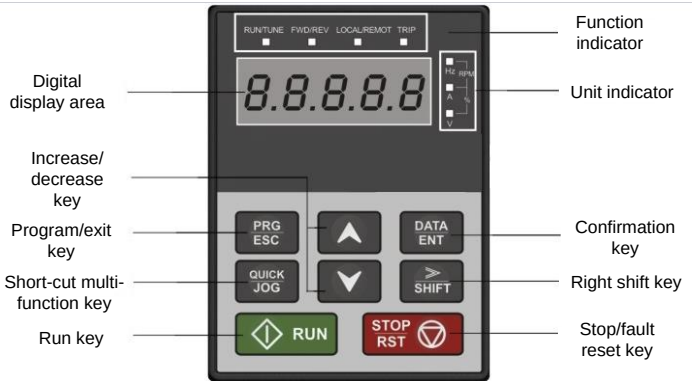


Figure A-1 Keypad diagram

A.2 External keypad installation dimensions

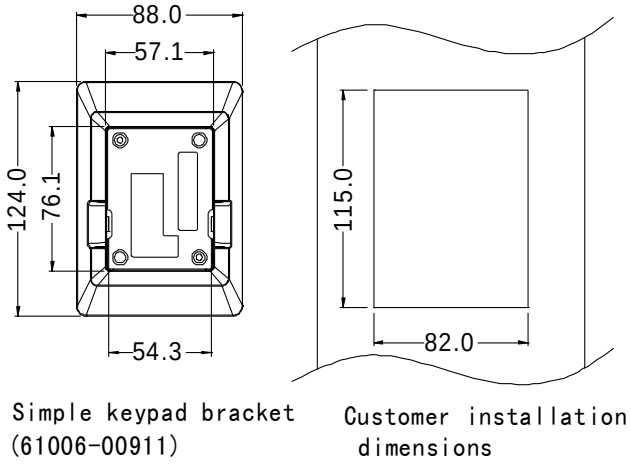


Figure A-2 External keypad

A.3 Wall installation dimensions

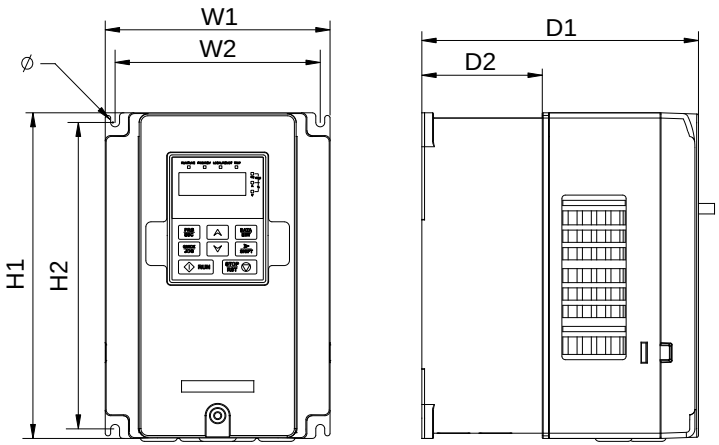


Figure A-3 Wall installation diagram

Table A-1 Wall installation dimensions (unit: mm)

Power	W1	W2	H1	H2	D1	D2	Diameter of mounting hole	Screw specification
7.5kW	146	131	256	243.5	167	86	6	M5
11–15kW	170	151	320	303.5	196.5	113	6	M5
22kW	200	185	340.5	328.5	184.5	104.5	6	M5
30–37kW	250	230	400	380	202	123.5	6	M5

A.4 Flange installation dimensions

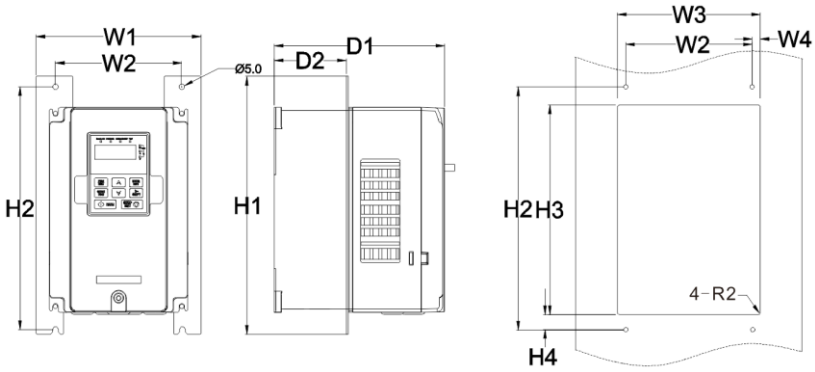


Figure A-4 Flange installation diagram

Table A-2 Flange installation dimensions (unit: mm)

Power	W1	W2	W3	W4	H1	H2	H3	H4	D1	D2	Diameter of mounting hole	Screw specification
7.5kW	170	131	150	9.5	292	276	260	6	167	84	6	M5
11kW–15kW	191	151	174	11.5	370	351	324	12	196.5	113	6	M5
22kW	266	250	224	13	371	250	350.5	20.5	184.5	104	6	M5
30kW–37kW	316	300	274	13	430	300	410	55	202	118.5	6	M5

Note: Flange mounting plates are often required for flange installation.

Appendix B RS485 communication LCD keypad

B.1 LCD keypad introduction

Goodrive300-01A-RT series VFD supports the use of the optional LCD keypad that uses RS485 communication. The LCD keypad can be used to control the start and stop of the VFD, read and write the status data, and set the parameters.

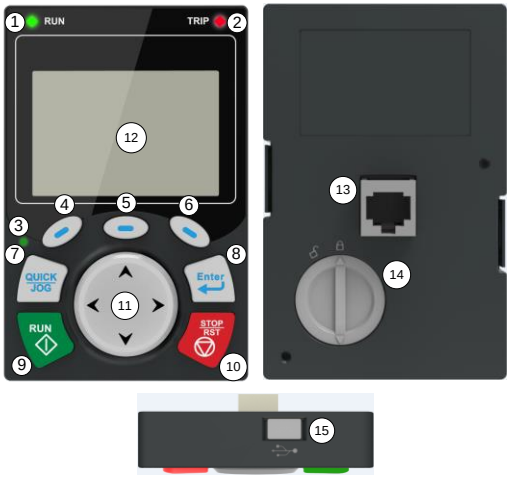


Figure B-1 LCD keypad

Note:

- ✧ The LCD keypad is equipped with a real-time clock, which can run properly after being installed with batteries even if the power line is disconnected. The clock battery (type: CR2032) is user purchased.
- ✧ The LCD keypad has the parameter copying function.
- ✧ If you need install the keypad on another position rather than on the VFD, use M3 screws or a keypad installation bracket for fixing, and use a keypad extension cable with a standard RJ45 crystal head.

Table B-1 Ordering description for the RS485 communication LCD keypad

Item	Description	Order No.
RS485 communication LCD keypad	Includes a 2.5-meter RS485 keypad cable, a 2.5-meter emergency stop cable, and a keypad installation bracket.	11022-00141

Table B-2 LCD keypad description

Name	Description			
Status indicator	①	RUN		VFD running status indicator. LED on: in running state LED off: in stopped state LED blinking: in parameter autotuning state
	②	TRIP		Fault indicator. LED on: in fault state LED off: in normal state LED blinking: in pre-alarm state
	③	QUICK/JOG		None
Keys	④		Function key	The function of a function key varies with the menu and is displayed at the bottom of the display area.
	⑤			
	⑥			
	⑦		Shortcut key	None
	⑧		Confirmation key	None
	⑨		Run key	Under keypad operation mode, the run key is used for running or autotuning.
	⑩		Stop/Reset key	In running state, you can press this key to stop running or autotuning. This key is restricted by P07.04. In fault alarm state, this key can be used for reset in any control modes.
	⑪		Direction key Up: Down: Left: Right:	Up: Its function varies with the interface (Example: shifting up the displayed/selected item and changing digits) Down: Its function varies with the interface (Example: shifting down the displayed/selected item and changing digits) Left: Its function varies with the interface (Example: switching the monitoring interface) Right: Its function varies with the interface (Example: switching the monitoring interface)

Name	Description			
Display area	⑫	LCD	Display screen	240*160 dot-matrix LCD, able to display three monitoring parameters or six sub-menu items simultaneously.
Other	⑬	RJ45 interface	RJ45 interface	The RJ45 interface is used to connect to the VFD.
	⑭	Battery cover	Clock battery cover	To replace or mount the clock battery, remove this cover, and then close the cover after the battery is mounted.
	⑮	USB terminal	Mini USB terminal	The mini USB terminal is used to connect to the USB flash drive through an adapter.

B.2 LCD keypad structure

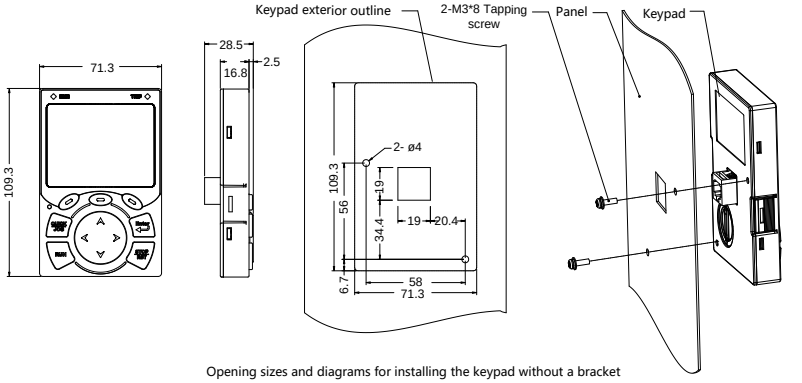


Figure B-2 LCD keypad structure diagram

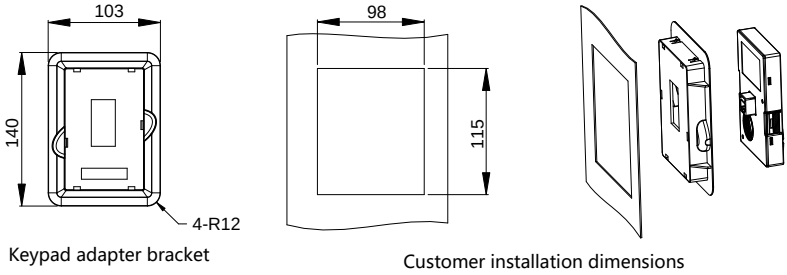


Figure B-3 Keypad installation bracket

B.3 RS485 communication cable

B.3.1 Wiring description

Please use the provided RS485 communication cable, of which one end is connected to the keypad network port and the other is connected to Goodrive300-01A-RT VFD control board user terminal (CN7). Do not use the ordinary network cable.

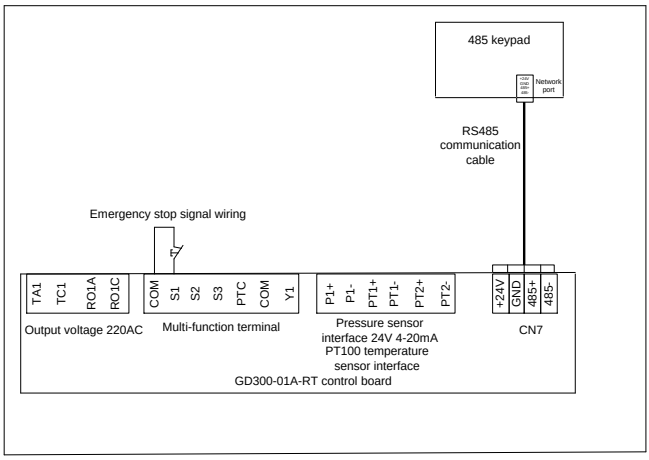


Figure B-4 RS485 communication cable connection diagram

B.3.2 Cable description

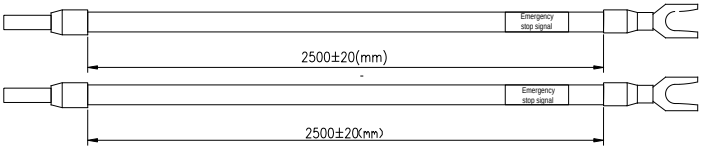


Figure B-5 Emergency stop cable diagram

Note: The emergency stop cable is used for emergency stop control when a device fault occurs and it is often connected to the S1 terminal and COM terminal.

