Operation Manual

Goodrive3000 Series
Medium Voltage VFD

SHENZHEN INVT ELECTRIC CO., LTD.

Preface

Thanks for choosing Goodrive3000 series medium voltage variable-frequency drive (VFD).

If not otherwise specified in this manual, the VFD always indicates Goodrive3000 series VFD, which is a high-performance general-purpose vector VFD. Using the three-level topological structure and supporting both two-quadrant and four-quadrant modes, the VFD can be used to control AC asynchronous induction motors and PMS motors and can satisfy the work patterns of different motors. Using the international advanced vector control technology, the VFD achieves more optimized functions, more flexible application and more stable performance.

The VFD applies modularized design. On the premise of meeting the general requirement of customers, by configuring different communication extension cards, position sensor extension cards and comprehensive extension cards, the product can meet individual and industrial requirements flexibly and go with the trend of industry applications. With high performance speed and torque control, simple PLC, flexible input/output terminals and multiple mainstream communication settings, the product can meet the requirements of various complicated high-performance driving.

This manual provides installation and configuration, parameters setting, fault diagnoses and daily maintenance and relative precautions. Please read this manual carefully before the installation to ensure a proper installation and operation of the VFD.

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

We reserve the right to update the manual information without prior notice and have the final interpretation for the manual content.

Contents

Preface.......... i

Contents.......... ii

1 Safety precautions.......... 1
1.1 Safety definition.......... 1
1.2 Warning symbols.......... 1
1.3 Safety guidelines.......... 1
1.3.1 Installation and maintenance precautions.......... 1
1.3.2 Grounding.......... 2
1.3.3 Delivery and installation.......... 2
1.3.4 Running.......... 3

2 Product overview.......... 4
2.1 Product model designation.......... 4
2.2 Goodrive3000 two-quadrant VFD technical specifications.......... 4
2.3 Goodrive3000 four-quadrant VFD technical specifications.......... 7
2.3.1 Goodrive3000 PWM rectifier technical specifications.......... 7
2.3.2 Goodrive3000 inverter technical specifications.......... 8
2.4 Product ratings.......... 11
2.4.1 Goodrive3000 two-quadrant VFD.......... 11
2.4.2 Goodrive3000 four-quadrant VFD.......... 12

3 Installation guidelines.......... 13
3.1 Unpacking inspection.......... 13
3.2 Environment requirements.......... 13
3.2.1 Storage environment.......... 13
3.2.2 Running environment.......... 14
3.3 Main circuit terminals.......... 14
3.4 Control circuit terminals.......... 15
3.4.1 Control circuit wiring.......... 15
3.4.2 Control terminal description.......... 15

4 HMI.......... 18
4.1 Keypad.......... 18
4.1.1 Description of key functions.......... 18
4.1.2 Description of indicators.......... 19
4.2 Keypad displaying.......... 19
4.2.1 Displaying stopped-state parameters.......... 20
4.2.2 Displaying running-state parameters.......... 20
4.2.3 Displaying fault information.......... 20
4.2.4 Keypad setting and checking.......... 21
4.2.5 Editing function codes.......... 21
4.3 Keypad operation.......... 21
4.4 Keypad dimension.......... 22

5 Goodrive3000 PWM rectifier.......... 23
5.1 Description of the PWM rectifier.......... 23
5.2 Detailed function codes.......... 24
P00 group—Basic function.......... 24
P01 group—Power control and protection function.......... 27
P03 group—Control parameters.......... 29
P05 group—Input terminals.......... 32
P06 group—Output terminals.......... 36
P07 group—Human-machine interface.......... 39
P08 group—State view.......... 42
P10 group—Fault information.......... 43
P11 group—Serial communication and CANopen communication.......... 47
P12 group—PROFIBUS communication.......... 50
P13 group—Ethernet communication.......... 53
5.3 Fault information and solution.......... 54
5.4 Parameters list.......... 57

6 Goodrive3000 inverter.......... 77

6.1 Detailed function codes ... 77
P00 group—Basic function ... 77
P01 group—Start-up and stop control ... 84
P02 group—Motor 1 parameters ... 91
P03 group—Vector control ... 94
P04 group—V/F control ... 100
P05 group—Input terminals ... 106
P06 group—Output terminals ... 118
P07 group—Human-machine interface ... 126
P08 group—Enhanced functions ... 136
P09 group—PID control ... 145
P11 group—Protective parameters ... 155
P12 group—Motor 2 parameters ... 160
P14 group—Serial communication ... 162
P15 group—PROFIBUS function ... 165
P16 group—Ethernet function ... 170
P17 group—State view 1 ... 171
P18 group—State view 2 ... 174
P19 group—External temperature detection ... 175
P20 group—Encoders ... 176
P21 group—Master-slave control ... 178
6.2 Fault information and solution ... 179
6.3 Common fault analysis ... 184
6.3.1 The motor does not work ... 184
6.3.2 Motor vibration ... 184
6.3.3 Overvoltage ... 185
6.3.4 Undervoltage fault ... 185
6.3.5 Abnormal heat of the motor ... 186
6.3.6 Overheat of the VFD ... 187
6.3.7 Motor stall during ACC ... 187
6.3.8 Overcurrent ... 188
6.4 List of function parameters ... 189

7 Maintenance guidelines ... 243
7.1 Daily maintenance ... 243
7.2 Regular maintenance ... 243
7.3 Replacement of wearing parts ... 245

8 MODBUS protocol ... 246
8.1 Overview of MODBUS protocol ... 246
8.2 Brief introduction to MODBUS ... 246
8.3 Application of the VFD ... 246
8.3.1 RS485 ... 246
8.3.2 RTU mode ... 248
8.4 RTU command code and communication data illustration ... 251
8.4.1 Command code: 03H, read N words (continuously up to 16 words) ... 251
8.4.2 Command code: 06H, write one word ... 252
8.4.3 Command code: 08H, diagnosis function ... 253
8.4.4 The definition of data address ... 254
8.4.5 Fieldbus ratio values ... 261
8.4.6 Fault message response ... 261
8.4.7 Example of writing and reading ... 263
8.5 Common communication fault ... 265
8.6 Relevant function codes ... 266
8.6.1 Relevant function codes of Goodrive3000 PWM rectifier ... 266
8.6.2 Relevant function codes of Goodrive3000 inverter ... 267

9 PROFIBUS communication ... 269
9.1 PROFIBUS introduction ... 269
9.2 PROFIBUS-DP communication card ... 269
9.2.1 Communication card model designation ... 269
9.2.2 EC-TX103 communication card ... 270
9.2.3 EC-TX103 communication card delivery list ... 271
9.3 PROFIBUS-DP communication card installation ... 271
9.3.1 Mechanical installation of EC-TX103 communication card ... 271
9.3.2 Electrical installation of EC-TX103 communication card ... 272
9.3.3 System configuration ... 275
9.4 PROFIBUS-DP networking ... 277

9.4.1 SAPs 277
9.4.2 PROFIBUS-DP information frame data structure 277
9.4.3 PZD zone 280
9.5 Fault information 288
9.6 Related function codes 289
10 Ethernet communication 294
10.1 Operating procedure 294
10.2 Related function codes 294
11 Peripheral options and parts 296
11.1 Optional card 296
11.1.1 Operation instruction and wiring of comprehensive extension card 296
11.1.2 Operation instruction and wiring of incremental encoder PG card 298
11.1.3 Operation instruction and wiring of rotary encoder PG card 302
11.1.4 Communication extension card 303
11.2 Reactors 303
11.3 Filters 304
Appendix A Debugging of master-slave control 306
A.1 Wiring of master-slave control 306
A.2 Debugging procedure of master-slave control 307
Appendix B EMC installation guidelines 309
B.1 Installation guidelines compliable with EMC regulations 309
B.2 Interference processing 311

1 Safety precautions

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 by you or your customers due to your neglect of the safety precautions.

1.1 Safety definition

In this manual, safety information is classified into:

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.

Electrostatic sensitive: PCBA board or module damage can result if related requirements are not followed.

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

1.2 Warning symbols

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

Symbols	Name	Instruction
	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
	Electrostatic sensitive	PCBA board or module damage can result if related requirements are not followed.
Note	Note	Actions taken to ensure proper running

1.3 Safety guidelines

1.3.1 Installation and maintenance precautions

	✧ Never do installation and maintenance works on the equipment, motor and motor cables before disconnecting the power supply. ✧ Only qualified persons are allowed to install and maintain the equipment. ✧ When you need to maintain the VFD, motor, or motor cable, do as follows before the maintenance: **Check the power indicator first, wait for 25 minutes after the power is turned off, which is indicated by power indicator turn-off,** and then confirm that the internal bus capacitance of the VFD has been discharged. To check whether the discharge is completed, you can use a multimeter and an attenuation probe to

	measure whether the voltage between the VFD bus terminals (+) and (-) is below 36V. ✧ Do not touch control components of the VFD or external circuits connected with it, as even when powering down the VFD, the external control circuit may cause dangerous voltage inside the VFD. ✧ Never perform insulation withstand voltage test directly on the terminals of the VFD. ✧ Before reconnecting the motor, please make sure the phase sequence of the motor cable is correct. ✧ **So long as the VFD is powered on, whether it operates or not, there is dangerous voltage on its terminals.** ✧ **There is dangerous voltage over 1600V DC on the terminals (+) and (-) of the DC bus.** ✧ **There will be dangerous voltage on the output terminals of the relay. The specific voltage level depends on the external circuits.**
	✧ Do not refit the VFD unless authorized; otherwise fire, electric shock or other injury may occur.
	✧ The electrical parts and components inside Goodrive3000 series are electrostatic. Take measures to avoid electrostatic discharge during relevant operation.

1.3.2 Grounding

	✧ Ensure good grounding of the VFD, motor and associated equipment to insure personal safety under any conditions and effectively decrease the electromagnetic radiation of the VFD. ✧ Ensure the size of the grounding wire meets the requirement of applicable safety regulations. ✧ In the case of multi-cabinet connection, ensure independent grounding of each cabinet. ✧ In order to further decrease electromagnetic radiation, we suggest you to adopt shielded cable and 360º HF link, and connect the shielded wire directly to PE to meet the safety requirement. ✧ **The shielding layer can be used as grounding wire only when its sectional area meets the requirement of applicable safety regulations.** ✧ **When the operating leakage current of the VFD is higher than 3.5mA (DC) or 10mA (AC), independent grounding must be used to ensure personal safety.**

1.3.3 Delivery and installation

	✧ As the equipment is heavy, do not move it alone. Do not move the equipment upside down. ✧ Ensure sufficient heat dissipation space for the equipment after installation. ✧ Do not fix the VFD by riveting or welding.

1.3.4 Running

	✧ Before starting the VFD, make sure the connected motor auxiliary devices meet the operation speed requirements of the VFD. By adjusting the VFD, the connected motor can run in the speed ranges higher than power frequency or lower than power frequency. ✧ If a dangerous situation exists, please do not activate the automatic fault reset function as this function can enable the VFD, after a fault happens, reset fault automatically and continue to operate.

2 Product overview

2.1 Product model designation

GD3000 - 01 - 400G - 12

① ② ③ ④

Figure 2.1 Product model example

Table 2.1 Product model code description

No.	Field	Description
①	Product series	GD3000: Medium voltage three-level product
②	Sub-series	01: Two-quadrant module product of IP00 11: Four-quadrant module product of IP00 00: Standard two-quadrant product of IP20 10: Standard four-quadrant product of IP20 05: Standard two-quadrant product of IP54 15: Standard four-quadrant product of IP54
③	Rated power	075G: 75kW 500G: 500kW
④	Voltage class	06: 660V 12: 1140V 23: 2300V 33: 3300V

2.2 Goodrive3000 two-quadrant VFD technical specifications

Table 2.2 Goodrive3000 two-quadrant VFD technical specifications

Function		Specification
Power input	Input voltage (V)	AC 3PH 560V–760V; rated voltage: 660V AC 3PH 970V–1310V; rated voltage: 1140V AC 3PH 1955V–2645V; rated voltage: 2300V AC 3PH 2805V–3795V (6-pulse rectifier); rated voltage: 3300V AC 3PH 1750V–1905V (12-pulse rectifier); rated voltage: 3300V
	Input current (A)	See section 2.4.1 Goodrive3000 two-quadrant VFD.
	Input frequency (Hz)	50Hz/60Hz, fluctuation range: ±5%

Function		Specification
	Input efficiency (%)	Above 98%
Power output	Output current (A)	See section 2.4.1 Goodrive3000 two-quadrant VFD.
	Output voltage (V)	0–Input voltage
	Output power factor	0.85–0.95 (depend on different motors)
Running control feature	Control mode	V/F (V/F separation function), open loop vector, closed loop vector
	Max. output frequency	400Hz
	Motor parameter autotuning	Support for static and rotation autotuning
	Speed range	Closed loop vector: 1:1000 Open loop vector: 1:100
	Speed control accuracy	Closed loop vector: ±0.1% of max. speed Open loop vector: ±0.5% of max. speed
	Speed fluctuation	±0.3% (open loop vector) ±0.1% (closed loop vector)
	Current limit	Max. value can be set to 200% of rated current
	Restart after rotating speed tracking	Used to realize smooth start of a rotating motor
	Torque control accuracy	10% (open loop vector) 5% (closed loop vector)
	Starting torque	0.5Hz 150% (open loop vector) Zero frequency 180% (closed loop vector)
	Overload capability	150% of rated current: 60s; 180% of rated current: 10s
	Important functions	Master-slave control, multi-step speed running, simple PLC, ACC/DEC time switch, S curve ACC/DEC, energy saving running, PID adjustment, MODBUS communication, droop control, torque control, switch between torque and speed control mode, and so on
Peripheral interface	Analog input (AI)	Two AIs: 12-bit resolution, error of ±1%, at 25°C One input of 0–10V or 0–20mA, which can be selected through J3 One input of -10–10V, which can be selected through function codes
	Analog output (AO)	Two AOs: 12-bit resolution, error of ±1%, at 25°C Output range: -10V–+10V or -20mA–+20mA Whether voltage or current is selected as the output type is set

Function		Specification
		through J1 and J2
	Didital input	Six digital inputs
	Didital output	One open collector output; two relay output
	RS485	Support for MODBUS
	CAN communication	CAN communication can be use for master-slave control.
	Optical-fiber communication	Optical-fiber communication can be use for master-slave control.
Important protection function	Motor overtemperature protection	PT100 can be connected externally.
	Overload protection	150% of rated current: 60s, 180% of rated current: 10s
	Overvoltage protection	When the bus voltage above set overvoltage, report overvoltage
	Undervoltage protection	When the bus voltage below set undervoltage, report undervoltage
	Input phase loss protection	Input phase loss detection
	Output phase loss protection	Output phase loss detection
	Overcurrent protection	Protect instantly at 220% of rated current, including ACC, DEC and constant speed overcurrent
	Overheat protection	Rectifier diode and IGBT module temperature detection protection
	Overvoltage stalling protection	ACC, DEC and constant speed running protection, can set separately
	Overcurrent stalling protection	ACC, DEC and constant speed running protection, can set separately
	Short circuit protection	Short circuit protection in output phases and grounding short circuit protection
Other	Keypad	Standard configuration: LCD and 8 keys, with the copying function; compatible with the LED keypad
	Braking unit	A braking unit interface is available for externally connecting to braking circuit.
	Input/output reactor	Optional
	Input/output filter	Optional

Function		Specification
	Running environment temperature	-10°C – +50°C When the temperature exceeds 40°C, derating is required.
	Relative humudity	5%–95%
	Storage temperature	-40°C – +70°C
	Altitude	Less than 1000 meters When the VFD installation site altitude exceeds 1000 meters, derate by 1% for every increase of 100 meters.
	Ingress protection rating	Main module: IP00 Cabinet of a standard product: IP20, IP54

2.3 Goodrive3000 four-quadrant VFD technical specifications

2.3.1 Goodrive3000 PWM rectifier technical specifications

Table 2.3 Goodrive3000 PWM rectifier technical specifications

Function		Specification
Power input	Input voltage (V)	AC 3PH 560V–760V; rated voltage: 660V AC 3PH 970V–1310V; rated voltage: 1140V AC 3PH 2805V–3795V; rated voltage: 3300V
	Input current (A)	See section 2.4.2 Goodrive3000 four-quadrant VFD.
	Input frequency (Hz)	50Hz/60Hz, allowable range: 47–63Hz
	Input efficiency (%)	Above 98%
	Input power factor	Above 0.99
Important protection function	Overload protection	150% of rated current: 60s, 180% of rated current: 10s
	Overvoltage protection	When the bus voltage is > set overvoltage, overvoltage is reported.
	Undervoltage protection	When the bus voltage is < set undervoltage, undervoltage is reported.
	Input overvoltage protection	When the input voltage is > set overvoltage, overvoltage is reported.
	Input undervoltage protection	When the input voltage is < set undervoltage, undervoltage is reported.

Function		Specification
	Input phase loss protection	Input phase loss detection
	Overcurrent protection	Input overcurrent protection
	Overheat protection	IGBT module temperature detection protection
Other	Keypad	Standard configuration: LCD and 8 keys, with the copying function; compatible with the LED keypad
	Running environment temperature	-10°C – +50°C When the temperature exceeds 40°C, derating is required.
	Relative humudity	5%–95%
	Storage temperature	-40°C – +70°C
	Altitude	Less than 1000 meters When the VFD installation site altitude exceeds 1000 meters, derate by 1% for every increase of 100 meters.
	Ingress protection rating	Main module: IP00 Cabinet of a standard product: IP20, IP54
	RS485	Support for MODBUS

2.3.2 Goodrive3000 inverter technical specifications

Table 2.4 Goodrive3000 inverter technical specifications

Function		Specification
Power output	Output current (A)	See section 2.4.2 Goodrive3000 four-quadrant VFD.
	Output voltage (V)	0–Input voltage of rectifier
	Output power factor	0.85–0.95 (depending on motors)
Running control feature	Control mode	V/F (V/F separation function), open loop vector, closed loop vector
	Max. output frequency	400Hz
	Motor parameter autotuning	Support for static and rotation autotuning
	Speed range	Closed loop vector: 1:1000 Open loop vector: 1:100

Function		Specification
	Speed control accuracy	Closed loop vector: ±0.1% of Max. speed Open loop vector: ±0.5% of Max. speed
	Speed fluctuation	±0.3% (open loop vector) ±0.1% (closed loop vector)
	Current limit	Max. value can be set to 200% of rated current
	Restart after rotating speed tracking	Used to realize smooth start of rotating motor
	Torque control accuracy	10% (open loop vector) 5% (closed loop vector)
	Starting torque	0.5Hz 150% (open loop vector) Zero frequency 180% (closed loop vector)
	Important functions	Master-slave control, multi-step speed running, simple PLC, ACC/DEC time switch, S curve ACC/DEC, energy saving running, PID adjustment, MODBUS communication, droop control, torque control, switch between torque and speed control mode, and so on
Peripheral interface	Analog input (AI)	Two AIs: 12-bit resolution, error of ±1%, at 25°C One input of 0–10V or 0–20mA, which can be selected through J3 One input of -10–10V, which can be selected through function codes
	Analog output (AO)	Two AOs: 12-bit resolution, error of ±1%, at 25°C Output range: -10V–+10V or -20mA–+20mA Whether voltage or current is selected as the output type is set through J1 and J2
	Didital input	Six digital inputs
	Didital output	One open collector output; two relay output
	RS485	Support for MODBUS
	CAN communication	CAN communication can be use for master-slave control.
	Optical-fiber communication	Optical-fiber communication can be use for master-slave control.
Important protection function	Motor overtemperature protection	PT100 can be externally connected.
	Overload protection	150% of rated current: 60s, 180% of rated current: 10s
	Overvoltage	When the bus voltage above set overvoltage, report overvoltage

Function		Specification
	protection	
	Undervoltage protection	When the bus voltage below set undervoltage, report undervoltage
	Overcurrent protection	Protect instantly at 220% of rated current, including ACC, DEC and constant speed overcurrent
	Overheat protection	IGBT module temperature detection protection
	Overvoltage stalling protection	ACC, DEC and constant speed running protection, can set separately
	Overcurrent stalling protection	ACC, DEC and constant speed running protection, can set separately
	Short circuit protection	Short circuit protection in output phases and grounding short circuit protection
Other	Keypad	Standard configuration: LCD and 8 keys, with the copying function; compatible with the LED keypad
	Braking unit	A braking unit interface is available for externally connecting to braking circuit.
	Input/output reactor	Optional
	Input/output filter	Optional
	Running environment temperature	-10°C – +50°C When the temperature exceeds 40°C, derating is required.
	Relative humudity	5%–95%
	Storage temperature	-40°C – +70°C
	Altitude	Less than 1000 meters When the VFD installation site altitude exceeds 1000 meters, derate by 1% for every increase of 100 meters.
	Ingress protection rating	Main module: IP00 Cabinet of a standard product: IP20, IP54

2.4 Product ratings

2.4.1 Goodrive3000 two-quadrant VFD

Table 2.5 Goodrive3000 two-quadrant VFD ratings

Model	Rated power (kW)	Rated input current (A)	Rated output current (A)
U_N=660V			
GD3000-01-110G-06	110	118	120
GD3000-01-160G-06	160	165	175
GD3000-01-200G-06	200	210	220
GD3000-01-250G-06	250	255	270
GD3000-01-315G-06	315	334	350
GD3000-01-400G-06	400	411	430
GD3000-01-500G-06	500	518	540
GD3000-01-630G-06	630	668	700
GD3000-01-800G-06	800	822	860
U_N=1140V			
GD3000-01-055G-12	55	34	36
GD3000-01-075G-12	75	47	50
GD3000-01-090G-12	90	56	60
GD3000-01-110G-12	110	68	73
GD3000-01-132G-12	132	82	85
GD3000-01-160G-12	160	98	104
GD3000-01-200G-12	200	122	128
GD3000-01-250G-12	250	150	160
GD3000-01-315G-12	315	185	195
GD3000-01-400G-12	400	235	250
GD3000-01-500G-12	500	300	310
GD3000-01-630G-12	630	380	395
GD3000-01-800G-12	800	480	500
GD3000-01-1000G-12	1000	600	620
U_N=2300V			
GD3000-01-200G-23	200	70	62
U_N=3300V			
GD3000-01-1250G-33	1250	260	280
GD3000-01-1500G-33	1500	300	320
GD3000-01-1600G-33	1600	330	360
GD3000-01-2500G-33	2500	540	565

2.4.2 Goodrive3000 four-quadrant VFD

Table 2.6 Ratings of Goodrive3000 four-quadrant VFD ratings

Model	Rated power (kW)	Rated input current (A)	Rated output current (A)
U_N=660V			
GD3000-11-110G-06	110	101	120
GD3000-11-160G-06	160	147	175
GD3000-11-200G-06	200	184	220
GD3000-11-250G-06	250	230	270
GD3000-11-315G-06	315	290	350
GD3000-11-400G-06	400	368	430
GD3000-11-500G-06	500	460	540
GD3000-11-630G-06	630	580	700
GD3000-11-800G-06	800	736	860
U_N=1140V			
GD3000-11-055G-12	55	30	36
GD3000-11-075G-12	75	40	50
GD3000-11-090G-12	90	49	60
GD3000-11-110G-12	110	58	73
GD3000-11-132G-12	132	70	85
GD3000-11-160G-12	160	85	104
GD3000-11-200G-12	200	106	128
GD3000-11-250G-12	250	133	160
GD3000-11-315G-12	315	168	195
GD3000-11-400G-12	400	213	250
GD3000-11-500G-12	500	265	310
GD3000-11-630G-12	630	335	395
GD3000-11-800G-12	800	425	500
GD3000-11-1000G-12	1000	530	620
U_N=3300V			
GD3000-11-1500G-33	1500	265	320
GD3000-11-2500G-33	2500	442	565

3 Installation guidelines

3.1 Unpacking inspection

1 Package inspections

Please check the package carefully, if there is any damage or opening, flooding or damp, contact with the local supplier or our company as soon as possible.

2 Unpacking inspections

Please check as follows after unpacking:

Ensure there is no any component loss, the operation manual, keypad and other accessories are kept well and there is only air bag in the package. If any problem, contact with the local supplier or our company as soon as possible.

3.2 Environment requirements

3.2.1 Storage environment

(1) The temporary storage environment must meet the requirements in the table below

Table 3.1 Requirements for temporary storage environment

<table>
<tr><th>Items</th><th colspan="2">Specifications</th></tr>
<tr><td>Storage temperature</td><td>-40°C – +70°C</td><td rowspan="3">It is required to avoid condensation and icing caused by sudden change of temperature</td></tr>
<tr><td>Transport temperature</td><td>-10°C – +50°C</td></tr>
<tr><td>Relative humidity</td><td>5–95%, even if the humidity meets the requirement, the situations which can cause condensation and icing due to sudden temperature change cannot yet meet the requirement</td></tr>
<tr><td>Atmosphere</td><td colspan="2">The VFD should be stored in a place free of dust, direct sunshine, flammable gasses, oil pollution, steam and vibration</td></tr>
</table>

(2) Requirements for permanent storage environment

If the VFD cannot be used at the moment due to change of project or other reasons after it is bought, please store it by referring to the following instructions according to the specific situations.

The environment requirements for temporary storage must be met first of all. If the storage period exceeds 3 months, the environment temperature must be controlled below 30°C. This is mainly because the performances of the electrolytic capacitor inside the VFD will degrade if it is not powered.

Store the VFD with care to avoid intrusion of moisture. You can consider putting desiccant in the packing box of the VFD to control the humidity inside the box below 70%.

If the VFD is installed inside a control cabinet or other equipment, especially on a construction site, it will be in a moist and dusty condition. If it will not be used for a long period, we suggest you to remove it and store in a place with a good environment.

The performances of the electrolytic capacitor will degrade if not used for a long period. When it is stored long-term, we suggest you to electrify it at least once every year.

3.2.2 Running environment

Table 3.2 Requirements for operation environment

Items	Specifications
Environment temperature	-10°C–50°C, derate by 3% for every additional 1°C when the temperature is above 40°C
RH	5–95%
Atmosphere	The VFD should be installed in a place free of dust, direct sunshine, flammable gasses, oil pollution, steam and vibration.
Altitude	Below 1000m. Derating is required over 1000m. See Table 3.3 Altitude derating for the specific derating factor.
Vibration amplitude	2–9Hz displacement 3mm；9–20Hz acceleration 9.8m/s^2；20–55Hz acceleration 2m/s^2；55–200Hz acceleration 1m/s^2

Table 3.3 Altitude derating

Altitude	Derating factor	Altitude	Derating factor
< 1000m	1.0	1000–1500m	0.97
1500–2000m	0.95	2000–2500m	0.91
2500–3000m	0.88	3000–3500m	0.8

3.3 Main circuit terminals

Goodrive3000 series product contains multiple main modules and the main circuit terminals are listed as follows:

Table 3.4 Terminals of the main circuit

Sign	Description
R, S, T	3-phase AC input
U, V, W	3-phase AC output
DC+, DC-	DC bus output
PE	Grounding terminal

3.4 Control circuit terminals

3.4.1 Control circuit wiring

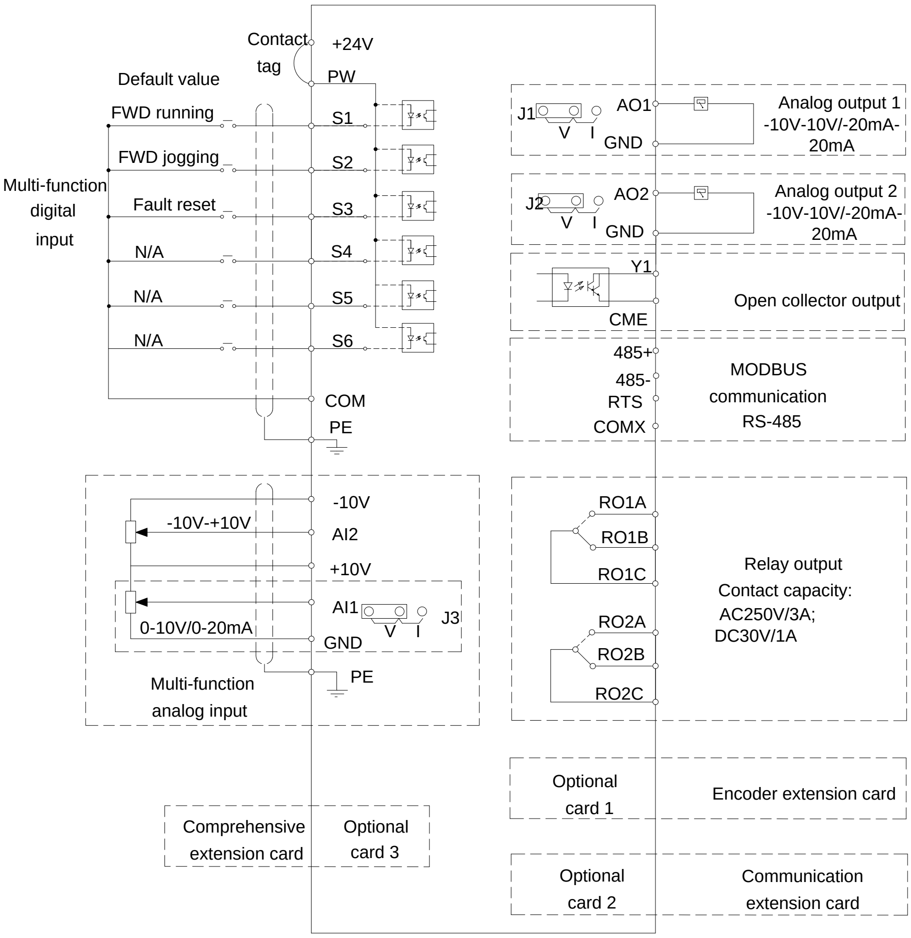


Figure 3.1 Wiring of VFD control circuit

3.4.2 Control terminal description

Arrangement of terminals of control circuit:

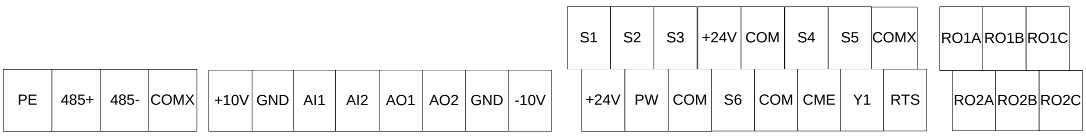


Figure 3.2 Terminals of VFD control circuit

Description of terminals of control circuit:

Table 3.5 Description of terminals of VFD control circuit

Type	Code	Name	Description
Power supply	+10V	+10V reference power supply	GND reference Set point of 10.5V, Max. output current of 100mA, with output shortcircuit protection, accuracy of 1%
	-10V	-10V reference power supply	GND reference Set point of -10.5V, Max. output current of 20mA,

Type	Code	Name	Description
			with output shortcircuit protection, accuracy of 1%
	24V	24V power supply	COM reference With output shortcircuit protection, provide the power supply with a maximum current of 100mA, accuracy of 10%, generally as the the working power of switch input/output or the power of external sensor
	PW	External power supply	COM reference Provide the working power supply for switch input/output from external to internal Input voltage range: DC12–30V
Analog input	AI1	Analog input 1	GND reference 1. Input range: 0–10V or 0–20mA, 12bit resolution, error±1%, 25°C 2. Voltage or current input is determined by J3
	AI2	Analog input 2	GND reference 1. Input range: -10–10V, 12bit resolution, error±1%, 25°C 2. Voltage input is determined by the function code
Analog output	AO1	Analog output 1	GND reference 1. Output range: -10V–10V or -20mA–20mA, error±1%, 25°C 2. Voltage or current output is determined by J1 and J2
	AO2	Analog output 2	
Digital input/ output	S1	Switch input 1	COM reference 1. Internal impedance: 3.3kΩ 2. Support NPN and PNP input 3. Allow 12–30V voltage input 4. Max. input frequency: 1kHz
	S2	Switch input 2	
	S3	Switch input 3	
	S4	Switch input 4	
	S5	Switch input 5	
	S6	Switch input 6	
	Y1	Open loop collector output	CME reference 1. Switch capacity: 50mA/30V 2. Output frequency range: 0–1kHz, OC output 3. Input power: DC12–30V
Relay output	RO1A	Relay 1 NO contact	1. Contact capacity: AC250V/3A, DC30V/1A

Type	Code	Name	Description
	RO1B	Relay 1 NC contact	2. Cannot be used as the high frequency switch output
	RO1C	Relay 1 common contact	
	RO2A	Relay 1 NO contact	
	RO2B	Relay 1 NC contact	
	RO2C	Relay 1 common contact	
Communication	485+ 485- RTS COMX	RS485 communication	RS485 communication terminal, adopting Modbus protocol. RTS is 485 control signal
Others	PE	Grounding terminal	For the grounding of shielded layers during terminal connections; can be connected to shielded layers of analog signal cable, 485 communication cable and motor cable

Note: The I/O extension card, communication card and PG card are optional.

4 HMI

4.1 Keypad

The LCD keypad is a standard configuration for Goodrive3000 series VFD.

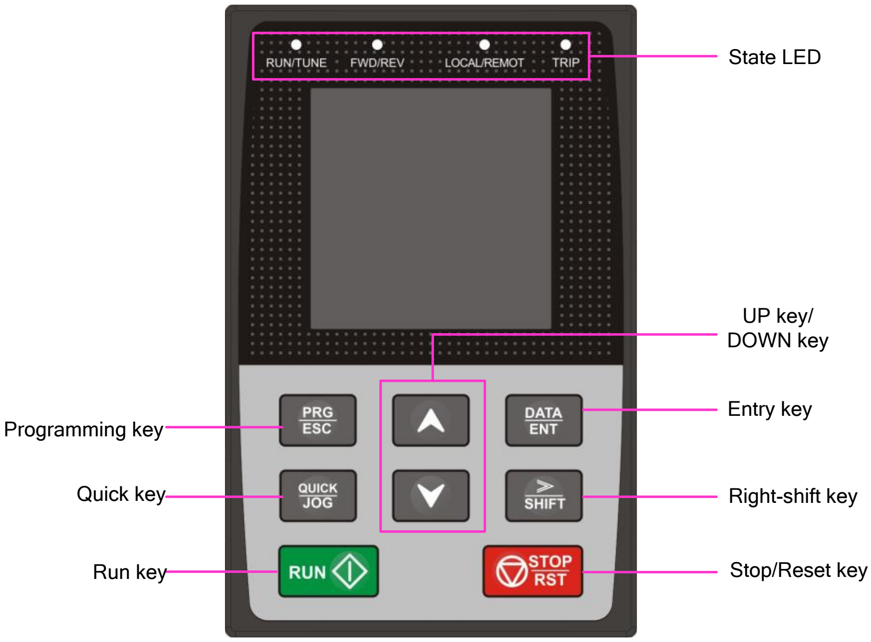


Figure 4.1 Keypad

4.1.1 Description of key functions

Table 4.1 Key functions

Key symbol	Name	Function description
	Programming key	Enter or escape from the first level menu and remove the parameter quickly
	Enter key	Enter the menu step-by-step Confirm parameters
	UP key	Increase data or function code progressively
	DOWN key	Decrease data or function code progressively
	SHIFT key	Select the displaying parameter circularly in stopping and running mode. Select the parameter modifying digit during the parameter modification
	RUN key	This key is used to operate on the VFD in key operation mode
	STOP/RESET key	This key is used to stop in running state and it is limited by function code P07.04.

Key symbol	Name	Function description
		This key is used to reset all control modes in the fault alarm state
	Quick key	The function of this key is confirmed by function code P07.02. 0: Jogging (only apply to keypad control) 1: Shift between forward rotations and reverse rotations (only apply to keypad control)
 + 	Combination	When RUN key and STOP/RST key are pressed down simultaneously, the VFD will coast to stop

4.1.2 Description of indicators

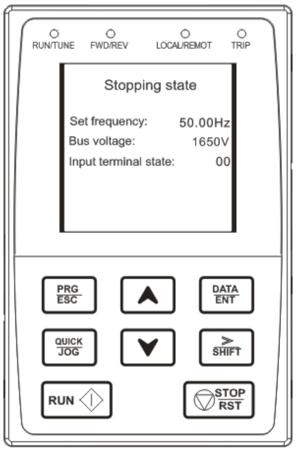
Table 4.2 Indicators

Indicator symbol	Name	Description
RUN/TUNE	State LED	LED off means that the VFD is in the stopping state; LED blinking means the VFD is in the parameter autotune state; LED on means the VFD is in the running state.
FWD/REV	Forward/Reverse rotation LED	LED off means the VFD is in the forward rotation state; LED on means the VFD is in the reverse rotation state
LOCAL/REMOT	Operation LED	LED for keypad operation, terminals operation and remote communication control LED off means that the VFD is in the keypad operation state; LED blinking means the VFD is in the terminals operation state; LED on means the VFD is in the remote communication control state.
TRIP	Fault LED	LED on when the VFD is in the fault state; LED off in normal state; LED blinking means the VFD is in the pre-alarm state.

4.2 Keypad displaying

The keypad displays information such as the stopped-state parameters, running-state parameters, and fault status.

4.2.1 Displaying stopped-state parameters

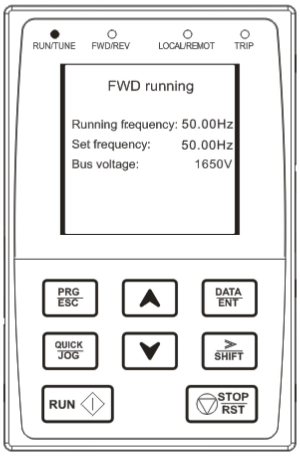


When the VFD is in the stopping state, the keypad will display stopping parameters which is shown in figure.

In the stopping state, various kinds of parameters can be displayed. Select the parameters to be displayed or not by the binary bit according to the displayed parameter of stopping state. See the instructions for the detailed definition of each bit in Chapter 5 P07.05 and Chapter 6 P07.07.

》/SHIFT can shift the parameters from left to right, QUICK/JOG can shift the parameters from right to left.

4.2.2 Displaying running-state parameters

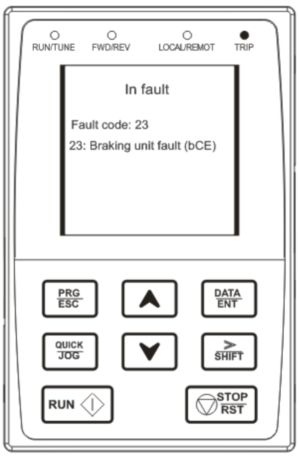


After the VFD receives valid running commands, the VFD will enter into the running state and the keypad will display the running parameters. RUN/TUNE LED on the keypad is on, while the FWD/REV is determined by the current running direction which is shown in figure.

In the running state, various kinds of parameters can be displayed. Select the parameters to be displayed or not by the binary bit according to the displayed parameter of stopping state. See the instructions for the detailed definition of each bit in Chapter 5 P07.05 and Chapter 6 P07.05 and P07.06.

》/SHIFT can shift the parameters from left to right, QUICK/JOG can shift the parameters from right to left.

4.2.3 Displaying fault information



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

If the fault continues, the keypad will keep displaying the fault information.

4.2.4 Keypad setting and checking

Press SHIFT key and DOWN key for 3 seconds when power on. The keypad will enter the interface of selection modes in the menu as follows:

1. Hardware test: test the buttons, display and whether the LED functions are normal or not.
2. Flash date program: be used when FLASH configuration table is updated.
3. Language select: can select Chinese and English.
4. Keypad SW ver: check MCU and Flash software version.
5. VFD Type Select: option 1: GD3000, other: reserved.

Goodrive3000 series English mode is selected by default.

4.2.5 Editing function codes

In the state of stopped, running or fault, press PRG/ESC to enter into the editing state (if there is a password, see P07.00). Press DATA/ENT into the displayed state of function parameter. On this state, you can press DATA/ENT to save the parameters or press PRG/ESC to retreat.

4.3 Keypad operation

Operate the VFD through the keypad.

The VFD has three levels menu, which are:

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

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

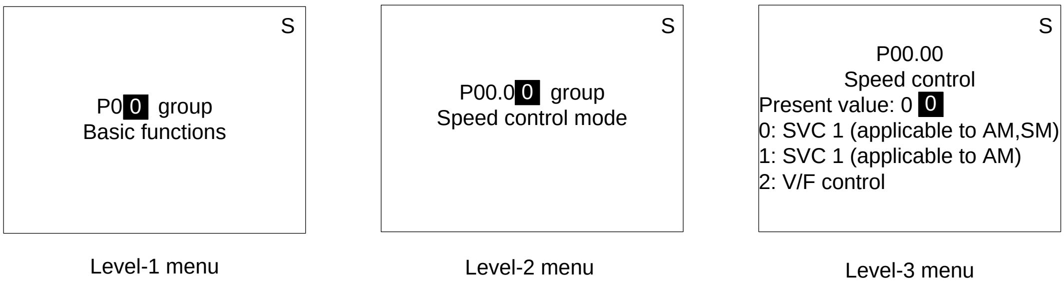


Figure 4.2 Operation flow chart of three levels menu

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

1) This function code is not modifiable parameter, such as actual detected parameter, operation records and so on;

2) This function code is not modifiable in running state, but modifiable in stop state.

4.4 Keypad dimension

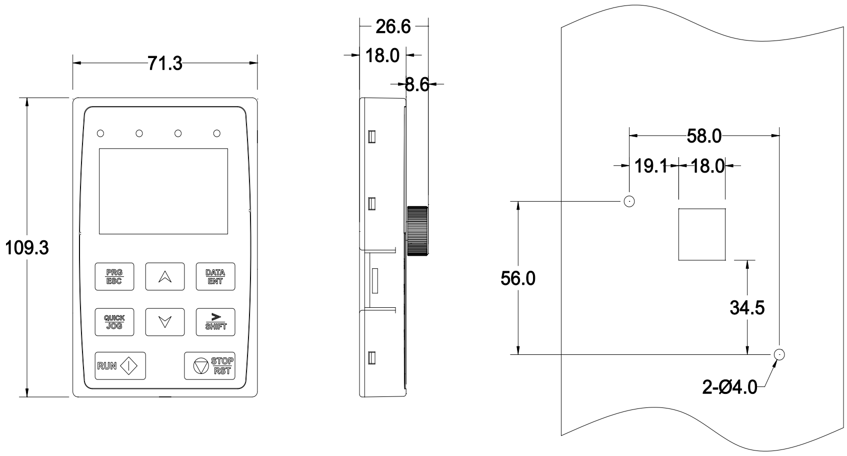


Figure 4.3 LCD keypad dimension

5 Goodrive3000 PWM rectifier

Note: This chapter is only for the rectifier of the four-quadrant VFD.

5.1 Description of the PWM rectifier

The main circuit of PWM rectifier unit includes the LCL filter circuit, main contactor, buffer contactor, buffer resistor, IGBT power modules and bus capacitors. Dual closed-loop control structure is also applied. The outer loop is the bus voltage loop and the inner loop is the current loop. The reactive current component of the input grid current can be controlled by the voltage phase detection and coordinate transformation and regulation of PI regulator. When the controlled reactive current is 0, the power factor of the rectifier can be close to 1 and the energy can flow in both directions.

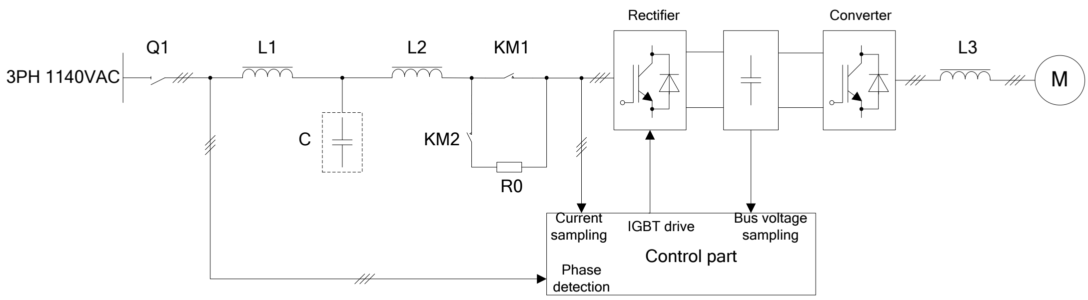


Figure 5.1 PWM rectifier

Note: Q1 is the isolating changeover switch; the LCL filter consists of L1, C and L2; R0 is the power buffer resistor; KM1 is the main contactor; KM2 is the buffer contactor and L3 is the output reactor.

PWM rectifier and inverter can be combined into the four-quadrant VFD. The PWM rectifier can be used for potential loads, such as hoists, locomotive traction, oil pumping units and centrifugal machines. In some large power applications, the four-quadrant VFDs are needed to reduce harmonic pollution to the grid. The VFD with PWM rectifier has the functions of four-quadrant operation, meeting the requirements of speed regulation of various potential loads. It can transform the regenerative energy of the motor into electric energy back to the grid and achieve high-efficiency energy saving in energy feedback braking.

After the conversion of PWM rectifier, 3-phase AC current can be provided as DC current into the DC bus and the DC circuit provides power to the motor. PWM rectifier monitors the control power before AC power overvoltage, phase loss fault, IGBT module overtemperature, overcurrent, overload and pre-charging. Rectifier unit will lock the pulse and send a fault single which can be reset after repowering if fault occurs.

5.2 Detailed function codes

P00 group—Basic function

Function code	Name	Description	Setting range	Default
P00.01	Run command channel	0: Keypad command channel (LED off) 1: Terminal command channel (LED flickering) 2: Communication command channel (LED on)	0–2	0

Select the run command channel of PWM rectifier.
The control command of PWM rectifier includes: start-up, stop and fault reset.
0: Keypad running command channel ("LOCAL/REMOT" light off)
Carry out the command control by RUN, STOP/RST on the keypad.
1: Terminal running command channel ("LOCAL/REMOT" flickering)
Carry out the running command control by the multi-function terminals
2: Communication running command channel ("LOCAL/REMOT" on);
The running command is controlled by the upper computer via communication.

Function code	Name	Description	Setting range	Default
P00.02	Communication running commands	0: 485 communication channel 1: PROFIBUS communication channel 2: Ethernet communication channel 3: CANopen communication channel 4: Reserved 5: Reserved 6: Reserved	0–6	0

Select the controlling communication command channel of PWM rectifier.
Note: 1, 2 and 3 are extension functions which need corresponding extension cards.

Function code	Name	Description	Setting range	Default
P00.03	Running mode	0: COSφ mode 1: Reserved 2: Reserved	0–2	0

Select the running mode of PWM rectifier.
0: COSφ mode; the reactive current is determined by the power factor.
Note: The mode 0 has voltage loop and needs to set the parameters in P03 group.

Function code	Name	Description	Setting range	Default
P00.04	DC bus voltage setting	0: Automatic 1: Keypad setting 2: Reserved	0–2	1
P00.05	Setting value of DC bus voltage	300.0–4000.0V	300.0–4000.0	Depends on model

When P00.04=1, P00.05 DC bus voltage is set by keypad.

The relation between the voltage and DC bus voltage:

VFD	Default value of DC bus voltage (P00.05)	Overvoltage point
1140V	1850V	2300V

Function code	Name	Description	Setting range	Default
P00.08	Resonance suppression factor	0–10	0–10	0

Function code	Name	Description	Setting range	Default
P00.09	Overmodulation selection	0: Invalid 1: Valid	0–1	1

Function code	Name	Description	Setting range	Default
P00.10	Running mode of cooling fan	0: Normal running mode 1: Keep running after power on	0–1	0

Set the running mode of cooling fan.

0: Normal running mode: after the rectifier receives the running command or the detection temperature of the rectifier is higher than 45°C or the current of the rectifier is higher than 50% of the rated current, the cooling fan will run.

1: Keep running after power on (applicable to high temperature and humidity situations)

Function code	Name	Description	Setting range	Default
P00.14	Carrier frequency	2.0–8.0kHz	2.0–8.0	4.0
P00.15	Function parameter restore	0: No operation 1: Restore the default value	0–3	0

Function code	Name	Description	Setting range	Default
		2: Clear the fault record 3: Clear the accumulative power consumption		

0: No operation

1: Restore the default value: the rectifier restores the parameter to the default value.

2: Clear the fault record: the rectifier clears the recent fault records.

3: Clear the accumulative power consumption: the rectifier clears the power consumption.

Note: After the selected operation is completed, the function code is restored to 0.

Restoring to the default value will cancel the user password, please use this function with caution.

Function code	Name	Description	Setting range	Default
P00.16	Function parameter attribute	0: Invalid 1: Read-only	0–1	0

Note: When P00.16=1, other function codes are read-only except P00.16 and the users cannot carry out any operations.

P01 group—Power control and protection function

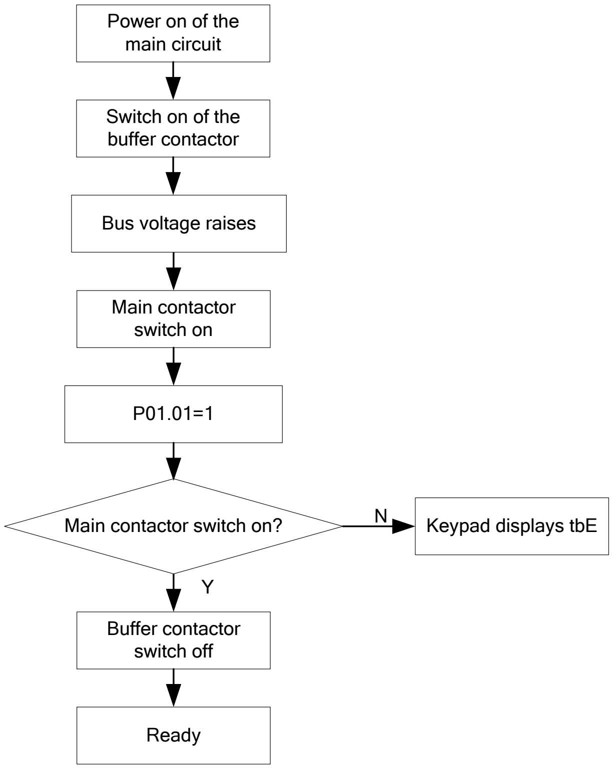
Function code	Name	Description	Setting range	Default
P01.01	Main contactor switching-on feedback detection	0: No detection 1: Detection	0–1	1

Pre-charging buffer circuit is in the rectification part and when the charging voltage exceeds the set value, the contactor is switched on and the charging resistor is switched off.

When P01.01=1, if there is switching-on command but no feedback signal, or there is feedback signal but no switching-on command, it will report main contactor fault (TbE).

When P01.01=0, then there is no detection (TbE).

Note: The switching-on signal is only controlled by the control board.



Function code	Name	Description	Setting range	Default
P01.02	Undervoltage setting value of input voltage	75.0–95.0%	75.0–95.0	85.0%
P01.03	Overvoltage setting value of input voltage	105.0–125.0%	105.0–125.0	115.0%

Function code	Name	Description	Setting range	Default
P01.06	Waiting time of automatic operation	0–3600.0s	0–3600.0	0.0s

When P01.06=0.0s, the automatic operation is invalid. If P01.06≠0.0s, the system will lock phase after power on in rectification mode. The system will operate automatically if it locks phase and detects successfully.

The function is only valid when power on. If fault occurs, the function will be invalid automatically and the system will stop. And after that, the system will be started manually. The function will be enabled if power on again.

Note: The diode rectification mode is always valid and the DC bus always have voltage no matter the automatic operation is valid or not.

Function code	Name	Description	Setting range	Default
P01.07	Delay time of automatic fault reset	0.0–3600.0s	0.0–3600.0	1.0s
P01.08	Fault reset times	0–10	0–10	0

The automatic fault reset is invalid if P01.08 is 0.

When P01.08 is not 0, fault reset is enabled. And the system will operate automatically after the time of P01.07.

For following faults, fault reset is invalid.

EF, dIS, PC_T1, OH1, OUT1, OUT2 and OUT3.

Note: It will report a fault if continuous reset exceeds the value.

P03 group—Control parameters

Function code	Name	Description	Setting range	Default
P03.06	Positive limit amplitude of active current (rectification)	0.0–200.0% (rated current of the rectifier)	0.0–200.0%	150.0%
P03.07	Negative limit amplitude of active current (feedback)	0.0–200.0% (rated current of the rectifier)	0.0–200.0%	150.0%
P03.08	Positive limit amplitude of reactive current (rectification)	0.0–200.0% (rated current of the rectifier)	0.0–200.0%	150.0%
P03.09	Negative limit amplitude of reactive current (feedback)	0.0–200.0% (rated current of the rectifier)	0.0–200.0%	150.0%
P03.10	Maximum current setting	0–250.0% (rated current of the rectifier)	0.0–250.0%	200.0%

P03.06 is the Max. active current at rectification output.

P03.07 is the Max. active current at energy feedback.

P03.08 is the Max. reactive current at rectification output.

P03.09 is the Max. reactive current at energy feedback.

The rectifier has automatic current limiting function, which will limit current output no more than P03.10.

Function code	Name	Description	Setting range	Default
P03.11	Voltage loop proportional coefficient 1	0.001–30.000	0.001–30.000	2.000
P03.12	Voltage loop integral coefficient 1	0.01–300.00	0.01–300.00	20.00
P03.13	Voltage loop proportional coefficient 2	0.001–30.000	0.001–30.000	5.500
P03.14	Voltage loop integral coefficient 2	0.01–300.00	0.01–300.00	10.00
P03.15	Switching voltage of PI parameters	0.01–30.00V	0.01–30.00	10.00V

The absolute value of the difference between the setting value and feedback value of DC voltage is ∆. When ∆ is less than P03.15, it will apply PI parameter 1; when ∆ is more than (or equal to) P03.15, it will apply PI parameter 2.

Function code	Name	Description	Setting range	Default
P03.16	Bus voltage filter coefficient	0–1.000s	0–1.000s	0.000s

P03.16 is displayed on the keypad.

Function code	Name	Description	Setting range	Default
P03.17	Current loop proportional coefficient P	0.001–30.000	0.001–30.000	1.000
P03.18	Current loop integral coefficient I	0.01–300.00	0.01–300.00	1.00

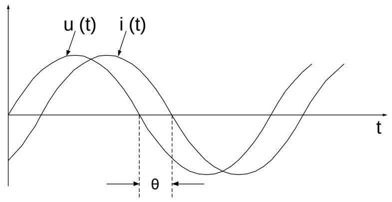
Note: These parameters affect the dynamic response and control accuracy. Generally the user need not modify.

Function code	Name	Description	Setting range	Default
P03.19	Power factor setting	0: Angle setting 1: Reserved	0–1	0
P03.20	Rectification power factor angle	-90.0°–90.0° The positive means inductive and the negative means capacitive.	-90.0–90.0	0.0°
P03.21	Feedback power factor angle	-90.0°–90.0° The positive means inductive and the negative means capacitive.	-90.0–90.0	0.0°

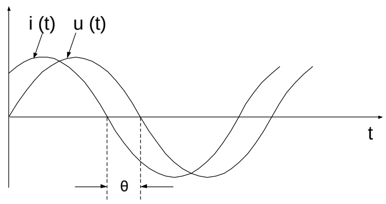
Note:

The setting value of power factor is only valid in COSφ operation mode and current close-loop operation mode.

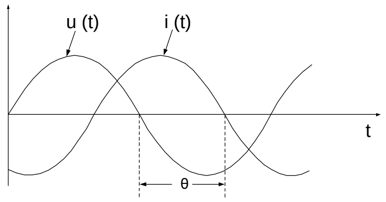
P03.19–P03.23 are used to set the power factor in COSφ running mode by using the angle between voltage and current or by direct setting. The following figures show the relationship between the power factor and the angle. When the angle is used for power factor setting, this function code group is used to determine θ. When the power factor is directly set, this function code group is used to determine cosθ.



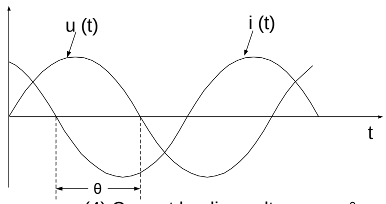
(1) Current lagging voltage, θ<90°



(2) Current leading voltage, θ<90°



(3) Current lagging voltage, θ>90°



(4) Current leading voltage, θ>90°

Figure (1) and (3) corresponds to inductive and figure (2) and (4) corresponds to capacitive.

When P03.19=0, rectification power factor is cos(P03.20), feedback power factor is cos(P03.21).

If P03.20>=0, then it corresponds to figure (1) and the value is θ in figure (1);

If P03.20<0, then it corresponds to figure (2), the negative in P03.20 means capacitive and the value is θ in figure (2);

If P03.21>=0, then it corresponds to figure (3) and the value is θ in figure (3);

If P03.21<0, then it corresponds to figure (4), the negative in P03.21 means capacitive and the value is θ in figure (4).

P05 group—Input terminals

Function code	Name	Description	Setting range	Default
P05.01	Polarity selection of digital input terminals	0x0–0xF	0x0–0xF	0x0

Set the polarity of digital input terminals

If set the bit as 0, the input terminal is positive, and when set the bit as 1, the input terminal is negative.

BIT3	BIT2	BIT1	BIT0
S4	S3	S2	S1

Function code	Name	Description	Setting range	Default
P05.03	Digital input filtering time	0.000–1.000s	0.000–1.000	0.000s

Set the filtering time for S1–S4 terminal sampling. In the case of strong interference, this parameter should be increased to avoid malfunction.

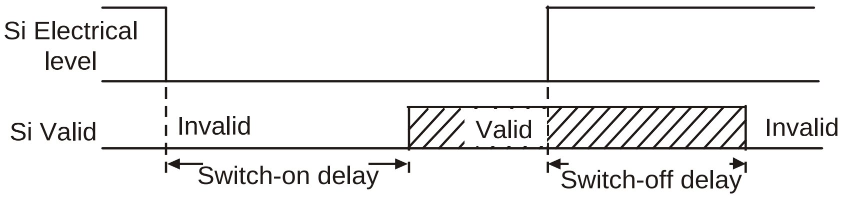
<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Setting range</th><th>Default</th></tr>
<tr><td>P05.04</td><td>S1 terminal function selection</td><td rowspan="4">0: No function
1: Run
2: Fault reset
3: External fault
4: Reserved
5: Run enabling
6: Reserved
7–12: Reserved
13: Total electricity consumption cleared
14: Accumulative power maintain
15: Reserved</td><td rowspan="4">0–15</td><td>1</td></tr>
<tr><td>P05.05</td><td>S2 terminal function selection</td><td>2</td></tr>
<tr><td>P05.06</td><td>S3 terminal function selection</td><td>0</td></tr>
<tr><td>P05.07</td><td>S4 terminal function selection</td><td>0</td></tr>
</table>

Terminal description:

Setting value	Function	Description
0	No function	PWM rectifier does not act even though there is signal. Set the unused terminal as non-function to avoid

Setting value	Function	Description
		misaction.
1	Run	Control the operation through external terminals.
2	Fault reset	External fault reset, same as the function of STOP/RST. Remote fault reset is available by the function.
3	External fault	PWM rectifier reports fault and stops when external fault signal is sent to the rectifier. The main contactor does not switch off and the diode rectifier works normally.
4	Reserved	
5	Run enabling	PWM rectifier works after the enabling terminal is valid.
6–12	Reserved	
13	Total electricity consumption cleared	Total electricity consumption is cleared if the command is valid (P07.17 and P07.18).
14	Accumulative power maintain	The current operation does not affect the accumulative power if the command is valid.
15	Reserved	

Function code	Name	Description	Setting range	Default
P05.12	Delay time of S1 switching-on	The function codes are used to set the delay time when electric level changes.	0.000–60.000s	0.000s
P05.13	Delay time of S1 switching-off			0.000s
P05.14	Delay time of S2 switching-on			0.000s
P05.15	Delay time of S2 switching-off			0.000s
P05.16	Delay time of S3 switching-on			0.000s
P05.17	Delay time of S3 switching-off			0.000s
P05.18	Delay time of S4 switching-on			0.000s
P05.19	Delay time of S4 switching-off			0.000s



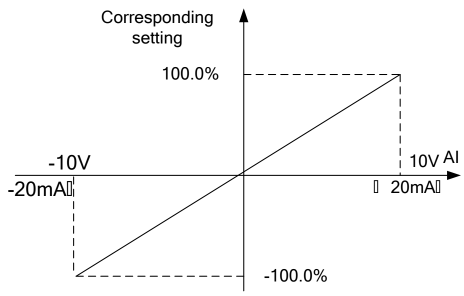
Function code	Name	Description	Setting range	Default
P05.28	AI1 lower limit	0.00V–P05.30	0.00V–P05.30	0.00V
P05.29	AI1 lower limit corresponding setting	-100.0%–100.0%	-100.0%–100.0%	0.0%
P05.30	AI1 upper limit	P05.28–10.00V	P05.28–10.00V	10.00V
P05.31	AI1 upper limit corresponding setting	-100.0%–100.0%	-100.0%–100.0%	100.0%
P05.32	AI1 input filtering time	0.000s–10.000s	0.000s–10.000s	0.100s
P05.33	AI2 lower limit	-10.00V–P05.35	-10.00V–P05.35	0.00V
P05.34	AI2 lower limit corresponding setting	-100.0%–100.0%	-100.0%–100.0%	0.0%
P05.35	AI2 middle value	P05.33–P05.37	P05.33–P05.37	0.00V
P05.36	AI2 middle value corresponding setting	-100.0%–100.0%	-100.0%–100.0%	0.0%
P05.37	AI2 upper limit	P05.35–10.00V	P05.35–10.00V	10.00V
P05.38	AI2 upper limit corresponding setting	-100.0%–100.0%	-100.0%–100.0%	100.0%
P05.39	AI2 input filtering time	0.000s–10.000s	0.000s–10.000s	0.100s
P05.40	AI3 lower limit	0.00V–P05.42	0.00V–P05.42	0.00V
P05.41	AI3 lower limit corresponding setting	-100.0%–100.0%	-100.0–100.0%	0.0%
P05.42	AI3 upper limit	P05.40–10.00V	P05.40–10.00V	10.00V

Function code	Name	Description	Setting range	Default
P05.43	AI3 upper limit corresponding setting	-100.0%–100.0%	-100.0–100.0%	100.0%
P05.44	AI3 input filtering time	0.000s–10.000s	0.000s–10.000s	0.100s

The above function codes define the relationship between the analog input voltage and its corresponding setting. When the analog input voltage goes beyond the range between the set upper limit and lower limit, it will be calculated with the upper limit or lower limit.