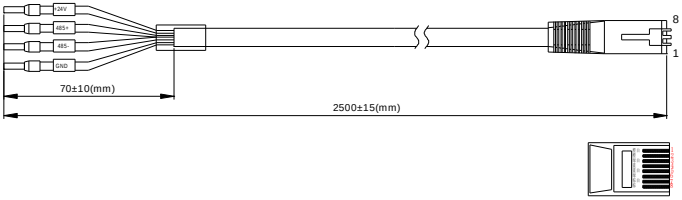
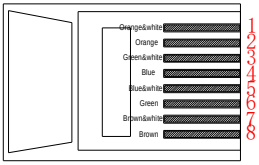


Figure B-6 RS485 communication cable diagram

Table B-3 Wires and terminals

Network port diagram	Terminal	Wire		
	GND	Orange & white	1	Twisted pair
		Orange	2	
	485-	Green & white	3	3 and 6 twisted pair
		Blue	4	
	485+	Blue & white	5	4 and 5 twisted pair
		Green	6	
	+24V	Brown & white	7	Twisted pair
		Brown	8	

B.4 Setting parameters on the LCD keypad

B.4.1 Initial interface

After power-on and startup, the initial interface appears, as shown in Figure B-7. The LCD keypad displays the product name and software version on this interface and goes to the working environment interface three seconds later.

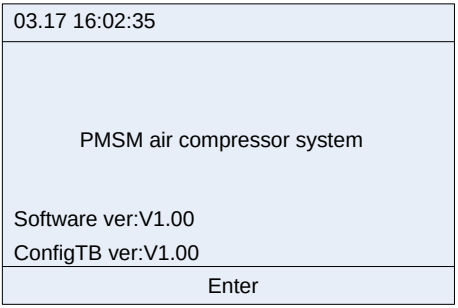


Figure B-7 Initial interface

B.4.2 Working environment interface

The working environment interface displays certain parameters about the running.

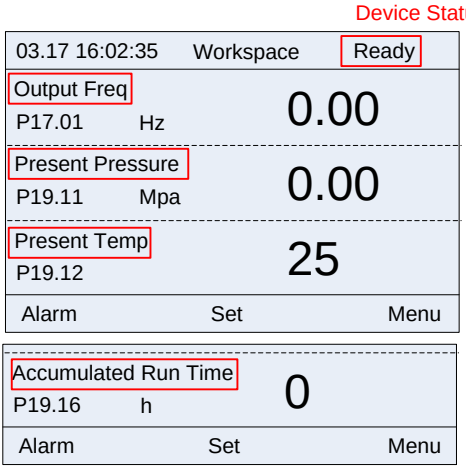


Figure B-8 Working environment

Parameter	Description
Device status	Ready: indicates the device is not started and it does not encounter an alarm. Only when the device is in standby state, the device can be started and the device startup key is valid.
	Run: indicates that the device is started and does not encounter an alarm.
	Fault: indicates that the master VFD or fan VFD encounters a fault. The fault alarm is cleared only after the fault is handled.
	Emergency stop: indicates that the emergency stop key is pressed. It is cleared only after the emergency stop key is reset.
	Undervoltage: indicates that the master VFD bus voltage is too low. In this case, you need to check the input power supply.
	Alarm: The alarm type is displayed in the pre-alarm area. ✧ When the temperature reaches the alarm threshold, the alarm is reported and the device stops. ✧ When the temperature reaches the pre-alarm threshold, the temperature is displayed in the pre-alarm area but the device continues running. ✧ When the temperature is lower than the low temperature protection threshold, the alarm is reported, low temperature protection is displayed, and the device stops running. ✧ When the pressure reaches the alarm threshold, the alarm is reported and the device stops. ✧ When the pressure reaches the pre-alarm threshold, the pre-alarm is displayed in the pre-alarm area, but the device continues running.

Parameter	Description
	Sleep: When you choose the sleep function and the master empty-load running time reaches the sleep time that is set, the device enters the sleep state. The device automatically wakes up when the pressure is lower than the loading pressure.
	Stop: indicates that the device has stopped.
	Restart delay: is used for device protection. If you press the restart key immediately after pressing the stop key, the device can be restarted with a restart delay, which is displayed and counted down. When the countdown time is 0, the device enters the standby state, and the start key is valid.
	Off: indicates the RS485 communication between the LCD keypad and VFD is disconnected.
Output frequency	It displays the value of the current running frequency of the master VFD.
Present pressure	It displays the value of the current pressure.
Present temperature	It displays the value of the current temperature.
Accumulated run time	It displays the total running time of device.

B.4.3 Setting interface

In the main interface, you can press  **Set** to enter the following interface:

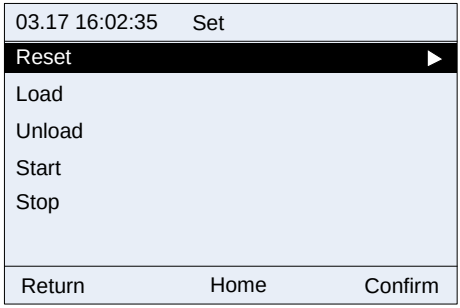


Figure B-9 Setting interface

In this interface, you can press the Up or Down key to select different operation functions. Then press  **OK** for control; press  **Back** or  **Home** to return to the working environment interface.

- Reset: enables you to reset a fault that the master VFD or fan VFD encounters.
- Load/Unload: controls the start or stop of the intake valve in manual loading or unloading mode.
- Start: enables you to start the device. The device can be started only in standby state.
- Stop: enables you to stop the device.

Note: You can implement the start, stop, and reset functions by pressing the RUN and STOP/RST keys on the keypad.

B.4.4 Alarm interface

You can press  **Alarm** in the main interface to access real-time alarm interface and view all the alarm records since the device power-on.

Note: This function equals the shortcut to **Menu** > **Fault records** > **Real-time alarm**. The only difference is that a real-time alarm that is accessed by using this shortcut method cannot be cleared in this interface and it can be cleared only in the fault record interface.

03.17 16:02:35 Real-time alarm
000. 03-17 16:00:05 xxx fault
001. 03-17 15:49:30 xxx fault
002. 03-17 15:08:20 xxx fault
...
Return Home

Figure B-10 Real-time alarm interface

B.4.5 Main menu interface

In the main interface, you can press  **Menu** to enter the main menu interface, which contains user parameters, maintenance parameters, protection parameters, running information, master parameters, fan parameters, fault records, VFD information, and system configuration. You can press the **Up** or **Down** key to switch between the menu items and then press  **Select** to enter a specific menu item.

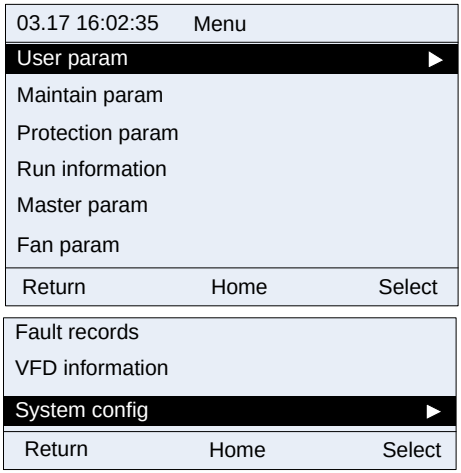
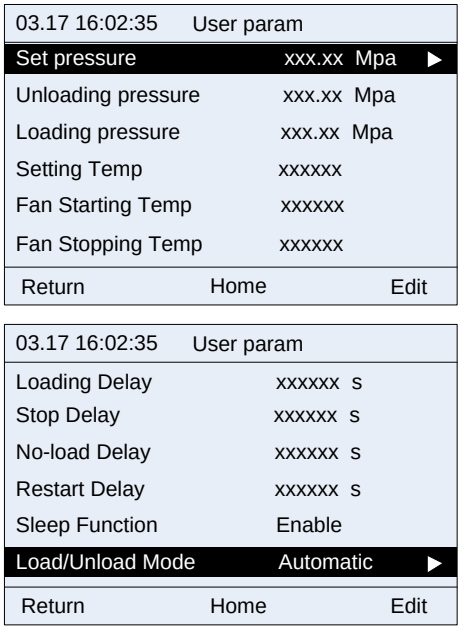


Figure B-11 Main menu interface

B.4.6 User parameter interface

1. Enter the user parameter interface through the main menu.



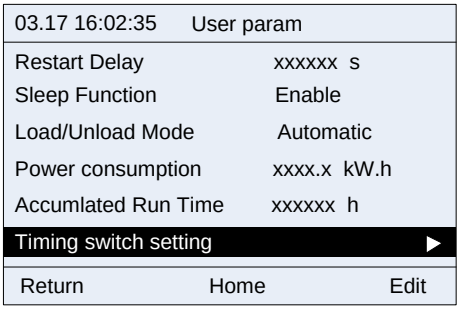


Figure B-12 User parameter interface

User parameter	Initial value	Function
Set temperature	75℃	Constant exhaust temperature that is set for constant temperature control on fan.
Fan stopping temperature	65℃	When the exhaust temperature is lower than this value, the fan is stopped.
Fan startup temperature	75℃	When the exhaust temperature is higher than this value, the fan is started.
Loading delay	10S	After the startup, the air compressor runs with load with this specified delay.
Load/unload mode	Automatic	If the manual mode is used, both load and unload need to be manually performed after the air compressor is started. If the automatic mode is used, the air compressor automatically loads or unloads depending on the pressure after being started.
Sleep function	Enabling	Disable/Enable
No-load delay	300s	Max. continuous empty-load running time allowed by the air compressor. If the time is reached, the air compressor enters the sleep state.
Stop delay	0s	Before stop, the device runs at the empty-load frequency and stops with this specified delay.
Restart delay	30s	After the device stops, the device determines whether to start with this specified delay.
Set pressure	0.70 MPa	Air supply pressure during stable running. The VFD controls the running frequency according to this pressure so as to implement constant pressure for air supply.
Unloading pressure	0.80 MPa	If the pressure is higher than this value when the air compressor is running, the VFD controls the air compressor to run without load.

User parameter	Initial value	Function
Loading pressure	0.60 MPa	If the VFD detects the pressure is lower than this value when the air compressor is running without load, the VFD controls the air compressor to run with load. If the VFD detects the pressure is lower than this value when the air compressor is sleeping, the master is waken up.
Power consumption	/	All the electricity consumption (kWh) of the VFD system. The value is automatically generated and cannot be set, but it can be cleared.
Accumulated running time	/	Accumulative running time (hours) of the VFD system. The value is automatically generated and cannot be set, but it can be cleared.
Timing switch setting		Press “Set” to access the corresponding interface. Startup time: Scheduled time when the device is automatically started. Shutdown time: Scheduled time when the device is automatically stopped. Startup action: Disable/enable (Timed startup is valid only in Enabled state. Otherwise, the device is not automatically started even though the scheduled startup time has been set.) Shutdown action: Disable/enable (Timed stop is valid only in Enabled state. Otherwise, the device is not automatically stopped even though the scheduled shutdown time has been set.)