When the analog input is current input, 0mA–20mA current corresponds to 0V–10V voltage.

In different applications, 100.0% of the analog setting corresponds to different nominal values. Please refer to the descriptions of each application section for details. The following figure illustrates the cases of several settings:



Input filtering time: adjust the sensitivity of analog input. Increasing this parameter properly can avoid malfunction caused by interfered analog input but may reduce the sensitivity of analog input.

Note: AI1 and AI3 can support 0–10V/0–20mA input and when AI1 and AI3 selects 0–20mA input, the corresponding voltage of 20mA is 10V; AI2 supports -10–+10V input.

P06 group—Output terminals

Function code	Name	Description	Setting range	Default
P06.00	Polarity selection of digital output terminal	0x0–0xF	0x0–0xF	0x00

Set the polarity of digital output terminals

If set the bit as 0, the output terminal is positive, and when set the bit as 1, the output terminal is negative.

BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	RO2	RO1

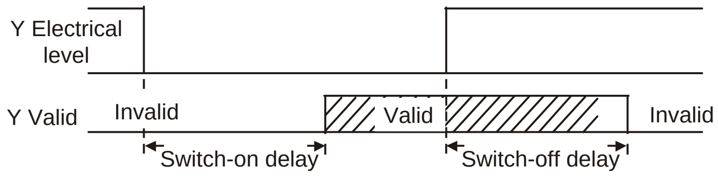
Function code	Name	Description	Setting range	Default
P06.01	Relay RO1 output selection	0: No output 1: Ready to run 2: In running 3: Fault output 4–31: Reserved	0–31	1
P06.02	Relay RO2 output selection			2

Above parameters can select following functions. The same output terminal functions can be selected repeatedly.

Setting value	Function	Description
0	No output	No output
1	Ready to run	The rectification unit is ready
2	In running	The output is valid when PWM rectifier operates
3	Fault output	The output is valid when fault occurs to the rectification unit
4–31	Reserved	

Function code	Name	Description	Setting range	Default
P06.05	Delay time of RO1 switching-on	0.000–60.000s	0.000–60.000	0.000s
P06.06	Delay time of RO1 switching-off			0.000s
P06.07	Delay time of RO2			0.000s

Function code	Name	Description	Setting range	Default
	switching-on			
P06.08	Delay time of RO2 switching-off			0.000s



Function code	Name	Description	Setting range	Default
P06.13	AO1 output selection	0: Null 1: The set value of the DC voltage (AC1140V, 100% corresponds to 3000V) 2: The actual value of the DC voltage (AC1140V, 100% corresponds to 3000V) 3: Valid value of input voltage (100% corresponds to 2*Vn) 4: Valid value of input current (100% corresponds to In*2) 5: Input power (100% corresponds to 2*Vn*In) 6: Input power factor (%) 7: Grid frequency value (100% corresponds to 100.0Hz) 8–20: Reserved	0–20	1
P06.14	AO2 output selection			2

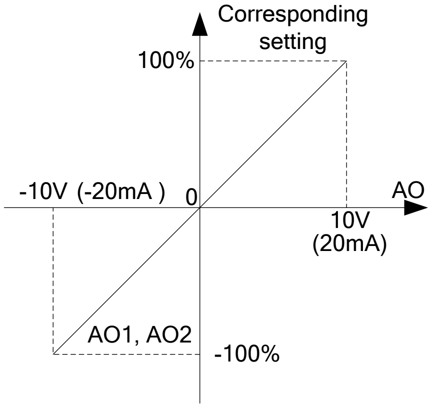
Function code	Name	Description	Setting range	Default
P06.15	Lower output limit AO1	-100.0%–P06.17	-100.0%–P06.17	0.0%
P06.16	Lower limit corresponding AO1 output	-10.00V–10.00V	-10.00V–10.00V	0.00V
P06.17	Upper output limit AO1	P06.15–100.0%	P06.15–100.0%	100.0%

Function code	Name	Description	Setting range	Default
P06.18	Upper limit corresponding AO1 output	-10.00V–10.00V	-10.00V–10.00V	10.00V
P06.19	AO1 output filtering time	0.000–10.000s	0.000–10.000s	0.000s
P06.20	Lower output limit 2	-100.0%–P06.22	-100.0%–P06.22	0.0%
P06.21	Lower limit corresponding AO2 output	-10.00–10.00V	-10.00–10.00V	0.00V
P06.22	Upper output limit 2	P06.20–100.0%	P06.20–100.0%	100.0%
P06.23	Upper limit corresponding AO2 output	-10.00V–10.00V	-10.00V–10.00V	10.00V
P06.24	AO2 output filtering time	0.000–10.000s	0.000–10.000s	0.000s

The function code defines the relationship between the output value and analog output. When the output exceeds the range, it will be calculated at the upper limit or lower limit value.

If the analog output is the current output, the function of 1mA is the same as the function of 0.5V.

In different applications, 100% of the output value corresponds to different analog output.



P07 group—Human-machine interface

Function code	Name	Description	Setting range	Default
P07.00	User password	0–65535	0–65535	0

The password protection function will be valid when set to be any non-zero data.

00000: user's password set before will be cleared and the password protection function will be disabled.

After the password has been set and becomes valid, the user cannot access menu if the user's password is not correct. Only when a correct user's password is input, the user can see and modify the parameters. Please keep user's password in mind.

Press PRG/ESC again to the function code editing state, "0.0.0.0.0" will be displayed. Unless using the correct password, the operators cannot enter it.

Note: The password will be cleared if the default value is restored.

Function code	Name	Description	Setting range	Default
P07.01	Parameters copy	0: No operation 1: Upload parameters to the keypad 2: Download parameters to the local	0–2	0

Set the way of parameter copy.

Note: When upload or download operation completes, the parameter will be set to 0 automatically.

Function code	Name	Description	Setting range	Default
P07.02	QUICK/JOG function selection	0:No function 1: Press QUICK/JOG to switch the displayed function code to the left 2: Reserved 3: Quick debugging	0–3	0

Set the function of QUICK/JOG.

Function code	Name	Description	Setting range	Default
P07.04	STOP/RST function selection	0: Valid when keypad control 1: Valid when keypad and terminal control 2: Valid when keypad and	0–3	3

Function code	Name	Description	Setting range	Default
		communication control 3: Always valid		

The function of STOP/RST is always valid.

Function code	Name	Description	Setting range	Default
P07.05	Parameter display selection in rectification state	0–0xFFFF	0–0xFFFF	0x000F

15 parameters can be displayed in operation and stopping state: DC bus voltage (V), grid frequency (Hz), input voltage (V), input current (A), input power factor (%), active current component (%), reactive current component (%), input terminal state, output terminal state, AI1 (V), AI2 (V), AI3 (V), input apparent power (kVA), input active power (kW) and input reactive power (kVar).

Parameter display is affected by the function code. If some bit is 1, then the corresponding parameter can be viewed in operation by >>/SHIFT. If the bit is 0, then the corresponding parameter will not display.

BIT15	BIT14	BIT13	BIT12	BIT11	BIT10	BIT9	BIT8
Reserved	Input reactive power	Input active power	Input apparent power	AI3	AI2	AI1	Output terminal state
BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
Input terminal state	Reactive current component	Active current component	Input power factor	Input current	Input voltage	Grid frequency	DC bus voltage

Function code	Name	Description	Setting range	Default
P07.07	Factory barcode 1	0x0000–0xFFFF		
P07.08	Factory barcode 2	0x0000–0xFFFF		
P07.09	Factory barcode 3	0x0000–0xFFFF		
P07.10	Factory barcode 4	0x0000–0xFFFF		
P07.11	Factory barcode 5	0x0000–0xFFFF		
P07.12	Factory barcode 6	0x0000–0xFFFF		

Display the local barcode.

Function code	Name	Description	Setting range	Default
P07.17	Accumulative power consumption high bit	0–65535kWh	0–65535kWh	0kWh
P07.18	Accumulative power consumption low bit	0.0–999.9kWh	0.0–999.9kWh	0.0kWh

Accumulative running power consumption=P07.17*1000+P07.18.

Function code	Name	Description	Setting range	Default
P07.19	Software version (DSP)	0.00–655.35	0.00–655.35	0.00

Display the software version of DSP.

Function code	Name	Description	Setting range	Default
P07.20	Software version (FPGA)	0.00–655.35	0.00–655.35	0.00

Display the software version of FPGA.

Function code	Name	Description	Setting range	Default
P07.21	Local accumulative operation time	0–65535h	0–65535h	0

Display the local accumulative operation time.

P08 group—State view

The function codes are used to view the system information.

Function code	Name	Description	Setting range	Default
P08.00	Rated power of the rectifier	0–6000kW	0–6000kW	Depends on model
P08.01	Rated current of the rectifier	0.0–6000.0A	0.0–6000.0A	Depends on model
P08.04	DC voltage	0.0–6000.0V	0.0–6000.0V	0.0V
P08.05	Grid frequency	0.00–120.0Hz	0.00–120.0Hz	0.0Hz
P08.06	Grid voltage	0.0–4000.0V	0.0–4000.0V	0.0V
P08.07	Grid input current	0.0–6000.0A	0.0–6000.0A	0.0A
P08.08	Power factor	-1.00–1.00	-1.00–1.00	0.00
P08.09	Percentage of active current	-200.0–200.0%	-200.0–200.0%	0.0%
P08.10	Percentage of reactive current	-200.0–200.0%	-200.0–200.0%	0.0%
P08.11	Digital input terminal state	0x0–0xF BIT0 corresponds to S1	0x0–0xF	0x0
P08.12	Digital output terminal state	0x0–0xF BIT0 corresponds to RO1	0x0–0xF	0x0
P08.13	AI1 input voltage	0.00–10.00V	0.00–10.00V	0.00V
P08.14	AI2 input voltage	-10.00–10.00V	-10.00–10.00V	0.00V
P08.15	AI3 input voltage	0.00–10.00V	0.00–10.00V	0.00V
P08.16	Input apparent power	0–6000.0kVA	0–6000.0kVA	0.0kVA
P08.17	Input active power	0–6000.0kW	0–6000.0kW	0.0kW
P08.18	Input reactive power	0–6000.0kVar	0–6000.0kVar	0.0kVar
P08.19	Unbalance factor of three-phase voltage	Ratio of rectifier max. input voltage to rectifier min. input voltage 1.00–10.00	1.00–10.00	0.00
P08.20	IGBT module temperature	-20.0–120.0°C	-20.0–120.0°C	0.0°C

P10 group—Fault information

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Setting range</th><th>Default</th></tr>
<tr><td>P10.00</td><td>Present fault type</td><td rowspan="6">Common fault types:
00: No fault
01: OC
02: LvI
03: OvI
04: SPI
05: PLLF
06: Lv
07: ov
08: ItE
09: E-DP
10: CE
11: E-CAN
12: E-NET
13: Reserved
14: Reserved
15: OL
16: EEP
17: TbE
18: Reserved
19: dF_CE
20: EF
21: dIS
22: Reserved
23: UPE
24: DnE
25: END
26: PC_t1
27: Reserved
28: Reserved
29: OH1
30: Out1
31: Out2</td><td rowspan="6">0–31
Or m.01–m.16
(m=1, 2, 3…6)</td><td>0</td></tr>
<tr><td>P10.01</td><td>Last fault type</td><td>0</td></tr>
<tr><td>P10.02</td><td>2nd-last fault type</td><td>0</td></tr>
<tr><td>P10.03</td><td>3rd-last fault type</td><td>0</td></tr>
<tr><td>P10.04</td><td>4th-last fault type</td><td>0</td></tr>
<tr><td>P10.05</td><td>5th-last fault type</td><td>0</td></tr>
</table>

Function code	Name	Description	Setting range	Default
		32: Out3 Pre-warning type: 05: A-vH1		

Refer to the fault information.

Function code	Name	Description	Setting range	Default
P10.06	Input terminal state at present fault	0x0–0xF	0x0–0xF	0x0

Record the input terminal state when fault occurs.

Function code	Name	Description	Setting range	Default
P10.07	Output terminal state at present fault	0x0–0xF	0x0–0xF	0x0

Record the output terminal state when fault occurs.

Function code	Name	Description	Setting range	Default
P10.08	DC bus voltage at present fault	0.0–6000.0V	0.0–6000.0V	0.0V

Record the DC bus voltage when fault occurs.

Function code	Name	Description	Setting range	Default
P10.09	Grid voltage at present fault	0.0–4000.0V	0.0–4000.0V	0.0V

Record the grid voltage when fault occurs.

Function code	Name	Description	Setting range	Default
P10.10	Input current at present fault	0.0–6000.0A	0.0–6000.0A	0.0A

Record the input current when fault occurs.

Function code	Name	Description	Setting range	Default
P10.13	IGBT temperature at present fault	-20.0–120.0°C	-20.0–120.0°C	0.0°C

Record the IGBT temperature when fault occurs and display 3PH IGBT temperature at no fault.

Function code	Name	Description	Setting range	Default
P10.22	Input terminal state at last fault	0x0–0xF	0x0–0xF	0x0
P10.23	Output terminal state at last fault	0x0–0xF	0x0–0xF	0x0
P10.24	DC bus voltage at last fault	0.0–6000.0V	0.0–6000.0V	0.0V
P10.25	Grid voltage at last fault	0.0–4000.0V	0.0–4000.0V	0.0V
P10.26	Input current at last fault	0.0–6000.0A	0.0–6000.0A	0.0A
P10.29	IGBT temperature at last fault	-20.0–120.0°C	-20.0–120.0°C	0.0°C

Record the IGBT temperature when fault occurs and display 3PH IGBT temperature at no fault.

Record the parameters at last fault. For details, refer to P10.22–P10.29.

Function code	Name	Description	Setting range	Default
P10.38	Input terminal state at 2nd-last fault	0x0–0xF	0x0–0xF	0x0
P10.39	Output terminal state at 2nd-last fault	0x0–0xF	0x0–0xF	0x0
P10.40	DC bus voltage at 2nd-last fault	0.0–6000.0V	0.0–6000.0V	0.0V
P10.41	Grid voltage at 2nd-last fault	0.0–4000.0V	0.0–4000.0V	0.0V
P10.42	Input current at 2nd-last fault	0.0–6000.0A	0.0–6000.0A	0.0A

Function code	Name	Description	Setting range	Default
P10.45	IGBT temperature at 2nd-last fault	-20.0–120.0°C	-20.0–120.0	0.0°C

Record the IGBT temperature when fault occurs and display 3PH IGBT temperature at no fault.

Record the parameters at 2nd-last fault. For details, refer to P10.38–P10.45.

P11 group—Serial communication and CANopen communication

Function code	Name	Description	Setting range	Default
P11.00	Local communication address	1–247 0: broadcast address	1–247	1

Set the slave communication address. When the address is 0, i.e. broadcast address, the slave only receives communication frames without response. Local communication address is exclusive in the communication network and this is the basis for realizing peer to peer communication between the upper PC and the rectifier.

Note: The slave address cannot be set as 0.

Function code	Name	Description	Setting range	Default
P11.01	Baud rate setting	0: 1200BPS 1: 2400BPS 2: 4800BPS 3: 9600BPS 4: 19200BPS 5: 38400BPS	0–5	4

This parameter is used to set the data transmission rate between the upper PC and the rectifier.

Note: The upper PC must be set with identical baud rate with the rectifier. Otherwise it is impossible to realize the communication. The larger the baud rate, the higher the communication speed.

Function code	Name	Description	Setting range	Default
P11.02	Check bit setting	0: No check (N, 8, 1)for RTU 1: Even check (E, 8, 1)for RTU 2: Odd check (O, 8, 1)for RTU 3: No check (N, 8, 2)for RTU 4: Even check (E, 8, 2)for RTU 5: Odd check (O, 8, 2)for RTU	0–5	1

The upper PC must have same data format with the rectifier. Otherwise it will be impossible to realize communication.

Function code	Name	Description	Setting range	Default
P11.03	Response delay	0–200ms	0–200	5

Response delay: indicates the interval from the end of data receiving to transmitting the response data to the upper PC of the rectifier. If the response delay is shorter than the processing time of the system, the response delay will follow the processing time of the system. If the response delay is longer than the processing time of the system, after completion of data processing, the system will wait until the response delay is over before transmitting data to the upper PC.

Function code	Name	Description	Setting range	Default
P11.04	Communication overtime fault	0.1–60.0s 0.0: Invalid	0.0–60.0	0.0s

When this function code is set as 0.0s, the communication overtime fault is invalid.

When this function code is set as a value other than zero, if the interval between one communication and the next communication exceeds the time for communication overtime, the system will report an error of 485 communication fault (CE). Generally this parameter is set as invalid. In a system that communicates continuously, this parameter can be set to monitor the communication state.

Function code	Name	Description	Setting range	Default
P11.05	Transmission error processing	0: Report fault and coast to stop 1: Not to report fault and keep working 2: Not to report fault and stop (only in the communication control mode) 3: Not to report fault and stop (in all control modes)	0–3	0

The function code is used to set the solution mode when transmission fault occurs.

Function code	Name	Description	Setting range	Default
P11.06	Communication processing	0x00–0x11 LED ones: 0: Response to write 1: No response to write LED tens:	0x00–0x11	0x00

Function code	Name	Description	Setting range	Default
		0: Reserved 1: Reserved		

The function code is used to select the communication processing.

0: Response to write; PWM rectifier responses to read/write commands from upper PC.

1: No response to write; PWM rectifier responses to read commands from upper PC only. The communication efficiency can be improved.

Function code	Name	Description	Setting range	Default
P11.09	CANopen communication address	0–127	0–127	1
P11.10	CANopen baud rate	0: 50K BPS 1: 125K BPS 2: 250K BPS 3: 500K BPS 4: 1M BPS	0–4	3
P11.11	CANopen communication fault delay	0.0 (invalid), 0.1–100.0s	0.1–100.0s	0.0s
P11.12	CANopen communication protocol	0: Common control protocol 1: Internal master-slave communication protocol	0–1	0

P12 group—PROFIBUS communication

Function code	Name	Description	Setting range	Default
P12.00	Module type	0: PROFIBUS	0–1	0
P12.01	Module address	0–127	0–127	2

The function code is used to identify the address of PWM rectifier.

Note: 0 is the broadcast address. If P12.01 is 0, then it can only receive and carry out the broadcast command from upper PC, other than response.

Function code	Name	Description	Setting range	Default
P12.02	Received PZD2	0: Invalid 1: DC voltage setting 2–4: Reserved 5: AO output setting 1 6: AO output setting 2 7–13: Reserved	0–13	0
P12.03	Received PZD3		0–13	0
P12.04	Received PZD4		0–13	0
P12.05	Received PZD5		0–13	0
P12.06	Received PZD6		0–13	0
P12.07	Received PZD7		0–13	0
P12.08	Received PZD8		0–13	0
P12.09	Received PZD9		0–13	0
P12.10	Received PZD10		0–13	0
P12.11	Received PZD11		0–13	0
P12.12	Received PZD12		0–13	0

Detailed description of the second PZD word of PROFIBUS-DP communication and master communication:

Function	Name	Description
0	Invalid	
1	DC voltage setting	0–20000, unit 0.1V
2	Reserved	
3	Reserved	
4	Reserved	

Function	Name	Description
5	AO output setting 1	-1000–1000, 1000 corresponds to 100.0%
6	AO output setting 2	-1000–1000, 1000 corresponds to 100.0%
7–13	Reserved	

P12.02–P12.12 can be modified in any state.

Function code	Name	Description	Setting range	Default
P12.13	Sent PZD2	0: Invalid 1: DC voltage 2: DC voltage feedback 3: Input voltage valid 4: Valid value of the input current 5: Input power 6: Input power factor 7: Grid frequency value 8: Active current feedback 9: Reactive current feedback 10: Fault code 11:AI1 12:AI2 13:AI3 14: Input state 15: Output state 16: Running status word 17–20: Reserved	0–20	0
P12.14	Sent PZD3		0–20	0
P12.15	Sent PZD4		0–20	0
P12.16	Sent PZD5		0–20	0
P12.17	Sent PZD6		0–20	0
P12.18	Sent PZD7		0–20	0
P12.19	Sent PZD8		0–20	0
P12.20	Sent PZD9		0–20	0
P12.21	Sent PZD10		0–20	0
P12.22	Sent PZD11		0–20	0
P12.23	Sent PZD12		0–20	0

Detailed description of the second PZD word of PROFIBUS-DP communication and master communication:

Function	Name	Description
0	Invalid	
1	DC voltage	*10, V
2	DC voltage feedback	*10, V
3	Input voltage valid	*10, V

Function	Name	Description
4	Valid value of the input current	*10, A
5	Input power	*10, kW
6	Input power factor	*100
7	Grid frequency value	*10, Hz
8	Active current feedback	100% corresponds to the rated current of the rectifier
9	Reactive current feedback	100% corresponds to the rated current of the rectifier
10	Fault code	
11	AI1	*100, V
12	AI2	*100, V
13	AI3	*100, V
14	Input state	
15	Output state	
16	Running status word	
17–20	Reserved	

P12.13–P12.23 can be modified in any state.

Function code	Name	Description	Setting range	Default
P12.24	Temporary variable 1 of PZD sending	0–65535	0–65535	0

The function code is used as temporary variable for PZD sending.

P12.24 can be written in any state.

Function code	Name	Description	Setting range	Default
P12.25	Time of DP communication overtime fault	0.0 (invalid), 0.1–60.0s	0.0–60.0	0.0s

If the function code is set to 0.0s, the fault is invalid. If it is set to a non-zero value (actual value, unit: second), if the interval time between two communications exceeds the set time, the system reports E-DP.

P13 group—Ethernet communication

Function code	Name	Description	Setting range	Default
P13.00	Ethernet communication speed setting	0: Self-adaptive 1: 100M full-duplex 2: 100M half-duplex 3: 10M full-duplex 4: 10M half-duplex	0–4	0

The function code is used to set the speed of Ethernet communication.

Function code	Name	Description	Setting range	Default
P13.01	IP address 1	0–255	0–255	192
P13.02	IP address 2	0–255	0–255	168
P13.03	IP address 3	0–255	0–255	0
P13.04	IP address 4	0–255	0–255	1
P13.05	Subnet mask 1	0–255	0–255	255
P13.06	Subnet mask 2	0–255	0–255	255
P13.07	Subnet mask 3	0–255	0–255	255
P13.08	Subnet mask 4	0–255	0–255	0

These function codes are used to set IP addresses and subnet masks for Ethernet communication.

Format of IP address: P13.01.P13.02.P13.03.P13.04. Example: IP address is 192.168.0.1.

Format of IP subnet mask: P13.05.P13.06.P13.07.P13.08. Example: mask is 255.255.255.0.

Function code	Name	Description	Setting range	Default
P13.09	Gateway address 1	0–255	0–255	192
P13.10	Gateway address 2	0–255	0–255	168
P13.11	Gateway address 3	0–255	0–255	1
P13.12	Gateway address 4	0–255	0–255	1

Set the gateway of Ethernet.

5.3 Fault information and solution

Fault code	Type of fault	Possible causes	Countermeasures
OC	Input overcurrent	● Wrong setting of current loop or parameters ● Hardware circuit abnormal ● Rectifiers overload	● Adjust the current loop and parameters ● Ask for service ● Adjust the load or rectifier
LvI	Input undervoltage	● Input power is abnormal power-down ● Input voltage detection circuit abnormal	● Check the input power ● Ask for service
OvI	Input overvoltage	● Input power abnormal ● Interference ● Input voltage detection circuit abnormal	● Check the input power ● Check the external interference ● Ask for service
SPI	Input phase loss	● Input power abnormal ● Interference ● Input voltage detection circuit abnormal	● Check the input power ● Ask for service ● Check the external interference
PLLF	Phase-locked failed	● The grid environment is abnormal ● The circuit of the sample board is abnormal	● Check and find out the interference ● Ask for service
Lv	DC bus undervoltage	● Input power abnormal ● Interference ● Input voltage detection circuit abnormal	● Check the input power ● Ask for service ● Check the external interference
ov	DC bus overvoltage	● Input power abnormal ● Interference ● Bus voltage detection circuit abnormal	● Check the input power ● Ask for service ● Check the external interference
ItE	Current detection fault	● The circuit is abnormal or interfered ● Hoare components is broken	● Check and settle the faults
E-DP	PROFIBUS communication fault	● PROFIBUS communication offline ● Wrong PROFIBUS parameters setting	● Check communication ● Re-set the relevant parameters

Fault code	Type of fault	Possible causes	Countermeasures
CE	485 communication fault	● Improper setting of baud rate ● Error with serial communication ● Long period of communication interrupt	● Set appropriate baud rate ● Press STOP/RST to reset and contact the service department ● Check the wiring of the communication interfaces
E-CAN	CANopen communication fault	● CANopen communication offline ● Wrong parameters setting	● Check the parameter setting and external wiring and restore
E-NET	Ethernet communication fault	● Communication offline ● Wrong parameters setting	● Please check the parameter settings and external wiring
OL	Rectifier overload	● The load exceeds the range	● Adjust the load or change another rectifier
EEP	EEPROM operation fault	● Read/write fault of the control parameters ● Damage to DPRAM chip	● Press STOP/RST to reset ● Ask for service
TbE	Contactor fault	● Damage to the contactor ● Contactor auxiliary abnormal ● Interference	● Check contactor ● Check the contactor auxiliary contact ● Check the external environment to exclude interference
dF_CE	DSP-FPGA communication fault	● Excessive electromagnetic interference ● The quality of electric power is too low ● FPGA chip damage ● DSP chip damage	● View the unit state and ensure FPGA is damaged or not ● Contact with us
EF	External fault	● SI external fault input terminals action	● Check the external device input
dIS	Rectifier disabled	● The digital output function of the system: rectifier enabled but the digital terminal does not act	● Press the corresponding digital terminal and enter P5 function group to cancel the function
UPE	Upload fault	● Keyboard line is disconnected or offline ● Keyboard line is too long or interfered ● Circuit fault to the keypad or main	● Check the environment and eliminate the interference ● Change the hardware and ask for service ● Change the hardware and ask for

Fault code	Type of fault	Possible causes	Countermeasures
		board communication	service
DnE	Download fault	● Keyboard line disconnected or offline ● Keyboard line too long or interfered ● Data storage error	● Change the hardware and ask for service ● Change the hardware and ask for service ● Re-back up keyboard data
END	Run time arrived	● Set time arrived	● Reset the time and ask for service
PC_t1	Timeout fault of power-on buffer 1	● Unit disabled ● Buffer resistor burnout ● Buffer contactor fault	● Check the unit enabling ● Check the buffer resistor ● Check the buffer contactor
OH1	IGBT overheat fault	● Sudden overcurrent of the rectifier ● Short-circuit between 3 phases or grounding short circuit ● Duct blockage or fan damage ● Ambient temperature is too high ● Control panel connection or plug loose ● Auxiliary power damage or drive voltage undervoltage ● Power module bridge arm ● Control board abnormal	● Refer to the overcurrent solutions ● Rewire ● Clean the air duct or change the fan ● Reduce the environment temperature ● Check and rewire ● Ask for service ● Ask for service ● Ask for service
Out1	Vce detection fault of U phase	● Corresponding IGBT damage ● Strong interference ● External short circuit	● Ask for service ● Check the external environment and eliminate the interference ● Check the external circuit and eliminate the external fault
Out2	Vce detection fault of V phase		
Out3	Vce detection fault of W phase		
A-vH1	IGBT temperature pre-warning	● Duct blockage or fan damage ● Ambient temperature is too high ● Control panel connection or plug loose ● Auxiliary power damage or drive voltage undervoltage ● Power module bridge arm ● Control board abnormal	● Clean the air duct or change the fan ● Reduce the environment temperature ● Check and rewire ● Ask for service ● Ask for service ● Ask for service

5.4 Parameters list

The function parameters have been divided into groups according to the function. Each function group contains certain function codes applying 3-level menus. For example, "P00.08" means the eighth function code in the P00 group function, P29 group is factory reserved, and users are forbidden to access these parameters.

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

1. Below is the instruction of the function lists:

The first column "Function code": codes of function parameter group and parameters;

The second column "Name": full name of function parameters;

The third column "Description": detailed illustration of the function parameters;

The fourth column "Setting range": valid setting range of the function parameters, displayed on LCD;

The fifth column "Default": the original factory set value of the function parameter;

The sixth column "Modify": the modifying character of function codes (the parameters can be modified or not and the modifying conditions), below is the instruction:

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

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

"●": means the value of the parameter is the real detection value which cannot be modified;

(The system has limited the automatic inspection of the modifying character of the parameters to help users avoid modifying by mistake)

The seventh column "No.": the serial number of the function code in the whole function parameters, or register address during communication

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

3. "The default value" means the function parameter will restore to the default value during default parameters restoring. But the detected parameter or recorded value won’t be restored.