2. In the user parameter interface, you can edit parameters only after entering the correct user password.

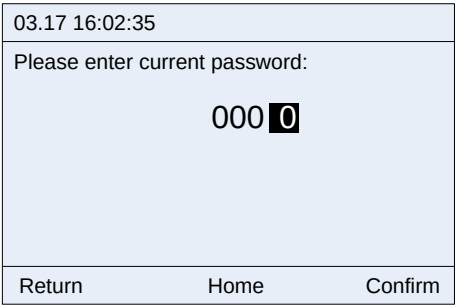


Figure B-13 User password input interface

3. Set user parameters after entering the correct user password.

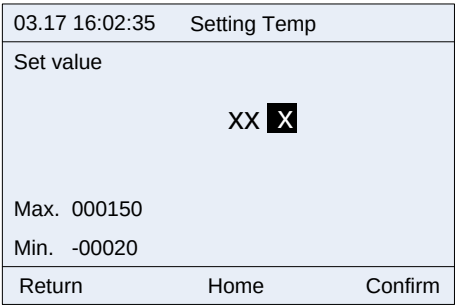


Figure B-14 Temperature setting interface

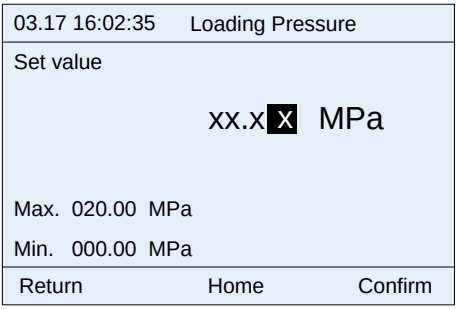


Figure B-15 Loading pressure setting interface

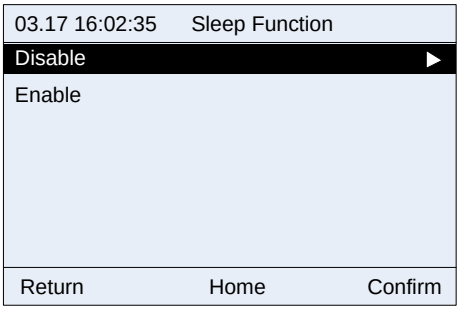


Figure B-16 Sleep function selection interface

Figure B-17 Accumulative running time display interface

In the **Timing switch setting** (timed startup/stop setting) interface, you can control the VFD to start or stop in different time points each day. To be specific, you can set a maximum of five scheduled startup/stop time points each day from Monday to Sunday.

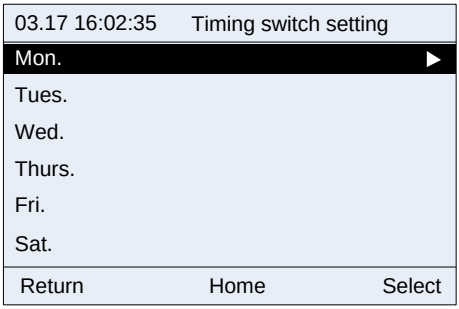


Figure B-18 Date selection interface

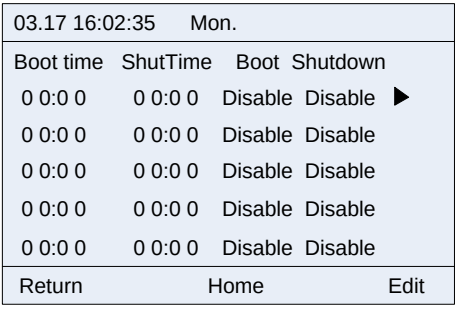


Figure B-19 Start/stop action selection interface

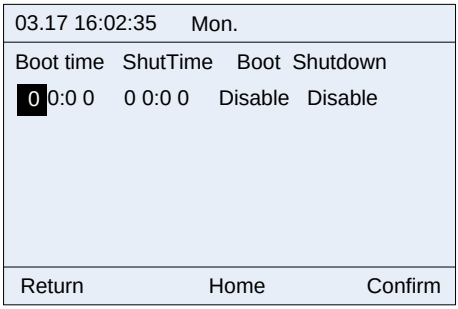


Figure B-20 Start/stop status setting interface

B.4.7 Maintenance parameter interface

1. Enter the maintenance parameter interface through the main menu.

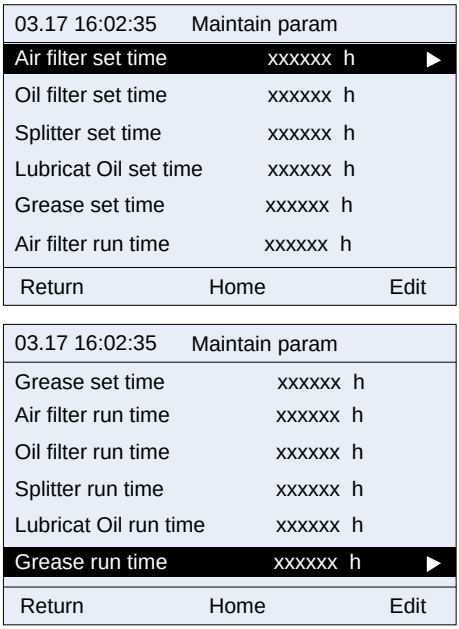


Figure B-21 Maintenance parameter interface

Maintenance parameter	Initial value	Function
Air filter set time	0	If the accumulative air filter use time exceeds this value, a pre-alarm is displayed. If this value is set to 0, no pre-alarm is displayed.

Maintenance parameter	Initial value	Function
Oil filter set time	0	If the accumulative oil filter use time exceeds this value, a pre-alarm is displayed. If this value is set to 0, no pre-alarm is displayed.
Splitter set time	0	If the accumulative splitter use time exceeds this value, a pre-alarm is displayed. If this value is set to 0, no pre-alarm is displayed.
Lubricate oil set time	0	If the accumulative lubrication oil use time exceeds this value, a pre-alarm is displayed. If this value is set to 0, no pre-alarm is displayed.
Grease set time	0	If the accumulative grease use time exceeds this value, a pre-alarm is displayed. If this value is set to 0, no pre-alarm is displayed.
Air filter run time	/	It is cleared when a new air filter is used.
Oil filter run time	/	It is cleared when a new oil filter is used.
Splitter run time	/	It is cleared when a new splitter is used.
Lubricate oil run time	/	It is cleared when new lubrication oil is used.
Grease run time	/	It is cleared when new grease is used.

2. You can edit parameters after entering the correct administrator password.

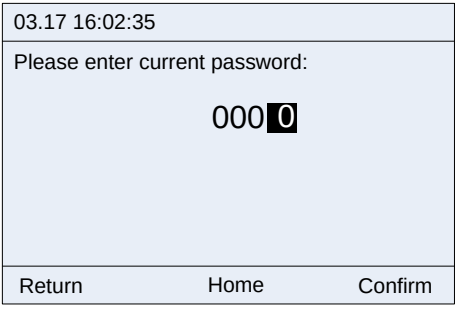


Figure B-22 Administrator password input interface

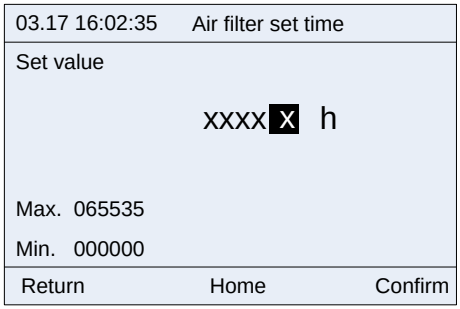


Figure B-23 Air filter set time

Maintenance parameters are set according to the use status of accessories. During running, if the use time of an accessory is equal to or greater than the set time, a pre-alarm is displayed, indicating that the accessory needs maintenance or it needs to be replaced. The use time needs to be cleared to 0 when the new accessory is used.

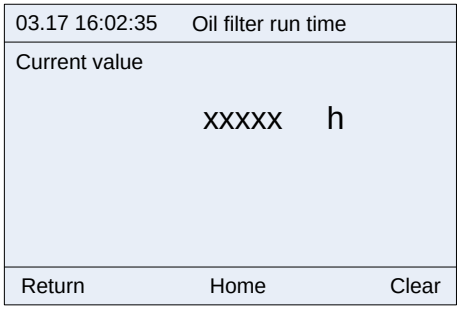
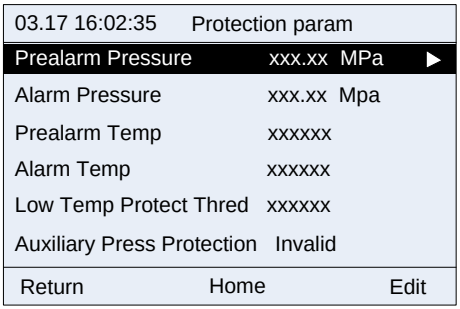


Figure B-24 Accumulative oil filter use time

B.4.8 Protection parameter interface

1. Enter the protection parameter interface through the main menu.



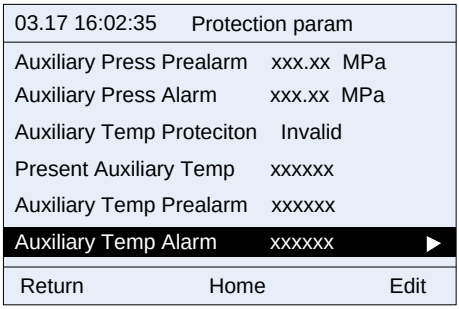


Figure B-25 Protection parameter interface

Protection parameter	Initial value	Function
Pre-alarm temperature	105℃	When the actual exhaust temperature is higher than this temperature, a pre-alarm is reported.
Alarm temperature	110℃	When the actual exhaust temperature is higher than this temperature, an alarm is reported, and the device is stopped.
Pre-alarm pressure	0.90Mpa	When the actual air supply pressure is higher than this pressure, a pre-alarm is reported.
Alarm pressure	1.00Mpa	When the actual air supply pressure is higher than this pressure, an alarm is reported, and the device is stopped.
Auxiliary temperature pre-alarm	105℃	When the detected temperature is higher than this temperature, a pre-alarm is reported. This parameter is valid only after it is enabled in system configuration.
Auxiliary temperature alarm	110℃	When the detected temperature is higher than this temperature, an alarm is reported, and the device is stopped. This parameter is valid only after it is enabled in system configuration.
Auxiliary pressure pre-alarm	0.90Mpa	When the detected pressure is higher than this pressure, a pre-alarm is reported. This parameter is valid only after it is enabled in system configuration.
Auxiliary pressure alarm	1.00Mpa	When the detected pressure is higher than this pressure, an alarm is reported. This parameter is valid only after it is enabled in system configuration.
Low temperature protection threshold	-10℃	When the detected temperature is lower than this temperature, a low temperature pre-alarm is reported. This parameter is valid only after it is enabled in system configuration.
Current auxiliary temperature	/	It displays the auxiliary temperature that is currently detected.

Protection parameter	Initial value	Function
Current auxiliary pressure	/	It displays the auxiliary pressure that is currently detected.
Enable auxiliary temperature protection	Disable	Disable/Enable
Enable auxiliary pressure protection	Disable	Disable/Enable

2. You can edit parameters only after entering the correct administrator password.

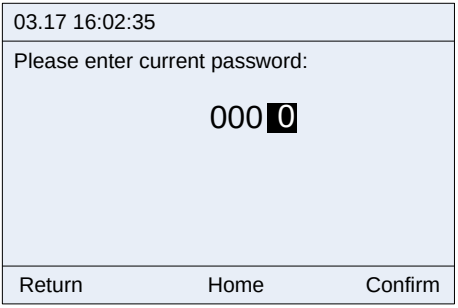


Figure B-26 Administrator password input interface

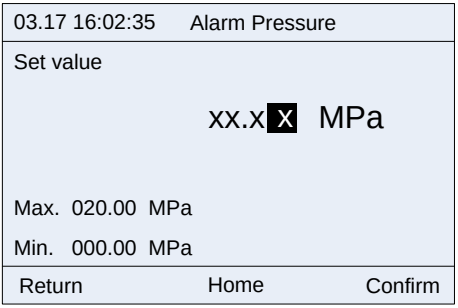


Figure B-27 Alarm pressure parameter setting interface

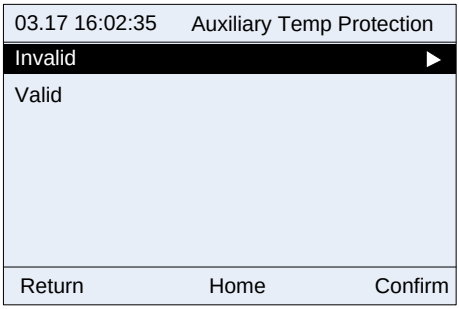


Figure B-28 Auxiliary temperature protection enabling

B.4.9 Running information

Enter the running information interface through the main menu. Running information includes master running information and fan running information.

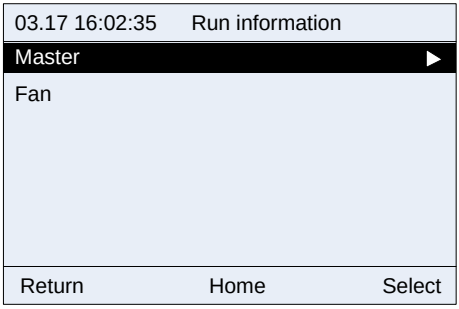


Figure B-29 Running information interface

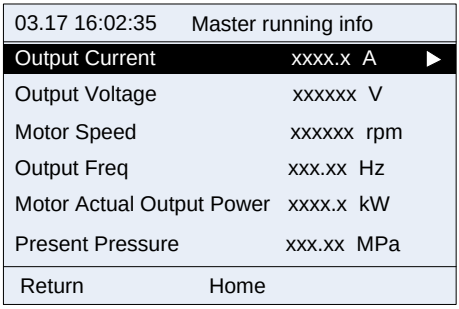


Figure B-30 Master running information

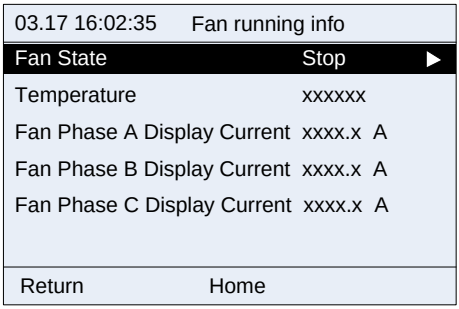


Figure B-31 Fan running information

Note: Master and fan running information is read only and therefore cannot be edited.

B.4.10 Master parameter interface

1. Enter the master parameter interface through the main menu.

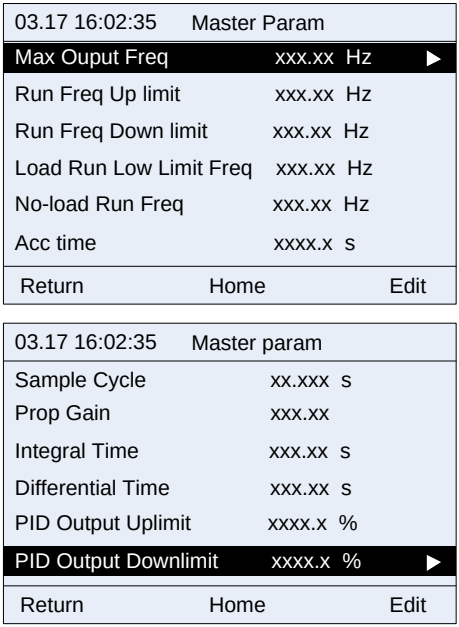


Figure B-32 Master parameter interface

Master parameter	Initial value	Function
Proportional gain (Kp)	10.00	It indicates the speed of tracking the set working pressure. A greater value indicates a higher speed of tracking and easier oscillation. A smaller value

Master parameter	Initial value	Function
		indicates a lower speed of tracking and slower adjustment. The recommended setting range is 5.00–15.00.
Integral time	2.00	The recommended setting range is 2.00–4.00.
Differential time (Td)	1.00	It is used for lag tracking on the large-scale lag system (such as temperature).
Sampling time (T)	0.100s	It indicates the sampling period for feedback values.
PID output upper limit	100%	It indicates the upper limit of the output of the PID regulator.
PID output lower limit	0.0%	It indicates the lower limit of the output of the PID regulator. It is set based on the lower limit frequency.
Max. output frequency	50.00Hz	It indicates the maximum output frequency of the VFD.
Upper limit of running frequency	50.00Hz	It indicates the upper limit of the output frequency of the VFD.
Lower limit of running frequency	00.00Hz	It indicates the lower limit of the output frequency of the VFD.
Loaded running frequency lower limit	40.00Hz	It indicates the minimum working frequency that is allowed to output when the pressure exceeds the set value but does not reach the unloading pressure during regulation.
Empty-load running frequency	38.00Hz	It indicates the working frequency when the air compressor is empty loaded.
ACC time	Model depended	It indicates the time taken by the VFD to accelerate from 0Hz to the maximum frequency.
DEC time	Model depended	It indicates the time taken by the VFD to decelerate from the maximum frequency to 0Hz.

2. You can edit parameters only after entering a correct administrator password.

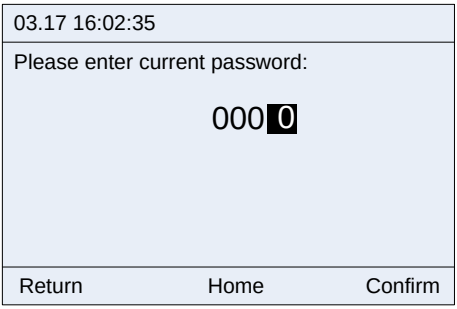


Figure B-33 Administrator password input interface

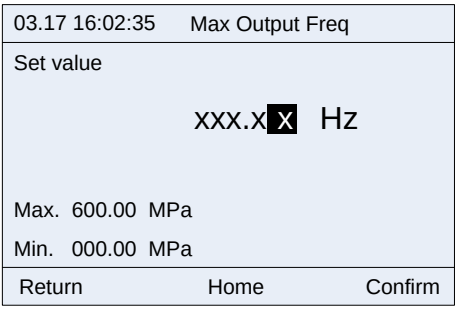


Figure B-34 Maximum output frequency setting interface

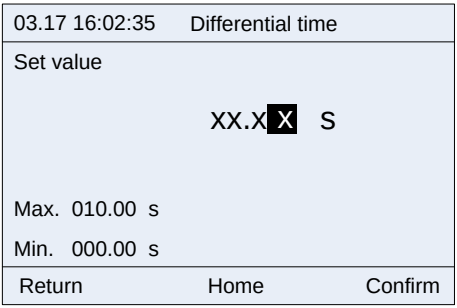


Figure B-35 Differential time setting interface

B.4.11 Fan parameter interface

1. Enter the fan parameter interface through the main menu.

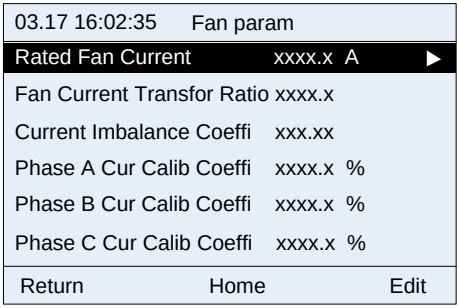


Figure B-36 Fan parameter interface

Fan parameter	Initial value	Function
Rated fan current	0.0A	It is associated with the power-frequency fan current detection and overload protection functions. It is valid only when the value is not 0, and it is invalid when the value is 0. Setting range: 0–40.0
Fan current transfer ratio	1000.0	Setting range: 1.0–4000.0
Current imbalance coefficient	3.00	When ratio of the maximum current to the minimum current among the fan three-phase currents is greater than this value, the VFD reports the fan current unbalance fault. Setting range: 1.00–5.00
Phase A current calibration coefficient	100.0%	Actual current = Displayed current * Current coefficient factor Setting range: 0.0–150.0% Note: When parameters are restored to the factory settings, this value is remained.
Phase B current calibration coefficient		
Phase C current calibration coefficient		

2. You can edit parameters only after entering a correct administrator password.

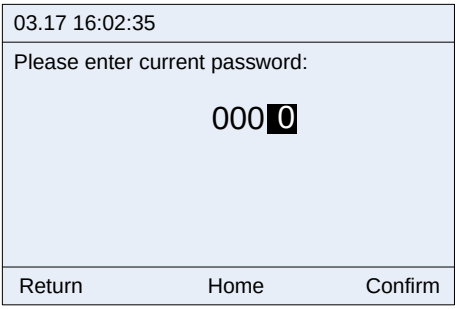


Table B-37 Administrator password input interface

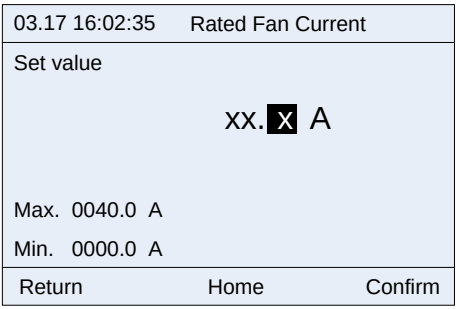


Figure B-38 Fan rated current setting interface

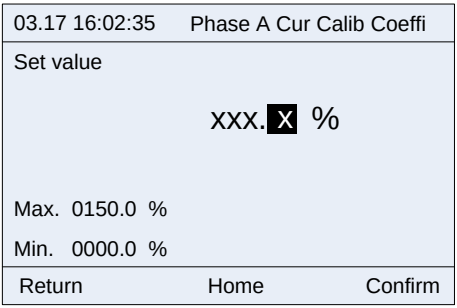


Figure B-39 Fan A-phase current correction factor setting interface

B.5 Fault records

The fault record interface is used to display the fault and alarm information about current device running. If an alarm is reported, alarm information is displayed. Fault records include VFD faults, air compressor faults, real-time alarms, and historic alarms.

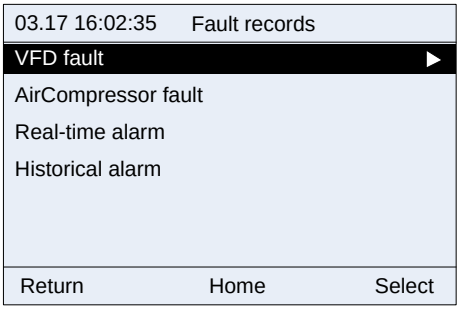


Figure B-40 Fault record interface

B.5.1 VFD fault interface

This interface displays fault information about the VFD. You can view the current fault and last five faults.