4. For a better parameter protection, the system provides password protection. After setting the user password (set P07.00 to non zero), the system will enter the password authentification state and display "0.0.0.0.0." while the users press PRG/ESC to enter the editing state of the function parameters. The users must input correct password or cannot enter. For the factory setting parameter zone, only factory can enter. (Remind that the users cannot modify the factory parameters by themselves, otherwise, if the parameter setting is incorrect, damage to the system may occur). If the password protection is unlocked, the user can modify the password freely and the system will work as the last setting one. When P07.00 is 0, the user password can be cancelled; when P07.00 is non-zero at power on, the parameters can be protected by the password.

5. When using serial communication to modify the function parameters, the functions of the user password follow the above rules.

Function code	Name	Description	Setting range	Default	Modify
P00 group—Basic function					
P00.00	Reserved				●
P00.01	Run command channel	0: Keypad command channel (LED off) 1: Terminal command channel (LED flickering) 2: Communication command channel (LED on)	0–2	0	◎
P00.02	Communication running commands	0: 485 communication channel 1: PROFIBUS communication channel 2: Ethernet communication channel 3: CANopen communication channel 4: Reserved 5: Reserved 6: Reserved	0–6	0	◎
P00.03	Running mode	0: COSφ mode 1: Reserved 2: Reserved	0–2	0	◎
P00.04	DC bus voltage setting	0: Automatic 1: Keypad setting 2: Reserved	0–2	1	◎
P00.05	Setting value of DC bus voltage	300.0–4000.0V	300.0–4000.0	AC1140: 1850V	○
P00.06	Reserved				●
P00.07	Reserved				●
P00.08	Resonance suppression factor	0–10	0–10	0	●
P00.09	Overmodulation selection	0: Invalid 1: Valid	0–1	1	◎
P00.10	Running mode of	0: Normal running mode	0–1	0	○

Function code	Name	Description	Setting range	Default	Modify
	cooling fan	1: Keep running after power on			
P00.01	Reserved				●
P00.02	Reserved				●
P00.03	Reserved				●
P00.14	Carrier frequency	2.0–8.0kHz	2.0–8.0	4.0	●
P00.15	Function parameter restore	0: No operation 1: Restore the default value 2: Clear the fault record 3: Clear the accumulative power consumption	0–3	0	◎
P00.16	Function parameter attribute	0: Invalid 1: Read-only	0–1	0	○
P01 group—Power control and protection function					
P00.00	Reserved				●
P00.01	Main contactor switching-on feedback detection	0: No detection 1: Detection	0–1	1	◎
P00.02	Undervoltage setting value of input voltage	75.0–95.0%	75.0–95.0%	85.0%	●
P00.03	Overvoltage setting value of input voltage	105.0–125.0%	105.0–125.0%	115.0%	●
P00.04	Reserved				●
P00.05	Reserved				●
P00.06	Waiting time of automatic operation	0–3600.0s	0–3600.0	0.0s	○
P00.07	Delay time of automatic fault reset	0.0–3600.0s	0.0–3600.0	1.0s	○
P00.08	Fault reset times	0–10	0–10	0	○
P03 group—Control parameters					

Function code	Name	Description	Setting range	Default	Modify
P03.00	Reserved				●
P03.01	Reserved				●
P03.02	Reserved				●
P03.03	Reserved				●
P03.04	Reserved				●
P03.05	Reserved				●
P03.06	Positive limit amplitude of active current (rectification)	0.0–200.0% (rated current of the rectifier)	0.0–200.0%	150.0%	○
P03.07	Negative limit amplitude of active current (feedback)	0.0–200.0% (rated current of the rectifier)	0.0–200.0%	150.0%	○
P03.08	Positive limit amplitude of reactive current (rectification)	0.0–200.0% (rated current of the rectifier)	0.0–200.0%	150.0%	○
P03.09	Negative limit amplitude of reactive current (feedback)	0.0–200.0% (rated current of the rectifier)	0.0–200.0%	150.0%	○
P03.10	Maximum current setting	0–250.0% (rated current of the rectifier)	0–250.0%	200.0%	○
P03.11	Voltage loop proportional coefficient 1	0.001–30.000	0.001–30.000	2.000	○
P03.12	Voltage loop integral coefficient 1	0.01–300.00	0.01–300.00	20.00	○
P03.13	Voltage loop proportional coefficient 2	0.001–30.000	0.001–30.000	5.500	○
P03.14	Voltage loop integral coefficient 2	0.01–300.00	0.01–300.00	10.00	○
P03.15	Switching voltage of	0.01–30.00V	0.01–30.00	10.00V	○

Function code	Name	Description	Setting range	Default	Modify
	PI parameters				
P03.16	Bus voltage filter coefficient	0–1.000s	0–1.000s	0.000s	○
P03.17	Current loop proportional coefficient P	0.001–30.000	0.001–30.000	1.000	○
P03.18	Current loop integral coefficient I	0.01–300.00	0.01–300.00	1.00	○
P03.19	Power factor setting	0: Angle setting 1: Reserved	0–1	0	◎
P03.20	Rectification power factor angle	-90.0°–90.0° The positive means inductive and the negative means capacitive.	-90.0–90.0°	0.0°	○
P03.21	Feedback power factor angle	-90.0°–90.0° The positive means inductive and the negative means capacitive.	-90.0–90.0°	0.0°	○
P03.22	Reserved				●
P03.23	Reserved				●
P05 group—Input terminals					
P05.00	Reserved				●
P05.01	Polarity selection of digital input terminals	0x0–0xF 0 stands for positive polarity BIT0: S1 BIT1: S2 BIT2: S3 BIT3: S4	0x0–0xF	0x0	◎
P05.02	Reserved				●
P05.03	Digital input filtering time	0.000–1.000s	0.000–1.000	0.000s	○
P05.04	S1 terminal function selection	0: No function	0–15	1	◎

Function code	Name	Description	Setting range	Default	Modify
P05.05	S2 terminal function selection	1: Run 2: Fault reset 3: External fault 4: Reserved 5: Run enabling 6: Reserved 7–12: Reserved 13: Total electricity consumption cleared 14: Accumulative power maintain 15: Reserved		2	◎
P05.06	S3 terminal function selection			0	◎
P05.07	S4 terminal function selection			0	◎
P05.08	Reserved			0	●
P05.09	Reserved			0	●
P05.10	Reserved			0	●
P05.11	Reserved			0	●
P05.12	Delay time of S1 switching-on	0.000–60.000s	0.000–60.000	0.000s	○
P05.13	Delay time of S1 switching-off	0.000–60.000s	0.000–60.000	0.000s	○
P05.14	Delay time of S2 switching-on	0.000–60.000s	0.000–60.000	0.000s	○
P05.15	Delay time of S2 switching-off	0.000–60.000s	0.000–60.000	0.000s	○
P05.16	Delay time of S3 switching-on	0.000–60.000s	0.000–60.000	0.000s	○
P05.17	Delay time of S3 switching-off	0.000–60.000s	0.000–60.000	0.000s	○
P05.18	Delay time of S4 switching-on	0.000–60.000s	0.000–60.000	0.000s	○
P05.19	Delay time of S4 switching-off	0.000–60.000s	0.000–60.000	0.000s	○
P05.20	Reserved				●
P05.21	Reserved				●
P05.22	Reserved				●
P05.23	Reserved				●
P05.24	Reserved				●

Function code	Name	Description	Setting range	Default	Modify
P05.25	Reserved				●
P05.26	Reserved				●
P05.27	Reserved				●
P05.28	AI1 lower limit	0.00V–P05.30	0.00–P05.30	0.00V	○
P05.29	AI1 lower limit corresponding setting	-100.0%–100.0%	-100.0–100.0	0.0%	○
P05.30	AI1 upper limit	P05.28–10.00V	P05.28–10.00	10.00V	○
P05.31	AI1 upper limit corresponding setting	-100.0%–100.0%	-100.0–100.0	100.0%	○
P05.32	AI1 input filtering time	0.000s–10.000s	0.000–10.000	0.100s	○
P05.33	AI2 lower limit	-10.00V–P05.35	-10.00–P05.35	-10.00V	○
P05.34	AI2 lower limit corresponding setting	-100.0%–100.0%	-100.0–100.0	-100.0%	○
P05.35	AI2 middle value	P05.33–P05.37	P05.33–P05.37	0.00V	○
P05.36	AI2 middle value corresponding setting	-100.0%–100.0%	-100.0–100.0	0.0%	○
P05.37	AI2 upper limit	P05.35–10.00V	P05.35–10.00	10.00V	○
P05.38	AI2 upper limit corresponding setting	-100.0%–100.0%	-100.0–100.0	100.0%	○
P05.39	AI2 input filtering time	0.000s–10.000s	0.000–10.000	0.100s	○
P05.40	AI3 lower limit	0.00V–P05.42	0.00–P05.42	0.00V	○
P05.41	AI3 lower limit corresponding setting	-100.0%–100.0%	-100.0–100.0	0.0%	○
P05.42	AI3 upper limit	P05.40–10.00V	P05.40–10.00	10.00V	○

Function code	Name	Description	Setting range	Default	Modify
P05.43	AI3 upper limit corresponding setting	-100.0%–100.0%	-100.0–100.0	100.0%	○
P05.44	AI3 input filtering time	0.000s–10.000s	0.000–10.000	0.100s	○
P06 group—Output terminals					
P06.00	Polarity selection of digital output terminal	0x0–0xF 0 stands for positive polarity BIT0: RO1 BIT1: RO2 BIT2–BIT7: Reserved	0x0–0xF	0x0	○
P06.01	Relay RO1 output selection	0: No output 1: Ready to run 2: In running 3: Fault output 4–31: Reserved	0–31	1	○
P06.02	Relay RO2 output selection			2	○
P06.03	Reserved			0	●
P06.04	Reserved			0	●
P06.05	Delay time of RO1 switching-on	0.000–60.000s	0.000–60.000	0.000s	○
P06.06	Delay time of RO1 switching-off	0.000–60.000s	0.000–60.000	0.000s	○
P06.07	Delay time of RO2 switching-on	0.000–60.000s	0.000–60.000	0.000s	○
P06.08	Delay time of RO2 switching-off	0.000–60.000s	0.000–60.000	0.000s	○
P06.09	Reserved	0.000–60.000s	0.000–60.000		●
P06.10	Reserved	0.000–60.000s	0.000–60.000		●
P06.11	Reserved	0.000–60.000s	0.000–60.000		●
P06.12	Reserved	0.000–60.000s	0.000–60.000		●
P06.13	AO1 output selection	0: Null 1: The set value of the DC voltage (AC1140V, 100%	0–20	1	○
P06.14	AO2 output			2	○

Function code	Name	Description	Setting range	Default	Modify
	selection	corresponds to 3000V) 2: The actual value of the DC voltage (AC1140V, 100% corresponds to 3000V) 3: Valid value of input voltage (100% corresponds to 2*Vn) 4: Valid value of input current (100% corresponds to In*2) 5: Input power (100% corresponds to 2*Vn*In) 6: Input power factor (%) 7: Grid frequency value (100% corresponds to 100.0Hz) 8–20: Reserved			
P06.15	Lower output limit AO1	-100.0%–P06.17	-100.0%–P06.17	0.0%	○
P06.16	Lower limit corresponding AO1 output	-10.00V–10.00V	-10.0V–10.0V	0.00V	○
P06.17	Upper output limit AO1	P06.15–100.0%	P06.15–100.0%	100.0%	○
P06.18	Upper limit corresponding AO1 output	-10.00V–10.00V	-10.0V–10.00V	10.00V	○
P06.19	AO1 output filtering time	0.000–10.000s	0.000–10.000s	0.000s	○
P06.20	Lower output limit 2	-100.0%–P06.22	-100.0%–P06.22	0.0%	○
P06.21	Lower limit corresponding AO2 output	-10.00–10.00V	-10.0V–10.00V	0.00V	○
P06.22	Upper output limit 2	P06.20–100.0%	P06.20–100.0%	100.0%	○
P06.23	Upper limit corresponding AO2 output	-10.00V–10.00V	-10.0V–10.00V	10.00V	○
P06.24	AO2 output filtering time	0.000–10.000s	0.000–10.000s	0.000s	○

Function code	Name	Description	Setting range	Default	Modify
P07 group—Human-machine interface					
P07.00	User password	0–65535	0–65535	0	○
P07.01	Parameters copy	0: No operation 1: Upload parameters to the keypad 2: Download parameters to the local	0–2	0	◎
P07.02	QUICK/JOG function selection	0:No function 1: Press QUICK/JOG to switch the displayed function code 2: Reserved 3: Quick debugging	0–3	0	○
P07.03	Reserved				●
P07.04	STOP/RST function selection	0: Valid when keypad control 1: Valid when keypad and terminal control 2: Valid when keypad and communication control 3: Always valid	0–3	3	○
P07.05	Parameter display selection in rectification state	0x0000–0xFFFF BIT0: DC bus voltage (V) BIT1: Grid frequency (Hz) BIT2: Input voltage (V) BIT3: Input current (A) BIT4: Input power factor BIT5: Active current component (%) BIT6: Reactive current component (%)(% light flickering) BIT7: Input terminal state BIT8: Output terminal state BIT9: AI1 (V) BIT10: AI2 (V)(V light flickering)	0–0xFFFF	0x000F	○

Function code	Name	Description	Setting range	Default	Modify
		BIT11: AI3 (V) BIT12: Input apparent power (kVA) BIT13: Input active power (kW) BIT14: Input reactive power (kVar) BIT15: Reserved			
P07.06	Reserved				●
P07.07	Factory barcode 1	0x0000–0xFFFF			●
P07.08	Factory barcode 2	0x0000–0xFFFF			●
P07.09	Factory barcode 3	0x0000–0xFFFF			●
P07.10	Factory barcode 4	0x0000–0xFFFF			●
P07.11	Factory barcode 5	0x0000–0xFFFF			●
P07.12	Factory barcode 6	0x0000–0xFFFF			●
P07.13	Reserved				●
P07.14	Reserved				●
P07.15	Reserved				●
P07.16	Reserved				●
P07.17	Accumulative power consumption high bit	0–65535kWh	0–65535	0kWh	●
P07.18	Accumulative power consumption low bit	0.0–999.9kWh	0.0–999.9	0.0kWh	●
P07.19	Software version (DSP)	0.00–655.35	0.00–655.35	0.00	●
P07.20	Software version (FPGA)	0.00–655.35	0.00–655.35	0.00	●
P07.21	Local accumulative operation time	0–65535h	0–65535	0	●
P08 group—State view					
P08.00	Rated power of the	0–6000.0kW	0–6000.0	Depends	●

Function code	Name	Description	Setting range	Default	Modify
	rectifier			on model	
P08.01	Rated current of the rectifier	0.0–6000.0A	0.0–6000.0	Depends on model	●
P08.02	Reserved				●
P08.03	Reserved				●
P08.04	DC voltage	0.0–6000.0V	0.0–6000.0	0.0V	●
P08.05	Grid frequency	0.00–120.0Hz	0.00–120.0	0.0Hz	●
P08.06	Grid voltage	0–4000V	0–4000	0V	●
P08.07	Grid input current	0.0–6000.0A	0.0–6000.0	0.0A	●
P08.08	Power factor	-1.00–1.00	-1.00–1.00	0.00	●
P08.09	Percentage of active current	-200.0–200.0%	-200.0–200.0	0.0%	●
P08.10	Percentage of reactive current	-200.0–200.0%	-200.0–200.0	0.0%	●
P08.11	Digital input terminal state	0x0–0xF BIT0 corresponds to S1	0x0–0xF	0x0	●
P08.12	Digital output terminal state	0x0–0xF BIT0 corresponds to RO1	0x0–0xF	0x0	●
P08.13	AI1 input voltage	0.00–10.00V	0.00–10.00	0.00V	●
P08.14	AI2 input voltage	-10.00V–10.00V	-10.00–10.00	0.00V	●
P08.15	AI3 input voltage	0.00–10.00V	0.00–10.00	0.00V	●
P08.16	Input apparent power	0–6000.0kVA	0–6000.0	0 .0kVA	●
P08.17	Input active power	0–6000.0kW	0–6000.0	0 .0kW	●
P08.18	Input reactive power	0–6000.0kVar	0–6000.0	0 .0kVar	●
P08.19	Unbalance factor of three-phase voltage	1.00–10.00	1.00–10.00	0.00	●
P08.20	IGBT module temperature	-20.0–120.0°C	-20.0–120	0.0°C	●

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Setting range</th><th>Default</th><th>Modify</th></tr>
<tr><td colspan="6">P10 group—Fault information</td></tr>
<tr><td>P10.00</td><td>Present fault type</td><td rowspan="6">Common fault types:
00:No fault
01: OC
02: LvI
03: OvI
04: SPI
05: PLLF
06: Lv
07: ov
08: ItE
09: E-DP
10: CE
11: E-CAN
12: E-NET
13: Reserved
14: Reserved
15: OL
16: EEP
17: TbE
18: Reserved
19: dF_CE
20: EF
21: dIS
22: Reserved
23: UPE
24: DnE
25: END
26: PC_t1
27: Reserved
28: Reserved
29: OH1
30: Out1
31: Out2</td><td rowspan="6">0–31
Or m.01–m.16
(m=1, 2, 3…6)</td><td>0</td><td>●</td></tr>
<tr><td>P10.01</td><td>Last fault type</td><td>0</td><td>●</td></tr>
<tr><td>P10.02</td><td>2nd-last fault type</td><td>0</td><td>●</td></tr>
<tr><td>P10.03</td><td>3rd-last fault type</td><td>0</td><td>●</td></tr>
<tr><td>P10.04</td><td>4th-last fault type</td><td>0</td><td>●</td></tr>
<tr><td>P10.05</td><td>5th-last fault type</td><td>0</td><td>●</td></tr>
</table>

Function code	Name	Description	Setting range	Default	Modify
		32: Out3 Pre-warning type: 05: A-vH1			
P10.06	Input terminal state at present fault	0x0–0xF	0x0–0xF	0x0	●
P10.07	Output terminal state at present fault	0x0–0xF	0x0–0xF	0x0	●
P10.08	DC bus voltage at present fault	0.0–6000.0V	0.0–6000.0	0.0V	●
P10.09	Grid voltage at present fault	0.0–4000.0V	0.0–4000.0	0.0V	●
P10.10	Input current at present fault	0.0–6000.0A	0.0–6000.0	0.0A	●
P10.11	Reserved				●
P10.12	Reserved				●
P10.13	IGBT temperature at present fault	-20.0–120.0°C	-20.0–120.0	0.0°C	●
P10.14	Reserved				●
P10.15	Reserved				●
P10.16	Reserved				●
P10.17	Reserved				●
P10.18	Reserved				●
P10.19	Reserved				●
P10.20	Reserved				●
P10.21	Reserved				●
P10.22	Input terminal state at last fault	0x0–0xF	0x0–0xF	0x0	●
P10.23	Output terminal state at last fault	0x0–0xF	0x0–0xF	0x0	●
P10.24	DC bus voltage at	0.0–6000.0V	0.0–6000.0	0.0V	●

Function code	Name	Description	Setting range	Default	Modify
	last fault				
P10.25	Grid voltage at last fault	0.0–4000.0V	0.0–4000.0	0.0V	●
P10.26	Input current at last fault	0.0–6000.0A	0.0–6000.0	0.0A	●
P10.27	Reserved				●
P10.28	Reserved				●
P10.29	IGBT temperature at last fault	-20.0–120.0°C	-20.0–120.0	0.0°C	●
P10.30	Reserved				●
P10.31	Reserved				●
P10.32	Reserved				●
P10.33	Reserved				●
P10.34	Reserved				●
P10.35	Reserved				●
P10.36	Reserved				●
P10.37	Reserved				●
P10.38	Input terminal state at 2nd-last fault	0x0–0xF	0x0–0xF	0x0	●
P10.39	Output terminal state at 2nd-last fault	0x0–0xF	0x0–0xF	0x0	●
P10.40	DC bus voltage at 2nd-last fault	0.0–6000.0V	0.0–6000.0	0.0V	●
P10.41	Grid voltage at 2nd-last fault	0.0–4000.0V	0.0–4000.0	0.0V	●
P10.42	Input current at 2nd-last fault	0.0–6000.0A	0.0–6000.0	0.0A	●
P10.43	Reserved				●
P10.44	Reserved				●

Function code	Name	Description	Setting range	Default	Modify
P10.45	IGBT temperature at 2nd-last fault	-20.0–120.0°C	-20.0–120.0	0.0°C	●
P10.46	Reserved				●
P10.47	Reserved				●
P10.48	Reserved				●
P10.49	Reserved				●
P10.50	Reserved				●
P10.51	Reserved				●
P10.52	Reserved				●
P10.53	Reserved				●
P11 group—Serial communication and CANopen communication					
P11.00	Local communication address	1–247 0: Broadcast address	1–247	1	○
P11.01	Baud rate setting	0: 1200BPS 1: 2400BPS 2: 4800BPS 3: 9600BPS 4: 19200BPS 5: 38400BPS	0–5	4	○
P11.02	Check bit setting	0: No check (N, 8, 1)for RTU 1: Even check (E, 8, 1) for RTU 2: Odd check (O, 8, 1) for RTU 3: No check (N, 8, 2) for RTU 4: Even check (E, 8, 2) for RTU 5: Odd check (O, 8, 2) for RTU	0–5	1	○
P11.03	Response delay	0–200ms	0–200	5	○
P11.04	Communication overtime fault	0.0 (invalid), 0.1–60.0s	0.0–60.0s	0.0s	○
P11.05	Transmission error processing	0: Report fault and coast to stop	0–3	0	◎

Function code	Name	Description	Setting range	Default	Modify
		1: Not to report fault and keep working 2: Not to report fault and stop (only in the communication control mode) 3: Not to report fault and stop (in all control modes)			
P11.06	Communication processing	0x00–0x11 LED ones: 0: Response to write 1: No response to write LED tens: 0: Reserved 1: Reserved	0x00–0x11	0x00	◎
P11.07	Reserved				●
P11.08	Reserved				●
P11.09	CANopen communication address	0–127	0–127	1	◎
P11.10	CANopen baud rate	0: 50K BPS 1: 125K BPS 2: 250K BPS 3: 500K BPS 4: 1M BPS	0–4	3	◎
P11.11	CANopen communication fault delay	0.0 (invalid), 0.1–100.0s	0.1–100.0s	0.0s	◎
P11.12	CANopen communication protocol	0: Common control protocol 1: Internal master-slave communication protocol	0–1	0	◎
P11.13	Reserved				●
P11.14	Reserved				●
P11.15	Reserved				●

Function code	Name	Description	Setting range	Default	Modify
P11.16	Reserved				●
P12 group—PROFIBUS communication					
P12.00	Module type	0: PROFIBUS	0	0	●
P12.01	Module address	0–127	0–127	2	◎
P12.02	Received PZD2	0: Invalid 1: DC voltage setting 2–4: Reserved 5: AO output setting 1 6: AO output setting 2 7–13: Reserved	0–13	0	○
P12.03	Received PZD3		0–13	0	○
P12.04	Received PZD4		0–13	0	○
P12.05	Received PZD5		0–13	0	○
P12.06	Received PZD6		0–13	0	○
P12.07	Received PZD7		0–13	0	○
P12.08	Received PZD8		0–13	0	○
P12.09	Received PZD9		0–13	0	○
P12.10	Received PZD10		0–13	0	○
P12.11	Received PZD11		0–13	0	○
P12.12	Received PZD12		0–13	0	○
P12.13	Sent PZD2	0: Invalid 1: DC voltage 2: DC voltage feedback 3: Input voltage valid 4: Valid value of the input current 5: Input power 6: Input power factor 7: Grid frequency value 8: Active current feedback 9: Reactive current feedback 10: Fault code 11:AI1 12:AI2 13:AI3	0–20	0	○
P12.14	Sent PZD3		0–20	0	○
P12.15	Sent PZD4		0–20	0	○
P12.16	Sent PZD5		0–20	0	○
P12.17	Sent PZD6		0–20	0	○
P12.18	Sent PZD7		0–20	0	○
P12.19	Sent PZD8		0–20	0	○
P12.20	Sent PZD9		0–20	0	○
P12.21	Sent PZD10		0–20	0	○
P12.22	Sent PZD11		0–20	0	○
P12.23	Sent PZD12		0–20	0	○

Function code	Name	Description	Setting range	Default	Modify
		14: Input state 15: Output state 16: Running status word 17–20: Reserved			
P12.24	Temporary variable 1 of PZD sending	0–65535	0–65535	0	○
P12.25	DP communication timeout fault duration	0.0: Invalid 0.1–60.0s	0.0–60.0s	0.0s	○
P12.26	Reserved				●
P12.27	Reserved				●
P12.28	Reserved				●
P12.29	Reserved				●
P13 group—Ethernet communication					
P13.00	Ethernet communication speed setting	0: Self-adaptive 1: 100M full-duplex 2: 100M half-duplex 3: 10M full-duplex 4: 10M half-duplex	0–4	3	◎
P13.01	IP address 1	0–255	0–255	192	◎
P13.02	IP address 2		0–255	168	◎
P13.03	IP address 3		0–255	0	◎
P13.04	IP address 4		0–255	1	◎
P13.05	Subnet mask 1	0–255	0–255	255	◎
P13.06	Subnet mask 2		0–255	255	◎
P13.07	Subnet mask 3		0–255	255	◎
P13.08	Subnet mask 4		0–255	0	◎
P13.09	Gateway address 1	0–255	0–255	192	◎
P13.10	Gateway address 2		0–255	168	◎

Function code	Name	Description	Setting range	Default	Modify
P13.11	Gateway address 3		0–255	1	◎
P13.12	Gateway address 4		0–255	1	◎
P13.13	Reserved				●
P13.14	Reserved				●

6 Goodrive3000 inverter

Note: This chapter is for the inverter of two-quadrant and four-quadrant products.

6.1 Detailed function codes

P00 group—Basic function

Function code	Name	Description	Setting range	Default
P00.00	Speed control mode	0: Reserved 1: Sensorless vector control mode 1 (applicable to AM) 2: V/F control 3: Closed loop vector control mode (applicable to AM and SM) **Note:** AM: Asynchronous motor SM: Synchronous motor	0–3	2

1: Sensorless vector control mode 1 (applicable to AM)

No need to install encoders. It is suitable in cases with high speed control accuracy for accurate speed and torque control at all power ratings.

2: V/F control

No need to install encoders. It can improve the control accuracy with the advantages of stable operation, valid low-frequency torque boost and current vibration suppression and the functions of slip compensation and voltage adjustment. For detailed settings, refer to P04 group.

3: Closed loop vector control mode (applicable to AM and SM)

Need to install encoders. It is suitable in cases with high speed control accuracy for accurate speed and torque control at all power ratings.

Function code	Name	Description	Setting range	Default
P00.01	Run command channel	0: Keypad running command (LED off) 1: Terminal running command channel (LED flickering) 2: Communication running command channel (LED on)	0–2	0

Select the run command channel of the VFD.

The control command of the VFD includes: start-up, stop, forward, reverse, jogging and fault reset.

0: Keypad running command channel("LOCAL/REMOT" light off)

Carry out the command control by RUN, STOP/RST on the keypad.

Press RUN and STOP/RST simultaneously in running state to make the VFD coast to stop.

1: Terminal running command channel ("LOCAL/REMOT" flickering)

Carry out the running command control by the forward rotation, reverse rotation and forward jogging and reverse jogging of the multi-function terminals

2: Communication running command channel ("LOCAL/REMOT" on);

The running command is controlled by the upper computer via communication.

Function code	Name	Description	Setting range	Default
P00.02	Communication running commands	0:MODBUS communication channel 1: PROFIBUS/CANopen communication channel 2:Ethernet communication channel 3:Reserved	0–3	0

Select the controlling communication command channel of the VFD.

Note: 1 and 2 are extension functions which need corresponding extension cards.

Function code	Name	Description	Setting range	Default
P00.03	Max. output frequency	P00.04–400.00Hz	P00.04–400.00	50.00Hz

Users should pay attention that the parameter used to set the maximum output frequency is the basis of frequency setting, acceleration and deceleration.

Function code	Name	Description	Setting range	Default
P00.04	Upper limit of running frequency	P00.05– P00.03(Max. frequency)	P00.05–P00.03	50.0Hz

The upper limit of running frequency is the upper limit of output frequency of the VFD which is lower than or equal to the maximum output frequency.

If the set frequency is above the upper limit, the VFD runs at the upper limit.

Function code	Name	Description	Setting range	Default
P00.05	Lower limit of	0.00Hz–P00.04 (Upper limit of	0.00–P00.04	0.00 Hz

Function code	Name	Description	Setting range	Default
	running frequency	running frequency)		

The lower limit of running frequency is the lower limit of output frequency of the VFD.

If the set frequency is lower than the lower limit, the VFD runs at the lower limit.

Note: Max. output frequency ≥ Upper limit frequency ≥ Lower limit frequency

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Setting range</th><th>Default</th></tr>
<tr><td>P00.06</td><td>A frequency command</td><td rowspan="2">0: Keypad data setting
1: AI1 setting
2: AI2 setting
3: AI3 setting
4: HDI setting
5: Simple PLC program setting
6: Multi-step speed running setting
7: PID control setting
8: MODBUS communication setting
9: PROFIBUS/CANopen communication setting
10: Ethernet communication setting
11: Reserved</td><td>0-11</td><td>0</td></tr>
<tr><td>P00.07</td><td>B frequency command</td><td>0-11</td><td>1</td></tr>
</table>

0: Keypad data setting

Modify the value P00.10 (set frequency by keypad) to set the frequency by keypad.

1: AI1 setting

2: AI2 setting

3: AI3 setting

Set the frequency by analog input terminals. The VFD provides 2 channel analog input terminals, among which AI1/AI3 is the voltage/current option (0-10V/0-20mA) and can be shifted by jumpers while AI2 is the voltage input (-10V–+10V).

Note: When the analog AI1/AI3 selects 0-20mA input, the corresponding voltage of 20mA is 10V.

100.0% of the analog input setting corresponds to Max. output frequency (P00.03) and -100.0% corresponds to the max output frequency (P00.03).

4: HDI setting

The frequency is set by the high-speed pulse terminals. The VFD provides 1 channel high-speed pulse input in the range of 0.00-50.00kHz.

100.0% of the high-speed pulse input setting corresponds to Max. output frequency (P00.03) in forward direction and -100.0% corresponds to Max. output frequency (P00.03) in reverse direction.

Note: The pulse setting can be only input by HDI. Set P05.00 (HDI input type selection) to pulse input and P05.51 (HDI pulse input function) to frequency setting input.