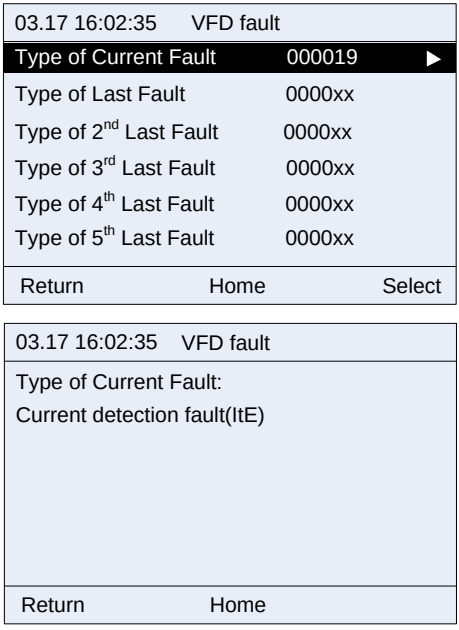


Figure B-41 VFD fault interface

B.5.2 Air compressor fault interface

This interface displays air compressor exception information, including the air filter, oil filter, and separator blockage, maintenance need, and auxiliary pressure or temperature pre-alarm or alarm.

03.17 16:02:35 Air Compressor fault		
000. Oil filter jam signal fault 001. External Signal 1 fault 002. Pressure Prealarm 003. Pressure Signal fault 004. Maintenance timeout ...		
Return	Home	

Figure B-42 Air compressor fault interface

B.5.3 Real-time alarm interface

This interface displays all fault records including fault time in real time since the keypad is started. If the keypad is re-powered on, the real-time alarm records are cleared but these records have been saved in the history alarm records before the power-off.

When there are many real-time alarm records, you can use the Up and Down keys to shift.

In the working environment interface, the  **Alarm** key is the shortcut access to real-time alarms, but alarm information can be cleared only in this interface.

03.17 16:02:35 Real-time alarm		
000. 03-17 16:00:05 xxx fault 001. 03-17 15:49:30 xxx fault 002. 03-17 15:08:20 xxx fault ...		
Return	Home	Clear

Figure B-43 Real-time alarm interface

When you need to clear real-time alarm records, you can press  **Clear** and enter a correct user password to clear the records.

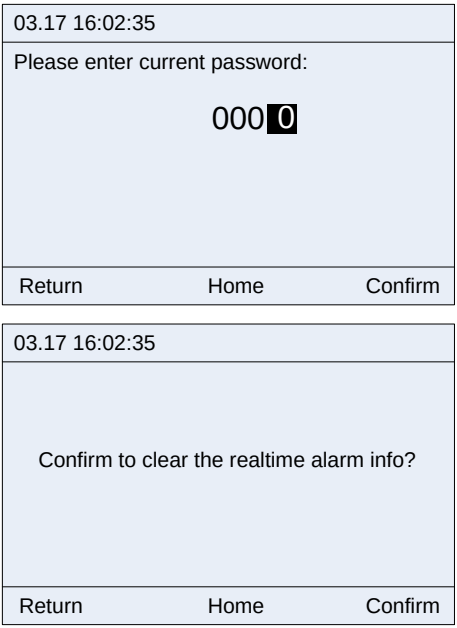


Figure B-44 Alarm record clearing interface

Note: The real-time alarm interface can keep a maximum of 50 fault records due to the restriction of memory. When the number of fault records exceeds 50, if you do not manually clear these extra records, the earliest fault records will be automatically overwritten.

B.5.4 Historic alarm interface

The fault information in the historic alarm interface is the same as that in the real-time alarm interface. The only difference is that the historic alarm interface always keeps the fault records even if the keypad is powered off, while the real-time alarm interface clears all the fault records if the keypad is powered off.

Note: The historic alarm interface can keep a maximum of 500 fault records due to the restriction of memory. When the number of fault records exceeds 500, if you do not manually clear these extra records, the earliest fault records will be automatically overwritten.

B.6 VFD information

Enter the VFD information interface through the main menu, as shown in the following figure.

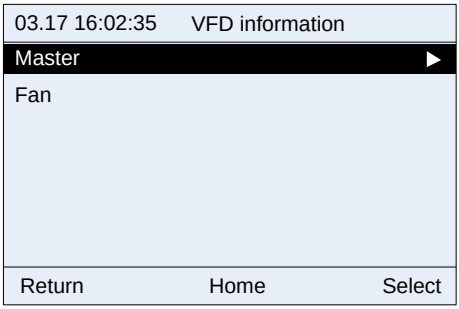


Figure B-45 VFD information interface

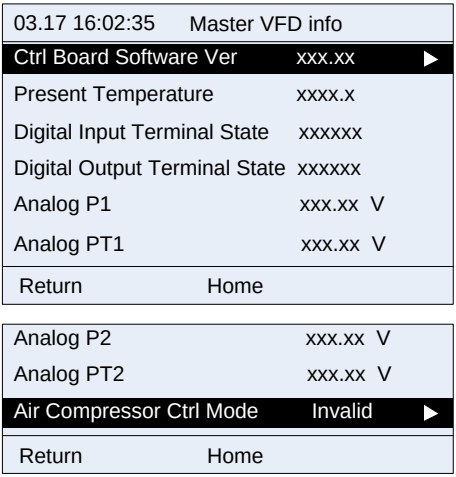


Figure B-46 Master VFD information

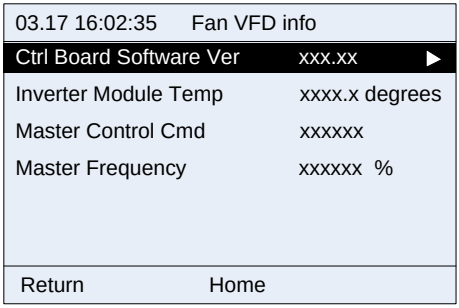


Figure B-47 Fan VFD information

Note:

✧ Fan VFD information only supports Goodrive300-21 series VFDs.

✧ VFD information is read only.

B.7 System configuration

Enter a correct factory password to enter the system configuration interface.

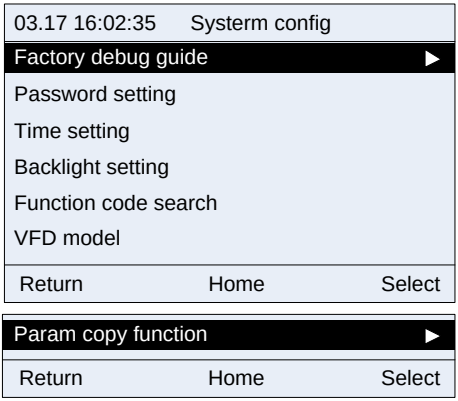


Figure B-48 System configuration interface

B.7.1 Factory commissioning wizard

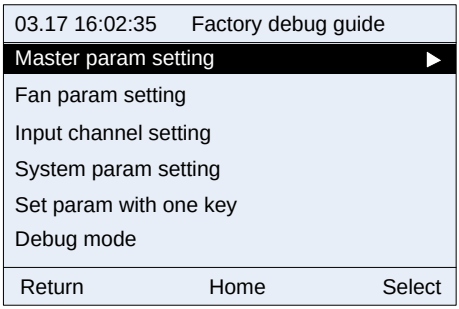


Figure B-49 Factory commissioning wizard interface

Factory commissioning procedure:

Step 1 Enter the master parameter setting interface.

Set motor parameters according to the motor nameplate. Perform motor parameter identifying. Enter motor parameters for motor variable-frequency commissioning. Parameter autotuning is located at the last line in the master parameter setting interface, as shown in Figure B-50.

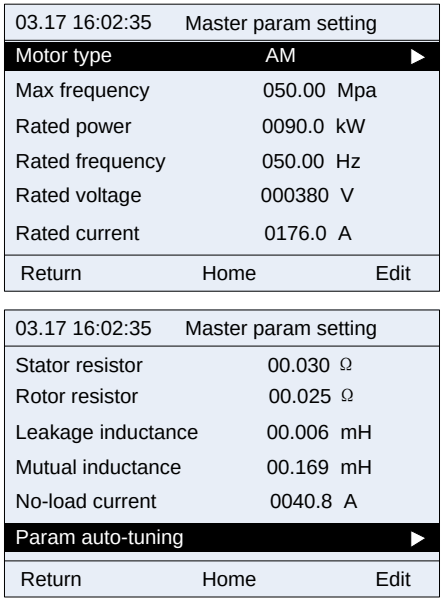


Figure B-50 Master parameter setting interface

Step 2 Enter the system parameter setting interface.

According to the sensor configuration, set the pressure sensor parameters, temperature sensor parameters, and oriented function parameters. Then return to the system configuration interface.

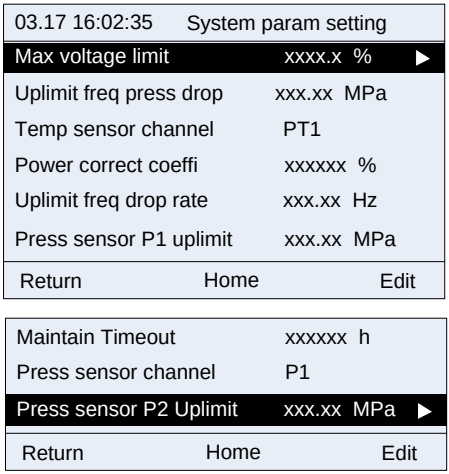


Figure B-51 System parameter setting interface

Step 3 Press the **Set up Parameters** key to automatically set parameters.

Step 4 Enter the commissioning mode. Run the master and fan in jogging mode to check the motor rotation direction.

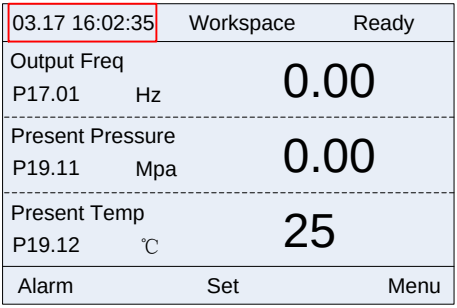
Step 5 Adjust user parameters, factory parameters, and maintenance parameters according to the manual.

During commissioning, if a signal exception occurs, check VFD information to view the signal status and handle the exception.

B.7.2 Date and time display

Generally, the date and time in the format of *AA.BB aa:bb:cc* is displayed in the upper left corner of the keypad interface. In the format, *AA* indicates month, *BB* indicates date, *aa* indicates hour, *bb* indicates minute, and *cc* indicates second. For example, "03.17 16:02:35" in the following figure indicates the current time is 16:02:35 on March 17.

Note: The real-time clock function can be used properly only when batteries are available. The battery compartment is located on the back of the keypad. You only need to remove the lid to check whether batteries are available.



B.7.3 Password setting

The controller provides multi-level password and permission management. The mapping between passwords and permissions is as follows:

- User password: able to modify user password and clear fault records.
- Administrator password: able to modify maintenance parameters, protection parameters, master parameters, and fan parameters, in addition to the permissions with a user password.
- Factory password: able to modify all parameters.
- Super factory password: able to modify all parameters.

Passwords are changeable. To change a password, enter the password correctly, enter a new password, and then re-enter the new password for confirmation. The password can be changed successfully only when no errors are made.