5: Simple PLC program setting

When P00.06 or P00.07 is equal to 5, the VFD runs at simple PLC program mode. Set parameters of P10 group (Simple PLC and multi-step speed control group) to select corresponding running frequency, running direction, time of acceleration and deceleration, and duration. Please refer to the description of P10 group functions.

6: Multi-step speed running setting

When P00.06 or P00.07 is equal to 6, the VFD runs at multi-step speed mode. Set multi-step speed terminals by P05 to select the current running step and select the current running frequency by parameters of P10.

When P00.06 or P00.07 is not equal to 6, the multi-step speed setting has the priority, but the set step can be only 1–15. When P00.06 or P00.07 is equal to 6, the set step is 0–15.

7: PID control setting

When P00.06 or P00.07 is equal to 7, the running mode of the VFD is process PID control. It is necessary to set P09 (PID control). The running frequency of the VFD is the value after PID effect. As for PID preset source, preset value and feedback source, refer to the description of P09 PID functions.

8: MODBUS communication setting

The frequency is set by MODBUS communication. See P14 function description.

9: PROFIBUS/CANopen communication setting

The frequency is set by PROFIBUS/CANopen communication. For PROFIBUS communication, see P15 function description and PROFIBUS communication card is optional. For CANopen communication, see P15 function description and CANopen communication card is optional.

10: Ethernet communication setting

The frequency is set by Ethernet communication. See P16 function description and Ethernet communication card is optional.

11: Reserved

Note:

- A and B frequency cannot be set to the same frequency reference mode.
- 2. 3, 4, 9 and 10 are extension functions which need corresponding extension cards.

Function code	Name	Description	Setting range	Default
P00.08	B frequency command reference	0: Max. output frequency 1: A frequency command	0–1	0

Select B frequency command reference.

0: Max. output frequency: 100% of B frequency setting corresponds to Max. output frequency.

1: A frequency command: 100% of B frequency setting corresponds to Max. output frequency. If it is necessary to adjust on basis of A frequency command, select this setting.

Function code	Name	Description	Setting range	Default
P00.09	Setting source combination	0: A 1: B 2: (A+B) 3: (A-B) 4: Max(A, B) 5: Min(A, B)	0–5	0

Select setting source combination.

0: A, the current frequency is set to A frequency command.

1: B, the current frequency is set to B frequency command.

2: A+B, the current frequency is set to A+B frequency command.

3: A-B, the current frequency is set to A-B frequency command.

4: Max (A, B): Take the larger value between A and B frequency commands as the set frequency.

5: Min (A, B): Take the smaller value between A and B frequency commands as the set frequency.

Note: The combination can be shifted by terminal functions (P05).

Function code	Name	Description	Setting range	Default
P00.10	Keypad set frequency	0.00Hz–P00.03 (Max. frequency)	0.00–P00.03	50.00Hz

When A and B frequency commands are selected as "keypad setting", the function code value is the initial value of the VFD frequency.

Note: A and B frequency cannot be set to the same frequency reference mode.

Function code	Name	Description	Setting range	Default
P00.11	ACC time1	0.0–3600.0s	0.0–3600.0	Depends on model
P00.12	DEC time1	0.0–3600.0s	0.0–3600.0	Depends on model

ACC time refers to the time that the VFD needs to accelerate from 0Hz to Max. output frequency (P00.03).

DEC time refers to the time that the VFD needs to decelerate from Max. output frequency (P00.03) to 0Hz.

The VFD totally defines four groups of ACC/DEC time which can be selected via input terminals (P05). The default value of ACC/DEC time is the first group.

Function code	Name	Description	Setting range	Default
P00.13	Running direction	0: Run in default direction 1: Run in opposite direction 2: Forbid reverse running	0–2	0

0: Run in default direction: the VFD runs in forward direction. FWD/REV LED is off.

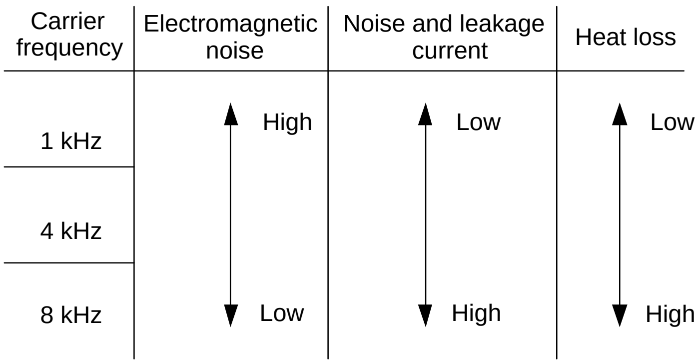
1: Run in opposite direction: the VFD runs in reverse direction. FWD/REV LED is on.

The rotation direction of the motor can be shifted by changing the function code. The effect is equivalent to the switchover of the rotation directions by adjusting arbitrary two motor lines (U, V and W). When the running channel is set under the keypad control, the rotation direction can be changed by QUICK/JOG on the keypad. Refer to P07.02 (P07.02=3) for detailed information.

Note: After the function parameter returns to the default value, the running direction of the motor will restore to the factory default state. It should be used with caution in the cases where the rotation direction of the motor cannot be changed after commissioning.

2: Forbid reverse running: forbid the VFD to run in reverse direction. It is suitable in special cases forbidding reverse running.

Function code	Name	Description	Setting range	Default
P00.14	Carrier frequency setting	1.0–2.0kHz	1.0–2.0	Depends on model



The advantages of the high carrier frequency: ideal current waveform, little current harmonic and motor noise;

The disadvantages of the high carrier frequency: The switch loss and temperature of the VFD increase, so the output ability of the VFD is affected. Under the high carrier frequency, the VFD is used by derating. Simultaneously, the leakage current increase of the VFD causes more electromagnetic interference to the environment.

Applying low carrier frequency is contrary to the above. Too low carrier frequency will cause unstable running, torque decreasing and even oscillation. The manufacturer has set proper carrier frequency in factory. Generally, there is no need for users to modify the parameters. In case of above the default carrier frequency, users should derate 10% for each additional 1k carrier frequency.

Function code	Name	Description	Setting range	Default
P00.15	Motor parameter autotuning	0: No operation 1: Rotation autotuning 2: Static autotuning 1 3: Static autotuning 2	0–3	0

Select the mode of motor parameter autotuning.

0: No operation

1: Rotation autotuning: comprehensive motor parameter autotuning, the method is recommended when high control precision is needed.

2: Static autotunnig 1: the method is suitable in the cases where the motor cannot decouple from load, autotune the motor parameters totally.

3: Static autotuning 2: the method is suitable in the cases where the motor cannot decouple from load, only autotune the previous 3 parameters.

Note:

- Recommend rotation autotuning.
- For 4-quadrant VFD, recommend not operating the rectifier during parameter autotuning, otherwise affect the accuracy.
- The power difference between the motor and the VFD should be in 2 grades during parameter autotuning, otherwise affect the accuracy.

Function code	Name	Description	Setting range	Default
P00.16	AVR function	0: Invalid 1: Valid during the whole process	0–1	1

Enable AVR function.

0: Invalid

1: Valid during the whole process

The output voltage auto-adjusting function of the VFD can eliminate the impact from the bus voltage fluctuation.

Function code	Name	Description	Setting range	Default
P00.18	Function parameter restoring	0: No operation 1: Restore the default value 2: Cancel the fault record	0–2	0

Note: The function code will automatically restore to 0 after finishing the selected function operation.

Note: Please use the function code with caution because restoring the default value will cancel the user password.

P01 group—Start-up and stop control

Function code	Name	Description	Setting range	Default
P01.00	Start-up mode	0: Start-up directly 1: Start-up after DC braking 2: Start-up after rotating speed tracking	0–2	0

0: Start-up directly: start from the starting frequency P01.01

1: Start-up after DC braking: start the motor from the starting frequency after DC braking (Set the parameters P01.03 and P01.04). It is suitable in cases where reverse rotation may occur to the small inertia load during starting.

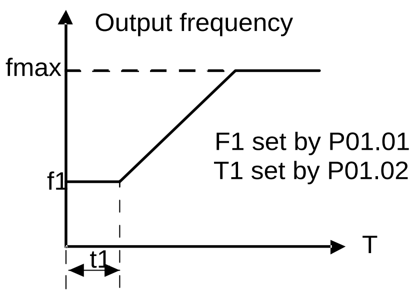
2: Start-up after rotating speed tracking: automatically track the rotating speed and direction of the motor, and start the rotating motor smoothly. It is suitable in cases where reverse rotation may occur to the large inertia load during starting.

Function code	Name	Description	Setting range	Default
P01.01	Starting frequency of direct start-up	0.00–50.00Hz	0.00–50.00	0.50Hz

The starting frequency of direct start-up refers to the original frequency during the VFD starting. See detailed information in the function code P01.02 (Retention time of starting frequency).

Function code	Name	Description	Setting range	Default
P01.02	Retention time of starting frequency	0.0–50.0s	0.0–50.0	0.0s

Set up proper starting frequency to increase the torque during the motor starting. In the retention time of starting frequency, the output frequency of the VFD is the starting frequency. Then the VFD runs from the starting frequency to the set frequency. If the set frequency is lower than the starting frequency, the VFD will stop running and keep in the stand-by state. The starting frequency is not limited in the lower limit value.



Function code	Name	Description	Setting range	Default
P01.03	Braking current before start-up	0.0–100.0% (VFD rated current)	0.0–100.0	0.0%
P01.04	Braking time before start-up	0.0–50.0s	0.0–50.0	0.0s

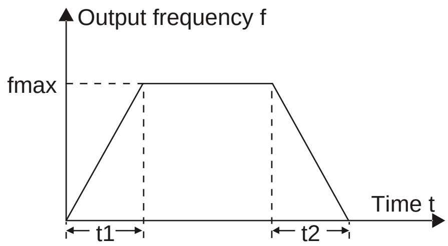
The VFD will carry out DC braking at the braking current set before start-up and it will speed up after DC braking time. If the set DC braking time is 0, the DC braking is invalid.

The higher the DC braking current, the bigger the braking power. The DC braking current before start-up refers to the rated current percentage of the VFD.

Function code	Name	Description	Setting range	Default
P01.05	ACC/DEC type	0: Linear type 1: S curve type	0–1	0

The changing mode of the frequency during start-up and running;

0: Linear type: the output frequency increases or decreases linearly.

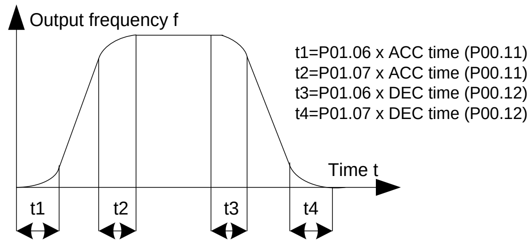


1: S curve type: the output frequency increases or decreases in S curve.

The S curve is generally used in cases requiring smooth start-up and stop such as elevators and conveyors.

Function code	Name	Description	Setting range	Default
P01.06	S curve beginning proportion	0.0–50.0% (ACC/DEC time)	0.0–50.0	30.0%
P01.07	S curve end proportion	0.0–50.0% (ACC/DEC time)	0.0–50.0	30.0%

The curvature of the S curve is determined by accelerating range, ACC/DEC time, beginning time and end time.



Function code	Name	Description	Setting range	Default
P01.08	Stop mode	0: Decelerate to stop 1: Coast to stop	0–1	0

0: Decelerate to stop: after the stop command becomes valid, the VFD decelerates to decrease output frequency during the set time. When the frequency decreases to 0Hz, the VFD will stop.

1: Coast to stop: after the stop command becomes valid, the VFD immediately ceases the output. The load coasts to stop at the mechanical inertia.

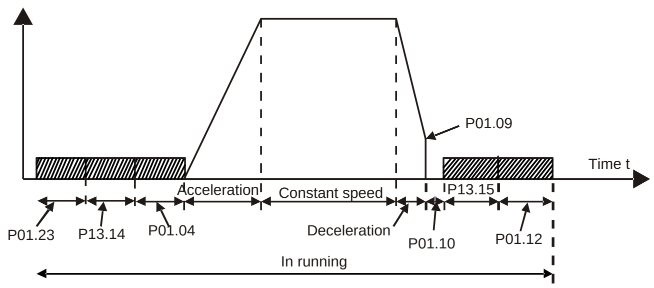
Function code	Name	Description	Setting range	Default
P01.09	Starting frequency of DC braking	0.00–P00.03 (Max. frequency)	0.00–P00.03	0.00Hz
P01.10	Waiting time before DC braking	0.0–50.0s	0.0–50.0	0.0s
P01.11	DC braking current	0.0–100.0% (Motor rated current)	0.0–100.0	0.0%
P01.12	DC braking time	0.0–50.0s	0.0–50.0	0.0s

Starting frequency of DC braking: start the DC braking when running frequency reaches the starting frequency during stop.

Waiting time before DC braking: the VFD blocks the output before starting DC braking. Start the DC braking after the waiting time to prevent overcurrent fault caused by DC braking at high speed.

DC braking current refers to the added DC braking. The higher the current, the greater the braking effect.

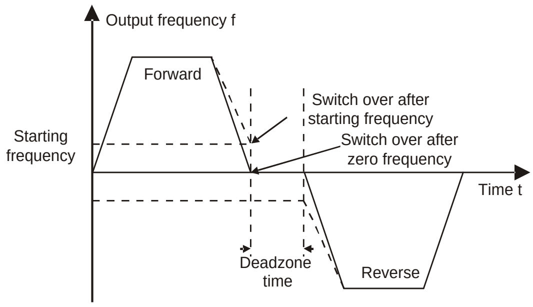
DC braking time refers to the retention time of DC braking. If the time is 0, DC braking is invalid and the VFD will stop at the set deceleration time.



Function code	Name	Description	Setting range	Default
P01.13	Dead time of FWD/REV rotation	0.0–3600.0s	0.0–3600.0	0.0s
P01.14	Shifting between FWD/REV rotation	0: Switch after 0 frequency 1: Switch after starting frequency 2: Switch after delay at stop speed (Reserved)	0–2	0

Set the shifting between FWD/REV rotation of the VFD.

Set the transient time by P01.13 during the process of switching FWD/REV rotation, which is shown in following figure:



Function code	Name	Description	Setting range	Default
P01.15	Stop speed	0.00–100.00Hz	0.00–100.00	0.50 Hz
P01.16	Detection of stop speed	0: Speed set value (delay without stopping) 1: Speed detecting value (only valid under vector control)	0–1	1
P01.17	Detection time of feedback speed	0.0–100.0s (only valid for P01.16=1)	0.0–100.0	0.5s

Set the detection of stopping speed of the VFD.

0: Speed set value (delay without stopping) (the only detection method in V/F control)

1: Speed detecting value (only valid under vector control)

In vector control or P01.16=0, when the ramp reference frequency is less than or equal to the set value of P01.15 and passes delay time of stop speed P01.24, the VFD will coast to stop immediately.

In vector control or P01.16=1, when the actual frequency is less than or equal to the set value of P01.15, the VFD will coast to stop immediately; when the frequency is larger than the set value, the VFD will stop after the delay time of P01.17.

Function code	Name	Description	Setting range	Default
P01.18	Terminal running protection when power on	0: Terminal running command is invalid when power on 1: Terminal running command is valid when power on	0–1	0

When the running command channel is the terminal control, the system will detect the state of the running terminal during power on.

0: Terminal running command is invalid when power on. Even the running command is detected to be valid during power on, the VFD will not run and the system keeps in running protection state until the running command is canceled and enabled again.

1: Terminal running command is valid when power on. If the running command is detected to be valid during power on, the system will automatically start the VFD after finishing the initialization.

Note: The function should be used with caution, or serious result may follow.

Function code	Name	Description	Setting range	Default
P01.19	The running frequency is lower than the lower limit one (valid if the lower limit frequency is above 0)	0: Run at the lower-limit frequency 1: Stop 2: Hibernation	0–2	0

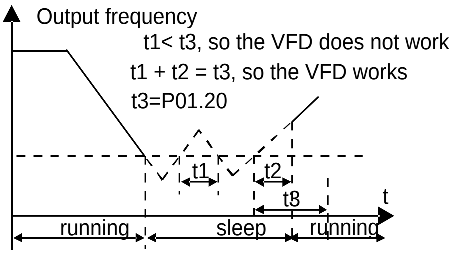
This function code determines the running state of the VFD when the set frequency is lower than the lower-limit one.

When the set frequency is lower than the lower-limit one, the VFD will coast to stop; when the set frequency is higher than the lower limit one again and it lasts over the time set by P01.20, the VFD will come back to the running state automatically.

Function code	Name	Description	Setting range	Default
P01.20	Hibernation restore delay time	0.0–3600.0s (valid when P01.19=2)	0.0–3600.0	0.0s

The function code determines the hibernation stand-by delay time. When the running frequency of the VFD is lower than the lower-limit one, the VFD will pause to stand by.

When the set frequency of the VFD is above the lower-limit one again and it lasts for the time set by P01.20, the VFD will run automatically.



Function code	Name	Description	Setting range	Default
P01.21	Restart after power off	0: Disabled 1: Enabled	0–1	0

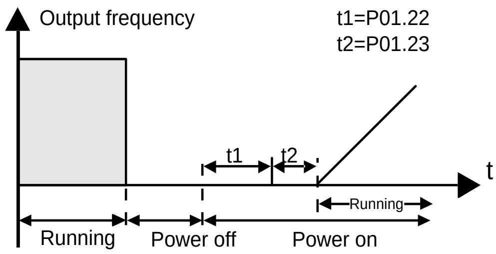
The function determines the VFD to start or not after power off and then power on.

0: Disabled

1: Enabled: during power off and then power on, if meeting the starting conditions, the VFD will automatically run after waiting for the time defined by P01.22.

Function code	Name	Description	Setting range	Default
P01.22	Waiting time of restart after power off	0.0–3600.0s	0.0–3600.0	1.0s

The function determines the waiting time before the VFD runs automatically when power off and then power on.

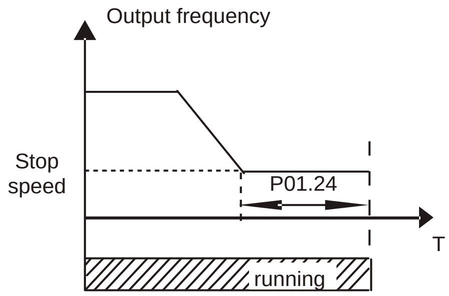


Function code	Name	Description	Setting range	Default
P01.23	Start delay time	0.0–60.0s	0.0–60.0	0.0s

The function determines the VFD is in stand-by state after the running command is given and then restart after the delay time set by P01.23 so as to release the brake.

Function code	Name	Description	Setting range	Default
P01.24	Delay time of stop speed	0.0–100.0s	0.0–100.0	0.0s

Set the delay time of stop speed of the VFD. When the actual output frequency of the VFD is equal to P01.15 and it lasts over the time set by P01.24, the VFD will stop.



Function code	Name	Description	Setting range	Default
P01.25	0Hz output selection	0: Output without voltage 1: Output with voltage 2: Output according to DC braking current at stopping	0–2	0

Select the output type of the VFD at 0Hz.

P02 group—Motor 1 parameters

Function code	Name	Description	Setting range	Default
P02.00	Motor 1 type	0: Asynchronous motor 1: Reserved	0–1	0

Select the type of motor 1.

Function code	Name	Description	Setting range	Default
P02.01	Asynchronous motor 1 rated power	0.1–3000.0kW	0.1–3000.0	Depends on model
P02.02	Asynchronous motor 1 rated frequency	0.01Hz – P00.03 (Max. frequency)	0.01–P00.03	50.00Hz
P02.03	Asynchronous motor 1 rated speed	1 – 36000rpm	1–36000	Depends on model
P02.04	Asynchronous motor 1 rated voltage	0 – 4000V	0–4000	Depends on model
P02.05	Asynchronous motor 1 rated current	0.8 – 6000.0A	0.8–6000.0	Depends on model

Set the parameters of the asynchronous motor under control.

To ensure control performance, please set values of P02.01 – P02.05 correctly in accordance with the parameters on the nameplate of the asynchronous motor.

Goodrive3000 VFDs provide parameter autotuning function from proper parameter setting of the nameplate.

To ensure control performance, please configure the motor according to the standard motor of the VFD. If the power is quite different from the standard motor, VFD control performance will decrease obviously.

Note: Reset the rated power of the motor (P02.01) to initialize the parameters of P02.02–P02.10.

Function code	Name	Description	Setting range	Default
P02.06	Asynchronous motor 1 stator resistor	0.001–65.535Ω	0.001–65.535	Depends on model
P02.07	Asynchronous motor 1 rotor resistor	0.001–65.535Ω	0.001–65.535	Depends on model

Function code	Name	Description	Setting range	Default
P02.08	Asynchronous motor 1 leakage inductance	0.1–6553.5mH	0.1–6553.5	Depends on model
P02.09	Asynchronous motor 1 mutual inductance	0.1–6553.5mH	0.1–6553.5	Depends on model
P02.10	Asynchronous motor 1 non-load current	0.1–6553.5A	0.1–6553.5	Depends on model

Note: Arbitrary modification on the parameters is not allowed.

After the motor finishes the parameter autotuning normally, the set values of P02.06–P02.10 will automatically update. These parameters are the fundamental parameters of high performance vector control and directly influence control performance.

Function code	Name	Description	Setting range	Default
P02.11	Magnetic saturation coefficient 1 for the iron core of AM 1	0.0–100.0%	0.0–100.0	88.0%
P02.12	Magnetic saturation coefficient 2 for the iron core of AM 1	0.0–100.0%	0.0–100.0	68.0%
P02.13	Magnetic saturation coefficient 3 for the iron core of AM 1	0.0–100.0%	0.0–100.0	57.0%
P02.14	Magnetic saturation coefficient 4 for the iron core of AM 1	0.0–100.0%	0.0–100.0	40.0%

Function code	Name	Description	Setting range	Default
P02.26	Motor 1 overload protection	0: No protection 1: Common motor (with low speed compensation) 2: Frequency conversion motor (without low speed compensation)	0–2	2

0: No protection

1: Common motor (with low speed compensation): because the heat dissipation effect of the common motor at low speed will be weakened, the corresponding electric heat protection will be adjusted properly. The low speed compensation characteristic mentioned here means reducing the threshold of the overload protection of the motor whose running frequency is below 30Hz.

2: Frequency conversion motor (without low speed compensation): because the heat dissipation effect of the special motor for the VFD is not affected by the speed, there is no need to adjust the protection value during low speed running.

Function code	Name	Description	Setting range	Default
P02.27	Motor 1 overload protection coefficient	20.0%–120.0%	20.0–120.0	100.0%

Motor overload multiple M=Iout/(In*K)

In: motor rated current, Iout: VFD output current, K: motor overload protection coefficient

The relation between motor overload time and protection coefficient is:

Protection coefficient	110%	120%	130%	140%	150%	160%	180%	190%	200%
Overload time	60min	30min	10min	5min	1min	45s	10s	3s	1s

Function code	Name	Description	Setting range	Default
P02.28	Motor 1 power correction coefficient	0.00–3.00	0.00–3.00	1.00

Function code	Name	Description	Setting range	Default
P02.29	Motor 1 parameter display	0: Display according to motor type 1: Display all parameters	0–1	0

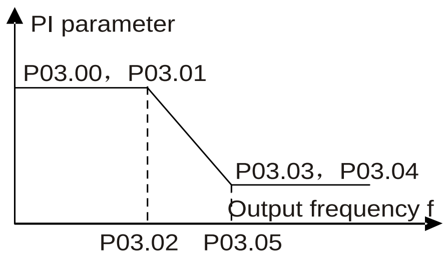
0: Display according to motor type: only display related parameters of motor types for easy operation.

1: Display all parameters: display the parameters of all motors.

P03 group—Vector control

Function code	Name	Description	Setting range	Default
P03.00	Speed loop proportional gain 1	0–200.0	0–200.0	20.0
P03.01	Speed loop integral time 1	0.000–10.000s	0.000–10.000	1.000s
P03.02	Switching low frequency	0.00Hz–P03.05	0.00–P03.05	5.00Hz
P03.03	Speed loop proportional gain 2	0–200.0	0–200.0	10.0
P03.04	Speed loop integral time 2	0.001–10.000s	0.001–10.000	0.500s
P03.05	Switching high frequency	P03.02–P00.03(Max. frequency)	P03.02–P00.03	10.00Hz

Parameters of P03.00–P03.05 are only applicable to vector control mode. Below the switching frequency 1 (P03.02), the speed loop PI parameters are P03.00 and P03.01. Above the switching frequency 2 (P03.05), the speed loop PI parameters are P03.03 and P03.04. Between the switching frequency 1 and 2, the PI parameters are achieved by the linear variation of two group parameters, as shown below:



The speed loop dynamic response characteristic of vector control can be adjusted by setting the proportional coefficient and integral time of the speed regulator. Either increasing proportional gain or decreasing integral time will speed up the dynamic response while too high proportional gain or too low integral time will easily cause system oscillation and overshoot. Too low proportional gain will also easily cause system oscillation and speed static deviation.

Parameters of the speed loop PI relate to the system inertia closely. Adjust the parameters on basis of default PI parameters for different load characteristics to meet requirements in various cases.

Function code	Name	Description	Setting range	Default
P03.06	Speed loop output filter	0–8 (corresponding to 0–2^8/10ms)	0–8	0

Set the filter time of the speed loop.

Function code	Name	Description	Setting range	Default
P03.07	Vector control slip compensation coefficient (Electromotion)	50–200%	50–200	100%
P03.08	Vector control slip compensation coefficient (Power generation)	50–200%	50–200	100%

Slip compensation coefficient is used to adjust the slip frequency of vector control and improve the speed control precision. Adjusting the parameters properly can prevent speed static deviation.

Function code	Name	Description	Setting range	Default
P03.09	Current loop proportional coefficient P	0–65535	0–65535	1000
P03.10	Current loop integral coefficient I	0–65535	0–65535	1000

Note:

1. Adjusting the two parameters is to adjust PI parameters of the current loop, which directly influences system dynamic response and control precision. Generally, there is no need to change the default value.

2. Only applicable to sensorless vector control mode 1 (P00.00=1).

Function code	Name	Description	Setting range	Default
P03.11	Torque setting method	0: Invalid torque control 1: Keypad setting (P03.12) 2: AI1 setting 3: AI2 setting 4: AI3 setting 5: HDI pulse frequency setting 6: Multi-step setting 7: MODBUS communication setting 8: PROFIBUS/CANopen communication setting 9: Ethernet communication setting	0–10	0

Function code	Name	Description	Setting range	Default
		10: Reserved		

Enable the torque control mode and set the torque setting method.

Note: 100% of the setting methods 2–10 corresponds to 3 times of motor rated current.

Note: 4, 5, 8 and 9 need to use extension cards.

Function code	Name	Description	Setting range	Default
P03.12	Keypad setting torque	-300.0%–300.0% (Motor rated current)	-300.0–300.0	50.0%

When P03.11=1, the keypad sets the torque.

Function code	Name	Description	Setting range	Default
P03.13	Torque given filter time	0.000–10.000s	0.000–10.000	0.100s

Set the torque given filter time.

Function code	Name	Description	Setting range	Default
P03.14	Torque control forward rotation upper-limit frequency setting source selection	0: Keypad setting (P03.16 sets P03.14 and P03.17 sets P03.15) 1: AI1 setting 2: AI2 setting 3: AI3 setting 4: HDI pulse frequency setting 5: Multi-step setting 6: MODBUS communication setting	0–9	0
P03.15	Torque control reverse rotation upper-limit frequency setting		0–9	0

Function code	Name	Description	Setting range	Default
	source selection	7: PROFIBUS/CANopen communication setting 8: Ethernet communication setting 9: Reserved		

Note: 100% of the setting methods 1–9 corresponds to the maximum frequency.

Note: 3, 4, 7 and 8 need to use extension cards.

Function code	Name	Description	Setting range	Default
P03.16	Keypad defined value of torque control forward rotation upper-limit frequency	0.00Hz–P00.03	0.00–P00.03	50.00Hz
P03.17	Keypad defined value of torque control reverse rotation upper-limit frequency	0.00Hz–P00.03	0.00–P00.03	50.00Hz

The function code is used to set upper limit of the frequency, 100% corresponding to the maximum frequency. P03.16 sets P03.14 and P03.17 sets P03.15.

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Setting range</th><th>Default</th></tr>
<tr><td>P03.18</td><td>Electromotion torque upper-limit setting source</td><td rowspan="2">0: Keypad setting (P03.20 sets P03.18 and P03.21 sets P03.19)
1: AI1 setting
2: AI2 setting
3: AI3 setting
4: HDI pulse frequency setting
5: MODBUS communication setting
6: PROFIBUS/CANopen communication setting
7: Ethernet communication setting
8: Reserved</td><td>0–8</td><td>0</td></tr>
<tr><td>P03.19</td><td>Braking torque upper-limit setting source</td><td>0–8</td><td>0</td></tr>
</table>

The function code is used to select electromotion and braking torque upper-limit setting source.

Note: 100% of the setting methods 1–8 corresponds to 3 times of motor rated current.

Note: 3, 4, 6 and 7 need to use extension cards.

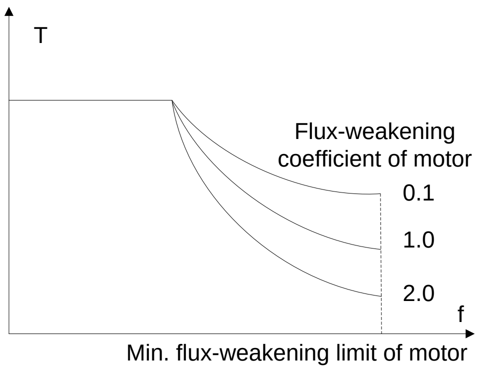
Function code	Name	Description	Setting range	Default
P03.20	Electromotion torque upper-limit keypad setting	0.0–300.0% (Motor rated current)	0.0–300.0	180.0%
P03.21	Braking torque upper-limit keypad setting	0.0–300.0% (Motor rated current)	0.0–300.0	180.0%

The function code is used to set upper limit of the torque via keypad.

Function code	Name	Description	Setting range	Default
P03.22	Weakening coefficient in constant power field	0.1–2.0	0.1–2.0	0.3
P03.23	Lowest weakening point in constant power field	10%–100%	10–100	20%

P03.22 is only valid to the vector mode 1 and closed loop vector.

The motor is used in weakening control.