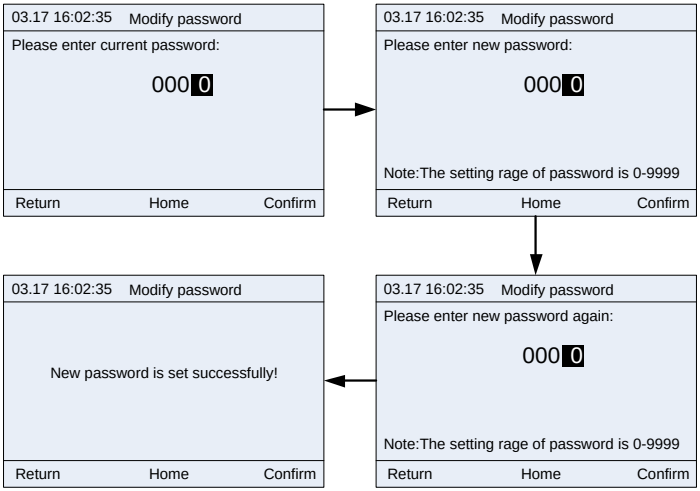


Figure B-52 Password changing interface

B.7.4 Date and time setting

If the keypad time is incorrect, you can change the time in the date and time setting interface. The year setting range is 2000–2099.

You can move the black cursor leftward or rightward through the keypad, adjust the digits through the Up or Down key, and then press  to confirm the change.

Note: Ensure that batteries have been installed in the back of the keypad.

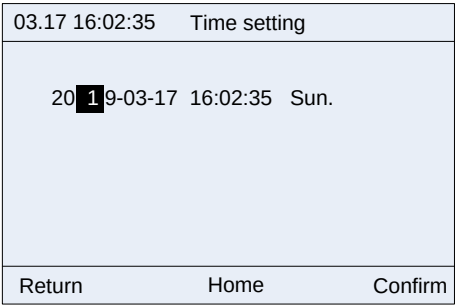


Figure B-53 Date and time setting interface

B.7.5 Screen backlight setting

The LCD keypad backlight setting includes the backlight brightness and time.

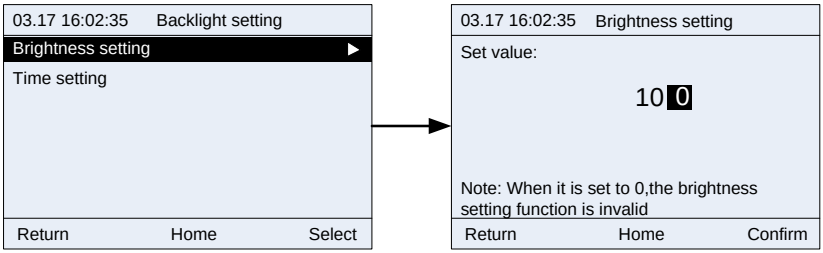


Figure B-54 Screen backlight brightness setting interface

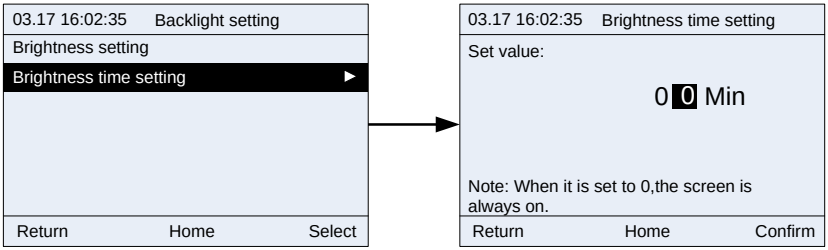


Figure B-55 Screen backlight time setting interface

B.7.6 Function code searching

The function code searching interface allows you to query and modify all VFD function codes. Figure B-56 shows an example of how to query and modify P00.04.

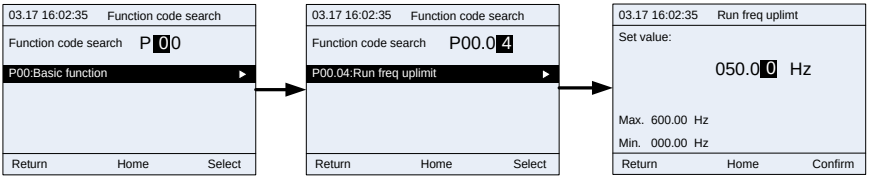


Figure B-56 Function code searching interface

B.7.7 VFD model selection

This interface allows you to select the VFD model. Different VFD models may be different in the function codes.

When communication is proper, the keypad automatically identifies the VFD model. In certain cases, you need to manually select the VFD model.

For example, when the connected VFD is Goodrive300-21, and the dual-VFD integrated machine contains the master and fan, the keypad identifies Goodrive300-21 (master) by default. In this case, if you want to check the function codes of the fan VFD, you need to manually switch to the fan VFD.

Note: After you search fan VFD function codes and return to the main menu interface, the keypad will automatically identify the master VFD again.

Figure B-57 lists the supported VFD series. In future, more VFD series may be supported.

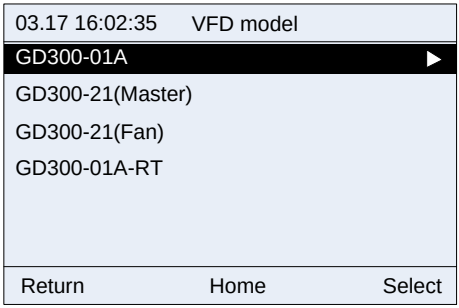


Figure B-57 VFD model selection interface

B.7.8 Parameter copying

The parameter copying function allows you to upload parameters from the connected VFD to the keypad and also allows you to download parameters from the keypad to the connected VFD.

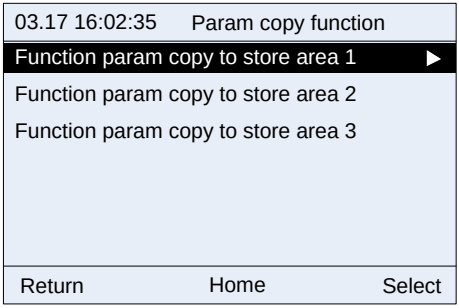


Figure B-58 Parameter copying function 1

Each storage area supports parameter upload, parameter download 1 (all parameters), parameter download 2 (non-motor parameters), and parameter download 3 (only motor parameters). After you press  for confirmation, the corresponding operation is performed.

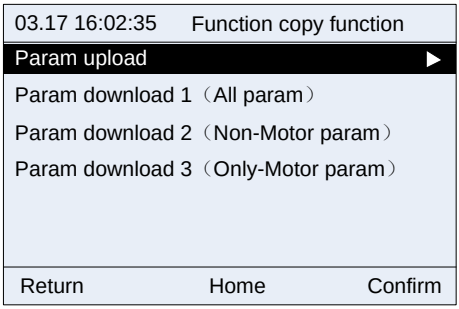
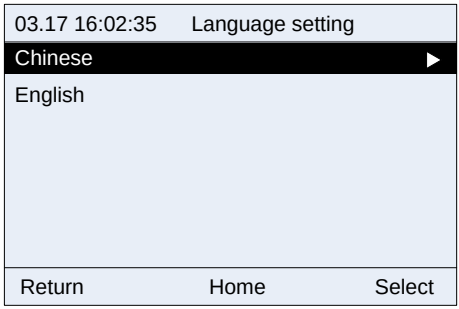


Figure B-59 Parameter copying function 2

B.7.9 Language setting

The LCD keypad supports switching between Chinese and English. Each time you switch between Chinese and English, the switching will take effect only after the keypad is powered off and restarted.



Appendix C HMI

C.1 Specifications

Table C-1 Touch screen specifications

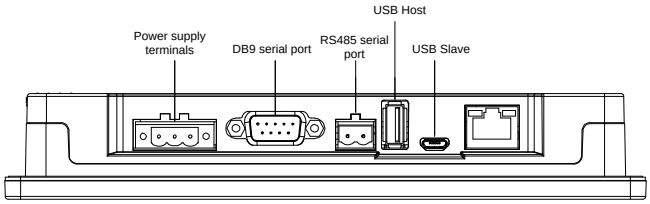
Category	Function	Specifications
Hardware parameter	Screen	7” 16: 9 TFT LCD screen
	Resolution	800×480
	Color	24 bits
	Brightness	360 cd/m²
	Backlight	LED
	LCD lifetime	50000 hours
	Touch screen	4-wire industrial resistance touch screen
	CPU	600MHz ARM Cortex-A8
	Memory	128M Flash + 128M DDR3
	RTC	Real-time clock (embedded)
	Ethernet	None
	USB port	1 USB Slave 2.0 port; 1 USB Host 2.0 port
	Program download method	USB Slave/U disk
	Serial communication port	COM1: RS232/RS485/RS422； COM2: RS485 COM3: RS232
	Viewing angle of LCD (T/B/L/R)	50'/70'/70'/70'
Electrical performance	Rated power	< 10W
	Rated voltage	DC24V, allowable working range DC 9V–28V
	Power supply protection	Surge protection capability
	Allowed power outage	< 5ms
	CE & RoHS	Compliant with EN61000-6-2:2005 and EN61000-6-4:2007 Compliant with RoHS lightning surge ±1kV, group pulse ±2kV Static contact 4kV, air discharge 8kV
Environment requirement	Working temperature	0–50℃

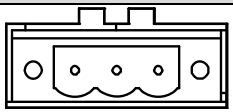
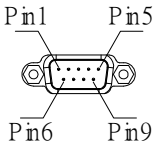
Category	Function	Specifications
	Storage temperature	-20–60℃
	UV resistance	Disallowed to work under strong UV (such as direct sunlight)
	Ambient humidity	10–90%RH (no condensation)
	Shock resistance	10–25Hz (X, Y, Z direction 2G/30 minutes)
	Cooling method	Natural air cooling
Mechanical performance	Ingress protection rating	The front panel reaches IP65 (installed with a flat panel cabinet), and the rear shell of the device reaches IP20.
	Mechanical structure	Engineering plastic
	Cut-out dimensions	192mm×138mm
	Overall dimensions	204mm×145mm×33.8mm
	Overall weight	About 560g

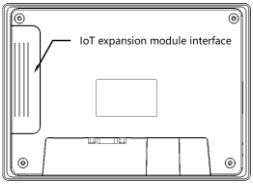
Table C-2 Ordering description for the touch screen

Item	Description	Order No.
HMI	Includes a 2.5-meter RS485 communication cable, a 2.5-meter 24V power supply cable, and a 2.5-meter emergency stop cable.	11026-00011

C.2 Connection terminals



Power supply terminals (Pins 1–3, from left to right)		
	Pin1	FG
	Pin2	0V
	Pin3	DC24V
DB9 serial port terminals		
	Pin1	Rx-(B)
	Pin2	RxD (COM1 RS232)
	Pin3	TxD (COM1 RS232)
	Pin4	Tx-
	Pin5	GND

	Pin6	Rx+(A)
	Pin7	RxD (COM3 RS232)
	Pin8	TxD (COM3 RS232)
	Pin9	Tx+
RS485 terminals (Pins 1–2, from left to right)		
	Pin1	A+ (COM2 RS485)
	Pin2	B- (COM2 RS485)
USB Host		
	USB Type A	Used to connect external peripherals such as the USB disk and barcode scanning device.
USB Slave		
	MicroUSB	Used for program download and debugging.
FLink expansion module		
	Expansion module card slot	Supported modules: FLink, FLink-2G, FLink-4G, and FLink-WiFi

C.3 Wiring description

In order to drive and manage the air compressor better, use the provided RS485 communication cable, of which one end is connected to the touch screen power supply port and DB9 serial port terminal and the other is connected to Goodrive300-01A-RT VFD control board user terminal (CN7). Do not use the ordinary network cable.

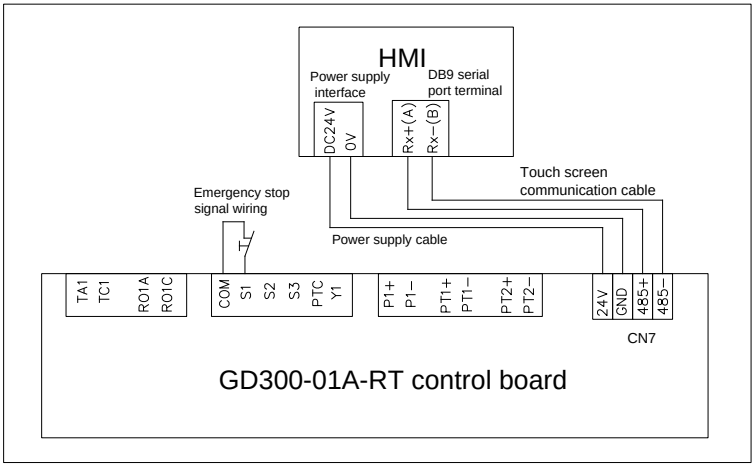


Figure C-1 Touch screen cable connection diagram (standard configuration)

C.4 Cable description

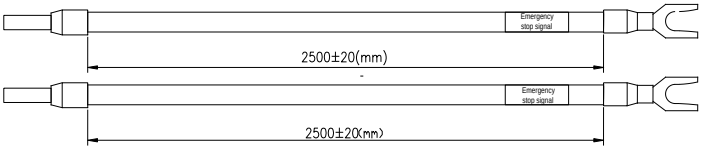


Figure C-2 Emergency stop cable diagram

Note: The emergency stop cable is used for emergency stop control when a device fault occurs and it is often connected to the S1 terminal and COM terminal.

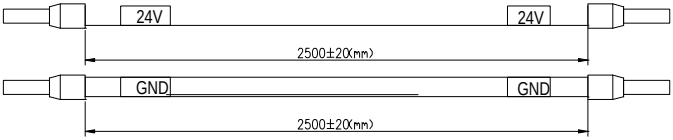


Figure C-3 Touch screen power supply cable diagram

Note: As shown in Figure C-1, the touch screen power supply interface is connected to CN7 of GD300-01A-RT VFD control board.

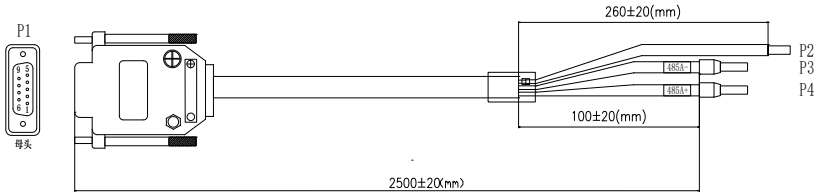
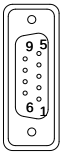


Figure C-4 Touch screen communication cable diagram

Terminal diagram	Terminal		Cable	
P1  Female	P1(1PIN)	RX-(B)	P3	485-
	P1(6PIN)	RX+(A)	P4	485+
	Iron shell		P2	Shield layer grounding cable

C.5 Installation dimensions and description

C.5.1 Touch screen installation dimensions

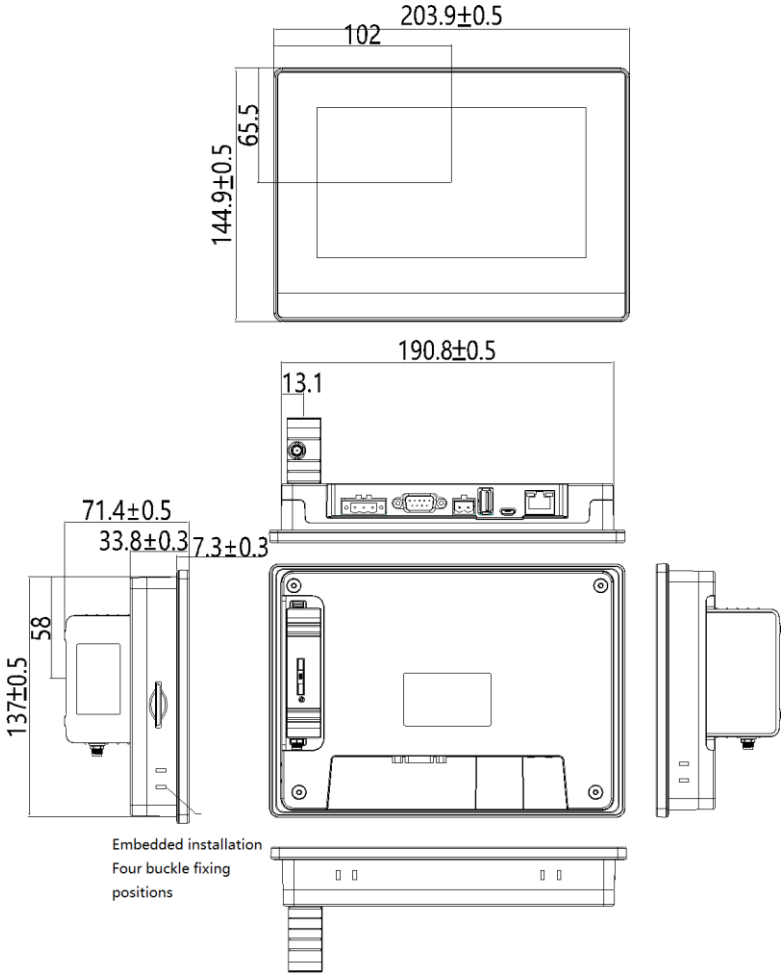
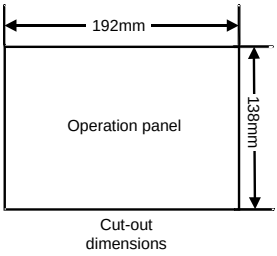


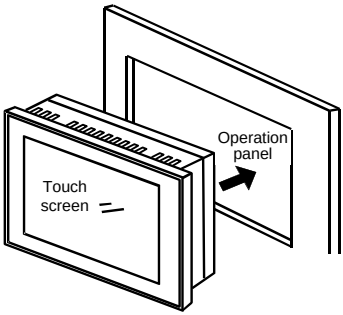
Figure C-5 Touch screen installation dimensions (unit: mm)

C.5.2 Cut-out installation description

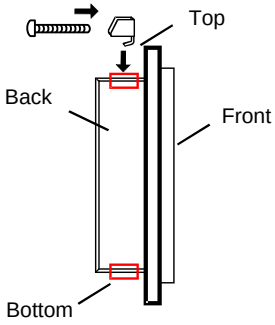
When you want to build the touch screen into the operation panel of the control cabinet, use the cross screwdriver and metal installation snap-fit. The installation procedure is as follows:

Step 1 Cut a rectangular installation groove on the operation panel of the control cabinet according to the cut-out dimensions, and then insert the touch screen from the front of the operation panel.





Step 2 Insert the metal snap-fits into the back, top and bottom mounting jacks of the touch screen, insert the fastening screws (attached), and then tighten the screws with the cross screwdriver.



C.6 Touch screen parameter setting with one click

Function code	Name	Default	Description
P00.00	Speed control mode	0	0: SVC mode 0 (applicable to AM, SM) 1: SVC mode 1(applicable to AM) 2: V/F control **Note:** AM: Asynchronous Motor; SM: Synchronous Motor;
P00.01	Channel of running commands	2	0: Keypad (LED off) 1: Terminal (LED blinks) 2: Communication (LED on)
P00.06	Setting channel of A frequency command	7	7: PID control setting
P00.13	Running	2	2: Disable reverse running

Function code	Name	Default	Description
	direction		
P01.15	Stop speed	500	5Hz
P03.27	Speed display selection in vector control	1	0: Display the actual value 1: Display the set value
P05.01	Function of S1	6	6: Coast to stop
P05.02	Function of S2	46	46: External fault 1
P05.03	Function of S3	9	9: External fault input
P05.04	PTC signal input	51	51: PTC signal
P05.10	Input terminal polarity	1	1: Emergency stop terminal is normally closed.
P05.11	Digital input filter time	0.2000	/
P06.02	RO1 output	29	29: Cooling fan control of main motor
P06.03	Solenoid valve output (TA-TC)	28	28: Solenoid valve control output (used for air compressor)
P09.00	PID reference source	10	10: Pressure setting of dedicated function of air compressor
P09.02	PID feedback source	8	8: Pressure feedback of dedicated function of air compressor
P09.08	Final limit of PID control deviation	0.1	/
P11.15	Speed deviation detection time	0.0	/
P11.16	Automatic frequency reduction during voltage drop	1	0: Invalid 1: Valid
P13.08	Control parameter 1	288	0x120
P13.09	Control parameter 2	5.00	/
P18.00	Air compressor control mode	1	0: Normal VFD mode 1: Air-compressor control mode

Function code	Name	Default	Description
P18.43	Fan control mode	0	0: Air compressor mode, the power-frequency fan starts/stops as per the temperature; 1: Terminal, the power-frequency fan starts/stops via terminals; 2: RS485 communication (address 0X201B, write 1 to start, write 3 to stop)

Appendix D Communication protocol

D.1 Application mode

The Modbus protocol of this VFD is RTU mode and the network line is RS485.

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

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

Communication baud rate (P14.01) means the binary bit number transmitted in one second. The unit is bit/s (bps). The higher the baud rate is, the quicker the transmission speed is and the weaker the anti-interference is. If the twisted pairs of 0.56mm (24AWG) is used as the communication cables, the max. transmission distance is as below.

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

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

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

D.2 RTU command code and communication data

D.2.1 Command code: 03H, read N words (N≤16)

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

This command code is used to read the parameter and working state of the VFD.

D.2.2 Command code: 06H, write one word

This command means the master writes data to the VFD and one command can write one data only. It is used to change the parameter and working mode of the VFD.

D.2.3 Command code: 08H, diagnosis function

Meaning of sub-function codes:

Sub-function code	Description
0000	Return to inquire information data

D.2.4 Definition of data address

The address definition of communication data is used to control VFD operations, obtain VFD state information and set function parameters.

D.2.4.1 Rules for presentation of function code address

The parameter address occupies 2 bytes with the most significant byte (MSB) in the front and the least significant byte (LSB) in the behind. The ranges of the MSB and LSB are: MSB—00 – ffH; LSB—00 – ffH. The MSB is the group number before the radix point of the function code and the LSB is the number after the radix point, but both the MSB and the LSB should be converted into hex. For example P05.06, the group number before the radix point of the function code is 05, then the MSB of the parameter is 05, the number after the radix point is 06, then the LSB of the parameter is 06, and the function code address is 0506H in hex. Similarly, the parameter address of P10.01 is 0A01H.

D.2.4.2 Address description of other Modbus functions

The address definition of communication data is used to control VFD operations, obtain VFD state information and set function parameters.