P03.22 and P03.23 are valid at constant power. When the motor runs above the rated rotating speed, it comes into weakening state. The curvature of weakening curve can be changed by modifying the control coefficient. The larger the coefficient is, the steeper the curve is.

Function code	Name	Description	Setting range	Default
P03.24	Max. voltage limit	0.0–120.0% (Motor rated voltage)	0.0–120.0	100.0%

Function code	Name	Description	Setting range	Default
P03.25	Pre-exciting time	0.000–10.000s	0.000–10.000	0.300s
P03.26	Weak magnetic proportional gain	0–4000	0–4000	1200

P03.24 sets the maximum voltage the VFD can output, which is decided by practical situations.

P03.25: the VFD carries out motor pre-exciting at starting and sets up magnetic field inside the motor to improve the torque performance during starting.

P03.26: The parameters are valid in weak magnetic control. The running performance of the motor can be improved by adjusting the parameters properly.

P03.24–P03.26 are invalid to vector control mode 1 and V/F control.

Function code	Name	Description	Setting range	Default
P03.27	Vector control speed display	0: Display the actual value 1: Display the set value	0–1	0

Set the vector control speed display of the VFD.

P04 group—V/F control

Function code	Name	Description	Setting range	Default
P04.00	Motor 1 V/F curve setting	0: Straight line V/F curve 1: Multi-dot V/F curve 2: Torque step-down V/F curve (power of 1.3) 3: Torque step-down V/F curve (power of 1.7) 4: Torque step-down V/F curve (power of 2.0) 5: Customized V/F curve (V/F separation)	0–5	0

These function codes define the V/F curves of Goodrive3000 series motor 1 to meet different requirements of load features.

0: Straight line V/F curve: suitable for constant torque load

1: Multi-dot V/F curve

2: Torque step-down V/F curve (power of 1.3)

3: Torque step-down V/F curve (power of 1.7)

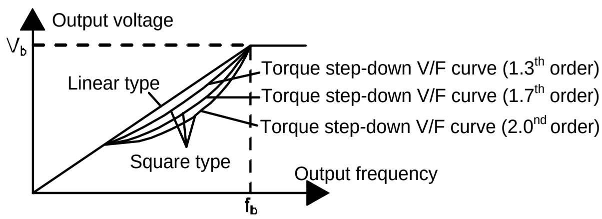
4: Torque step-down V/F curve (power of 2.0)

Curves 2–4 are suitable for variable torque load such as fans and water pumps. Users can adjust according to load features to achieve the most effective energy saving.

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

V and F separate in the mode. The feature of the curve changes either by the frequency channel of P00.06 adjusting F or by the voltage channel of P04.27 adjusting V.

Note: In the following figure, V_b is motor rated voltage and f_b is motor rated frequency.



Function code	Name	Description	Setting range	Default
P04.01	Motor 1 torque boost	0.0%: (Automatic) 0.1%–10.0%	0.0–10.0	0.0%
P04.02	Motor 1 torque boost close	0.0%–50.0% (Relative to motor 1 rated frequency)	0.0–50.0	20.0%

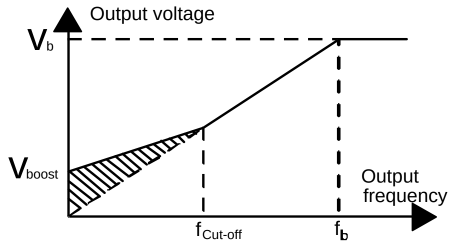
Boost and compensate the output voltage for the features of low frequency torque. P04.01 is on the basis of the maximum output voltage V_b.

P04.02 defines the percentage of closing frequency of manual torque to f_b. The torque boost can improve the low frequency torque feature of V/F.

Torque boost should be selected according to the load. When the load is big, boost the torque. But too big torque boost is inappropriate because the motor will run with overexcitation, the output current of the VFD will increase, the heat of the motor will be high and the efficiency will decrease.

When the torque boost is set to 0.0%, the VFD is in automatic torque boost.

Torque boost threshold: below the frequency point, the torque boost is effective, but over the set frequency, the torque boost is ineffective.

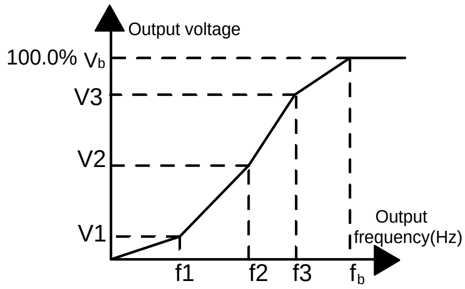


Function code	Name	Description	Setting range	Default
P04.03	Motor 1 V/F frequency point 1	0.00Hz–P04.05	0.00–P04.05	0.00Hz
P04.04	Motor 1 V/F voltage point 1	0.0%–110.0% (Rated voltage of motor 1)	0.0–110.0	00.0%
P04.05	Motor 1 V/F frequency point 2	P04.03– P04.07	P04.03–P04.07	00.00Hz
P04.06	Motor 1 V/F voltage point 2	0.0%–110.0% (Rated voltage of motor 1)	0.0–110.0	00.0%
P04.07	Motor 1 V/F frequency point 3	P04.05–P02.02 (Rated frequency of motor 1)/ P04.05–P02.16 (Rated frequency of motor 1)	P04.05–P02.02	00.00Hz
P04.08	Motor 1 V/F voltage point 3	0.0%–110.0% (Rated voltage of motor 1)	0.0–110.0	00.0%

When P04.00=1 (multi-dot V/F curve), set the V/F curve by P04.03–P04.08.

The V/F curve is usually set according to the load feature of the motor.

Note: V1<V2<V3, f1< f2< f3. Too high low frequency voltage may cause motor overheat or burnout, VFD overcurrent speed loss or overcurrrent protection.



Function code	Name	Description	Setting range	Default
P04.09	Motor 1 V/F slip compensation gain	0.0–200.0%	0.0–200.0	100.0%

This function code is used to compensate the change of the rotating speed caused by the change of load at V/F control to improve mechanical rigidity of the motor. The rated slip frequency of the motor should be calculated as follows:

$\triangle f = f_b - n*p/60$

Of which, f_b is motor rated frequency, corresponding to the function code P02.02; n is motor rated speed, corresponding to the function code P02.03; p is motor pole pair, 100.0% corresponding to the rated slip frequency $\triangle f$.

Function code	Name	Description	Setting range	Default
P04.10	Motor 1 low frequency oscillation control factor	0–100	0–100	10
P04.11	Motor 1 high frequency oscillation control factor	0–100	0–100	10
P04.12	Motor 1 oscillation control threshold	0.00Hz–P00.03 (Max. frequency)	0.00–P00.03	30.00Hz

Under V/F control mode, especially the motor with big power, current oscillation may occur to some frequency, causing unstable running of the motor or even VFD overcurrent. Eliminate the results by adjusting the parameters properly.

Function code	Name	Description	Setting range	Default
P04.13	Motor 2 V/F curve setting	0: Straight line V/F curve 1: Multi-dot V/F curve 2: Torque step-down V/F curve (power of 1.3) 3: Torque step-down V/F curve (power of 1.7) 4: Torque step-down V/F curve (power of 2.0) 5: Customized V/F curve (V/F separation)	0–5	0
P04.14	Motor 2 V/F torque boost	0.0%: (Automatic) 0.1%–10.0%	0.0–10.0	0.0%
P04.15	Motor 2 V/F torque boost close	0.0%–50.0% (Relative to rated frequency of motor 2)	0.0–50.0	20.0%
P04.16	Motor 2 V/F frequency point 1	0.00Hz– P04.18	0.00–P04.18	0.00Hz
P04.17	Motor 2 V/F voltage point 1	0.0%–110.0% (Rated voltage of motor 2)	0.0–110.0	00.0%
P04.18	Motor 2 V/F frequency point 2	P04.16– P04.20	P04.16–P04.20	00.00Hz
P04.19	Motor 2 V/F voltage point 2	0.0%–110.0% (Rated voltage of motor 2)	0.0–110.0	00.0%
P04.20	Motor 2 V/F frequency point 3	P04.18–P12.02 (Rated frequency of motor 2)/P04.18–P12.16 (Rated frequency of motor 2)	P04.18–P12.02/ P04.18–P12.16	00.00Hz
P04.21	Motor 2 V/F voltage point 3	0.0%–110.0%(Rated voltage of the motor 2)	0.0–110.0	00.0%
P04.22	Motor 2 V/F slip compensation gain	0.0–200.0%	0.0–200.0	100.0%
P04.23	Motor 2 low frequency oscillation control factor	0–100	0–100	10
P04.24	Motor 2 high frequency oscillation control factor	0–100	0–100	10

Function code	Name	Description	Setting range	Default
P04.25	Motor 2 oscillation control threshold	0.00Hz–P00.03(Max. frequency)	0.00–P00.03	30.00Hz

The function codes define the setting way of Goodrive3000 series motor 2 to meet different requirements of load features. See specific information in P04.13–P04.25.

Note: P04 group includes V/F parameters of four motors which can be displayed simultaneously and will be valid to the selected motor. The motor can be selected by the channels defined in the function code P08.31.

Function code	Name	Description	Setting range	Default
P04.26	Energy-saving operation	0: No action 1: Automatic energy-saving operation	0–1	0

The motor will automatically adjust the output voltage under light load to save energy.

Function code	Name	Description	Setting range	Default
P04.27	Voltage setting channel	0: Keypad setting (Determined by P04.28) 1: AI1 setting 2: AI2 setting 3: AI3 setting 4: HDI pulse setting 5: Multi-step setting (Determined by the multi-step speed parameter of P10) 6: PID setting 7: MODBUS communication setting 8: PROFIBUS/CANopen communication setting 9: Ethernet communication setting 10: Reserved	0–10	0

Select the output voltage setting channel at V/F curve separation.

Note: 100% corresponds to motor rated voltage.

Note: 3, 4, 8 and 9 need to use extension cards.

Function code	Name	Description	Setting range	Default
P04.28	Keypad setting voltage	0.0%–100.0% (Motor rated voltage)	0.0–100.0	100.0%

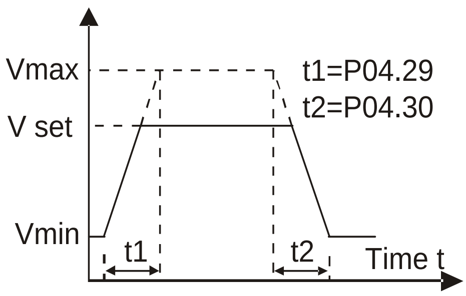
The function code is the voltage digital set value when the voltage setting channel is selected as "keypad setting" (P04.27=0).

Function code	Name	Description	Setting range	Default
P04.29	Voltage increasing time	0.0–3600.0s	0.0–3600.0	5.0s
P04.30	Voltage decreasing time	0.0–3600.0s	0.0–3600.0	5.0s

Voltage increasing time is the time required by the VFD which accelerates from 0V to the rated voltage. Voltage decreasing time is the time required by the VFD which decelerates from the rated voltage to 0V.

Function code	Name	Description	Setting range	Default
P04.31	Max. output voltage	P04.32–100.0% (Motor rated voltage)	P04.32–100.0	100.0%
P04.32	Min output voltage	0.0%–P04.31 (Motor rated voltage)	0.0–P04.31	0.0%

Set the upper and lower limit of the output voltage.



P05 group—Input terminals

Function code	Name	Description	Setting range	Default
P05.00	HDI input type	0: HDI is pulse input. 1: HDI is switch input.	0–1	0

Set the HDI input type.

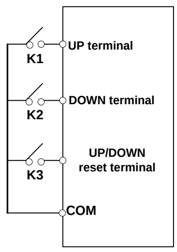
<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Setting range</th><th>Default</th></tr>
<tr><td>P05.01</td><td>S1 terminal function</td><td rowspan="8">0: No function
1: Forward rotation operation
2: Reverse rotation operation
3: 3-wire control operation
4: Forward rotation jogging
5: Reverse rotation jogging
6: Coast to stop
7: Fault reset
8: Operation pause
9: External fault input
10: Increasing frequency setting (UP)
11: Decreasing frequency setting (DOWN)
12: Cancel the frequency change setting
13: Shift between A setting and B setting
14: Shift between combination setting and A setting
15: Shift between combination setting and B setting
16: Multi-step speed terminal 1
17: Multi-step speed terminal 2
18: Multi-step speed terminal 3
19: Multi-step speed terminal 4
20: Multi- step speed pause
21: ACC/DEC time option 1
22: ACC/DEC time option 2</td><td>0–63</td><td>0</td></tr>
<tr><td>P05.02</td><td>S2 terminal function</td><td>0–63</td><td>0</td></tr>
<tr><td>P05.03</td><td>S3 terminal function</td><td>0–63</td><td>0</td></tr>
<tr><td>P05.04</td><td>S4 terminal function</td><td>0–63</td><td>0</td></tr>
<tr><td>P05.05</td><td>S5 terminal function</td><td>0–63</td><td>0</td></tr>
<tr><td>P05.06</td><td>S6 terminal function</td><td>0–63</td><td>0</td></tr>
<tr><td>P05.07</td><td>S7 terminal function</td><td>0–63</td><td>0</td></tr>
<tr><td>P05.08</td><td>S8 terminal function</td><td>0–63</td><td>0</td></tr>
</table>

Function code	Name	Description	Setting range	Default
		23: Simple PLC stop reset 24: Simple PLC pause 25: PID control pause 26: Reserved 27: Reserved 28: Reserved 29: Torque control prohibition 30: ACC/DEC prohibition 31: Reserved 32: Reserved 33: Cancel the frequency change setting temporarily 34: DC brake 35: Shift motor 1 to motor 2 36: Shift the command to the keypad 37: Shift the command to the terminals 38: Shift the command to the communication 39: Pre-exciting command 40: Consumption power clear 41: Consumption power holding 42: External fault input 2 43–63: Reserved		

The parameters are used to set the corresponding functions of digital multi-functional input terminals.

Note: Two different multi-functional input terminals cannot be set to the same function.

Set value	Function	Instruction
0	No function	The VFD will not work even when there are signals to input. The terminals out of use may be set with no function in case of malfunction.
1	Forward rotation operation (FWD)	Both the forward rotation and reverse rotation of the VFD are controlled by external terminals.
2	Reverse rotation operation (REV)	
3	3-wire control	The terminal is used to ensure the running mode of the VFD is

<table>
<tr><th>Set value</th><th>Function</th><th>Instruction</th></tr>
<tr><td></td><td>operation (Sln)</td><td>3-wire control. See specific information in the description of 3-wire control mode in P05.12.</td></tr>
<tr><td>4</td><td>Forward rotation jogging</td><td rowspan="2">As for the frequency and ACC/DEC time at jogging, refer to the detailed descriptions in P08.06, P08.07 and P08.08.</td></tr>
<tr><td>5</td><td>Reverse rotation jogging</td></tr>
<tr><td>6</td><td>Coast to stop</td><td>The VFD blocks the output, so the motor is out of control of the VFD during stopping. The way is usually applied to large load and no stop time limit. The definition is the same with that in P01.08 and the function is applicable to remote control.</td></tr>
<tr><td>7</td><td>Fault reset</td><td>External fault reset function is the same with the function of STOP/RST on the keypad and it can realize remote fault reset.</td></tr>
<tr><td>8</td><td>Operation pause</td><td>The VFD slows down to stop but all running parameters are in memory state, such as PLC parameters, traverse parameters and PID parameters. When the signals disappear, the VFD will restore to the state before stopping.</td></tr>
<tr><td>9</td><td>External fault input</td><td>After the external fault signal is sent to the VFD, the VFD will alarm the fault and stop.</td></tr>
<tr><td>10</td><td>Increasing frequency setting (UP)</td><td rowspan="3">The external terminals modify increasing and decreasing commands of the VFD when the terminals set the frequency.

The reset terminals of increasing and decreasing frequency setting can clear the auxiliary channel frequency set by the internal UP/DOWN of the VFD so that the frequency reference restores to the value from the main frequency setting channel.</td></tr>
<tr><td>11</td><td>Decreasing frequency setting (DOWN)</td></tr>
<tr><td>12</td><td>Cancel the frequency change setting</td></tr>
<tr><td>13</td><td>Shift between A setting and B setting</td><td rowspan="3">The function mainly realizes the shift between frequency setting channels.
The shift between A and B setting channels can be realized by 13. The shift between combination setting and A setting channels set by P00.09 can be realized by 14. The shift between combination setting and B setting channels set by P00.09 can be realized by 15.</td></tr>
<tr><td>14</td><td>Shift between combination setting and A setting</td></tr>
<tr><td>15</td><td>Shift between combination setting and B setting</td></tr>
</table>

<table>
<tr><th>Set value</th><th>Function</th><th>Instruction</th></tr>
<tr><td>16</td><td>Multi-step speed terminal 1</td><td rowspan="4">16-step speed setting can be realized by the digital combination of four terminals.
Note: Multi-step speed 1 is low bit while multi-step speed 4 is high bit.
<table><tr><th>Multi-step speed 4</th><th>Multi-step speed 3</th><th>Multi-step speed 2</th><th>Multi-step speed 1</th></tr><tr><td>BIT3</td><td>BIT2</td><td>BIT1</td><td>BIT0</td></tr></table></td></tr>
<tr><td>17</td><td>Multi-step speed terminal 2</td></tr>
<tr><td>18</td><td>Multi-step speed terminal 3</td></tr>
<tr><td>19</td><td>Multi-step speed terminal 4</td></tr>
<tr><td>20</td><td>Multi-step speed pause</td><td>Shield the functions of multi-step speed terminals to keep the set value at current state.</td></tr>
<tr><td>21</td><td>ACC/DEC time option 1</td><td rowspan="2">Select 4 groups of ACC/DEC time by the combination of two terminals.
<table><tr><th>Terminal1</th><th>Terminal 2</th><th>ACC/DEC time</th><th>Corresponding parameter</th></tr><tr><td>OFF</td><td>OFF</td><td>ACC/DEC time 1</td><td>P00.11/P00.12</td></tr><tr><td>ON</td><td>OFF</td><td>ACC/DEC time 2</td><td>P08.00/P08.01</td></tr><tr><td>OFF</td><td>ON</td><td>ACC/DEC time 3</td><td>P08.02/P08.03</td></tr><tr><td>ON</td><td>ON</td><td>ACC/DEC time 4</td><td>P08.04/P08.05</td></tr></table></td></tr>
<tr><td>22</td><td>ACC/DEC time option 2</td></tr>
<tr><td>23</td><td>Simple PLC stop reset</td><td>Reset the simple PLC process to clear previous memory information of PLC.</td></tr>
<tr><td>24</td><td>Simple PLC pause</td><td>PLC pauses in the process of operation and runs at current speed. After canceling the function, simple PLC continues to run.</td></tr>
<tr><td>25</td><td>PID control pause</td><td>PID becomes invalid temporarily and the VFD keeps current frequency output.</td></tr>
<tr><td>29</td><td>Torque control prohibition</td><td>The VFD shifts from torque control mode into speed control mode.</td></tr>
<tr><td>30</td><td>ACC/DEC prohibition</td><td>Ensure there is no external signal impact on the VFD (Except stop command) to keep current frequency output.</td></tr>
<tr><td>33</td><td>Cancel the frequency change setting temporarily</td><td>When the terminal switches on, the frequency set by UP/DOWN can be cleared and all frequency references restore to the values set by the channels. When the terminal switches off, the frequency comes back the values after increasing or decreasing setting.</td></tr>
<tr><td>34</td><td>DC brake</td><td>In the process of slowing down to stop, after the command becomes valid, the VFD will decrease to P01.15 (stop speed) and then begin DC braking immediately. The braking time is not limited</td></tr>
</table>

Set value	Function	Instruction
		by P01.12 (DC braking time at stopping).
35	Shift motor 1 to motor 2	When the terminal is valid, motor 1 will shift into motor 2. When the terminal is invalid, the running command returns to the original state.
36	Shift the command to the keypad	When the terminal is valid, the running command will compel to shift to keypad running command. When the terminal is invalid, the running command returns to the original state.
37	Shift the command to the terminals	When the terminal is valid, the running command will compel to shift to terminal running command. When the terminal is invalid, the running command returns to the original state.
38	Shift the command to the communication	When the terminal is valid, the running command will compel to shift to communication running command. When the terminal is invalid, the running command returns to the original state.
39	Pre-exciting command	Start pre-exciting command of the motor until the terminal becomes invalid.
40	Consumption power clear	When the command is valid, the power of the VFD will be cleared.
41	Consumption power holding	When the command is valid, the current running of the VFD will not influence the power.
42	External fault input 2	The VFD will alarm and stop after receiving the external fault signal.
43–63	Reserved	

Function code	Name	Description	Setting range	Default
P05.10	Polarity of input terminals	0x000–0x1FF	0x000–0x1FF	0x000

The function code is used to set the polarity of the input terminals.

Set the bit to 0, the input terminal is anode.

Set the bit to 1, the input terminal is cathode.

BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
S8	S7	S6	S5	S4	S3	S2	S1

Function code	Name	Description	Setting range	Default
P05.11	ON-OFF filter time	0.000–1.000s	0.000–1.000	0.010s

Set the sample filter time of S1–S8 terminals. If the interference is strong, increase the parameter to avoid the incorrect operation.

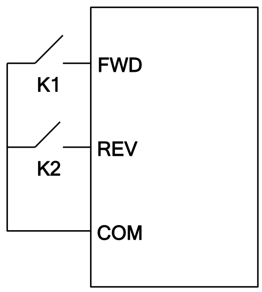
Function code	Name	Description	Setting range	Default
P05.12	Virtual terminal setting	0: Virtual terminals are invalid. 1: MODBUS communication virtual terminals are valid. 2: PROFIBUS/CANopen communication virtual terminals are valid. 3: Ethernet communication virtual terminals are valid. 4: Reserved	0–4	0

Enable the input function of virtual terminals at communication modes.

Function code	Name	Description	Setting range	Default
P05.13	Terminal control running mode	0: 2-wire control 1 1: 2-wire control 2 2: 3-wire control 1 3: 3-wire control 2	0–3	0

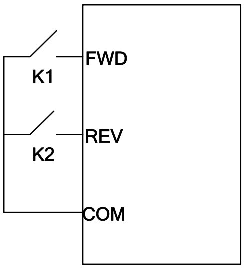
Set the running mode of the terminal control.

0: 2-wire control 1, comply the enable with the direction. This mode is widely used. It determines the rotation direction of the motor by defined FWD and REV terminal commands.



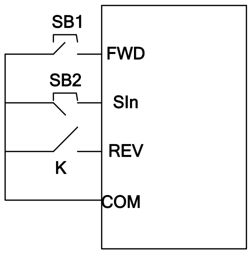
FWD	REV	Running command
OFF	OFF	Stop
ON	OFF	FWD running
OFF	ON	REV running
ON	ON	Hold

1: 2-wire control 2: Separate the enable from the direction. FWD defined by this mode is the enabling one. The direction depends on the state of the defined REV.



FWD	REV	Running command
OFF	OFF	Stop
ON	OFF	FWD running
OFF	ON	Stop
ON	ON	REV running

2: 3-wire control 1: SIn is the enabling terminal defined by the mode, the running command is caused by FWD and the direction is controlled by REV. When the VFD runs, SIn needs to be in the closed state. FWD generates a rising-edge signal. When the VFD starts running, the state of REV decides the direction. When the VFD stops, SIn needs be disconnected.

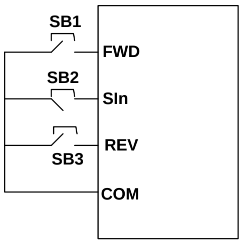


The running direction is:

SIn	REV	Previous running direction	Current running direction
ON	OFF→ON	Forward running	Reverse running
		Reverse running	Forward running
ON	ON→OFF	Reverse running	Forward running
		Forward running	Reverse running
ON→OFF	ON	Decelerate to stop	
	OFF		

SIn: 3-wire running control, FWD: forward running, REV: reverse running

3: 3-wire control 2: SIn is the enabling terminal defined by the mode, the running command is caused by FWD or REV and both of them control the running direction. When the VFD runs, SIn needs to be in the closed state. FWD or REV generates a rising-edge signal to control the running and direction of the VFD. When the VFD stops, SIn needs be disconnected.



SIn	FWD	REV	Running direction
ON	OFF→ON	ON	Forward running
		OFF	Forward running
ON	ON	OFF→ON	Reverse running
	OFF		Reverse running
ON→OFF			Decelerate to stop

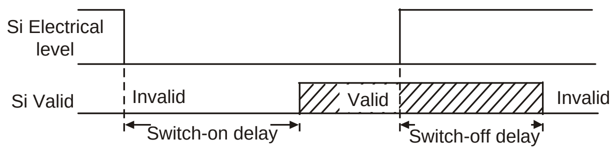
SIn: 3-wire running control, FWD: forward running, REV: reverse running

Note: For the 2-wire running mode, when the FWD/REV terminal is valid, the VFD will stop because of the stop command from other sources. Even though the FWD/REV control terminal keeps valid, the VFD will not run when the stop command is canceled. Only when FWD/REV is relaunched, the VFD can start again. For example, the effective STOP/RST stop at PLC single cycle stop, fixed-length stop and terminal control (See P07.04).

Function code	Name	Description	Setting range	Default
P05.14	S1 terminal switching-on delay time	0.000–50.000s	0.000–50.000	0.000s
P05.15	S1 terminal switching-off delay time	0.000–50.000s	0.000–50.000	0.000s
P05.16	S2 terminal switching-on delay time	0.000–50.000s	0.000–50.000	0.000s
P05.17	S2 terminal switching-off delay time	0.000–50.000s	0.000–50.000	0.000s
P05.18	S3 terminal switching-on delay time	0.000–50.000s	0.000–50.000	0.000s
P05.19	S3 terminal switching-off delay time	0.000–50.000s	0.000–50.000	0.000s
P05.20	S4 terminal switching-on delay time	0.000–50.000s	0.000–50.000	0.000s

Function code	Name	Description	Setting range	Default
P05.21	S4 terminal switching-off delay time	0.000–50.000s	0.000–50.000	0.000s
P05.22	S5 terminal switching-on delay time	0.000–50.000s	0.000–50.000	0.000s
P05.23	S5 terminal switching-off delay time	0.000–50.000s	0.000–50.000	0.000s
P05.24	S6 terminal switching-on delay time	0.000–50.000s	0.000–50.000	0.000s
P05.25	S6 terminal switching-off delay time	0.000–50.000s	0.000–50.000	0.000s
P05.26	S7 terminal switching-on delay time	0.000–50.000s	0.000–50.000	0.000s
P05.27	S7 terminal switching-off delay time	0.000–50.000s	0.000–50.000	0.000s
P05.28	S8 terminal switching-on delay time	0.000–50.000s	0.000–50.000	0.000s
P05.29	S8 terminal switching-off delay time	0.000–50.000s	0.000–50.000	0.000s
P05.30	HDI terminal switching-on delay time	0.000–50.000s	0.000–50.000	0.000s
P05.31	HDI terminal switching-off delay time	0.000–50.000s	0.000–50.000	0.000s

The function code defines the corresponding delay time of the electrical level variation of programmable input terminals from switching-on to switching-off.



Function code	Name	Description	Setting range	Default
P05.32	AI1 lower limit	0.00V–P05.34	0.00–P05.34	0.00V
P05.33	Corresponding setting of AI1 lower limit	-100.0%–100.0%	-100.0–100.0	0.0%
P05.34	AI1 upper limit	P05.32–10.00V	P05.32–10.00	10.00V
P05.35	Corresponding setting of AI1 upper limit	-100.0%–100.0%	-100.0–100.0	100.0%
P05.36	AI1 input filter time	0.000s–10.000s	0.000–10.000	0.100s
P05.37	AI2 lower limit	-10.00V–P05.39	-10.00V–P05.39	0.00V
P05.38	Corresponding setting of AI2 lower limit	-100.0%–100.0%	-100.0–100.0	0.0%
P05.39	AI2 middle value	P05.37–P05.41	P05.37–P05.41	0.00V
P05.40	Corresponding setting of AI2 middle value	-100.0%–100.0%	-100.0–100.0	0.0%
P05.41	AI2 upper limit	P05.39–10.00V	P05.39–10.00	10.00V
P05.42	Corresponding setting of AI2 upper limit	-100.0%–100.0%	-100.0–100.0	100.0%
P05.43	AI2 input filter time	0.000s–10.000s	0.000–10.000	0.100s
P05.44	AI3 lower limit	-10.00V–P05.46	-10.00–P05.46	-10.00V
P05.45	Corresponding setting of AI3 lower limit	-100.0%–100.0%	-100.0–100.0	-100.0%
P05.46	Middle value of AI3	P05.44–P05.48	P05.44–P05.48	0.00V

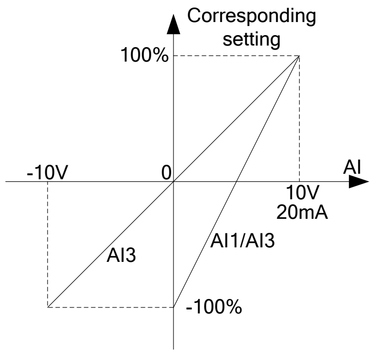
Function code	Name	Description	Setting range	Default
P05.47	Corresponding setting of AI3 middle value	-100.0%–100.0%	-100.0–100.0	0.0%
P05.48	AI3 upper limit	P05.46–10.00V	P05.46–10.00	10.00V
P05.49	Corresponding setting of AI3 upper limit	-100.0%–100.0%	-100.0–100.0	100.0%
P05.50	AI3 input filter time	0.000s–10.000s	0.000–10.000	0.100s

The function code defines the relationship between the analog input voltage and its corresponding set value. If the analog input voltage exceeds the set minimum or maximum input value, calculate with the minimum or maximum input value.

When the analog input is current input, the current of 0–20mA corresponds to the voltage of 0–10V.

In different cases, the corresponding nominal value of 100.0% analog setting is different. See specific information in each section.

The figure below illustrates different situations:



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

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

Function code	Name	Description	Setting range	Default
P05.51	HDI pulse input function	0: Frequency setting input 1–2: Reserved	0–2	0

HDI terminal is the function selection of pulse input.

0: Frequency setting input: the input of frequency, torque, PID reference and PID feedback. The corresponding relationship is determined by the function codes of P05.52–P05.56.

Function code	Name	Description	Setting range	Default
P05.52	HDI lower-limit frequency	0.00kHz–P05.54	0.00–P05.54	0.00kHz
P05.53	Corresponding setting of HDI lower-limit frequency	-100.0%–100.0%	-100.0–100.0	0.0%
P05.54	HDI upper-limit frequency	P05.52–50.00kHz	P05.52–50.00	50.00kHz
P05.55	Corresponding setting of HDI upper-limit frequency	-100.0%–100.0%	-100.0–100.0	100.0%
P05.56	Input filter time of HDI pulse frequency	0.000s–10.000s	0.000–10.000	0.100s

The function code defines the corresponding relations when the pulse is the setting input. It is similar to AI functions (P05.32–P05.50).

P06 group—Output terminals

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Setting range</th><th>Default</th></tr>
<tr><td>P06.00</td><td>HDO output type</td><td>0: Open collector output
1: Reserved</td><td>0–1</td><td>0</td></tr>
<tr><td>P06.01</td><td>Y1 output</td><td rowspan="5">0: Invalid
1: In operation
2: Forward rotation operation
3: Reverse rotation operation
4: Jogging operation
5: VFD fault
6: Frequency degree test FDT1
7: Frequency degree test FDT2
8: Frequency arrival
9: Zero speed running
10: Upper limit frequency arrival
11: Lower limit frequency arrival
12: Ready for operation
13: Pre-excitation
14: Overload pre-alarm
15: Underload pre-alarm
16: Completion of simple PLC step
17: Completion of simple PLC cycle
18: Reserved
19: Reserved
20: External fault valid
21: Reserved
22: Running time arrival
23: MODBUS communication virtual terminal output
24: PROFIBUS/CANopen communication virtual terminal output
25: Ethernet communication virtual terminal output
26–28: Reserved
29: Motor overheat pre-alarm
30: Reserved</td><td>0–30</td><td>0</td></tr>
<tr><td>P06.02</td><td>HDO output</td><td>0–30</td><td>0</td></tr>
<tr><td>P06.03</td><td>Relay RO1 output</td><td>0–30</td><td>0</td></tr>
<tr><td>P06.04</td><td>Relay RO2 output</td><td>0–30</td><td>0</td></tr>
<tr><td>P06.05</td><td>Relay RO3 output</td><td>0–30</td><td>5</td></tr>
</table>

The below table is the options of function parameters which permit selecting the same output terminal function.

Set value	Function	Instruction
0	Invalid	There are no functions of output terminals.
1	In operation	When the VFD runs, the frequency output is valid.
2	Forward rotation operation	When the VFD runs forward, the frequency output is valid.
3	Reverse rotation operation	When the VFD runs reversely, the frequency output is valid.
4	Jogging operation	When the VFD jogs, the output is valid.
5	VFD fault	When there is an VFD fault, the frequency output is valid.
6	Frequency degree test FDT1	Refer to Function code P08.32 and P08.33 for detailed information.
7	Frequency degree test FDT2	Refer to Function code P08.34 and P08.35 for detailed information.
8	Frequency arrival	Refer to Function code P08.36 for detailed information.
9	Zero speed running	The output is valid when both the output frequency and frequency reference of the VFD are equal to zero.
10	Upper limit frequency arrival	The output is valid when the running frequency reaches the upper limit.
11	Lower limit frequency arrival	The output is valid when the running frequency reaches the lower limit.
12	Ready for operation	The output is valid when the power of the primary loop and control loop is set up, and the VFD is ready for operation without carrying out protection functions.
13	Pre-excitation	The output is valid at pre-excitation.
14	Overload pre-alarm	The output is valid after the VFD exceeds the pre-alarm time on basis of the overload pre-alarm point. Refer to the function codes P11.08–P11.10 for specific information.
15	Underload pre-alarm	The output is valid after the VFD exceeds the pre-alarm time on basis of the underload pre-alarm point. Refer to the function codes P11.11–P11.12 for specific information.
16	Completion of simple PLC step	The output is valid after the simple PLC current step is completed.
17	Completion of simple	The output is valid after one simple PLC cycle is completed.

Set value	Function	Instruction
	PLC cycle	
18	Reserved	
19	Reserved	
20	External fault valid	The output is valid when the external fault (EF) appears.
21	Reserved	
22	Running time arrival	The output is valid after the accumulated running time of the VFD exceeds the time set in P08.27.
23	MODBUS communication virtual terminal output	Output corresponding signals according to MODBUS set values, 1 for ON signal and 0 for OFF signal.
24	POROFIBUS/CANopen communication virtual terminal output	Output corresponding signals according to PROFIBUS/ CANopen set values, 1 for ON signal and 0 for OFF signal.
25	Ethernet communication virtual terminal output	Output corresponding signals according to Ethernet set values, 1 for ON signal and 0 for OFF signal.
26–28	Reserved	
29	Motor overheat pre-alarm	The output is valid when the temperature of the motor is larger than the set pre-alarm temperature and less than motor overheat protection point.
30	Reserved	

Function code	Name	Description	Setting range	Default
P06.06	Polarity of output terminals	00–1F	00–1F	00

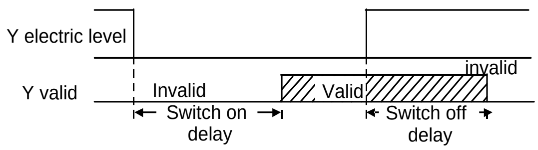
The function code is used to set the polarity of the output terminals.

Set the bit to 0, the output terminal is positive. Set the bit to 1, the output terminal is negative.

BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
RO4	RO3	RO2	RO1	Y1	HDO

Function code	Name	Description	Setting range	Default
P06.07	Y switching-on delay time	0.000–50.000s	0.000–50.000	0.000s
P06.08	Y switching-off delay time	0.000–50.000s	0.000–50.000	0.000s
P06.09	HDO switching-on delay time	0.000–50.000s (only valid when P06.00=1)	0.000–50.000	0.000s
P06.10	HDO switching-off delay time	0.000–50.000s (only valid when P06.00=1)	0.000–50.000	0.000s
P06.11	Relay RO1 switching-on delay time	0.000–50.000s	0.000–50.000	0.000s
P06.12	Relay RO1 switching-off delay time	0.000–50.000s	0.000–50.000	0.000s
P06.13	Relay RO2 switching-on delay time	0.000–50.000s	0.000–50.000	0.000s
P06.14	Relay RO2 switching-off delay time	0.000–50.000s	0.000–50.000	0.000s
P06.15	Relay RO3 switching-on delay time	0.000–50.000s	0.00–50.00	0.000s
P06.16	Relay RO3 switching-off delay time	0.000–50.000s	0.00–50.00	0.000s

The function code defines the corresponding delay time of the electrical level variation of programmable output terminals from switching-on to switching-off.



Function code	Name	Description	Setting range	Default
P06.17	AO1 output	0: Running frequency 1: Set frequency	0–30	0
P06.18	AO2 output		0–30	0

Function code	Name	Description	Setting range	Default
P06.19	AO3 output	2: Ramp reference frequency	0–30	0
P06.20	HDO pulse output	3: Running rotating speed 4: Output current (Relative to VFD) 5: Output current (Relative to motor) 6: Output voltage 7: Output power 8: Set torque value 9: Output torque 10: AI1 input value 11: AI2 input value 12: AI3 input value 13: HDI pulse frequency input value 14: MODBUS communication set value 1 15: MODBUS communication set value 2 16: PROFIBUS/CANopen communication set value 1 17: PROFIBUS/CANopen communication set value 2 18: Ethernet communication set value 1 19: Ethernet communication set value 2 20: PID reference 21: PID feedback 22: Torque current (Relative to motor rated current) 23: Ramp reference frequency (with sign) 24–30: Reserved	0–30	0

Instructions to output functions:

Set value	Function	Instruction
0	Running frequency	0– Max. output frequency
1	Set frequency	0– Max. output frequency

Set value	Function	Instruction
2	Ramp reference frequency	0– Max. output frequency
3	Running rotating speed	0–2 times motor rated synchronous rotating speed
4	Output current (Relative to VFD)	0–2 times VFD rated current
5	Output current (Relative to motor)	0–2 times motor rated current
6	Output voltage	0–1.5 times motor rated voltage
7	Output power	0–2 times motor rated power
8	Set torque value	0–2 times motor rated current
9	Output torque	0–2 times motor rated current
10	AI1 input value	0–10V/0–20mA
11	AI2 input value	-10V–10V
12	AI3 input value	0–10V/0–20mA
13	HDI pulse frequency input value	0-50kHz
14	MODBUS communication set value 1	-1000–1000, 1000 corresponds to 100.0%
15	MODBUS communication set value 2	-1000–1000, 1000 corresponds to 100.0%
16	PROFIBUS/CANopen communication set value 1	-1000–1000, 1000 corresponds to 100.0%
17	PROFIBUS/CANopen communication set value 2	-1000–1000, 1000 corresponds to 100.0%
18	Ethernet communication set value 1	-1000–1000, 1000 corresponds to 100.0%
19	Ethernet communication set value 2	-1000–1000, 1000 corresponds to 100.0%
20	PID reference	
21	PID feedback	
22	Torque current (Relative to motor rated current)	0–2 times motor rated current
23	Ramp reference frequency	With sign
24–30	Reserved	Reserved

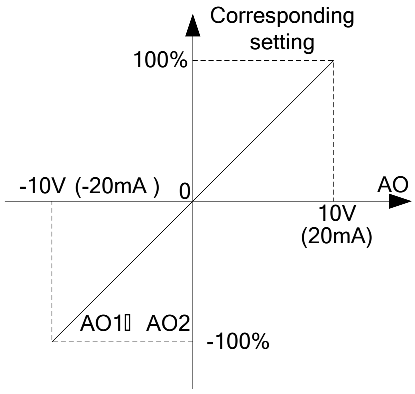
Function code	Name	Description	Setting range	Default
P06.21	Lower limit of AO1 output	-100.0%–P06.23	-100.0–P06.23	0.0%
P06.22	Corresponding AO1 output to lower limit	-10.00V–10.00V	-10.00–10.00	0.00V
P06.23	Upper limit of AO1 output	P06.21–100.0%	P06.21–100.0	100.0%
P06.24	Corresponding AO1 output to upper limit	-10.00V–10.00V	-10.00–10.00	10.00V
P06.25	AO1 output filter time	0.000s–10.000s	0.000–10.000	0.000s
P06.26	Lower limit of AO2 output	-100.0%–P06.28	-100.0–P06.28	0.0%
P06.27	Corresponding AO2 output to lower limit	-10.00V–10.00V	-10.00–10.00	0.00V
P06.28	Upper limit of AO2 output	P06.26–100.0%	P06.26–100.0	100.0%
P06.29	Corresponding AO2 output to upper limit	-10.00V–10.00V	-10.00–10.00	10.00V
P06.30	AO2 output filter time	0.000s–10.000s	0.000–10.000	0.000s
P06.31	Lower limit of AO3 output	-100.0%–P06.33	-100.0–P06.33	0.0%
P06.32	Corresponding AO3 output frequency to lower limit	-10.00V–10.00V	-10.00–10.00	0.00V
P06.33	Upper limit of AO3 output	P06.31–100.0%	P06.31–100.0	100.0%
P06.34	Corresponding AO3 output frequency to upper limit	-10.00V–10.00V	-10.00–10.00	10.00V
P06.35	AO3 output filter time	0.000s–10.000s	0.000–10.000	0.000s
P06.36	Lower limit of HDO output	-100.0%–P06.38	-100.0%–P06.38	0.00%

Function code	Name	Description	Setting range	Default
P06.37	Corresponding HDO output frequency to lower limit	0.00–50.00kHz	0.00–50.00	0.0kHz
P06.38	Upper limit of HDO output	P06.36–100.0%	P06.36–100.0	100.0%
P06.39	Corresponding HDO output frequency to upper limit	0.00–50.00kHz	0.00–50.00	50.00kHz
P06.40	HDO output filter time	0.000s–10.000s	0.000–10.000	0.000s

The function code defines the relationship between the output value and its corresponding analog output. If the output value exceeds the set minimum or maximum output value, calculate it as the lower limit or upper limit of output.

When the analog output is current output, the current of 1mA is equivalent to the voltage of 0.5V.

In different cases, the corresponding analog output to 100% of output value is different. See specific information in each section.



P07 group—Human-machine interface

Function code	Name	Description	Setting range	Default
P07.00	User password	0–65535	0–65535	0

The password protection will be valid when setting any non-zero number.

00000: Clear the previous user password and make the password protection invalid.
After the user password becomes valid, if the password is incorrect, the user cannot enter the parameter menu. Only correct password can make the user check or modify the parameters. Please remember the user password.

Retreat the editing state of the function code and the password protection will become valid in 1 minute. If the password is available, press PRG/ESC to enter the editing state of the function code, and then "0.0.0.0.0" will be displayed. Unless inputting the correct password, the user cannot enter it.

Note: Restoring to the default value may clear the user password, so please use it with caution.

Function code	Name	Description	Setting range	Default
P07.01	Parameter copy	0: No operation 1: Upload the local function parameters to the keypad 2: Download the function parameters of the keypad to the local address (including the motor parameters) 3: Download the function parameters of the keypad to the local address (excluding the motor parameters) 4: Download the function parameters of the keypad to the local address (only for the motor parameters)	0–4	0

The function code determines the function parameter copy mode.

Note: After completing the 1–4 operations, the parameter will come back to 0 automatically, and the functions of upload and download exclude the factory parameters of P29.

Function code	Name	Description	Setting range	Default
P07.02	QUICK/JOG function selection	0: No function 1: Jogging running 2: Shift the display state by the shifting key 3: Shift between forward rotation and	0–7	1

Function code	Name	Description	Setting range	Default
		reverse rotation 4: Clear UP/DOWN setting 5: Coast to stop 6: Shift the running command sources in sequence 7: Quick commission mode (according to the non-factory parameter commissioning)		

Select the functions of QUICK/JOG.

0: No function

1: Jogging running: Press QUICK/JOG to begin the jogging running.

2: Shift the display state by the shifting key: Press QUICK/JOG to shift the displayed function code from right to left.

3: Shift between forward rotation and reverse rotation: Press QUICK/JOG to shift the direction of the frequency commands. This function is only valid in the keypad command channels.

4: Clear UP/DOWN setting: Press QUICK/JOG to clear the set values of UP/DOWN.

5: Coast to stop: Press QUICK/JOG to coast to stop.

6: Shift the running command sources in sequence: Press QUICK/JOG to shift the running command sources in sequence.

7: Quick commission mode (According to the non-factory parameter commissioning)

Note: When QUICK/JOG is used to shift between forward rotation and reverse rotation, the VFD does not record the state after shifting during power off. The VFD will run according to the running direction set by P00.13 during next power on.

Function code	Name	Description	Setting range	Default
P07.03	QUICK shifting sequence of running command channel	0: Keypad control→terminal control →communication control 1: Keypad control←→terminal control 2: Keypad control←→communication control 3: Terminal control←→ communication control	0–3	0

When P07.02=6, set the shifting sequence of running command channel.

Function code	Name	Description	Setting range	Default
P07.04	STOP/RST stop function	0: Only valid for keypad control 1: Both valid for keypad and terminal control 2: Both valid for keypad and communication control 3: Valid for all control modes	0–3	0

Select the stop function by STOP/RST. STOP/RST is effective in any state for the fault reset.

Function code	Name	Description	Setting range	Default
P07.05	Parameter selection 1 at running state	BIT0: Running frequency (Hz on) BIT1: Set frequency (Hz flickering) 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(% flickering) BIT9: PID feedback(% on) BIT10: Input terminal state BIT11: Output terminal state BIT12: Torque set value(% on) BIT13: Pulse count value BIT14: Reserved BIT15: PLC and current step in multi-step speed	0x0000–0xFFFF	0x03FF

Function code	Name	Description	Setting range	Default
P07.06	Parameter selection 2 at running state	BIT0: AI1 value (V on) BIT1: AI2 value (V on) BIT2: AI3 value (V on) BIT3: HDI frequency BIT4: Motor overload percentage (% on) BIT5: VFD overload percentage (% on) BIT6: Ramp reference frequency (Hz on) BIT7: Reserved BIT8: Reserved BIT9–15: Reserved	0x0000–0xFFFF	0x0000

The parameter of Goodrive3000 series VFDs at running state determined by P7.06 is the 16-bit binary figure. If one bit of the figure is 1, the corresponding parameter of the bit can be checked through >>/SHIFT at running state. If the bit is 0, the corresponding parameter will not be displayed. When setting the function codes of P07.05 and P07.06, shift 2-bit into 16-bit and then input it into the function code.

Note: AI3 and HDI need to use extension cards.

P07.05	BIT15	BIT14	BIT13	BIT12	BIT11	BIT10	BIT9	BIT8
	PLC and current step in multi-step speed	Length value	Pulse count value	Torque set value	Output terminal state	Input terminal state	PID feedback	PID reference
	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
	Output torque	Output power	Running rotating speed	Output current	Output voltage	Bus voltage	Set frequency	Running frequency
P07.06	BIT15	BIT16	BIT13	BIT12	BIT11	BIT10	BIT9	BIT8
	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
	Reserved	Ramp frequency reference	VFD overload percentage	Motor overload percentage	HDI frequency	AI3 value	AI2 value	AI1 value

Function code	Name	Description	Setting range	Default
P07.07	The parameter at stop state	BIT0: Set frequency (Hz on, frequency flickering slowly) BIT1: Bus voltage (V on) BIT2: Input terminal state BIT3: Output terminal state BIT4: PID reference (% flickering) BIT5: PID feedback (% on) BIT6: Torque set value (% on) BIT7: AI1 value (V on) BIT8: AI2 value (V on) BIT9: AI3 value (V on) BIT10: HDI frequency BIT11: PLC and current step in multi-step speed BIT12: Reserved BIT13: Reserved BIT14 – BIT15: Reserved	0x0000–0xFFFF	0x00FF

The setting way of P07.07 is the same with that of P07.06. When Goodrive3000 series VFDs are at stop state, the parameter display is influenced by P7.07.

BIT15	BIT14	BIT13	BIT12	BIT11	BIT10	BIT9	BIT8
Reserved	Reserved	Reserved	Reserved	PLC and current step in multi-step speed	HDI frequency	AI3 value	AI2 value
BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
AI1 value	Torque set value	PID feedback	PID reference	Output terminal state	Input terminal state	Bus voltage	Set frequency

Function code	Name	Description	Setting range	Default
P07.08	Frequency coefficient	0.01–10.00	0.01–10.00	1.00
P07.09	Rotating speed coefficient	0.1–999.9%	0.1–999.9	100.0%

Function code	Name	Description	Setting range	Default
P07.10	Linear speed coefficient	0.1–999.9%	0.1–999.9	1.0%

Displayed frequency=Running frequency*P07.08;

Mechanical rotating speed=60*displayed running frequency×P07.09/motor pole pairs;

Linear speed= Mechanical rotating speed×P07.10.

Function code	Name	Description	Setting range	Default
P07.11	Rectifier bridge module temperature	0.0–100.0°C		
P07.12	Inverter module temperature	0.0–100.0°C		
P07.13	Software version of control board	1.00–655.35		
P07.14	Local accumulative running time	0–65535h		

The parameters above can be read but cannot be modified.

Function code	Name	Description	Setting range	Default
P07.15	High bit of power consumption	0–65535kWh (*1000)		
P07.16	Low bit of power consumption	0.0–999.9kWh		

Display the power consumption of the VFD.

The power consumption of the VFD=P07.15*1000+P07.16

Function code	Name	Description	Setting range	Default
P07.18	VFD rated power	0.4–3000.0kW		
P07.19	VFD rated voltage	0–4000V		
P07.20	VFD rated current	0.1–6000.0A		

Function code	Name	Description	Setting range	Default
P07.21	Factory bar code 1	0x0000–0xFFFF		
P07.22	Factory bar code 2	0x0000–0xFFFF		
P07.23	Factory bar code 3	0x0000–0xFFFF		
P07.24	Factory bar code 4	0x0000–0xFFFF		
P07.25	Factory bar code 5	0x0000–0xFFFF		
P07.26	Factory bar code 6	0x0000–0xFFFF		

The parameters above can be read but cannot be modified.

Function code	Name	Description	Setting range	Default
P07.27	Present fault type	0:No fault 1:IGBT U phase protection(OUt1) 2:IGBT V phase protection(OUt2) 3:IGBT W phase protection(OUt3) 4:OC1 5:OC2 6:OC3 7:OV1 8:OV2 9:OV3 10:UV 11:Motor overload(OL1) 12:The VFD overload(OL2) 13:Input side phase loss(SPI) 14:Output side phase loss(SPO) 15:Overheat of the rectifier module(OH1) 16:Overheat fault of the VFD module(OH2) 17:External fault(EF) 18:485 communication fault(CE) 19:Current detection fault(ItE) 20:Motor antotune fault(tE)		
P07.28	Last fault type			
P07.29	2nd-last fault type			
P07.30	3rd-last fault type			
P07.31	4th-last fault type			
P07.32	5th-last fault type			

Function code	Name	Description	Setting range	Default
		21:EEPROM operation fault(EEP) 22:PID response offline fault(PIDE) 23:Braking unit fault(bCE) 24:Running time arrival(END) 25:Electrical overload(OL3) 26:Panel communication fault(PCE) 27:Parameter uploading fault (UPE) 28:Parameter downloading fault(DNE) 29:PROFIBUS communication fault(E-DP) 30:Ethernet communication fault(E-NET) 31: CANopen communication fault(E-CAN) 32:Grounding short circuit fault 1(ETH1) 33:Reserved 34:Speed deviation fault(dEu) 35:Maladjustment(STo) 36: Undervoltage fault(LL) 37: Encoder offline fault (ENC1O) 38: Encoder reverse fault (ENC1D) 39: Encoder Z pulse offline fault (ENC1Z) 40: Reserved 41: Reserved 42: Reserved 43: Motor overtemperature fault (Ot) 44: SCR fault (SCE) Pre-alarm 0: Motor overheat pre-alarm (A-OT) 1: Overload pre-alarm (A-OL) 2–7: Reserved		

Refer to fault information.

Function code	Name	Description	Setting range	Default
P07.33	Running frequency at present fault			0.00Hz
P07.34	Ramp reference frequency at present fault			0.00Hz
P07.35	Output voltage at present fault			0V
P07.36	Output current at present fault			0.0A
P07.37	Bus voltage at present fault			0.0V
P07.38	The Max. temperature at present fault			0.0°C
P07.39	Input terminals state at present fault			0
P07.40	Output terminals state at present fault			0

Record the displaying values at present fault. Refer to P07.33–P07.40.

Function code	Name	Description	Setting range	Default
P07.41	Running frequency at last fault			0.00Hz
P07.42	Ramp reference frequency at last fault			0.00Hz
P07.43	Output voltage at last fault			0V
P07.44	The output current at last fault			0.0A
P07.45	Bus voltage at last fault			0.0V
P07.46	The Max. temperature at last			0.0°C

Function code	Name	Description	Setting range	Default
	fault			
P07.47	Input terminals state at last fault			0
P07.48	Output terminals state at last fault			0

Record the displaying values at last fault. Refer to P07.41–P07.48.

Function code	Name	Description	Setting range	Default
P07.49	Running frequency at 2nd-last fault			0.00Hz
P07.50	Ramp reference frequency at 2nd-last fault			0.00Hz
P07.51	Output voltage at 2nd-last faults			0V
P07.52	Output current at 2nd-last faults			0.0A
P07.53	Bus voltage at 2nd-last fault			0.0V
P07.54	The Max. temperature at 2nd-last fault			0.0°C
P07.55	Input terminals state at 2nd-last fault			0
P07.56	Output terminals state at 2nd-last fault			0

Record the displaying values at 2nd-last fault. Refer to P07.49–P07.56.

P08 group—Enhanced functions

Function code	Name	Description	Setting range	Default
P08.00	ACC time 2	0.0–3600.0s	0.0–3600.0	Depends on model
P08.01	DEC time 2	0.0–3600.0s	0.0–3600.0	Depends on model
P08.02	ACC time 3	0.0–3600.0s	0.0–3600.0	Depends on model
P08.03	DEC time 3	0.0–3600.0s	0.0–3600.0	Depends on model
P08.04	ACC time 4	0.0–3600.0s	0.0–3600.0	Depends on model
P08.05	DEC time 4	0.0–3600.0s	0.0–3600.0	Depends on model

Refer to P00.11 and P00.12 for detailed definitions.

Goodrive3000 series define four groups of ACC/DEC time which can be selected by the multi-function digital input terminals (P05). The first group of ACC/DEC time is the factory default one.

Function code	Name	Description	Setting range	Default
P08.06	Jogging frequency	0.00–P00.03 (Max. frequency)	0.00–P00.03	5.00Hz

The parameter is used to define the frequency reference during jogging.

Function code	Name	Description	Setting range	Default
P08.07	Jogging ACC time	0.0–3600.0s	0.0–3600.0	Depends on model
P08.08	Jogging DEC time	0.0–3600.0s	0.0–3600.0	Depends on model

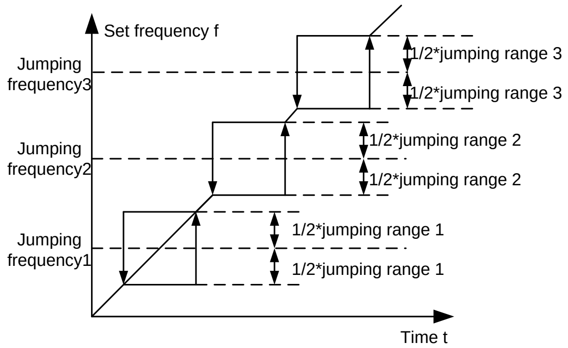
Jogging ACC time is the time required by the VFD which accelerates from 0Hz to the maximum frequency (P00.03).

Jogging DEC time is the time required by the VFD which decelerates from the maximum frequency (P00.03) to 0Hz.

Function code	Name	Description	Setting range	Default
P08.09	Jumping frequency 1	0.00–P00.03 (Max. frequency)	0.00–P00.03	0.00Hz
P08.10	Jumping frequency range 1	0.00–P00.03 (Max. frequency)	0.00–P00.03	0.00Hz
P08.11	Jumping frequency 2	0.00–P00.03 (Max. frequency)	0.00–P00.03	0.00Hz
P08.12	Jumping frequency range 2	0.00–P00.03 (Max. frequency)	0.00–P00.03	0.00Hz
P08.13	Jumping frequency 3	0.00–P00.03 (Max. frequency)	0.00–P00.03	0.00Hz
P08.14	Jumping frequency range 3	0.00–P00.03 (Max. frequency)	0.00–P00.03	0.00Hz

When the set frequency is in the range of the jumping frequency, the VFD will run at the edge of the jumping frequency.

The VFD can avoid the mechanical resonance point by setting the jumping frequency. The VFD can set three jumping frequency points. But this function will be invalid if all jumping points are 0.



Function code	Name	Description	Setting range	Default
P08.27	Set running time	0–65535min	0–65535	0min

Preset the running time of the VFD. When the accumulative running time achieves the set time, the multi-function digital output terminal will output the signal of "running time arrival".

Function code	Name	Description	Setting range	Default
P08.28	Fault reset times	0–10	0–10	0
P08.29	Interval time of	0.1–3600.0s	0.1–3600.0	1.0s

Function code	Name	Description	Setting range	Default
	automatic fault reset			

Fault reset times: Set the fault reset times when selecting this function. If the continuous reset times exceed this set value, the VFD will stop for the fault and wait to be repaired.

Interval time of automatic fault reset: The interval between the time when the fault occurs and the time when the reset action occurs.

Function code	Name	Description	Setting range	Default
P08.30	Frequency decreasing velocity of dropping control	0.00–50.00Hz	0.00–50.00	0.00Hz

The output frequency of the VFD changes along with the load variation. And it is mainly used to balance the power when several motors simultaneously drive one load.

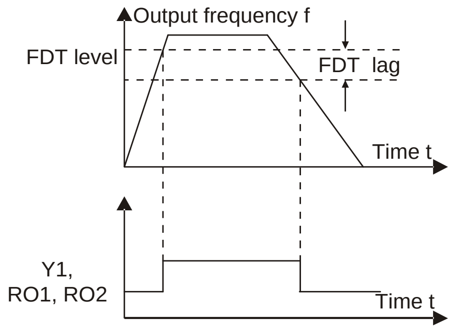
Function code	Name	Description	Setting range	Default
P08.31	Shifting channel of motors	0: Terminal shifting 1: MODBUS communication shifting 2: PROFIBUS/CANopen communication shifting 3: Ethernet communication shifting 4: Reserved	0–4	0

Goodrive3000 series VFDs support the shifting among two motors and the function code is used to shift the channels.

Function code	Name	Description	Setting range	Default
P08.32	FDT1 electrical level detection value	0.00–P00.03 (Max. frequency)	0.00–P00.03	50.00Hz
P08.33	FDT1 retention detection value	0.0–100.0% (FDT1 electrical level)	0.0–100.0	5.0%
P08.34	FDT2 electrical level detection value	0.00–P00.03 (Max. frequency)	0.00–P00.03	50.00Hz
P08.35	FDT2 retention	0.0–100.0% (FDT2 electrical level)	0.0–100.0	5.0%

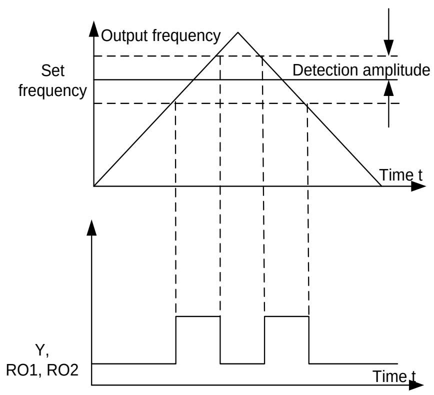
Function code	Name	Description	Setting range	Default
	detection value			

When the output frequency exceeds the corresponding frequency of FDT electrical level, the multi-function digital output terminal will output the signal of "frequency level detection FDT". The signal is invalid until the output frequency decreases to a value lower than (FDT electrical level-FDT retention detection value) the corresponding frequency. Below is the waveform diagram:



Function code	Name	Description	Setting range	Default
P08.36	Frequency arrival detection value	0.0–P00.03 (Max. frequency)	0.0–P00.03	0.00Hz

When the output frequency is among the below or above range of the set frequency, the multi-function digital output terminal will output the signal of "frequency arrival". See the diagram below for detailed information:



Function code	Name	Description	Setting range	Default
P08.37	Energy braking enable	0: Disabled 1: Enabled	0–1	0

Enable energy braking.