Table D-1 Other function parameters

Function description	Address definition	Data meaning	R/W characteristics
Communication control command	2000H	0001H: Forward running	R/W
		0002H: Reverse running	
		0003H: Forward jogging	
		0004H: Reverse jogging	
		0005H: Stop	
		0006H: Coast to stop (emergency stop)	
		0007H: Fault reset	
		0008H: Jogging stop	
Address of the set value of communication	2001H	The set communication frequency (0–Fmax (unit: 0.01Hz))	R/W
	2002H	PID reference, range (0–1000, 1000 corresponds to 100.0%)	
	2003H	PID feedback, range (0–1000, 1000 corresponds to 100.0%)	R/W
	2004H	The set torque value (-3000–3000, 1000 corresponds to 100.0% of the rated motor current)	R/W
	2005H	The set value of upper limit frequency of forward rotating (0–Fmax (unit: 0.01Hz))	R/W
	2006H	The set value of upper limit frequency of reverse rotating (0–Fmax (unit: 0.01Hz))	R/W

Function description	Address definition	Data meaning	R/W characteristics
	2007H	Upper limit torque of electromotion torque (0–3000, 1000 corresponds to 100.0% of motor current of the VFD)	R/W
	2008H	Upper limit torque of brake torque (0–3000, 1000 corresponds to 100.0% of rated motor current)	R/W
	2009H	Special control command word: Bit0–1: =00: Motor 1 =01: Motor 2 =10: Motor 3 =11: Motor 4 Bit2: =1 Torque control =0: Speed control Bit3: =1 Power consumption cleared to zero =0: Power consumption not cleared to zero Bit4: =1 Pre-excitation =0: Pre-excitation forbidden Bit5: =1 DC brake =0: DC brake forbidden	R/W
	200AH	Virtual input terminal command, range: 0x000–0x1FF	R/W
	200BH	Virtual output terminal command, range: 0x00–0x0F	R/W
	200CH	The set voltage value (used for V/F separation) (0–1000, 1000 corresponds to 100.0% of the rated motor voltage)	R/W
	200FH	BIT0: =1 running time of part 1 cleared to zero; =0: invalid BIT1: =1 running time of part 2 cleared to zero =0: invalid BIT2: =1 running time of part 3 cleared to zero =0: invalid BIT3: =1 running time of part 4 cleared to zero =0: invalid BIT4: =1 running time of part 5 cleared to zero =0: invalid BIT5: =1 device running time cleared to zero =0: invalid	R/W

Function description	Address definition	Data meaning	R/W characteristics
		BIT6: =1 solenoid valve loading =0: solenoid valve unloading	
	2010H	The set maintenance time of part 1; Range: 0–65535	W
	2011H	The set maintenance time of part 2; Range: 0–65535	W
	2012H	The set maintenance time of part 3; Range: 0–65535	W
	2013H	The set maintenance time of part 4; Range: 0–65535	W
	2014H	The set maintenance time of part 5; Range: 0–65535	W
	2015H	Running time of part 1, 0–65535	W
	2016H	Running time of part 2, 0–65535	W
	2017H	Running time of part 3, 0–65535	W
	2018H	Running time of part 4, 0–65535	W
	2019H	Running time of part 5, 0–65535	W
	201AH	Running time of the device: 0–65535	W
	201BH	Start/stop command of power-frequency fan, 0–3	W
VFD state word 1	2100H	0001H: In forward running	R
		0002H: In reverse running	
		0003H: In stopping	
		0004H: In fault	
		0005H: VFD Poff state	
		0006H: VFD pre-exciting state	
VFD state word 2	2101H	Bit0: =0: Not ready to run =1: Ready to run Bi1–2: =00: Motor 1 =01: Motor 2 =10: Motor 3 =11: Motor 4 Bit3: =0: Asynchronous motor =1: Synchronous motor Bit4: =0: Non-overload pre-alarm =1: Overload pre-alarm Bit5– Bit6: =00: Keypad control =01: Terminal control	R

Function description	Address definition	Data meaning	R/W characteristics
		=10: communication control	
VFD fault code	2102H	See fault type.	R
VFD identification code	2103H	Goodrive300-01A-RT-----0x0130	R
Running frequency	3000H	Compatible with CHF100A, CHV100 communication address	R
The set frequency	3001H		R
Bus voltage	3002H		R
Output voltage	3003H		R
Output current	3004H		R
Running speed	3005H		R
Output power	3006H		R
Output torque	3007H		R
Closed-loop setting	3008H		R
Closed-loop feedback	3009H		R
Input IO state	300AH		R
Output IO state	300BH		R
Analog input 1	300CH		R
Analog input 2	300DH		R
Analog input 3	300EH		R
External counting value	3014H		R
The set torque value	3015H		R
VFD identification code	3016H		R
Fault code	5000H		R

D.2.5 Error message response

Table D-2 Error message response and meaning

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

Code	Name	Meaning
02H	Illegal data address.	Some of the operation addresses are invalid or not allowed to access. Especially the combination of the register and the transmitting bytes are invalid.
03H	Illegal 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 failed	The parameter setting in parameter writing is invalid. For example, the function input terminal cannot be set repeatedly.
05H	Password error	The password written to the password check address is not same as the password set by P07.00.
06H	Data frame error	In the frame message sent by the upper computer, the length of the digital frame is incorrect or the counting of CRC check bit in RTU is different from the lower computer.
07H	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 during running	The modified parameter in the writing of the upper computer cannot be modified during running.
09H	Password protection	When the upper computer is writing or reading and the user password is set without password unlocking, it will report that the system is locked.

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

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

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

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

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

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

Appendix E Common EMC problems and troubleshooting

E.1 Interference problems of meter switches and sensors

Interference phenomena:

The sensor signal (pressure, temperature, displacement, etc.) is collected and displayed via HMI device, the sensor value displayed after VFD starts is wrong, the common phenomena are listed below:

- ✧ Incorrect display of upper limit or lower limit value, such as 999 or -999.
- ✧ The displayed value changes randomly (often occurred to pressure transmitter).
- ✧ The displayed value is stable but huge deviation exists e.g. the displayed temperature value is dozens of centigrade higher than the normal value (often occurred to thermocouple).
- ✧ The signal collected by the sensor does not display directly but acts as feedback signal for drive system operation e.g. the VFD is supposed to decelerate when the air compressor has reached the upper limit pressure, however, the VFD starts to decelerate before upper limit pressure is reached.
- ✧ Various meters connected by VFD analog output (AO) (such as frequency meter, current meter, etc.), the value displayed by these meters after VFD starts is inaccurate.
- ✧ The system adopts proximity switch. The indicator of proximity switch flickers after VFD starts, overturn occurred to output level by mistake.

Solutions:

- ✧ Check and confirm the sensor feedback line is routed with motor cable at a distance of at least 20cm.
- ✧ Check and ensure motor ground line has been connected to PE terminal of the VFD (if motor ground line has been connected to the grounding bar of VFD cabinet, measure with multimeter to confirm that the resistance between grounding bar and PE terminal is less than 1.5Ω).
- ✧ If there are too many interfered meters/sensors, it is recommended to install external C2 filter at the input power side of the VFD.

E.2 RS485 communication interferences

The RS485 communication interference mainly lies in communication delay, out-of-synchronization, disconnection or occasional normal after VFD starts.

Abnormal communication is not always caused by interference, which can be ruled out by below means.

- ✧ Check if circuit break or poor contact occurred to RS485 communication bus.
- ✧ Check if both ends of A, B cable of the RS485 communication bus are connected reversely.
- ✧ Check if the communication protocol (e.g. baud rate, data bit check, etc.) of the VFD is in

consistent with that of the upper PC.

✧ If it is confirmed that the abnormality is caused by interference, rule out the problem cause by below means.

Troubleshooting:

✧ The communication cable cannot be routed with motor cable in the same cable tray.

✧ In multi-machine application, the connection of communication cables between VFDs should adopt chrysanthemum mode to improve anti-interference ability.

✧ In multi-machine application, it is necessary to confirm that the drive capacity of the master is strong enough.

✧ For multi-machine connection, both ends should be connected to 120Ω terminal resistors.

Solutions:

✧ Check and confirm the motor ground line is connected to PE terminal of the VFD (if motor ground line has been connected to the grounding bar of VFD cabinet, measure with multimeter to confirm that the resistance between grounding bar and PE terminal is less than 1.5Ω);

✧ The VFD and motor cannot be common grounded along with the communication upper PC (PLC, touch screen, etc.). It is recommended to connect the VFD and motor to the power GND, and connect the communication upper PC to the ground pile separately;

✧ Try to short connect reference GND terminal of VFD signal to the reference GND terminal of upper PC controller signal to ensure the ground potential of their communication chips is the same;

✧ Try to short connect reference GND terminal of VFD signal to the grounding terminal (PE) of the VFD.

E.3 Unstoppable or shimmering indicator caused by coupling of motor cable

Interference phenomena:

Stop failure

✧ For VFD system whose start/stop is controlled by S terminal, the motor cable and control cable are routed in the same cable tray. After system starts, it cannot stop by S terminal.

Indicator shimmering

✧ After a VFD is started, the relay indicator, power distribution box indicator, PLC indicator, and indication buzzer shimmers, blinks, or emits unusual sounds unexpectedly.

Solutions:

✧ Check and confirm the abnormal signal cable is routed with motor cable at a distance of at least 20cm.

✧ Connect in parallel the digital input terminal (S) used for start/stop control with other idle digital input terminals. For instance, S1 terminal is used for start/stop control, S3 terminal is idled, then try to short connect S1 terminal with S3 terminal.

E.4 Leakage current and residual current device (RCD)

As the VFD outputs high frequency PWM voltage to drive the motor, the distributed capacitance against the radiator from internal IGBT and between rotor and stator of the motor may cause the VFD to generate high frequency leakage current against the ground. While the RCD is used to detect the power frequency leakage current when grounding fault occurred to electrical circuit, the application of VFD may cause mal-operation of RCD.

How to select RCD:

Due to the specialty of VFD system, it is required that the rated residual operating current should be above 200mA for regular RCDs at all levels, and the VFD must be grounded with proper technics.

As for the setting time of RCD, the time limit of preceding action should be longer than the secondary action and time gap between them should be set to a value larger than 20ms e.g. 1s, 0.5s and 0.2s.

It is recommended to use electromagnetic RCD for the electrical circuit of VFD system. Such RCD carries strong anti-interference capacity to prevent the RCD from being affected by high frequency leakage current.

Electronic RCD	Electromagnetic RCD
Low cost, high sensitivity, small size, vulnerable to voltage fluctuation of the grid and ambient temperature, weak anti-interference capacity.	Require the zero sequence current transformer to be quite sensitive, precise and stable, made from permalloy material with high permeability, complicated process and high cost, immune to voltage fluctuation of the grid and ambient temperature, strong anti-interference capacity.

Solution to mal-operation of RCD (on the part of VFD)

- ✧ Try to decrease the carrier frequency to 1.5kHz (P00.14=1.5).
- ✧ Try to change the modulation mode to “3PH modulation and 2PH modulation” (P8.40=00).

Solution to mal-operation of RCD (on the part of system distribution)

- ✧ Check and confirm the power cable is not immersed in water.
- ✧ Check and confirm the cable is not broken or switched over.
- ✧ Check and confirm if secondary grounding occurred to the null line.
- ✧ Check and confirm if power cable terminal is in the air switch or the contactor is poorly contacted (loose screws).
- ✧ Check the single-phase electric equipment and confirm if the ground line is misused as null line.
- ✧ VFD power cable and motor cable should not be shielded ones.

Leakage protection of motor autotuning:

During motor autotuning, the measurement on differing motor parameters is conducted step by step, in which the first two steps is to measure the resistance of motor stator/rotor while the VFD will output square wave to motor stator winding at 4kHz (default carrier frequency), as leakage current generated by 4kHz carrier frequency against distributed capacitance between motor rotor and stator during charging/discharging is quite obvious, which may cause mal-operation of RCD. If such problem occurred, bypass RCD first and restore after parameter autotuning is completed.

E.5 Problem of charged device shell

The problem mainly lies in that the device shell carries detectable voltage which gives anyone who touches it a feeling of electrical shock, however, when the VFD is powered up without running, the shell will be uncharged (or the voltage it carries is far lower than human body safety voltage).

Solutions:

- ✧ If there is distribution grounding or ground pile on users' site, ground the shell of VFD cabinet by power GND or ground pile;
- ✧ If there is no grounding connection on site, it is necessary to electrically connect the motor shell to grounding terminal PE of the VFD.

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