Note: After enabling the energy braking, the overvoltage speed loss point automatically raise at 20V. The parameter is only applicable to the type with built-in braking pipe.

Function code	Name	Description	Setting range	Default
P08.38	Threshold voltage of energy braking	600.0–6000.0V	600.0–6000.0	1950.0V

After setting the original bus voltage for the energy braking, adjust this parameter appropriately to achieve effective load braking. The default value changes with different voltage grades.

Function code	Name	Description	Setting range	Default
P08.39	Running mode of cooling fan	0: Normal running mode 1: The fan keeps running after power on all the time.	0–1	0

The function code is used to set the running mode of the cooling fan.

0: Normal running mode: the cooling fan runs when the rectifier receives the running command or the module detection temperature reaches above 45°C or the the module current exceeds 20% rated value.

1: The fan keeps running after power on all the time. (The mode is generally applied to high temperature and humidity situations, but in other cases it is not recommended.)

Function code	Name	Description	Setting range	Default
P08.41	Over modulation selection	0: Invalid 1: Valid	0–1	0x01

The function code is used to enable the over modulation function.

Function code	Name	Description	Setting range	Default
P08.42	Keypad data control	0x0000–0x1223 LED ones: Frequency enabling selection 0: Both ∧/∨ and digital potentiometer adjustments are effective. 1: Only ∧/∨ is effective. 2: Only digital potentiometer adjustment is effective. 3: Neither ∧/∨ nor digital potentiometer adjustments is	0000–1223	0x0000

Function code	Name	Description	Setting range	Default
		effective. LED tens: Frequency control selection 0: Only effective when P00.06=0 or P00.07=0 1: Effective for all frequency setting manners 2: Ineffective for multi-step speed when multi-step speed has the priority LED hundreds: Action selection during stopping 0: Effective setting 1: Effective during running, cleared after stopping 2: Effective during running, cleared after receiving the stop command LED thousands: ∧/∨ and digital potentiometer integral function 0: Effective integral function 1: Ineffective integral function		

Set the control functions of the keypad.

Function code	Name	Description	Setting range	Default
P08.43	Integral ratio of the keypad potentiometer	0.01–10.00s	0.01–10.00	0.10s
P08.44	UP/DOWN terminal control	0x000–0x221 LED ones: Frequency control selection 0: UP/DOWN terminal setting effective 1: UP/DOWN terminal setting ineffective LED tens: Frequency control selection 0: Only effective when P00.06=0 or	000–221	0x000

Function code	Name	Description	Setting range	Default
		P00.07=0 1: Effective for all frequency setting manners 2: Ineffective for multi-step speed when multi-step speed has the priority LED hundreds: Action selection during stopping 0: Effective setting 1: Effective during running, cleared after stopping 2: Effective during running, cleared after receiving the stop command		

Set the control functions of UP/DOWN terminals.

Function code	Name	Description	Setting range	Default
P08.45	UP terminal frequency changing ratio	0.01–50.00s	0.01–50.00	0.50s
P08.46	DOWN terminal frequency changing ratio	0.01–50.00s	0.01–50.00	0.50s

Set the frequency changing ratio of UP/DOWN terminals.

Function code	Name	Description	Setting range	Default
P08.47	Action when the frequency setting is at power off	0x000–0x111 LED ones: Action selection when the digital adjusting frequency is at power off 0: Save when the power is off 1: Clear when the power is off LED tens: Action selection when MODBUS setting frequency is at power off 0: Save when the power is off 1: Clear when the power is off LED hundreds: Action selection when other communication setting frequency is at power off 0: Save when the power is off 1: Clear when the power is off	0x000–0x111	0x000

The function code is the way to deal with set frequency at power off.

Function code	Name	Description	Setting range	Default
P08.50	Magnetic flux braking	0: Invalid 100－150	0–150	0

This function code is used to enable magnetic flux braking.

0: Invalid

100–150: The larger the coefficient is, the stronger the braking is.

This VFD can slow down the motor by increasing the magnetic flux. In this way, the energy generated by the motor during braking can be transformed into heat energy.

The VFD monitors the state of the motor continuously even during the magnetic flux braking period. So the magnetic flux braking can be used in the motor stop, as well as to change the rotating speed of the motor. The other advantages are:

Brake immediately after the stop command. It does not need to wait until the magnetic flux weakens.

The cooling effect becomes better. The current of the stator other than that of the rotor increases during magnetic flux braking, while the cooling of the stator is more effective than the cooling of the rotor.

Function code	Name	Description	Setting range	Default
P08.51	Input power factor of the VFD	0.00–1.00	0.00–1.00	0.56

Adjust the displayed current value of the input side of the VFD at AC input.

Note: The function is not applicable at DC input.

P09 group—PID control

Function code	Name	Description	Setting range	Default
P09.00	PID reference source	0: Keypad digital setting (P09.01) 1: AI1 setting 2: AI2 setting 3: AI3 setting 4: HDI pulse setting 5: Multi-step speed setting 6: MODBUS communication setting 7: PROFIBUS/CANopen communication setting 8: Ethernet communication setting 9: Reserved	0–9	0

The parameter decides the setting target channel of procedure PID. When the frequency command selection (P00.06, P00. 07) is 7 or the voltage setting channel (P04.27) is 6, the running mode of the VFD is procedure PID control.

The setting target of procedure PID is a relative one, 100% of the setting corresponds to 100% of the feedback signal of the controlled system.

The system is calculated according to the relative value (0–100.0%) all along.

Note: Multi-step speed reference can be realized by setting parameters of P10 group.

3, 4, 7 and 8 can be used only after inserting corresponding extension cards.

Function code	Name	Description	Setting range	Default
P09.01	Keypad PID preset	-100.0%–100.0%	-100.0–100.0	0.0%

When P09.00=0, the keypad sets the parameter.

Function code	Name	Description	Setting range	Default
P09.02	PID feedback source	0: AI1 feedback 1: AI2 feedback 2: AI3 feedback 3: HDI pulse feedback 4: MODBUS communication feedback 5: PROFIBUS/CANopen	0–7	0

Function code	Name	Description	Setting range	Default
		communication feedback 6: Ethernet communication feedback 7: Reserved		

Select PID feedback channel by the parameter.

Note: The reference channel and feedback channel cannot coincide; otherwise, PID cannot control effectively.

2, 3, 5 and 6 can be used only after inserting corresponding extension cards.

Function code	Name	Description	Setting range	Default
P09.03	PID output feature	0: PID output is positive. 1: PID output is negative.	0–1	0

Select PID output feature.

0: PID output is positive. When the feedback signal exceeds the PID reference, the output frequency of the VFD will decrease to balance PID. For example, rewind the strain PID control.

1: PID output is negative. When the feedback signal exceeds the PID reference, the output frequency of the VFD will increase to balance PID. For example, unwind the strain PID control.

Function code	Name	Description	Setting range	Default
P09.04	Proportional gain (Kp)	0.00–100.00	0.00–100.00	1.00

The function is applicable to the proportional gain P of PID input.

P determines the strength of the whole PID adjuster. Larger P, stronger the adjustment. The parameter of 100 means that when the offset of PID feedback and reference value is 100%, the adjusting range of PID adjuster is the maximum frequency (ignoring integral and differential function).

Function code	Name	Description	Setting range	Default
P09.05	Integral time(Ti)	0.00–10.00s	0.00–10.00	0.10s

This parameter determines the speed of the integral adjustment on the deviation of PID feedback and reference from PID adjuster.

When the deviation of PID feedback and reference is 100%, the integral adjuster works continuously during the time (ignoring proportional and differential function) to achieve the maximum output frequency (P00.03) or the maximum voltage (P04.31). Shorter the integral time, stronger the adjustment.

Function code	Name	Description	Setting range	Default
P09.06	Differential time(Td)	0.00–10.00s	0.00–10.00	0.00s

This parameter determines the strength of the change ratio adjustment on the deviation of PID feedback and reference from PID adjuster.

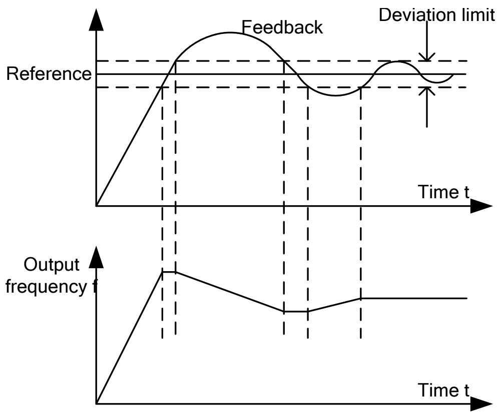
If the PID feedback changes 100% during the time, the adjustment of integral adjuster (ignoring proportional and integral function) is the maximum output frequency (P00.03) or the maximum voltage (P04.31). Longer the differential time, stronger the adjustment.

Function code	Name	Description	Setting range	Default
P09.07	Sampling cycle (T)	0.001–10.000s	0.001–10.000	0.100s

This parameter means the sampling cycle of the feedback. The adjuster calculates in each sampling cycle. The longer the sampling cycle is, the slower the response is.

Function code	Name	Description	Setting range	Default
P09.08	PID control deviation limit	0.0–100.0%	0.0–100.0	0.0%

The output of PID system is relative to the maximum deviation of the closed loop reference. As shown in the diagram below, PID adjuster stops regulating in the range of deviation limit. Set the function code properly to adjust the accuracy and stability of PID system.



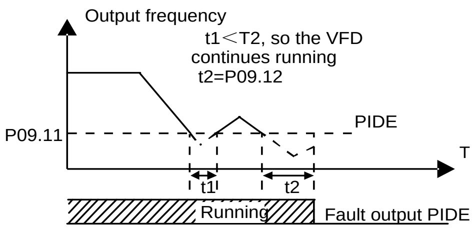
Function code	Name	Description	Setting range	Default
P09.09	Upper limit of PID output	P09.10–100.0% (Max. frequency or voltage)	P09.10–100.0	100.0%
P09.10	Lower limit of PID output	-100.0%–P09.09 (Max. frequency or voltage)	-100.0–P09.09	0.0%

The function code is used to set the upper and lower limit of PID adjuster output setting.

100.0% corresponds to the maximum output frequency (P00.03) or the maximum voltage (P04.31).

Function code	Name	Description	Setting range	Default
P09.11	Feedback offline detection value	0.0–100.0%	0.0–100.0	0.0%
P09.12	Feedback offline detection time	0.0–3600.0s	0.0–3600.0	1.0s

Set the PID feedback offline detection value. When the value is smaller than or equal to the feedback offline detection value and the duration exceeds the value set in P09.12, the VFD will alarm "PID feedback offline fault" and the keypad will display PIDE.



Function code	Name	Description	Setting range	Default
P09.13	PID adjustment	0x0000–0x1111 LED ones: 0: Keep the integral adjustment when the frequency reaches the upper and lower limit 1: Stop the integral adjustment when the frequency reaches the upper and lower limit LED tens: 0: The same with the setting direction 1:Opposite to the setting direction LED hundreds:	0000–1111	0x0001

Function code	Name	Description	Setting range	Default
		0: Limit to the maximum frequency 1: Limit to frequency A LED thousands: 0:A+B frequency, the buffer of A frequency is invalid 1:A+B frequency, the buffer of A frequency is valid ACC/DEC is determined by ACC time 4 of P08.04		

LED ones:

0: Keep the integral adjustment when the frequency reaches the upper and lower limit: the integration responses the changes between the reference and feedback unless it reaches the internal integral limit. When the size between the reference and feedback changes, it needs more time to offset the impact of continuous working integration and the integration can change with the trend.

1: Stop the integral adjustment when the frequency reaches the upper and lower limit: if the integration keeps stable and the size between the reference and feedback changes, the integration will change along with the trend quickly.

Function code	Name	Description	Setting range	Default
P09.14	Proportional gain at low frequency (Kp)	0.00–100.00	0.00–100.00	1.00
P09.15	PID command of ACC/DEC time	0.0–1000.0s	0.0–1000.0s	0.0s
P09.16	PID output filter time	0.000–10.000s	0.000–10.000s	0.000s

P10 group—Simple PLC and multi-step speed control

Function code	Name	Description	Setting range	Default
P10.00	Simple PLC	0: Stop after running once 1: Run at the final value after running once 2: Cycle running	0–2	0

Set the simple PLC running mode.

0: Stop after running once: it is necessary to give the VFD the running command again after it finishes a single cycle and automatically stops.

1: Run at the final value after running once: the VFD automatically keeps the running frequency and direction of the last step after finishing a single cycle.

2: Cycle running: the VFD automatically enters into next cycle after finishing a single cycle and the system will not stop until there is a stop command.

Function code	Name	Description	Setting range	Default
P10.01	Simple PLC memory	0: Power loss without memory 1: Power loss with memory	0–1	0

Set simple PLC memory manners when power loss.

0: Power loss without memory

1: Power loss with memory: PLC will memorize the running step and frequency when power loss.

Function code	Name	Description	Setting range	Default
P10.02	Multi-step speed 0	-100.0–100.0%	-100.0–100.0	0.0%
P10.03	Running time of step 0	0.0–6553.5s (min)	0.0–6553.5	0.0s
P10.04	Multi-step speed 1	-100.0–100.0%	-100.0–100.0	0.0%
P10.05	Running time of step 1	0.0–6553.5s (min)	0.0–6553.5	0.0s
P10.06	Multi-step speed 2	-100.0–100.0%	-100.0–100.0	0.0%
P10.07	Running time of step 2	0.0–6553.5s (min)	0.0–6553.5	0.0s
P10.08	Multi-step speed 3	-100.0–100.0%	-100.0–100.0	0.0%

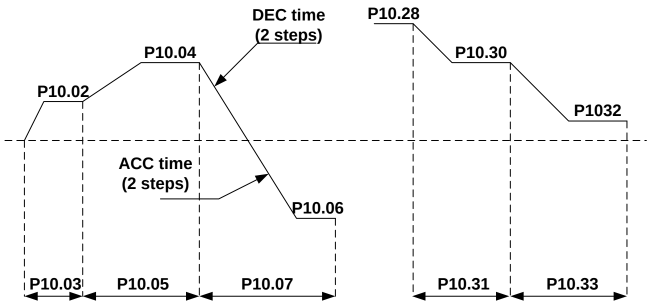
Function code	Name	Description	Setting range	Default
P10.09	Running time of step 3	0.0–6553.5s (min)	0.0–6553.5	0.0s
P10.10	Multi-step speed 4	-100.0–100.0%	-100.0–100.0	0.0%
P10.11	Running time of step 4	0.0–6553.5s (min)	0.0–6553.5	0.0s
P10.12	Multi-step speed 5	-100.0–100.0%	-100.0–100.0	0.0%
P10.13	Running time of step 5	0.0–6553.5s (min)	0.0–6553.5	0.0s
P10.14	Multi-step speed 6	-100.0–100.0%	-100.0–100.0	0.0%
P10.15	Running time of step 6	0.0–6553.5s (min)	0.0–6553.5	0.0s
P10.16	Multi-step speed 7	-100.0–100.0%	-100.0–100.0	0.0%
P10.17	Running time of step 7	0.0–6553.5s (min)	0.0–6553.5	0.0s
P10.18	Multi-step speed 8	-100.0–100.0%	-100.0–100.0	0.0%
P10.19	Running time of step 8	0.0–6553.5s (min)	0.0–6553.5	0.0s
P10.20	Multi-step speed 9	-100.0–100.0%	-100.0–100.0	0.0%
P10.21	Running time of step 9	0.0–6553.5s (min)	0.0–6553.5	0.0s
P10.22	Multi-step speed 10	-100.0–100.0%	-100.0–100.0	0.0%
P10.23	Running time of step 10	0.0–6553.5s (min)	0.0–6553.5	0.0s
P10.24	Multi-step speed 11	-100.0–100.0%	-100.0–100.0	0.0%
P10.25	Running time of step 11	0.0–6553.5s (min)	0.0–6553.5	0.0s
P10.26	Multi-step speed 12	-100.0–100.0%	-100.0–100.0	0.0%
P10.27	Running time of step 12	0.0–6553.5s (min)	0.0–6553.5	0.0s
P10.28	Multi-step speed 13	-100.0–100.0%	-100.0–100.0	0.0%
P10.29	Running time of step 13	0.0–6553.5s (min)	0.0–6553.5	0.0s

Function code	Name	Description	Setting range	Default
P10.30	Multi-step speed 14	-100.0–100.0%	-100.0–100.0	0.0%
P10.31	Running time of step 14	0.0–6553.5s (min)	0.0–6553.5	0.0s
P10.32	Multi-step speed 15	-100.0–100.0%	-100.0–100.0	0.0%
P10.33	Running time of step 15	0.0–6553.5s (min)	0.0–6553.5	0.0s

100% of the frequency setting corresponds to the maximum output frequency P00.03.

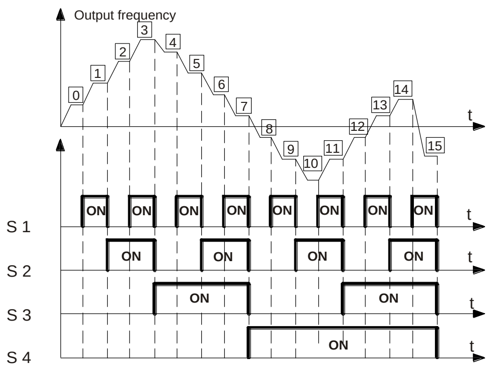
It is necessary for simple PLC to set P10.02–P10.33 to ensure the running frequency and direction of each step.

Note: The sign of multi-step speed decides the running direction of simple PLC. Value with minus indicates reverse running.



Multi-step speed can be set continuously in the range of -f_{max}–f_{max}

Goodrive3000 VFDs can be set with 16-step speed selected by the combined codes of 1–4 multi-step terminals, corresponding to multi-step speed 0–15 separately.



When S1=S2=S3=S4=OFF, the output way of the frequency is selected by the function code P00.06 or P00.07. When not all S1=S2=S3=S4 terminals are off, the VFD runs at multi-step speed and the multi-step speed has the priority over the keypad, analog values, high-speed pulse, PLC and communication frequency input. Select at most 16-step speed via the the combined codes of S1, S2, S3 and S4.

The start-up and stop of multi-step speed is determined by the function code P00.01. The relationship between the terminals of S1, S2, S3 and S4 and the multi-step speed is shown as follows:

S1	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON
S2	OFF	OFF	ON	ON	OFF	OFF	ON	ON	OFF	OFF	ON	ON	OFF	OFF	ON	ON
S3	OFF	OFF	OFF	OFF	ON	ON	ON	ON	OFF	OFF	OFF	OFF	ON	ON	ON	ON
S4	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON
Step	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Function code	Name	Description	Setting range	Default
P10.34	Simple PLC 0–7 step ACC/DEC time	0x0000–0xFFFF	00000–FFFF	0x0000
P10.35	Simple PLC 8–15 step ACC/DEC time	0x0000–0xFFFF	00000–FFFF	0x0000

See the detailed instruction in following table:

Function code	Binary bit		Step	ACC/DEC time 1	ACC/DEC time 2	ACC/DEC time 3	ACC/DEC time 4
P10.34	BIT1	BIT0	0	00	01	10	11
	BIT3	BIT2	1	00	01	10	11
	BIT5	BIT4	2	00	01	10	11
	BIT7	BIT6	3	00	01	10	11
	BIT9	BIT8	4	00	01	10	11
	BIT11	BIT10	5	00	01	10	11
	BIT13	BIT12	6	00	01	10	11
	BIT15	BIT14	7	00	01	10	11
P10.35	BIT1	BIT0	8	00	01	10	11
	BIT3	BIT2	9	00	01	10	11
	BIT5	BIT4	10	00	01	10	11
	BIT7	BIT6	11	00	01	10	11
	BIT9	BIT8	12	00	01	10	11
	BIT11	BIT10	13	00	01	10	11
	BIT13	BIT12	14	00	01	10	11
	BIT15	BIT14	15	00	01	10	11

After selecting corresponding ACC/DEC time, users have to convert the combined 16 binary bit into the decimal bit and set the related function codes.

Function code	Name	Description	Setting range	Default
P10.36	PLC restart	0: Restart from the first step 1: Continue to run from the stop frequency	0–1	0

Set the restart manners of PLC.

0: Restart from the first step: the VFD will restart from the first step after stop (caused by the stop command, faults or power loss).

1: Continue to run from the stop frequency: the VFD will record the running time at current step after stop (caused by the stop command or faults), automatically enter into the step and then remain to run at the frequency defined by the step.

Function code	Name	Description	Setting range	Default
P10.37	Multi-step time unit	0: Second 1: Minute	0–1	0

Set the time unit.

0: Second: the running time of all steps is counted by second.

1: Minute: the running time of all steps is counted by minute.

P11 group—Protective parameters

Function code	Name	Description	Setting range	Default
P11.00	Phase loss protection	0x00–0x11 LED ones: 0: Disable input phase loss protection 1: Enable input phase loss protection LED tens: 0: Disable output phase loss protection 1: Enable output phase loss protection	00–11	11

Enable the function of phase loss protection.

Function code	Name	Description	Setting range	Default
P11.01	Instantaneous power loss frequency decreasing	0: Disabled 1: Enabled	0–1	0

Enable instantaneous power loss frequency-decreasing function.

Function code	Name	Description	Setting range	Default
P11.02	Frequency decreasing velocity of instantaneous power loss	0.00Hz/s–P00.03Hz/s (Max. frequency)	0.00–P00.03	1.00Hz/s

After the power loss of the grid, when the bus voltage drops to the instantaneous power loss frequency-decreasing point, the VFD begins to decrease the running frequency according to the decreasing velocity and make the motor in power generation again. The feedback power can maintain the bus voltage to ensure the continuous running of the VFD until the recovery of power.

Voltage class	660V	1140V	2300V	3300V
Frequency-decreasing point of instantaneous power loss	700V	1350V	2700V	3900V

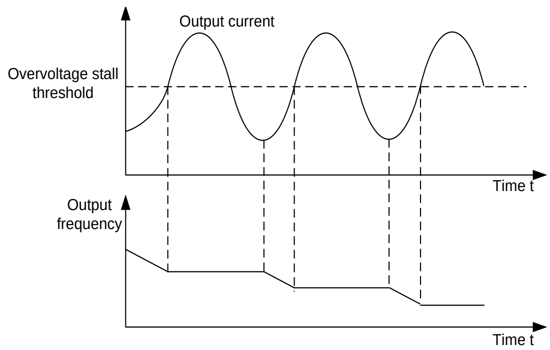
Note:

1. Adjusting the parameter properly can prevent the stop caused by the VFD protection during shifting the grid.

2. The function can be enabled only by disabling input phase loss protection.

Function code	Name	Description	Setting range	Default
P11.03	Overvoltage speed loss protection	0: Disabled 1: Enabled	0–1	0

Enable the function of overvoltage speed loss protection.



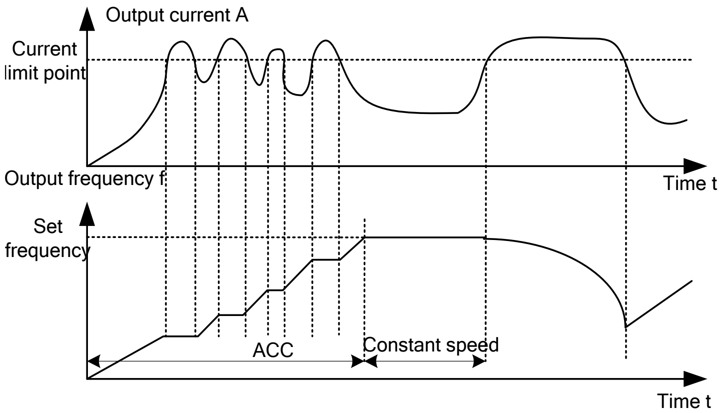
Function code	Name	Description	Setting range	Default
P11.04	Voltage protection of overvoltage stall	120–150% (standard bus voltage)	120–150	130%

Set the protection point of overvoltage stall.

Function code	Name	Description	Setting range	Default
P11.05	Current limit action	Ones: current limit: 0:Invalid 1:Valid Tens: overload alarm of hardware current limit (for factory commissioning) 0: Valid 1: Invalid	00–11	01
P11.06	Automatic current limit level	50.0–200.0% (100% corresponds to rated current)	50.0–200.0	160.0%
P11.07	Frequency decreasing velocity during current limit	0.00–50.00Hz/s	0.00–50.00	10.00Hz/s

During ACC running of the VFD, due to heavy load, the actual increasing ratio of the motor speed is lower than the increasing ratio of output frequency. The trips of the VFD will be caused by the ACC overcurrent fault if there are not any measures.

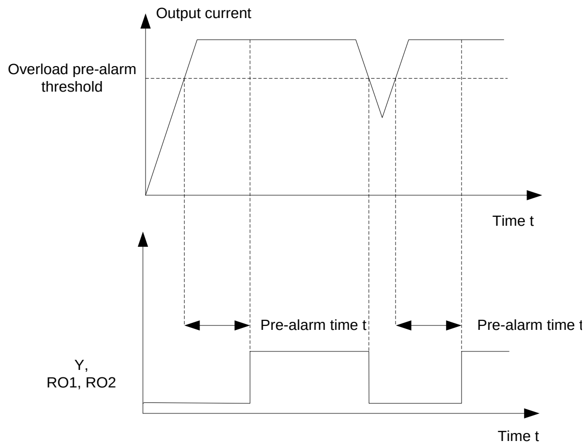
During the running of the VFD, this function will detect the output current and compare it with the limit level defined in P11.06. If it exceeds the level, the VFD will run at stable frequency during ACC running, while the VFD will derate to run during the constant running. If it exceeds the level continuously, the output frequency will keep decreasing to the lower limit. If the detected output current is lower than the limit level, the VFD will continue ACC running.



Function code	Name	Description	Setting range	Default
P11.08	VFD/Motor underload and overload pre-alarm	0x000–0x131 LED ones: 0: Motor underload and overload pre-alarm, relative to motor rated current 1: VFD underload and overload pre-alarm, relative to VFD rated current LED tens: 0: VFD continues running after underload and overload pre-alarm 1: VFD continues running after underload pre-alarm and stop running after overload fault 2: VFD continues running after overload pre-alarm and stop running after underload fault 3: VFD stops running after underload and overload alarm LED hundreds: 0: Detect all the time 1: Detect in constant running	000–131	0x000

Function code	Name	Description	Setting range	Default
P11.09	Detection level of overload pre-alarm	P11.11–200%	P11.11–200	150%
P11.10	Detection time of overload pre-alarm	0.1–60.0s	0.1–60.0	1.0s
P11.11	Detection level of underload pre-alarm	0%–P11.09	0–P11.09	50%
P11.12	Detection time of underload pre-alarm	0.1–60.0s	0.1–60.0	1.0s

Overload pre-alarm signals will be output when the output current of the VFD or motor is higher than the detection level of overload pre-alarm (P11.09) and the duration exceeds the detection time of overload pre-alarm (P11.10).



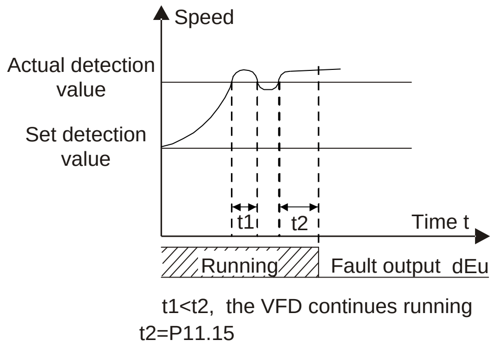
Underload pre-alarm signals will be output when the output current of the VFD or motor is lower than the detection level of underload pre-alarm (P11.11) and the duration exceeds the detection time of underload pre-alarm (P11.12).

Note: The set value of underload pre-alarm detection level (P11.11) should be smaller than the set value of overload pre-alarm detection level (P11.09).

Function code	Name	Description	Setting range	Default
P11.13	Output terminal action during undervoltage and auto-reset	0x00–0x11 LED ones: 0: Action at undervoltage 1: No action at undervoltage LED tens: 0: Action during auto-reset 1: No action during auto-reset	00–11	0x00

Function code	Name	Description	Setting range	Default
P11.14	Detection value of speed deviation	0.0–50.0%	0.0–50.0	10.0%
P11.15	Detection time of speed deviation	0.0–10.0s (No speed deviation protection at 0.0)	0.0–10.0	0.5s

Set the detection time of speed deviation.



Function code	Name	Description	Setting range	Default
P11.16	Automatic frequency-decreasing at voltage drop	0:Invalid 1:Valid	0–1	0

P12 group—Motor 2 parameters

Function code	Name	Description	Setting range	Default
P12.00	Motor 2 type	0: Asynchronous motor 1: Reserved	0–1	0
P12.01	Asynchronous motor 2 rated power	0.1–3000.0kW	0.1–3000.0	Depends on model
P12.02	Asynchronous motor 2 rated frequency	0.01Hz–P00.03 (Max. frequency)	0.01–P00.03	50.00Hz
P12.03	Asynchronous motor 2 rated speed	1–36000rpm	1–36000	Depends on model
P12.04	Asynchronous motor 2 rated voltage	0–4000V	0–4000	Depends on model
P12.05	Asynchronous motor 2 rated current	0.8–6000.0A	0.8–6000.0	Depends on model
P12.06	Asynchronous motor 2 stator resistor	0.001–65.535Ω	0.001–65.535Ω	Depends on model
P12.07	Asynchronous motor 2 rotor resistor	0.001–65.535Ω	0.001–65.535Ω	Depends on model
P12.08	Asynchronous motor 2 leakage inductance	0.1–6553.5mH	0.1–6553.5mH	Depends on model
P12.09	Asynchronous motor 2 mutual inductance	0.1–6553.5mH	0.1–6553.5mH	Depends on model
P12.10	Asynchronous motor 2 non-load current	0.1–6553.5A	0.1–6553.5A	Depends on model
P12.11	Magnetic saturation coefficient 1 for the iron core of AM 2	0.0–100.0%	0.0–100.0	80.0%
P12.12	Magnetic saturation coefficient 2 for the iron core of AM 2	0.0–100.0%	0.0–100.0	68.0%
P12.13	Magnetic saturation coefficient 3 for the iron core of AM 2	0.0–100.0%	0.0–100.0	57.0%
P12.14	Magnetic saturation coefficient 4 for the	0.0–100.0%	0.0–100.0	40.0%

Function code	Name	Description	Setting range	Default
	iron core of AM 2			
P12.26	Motor 2 overload protection	0: No protection 1: Common motor (with low speed compensation) 2: Frequency conversion motor (without low speed compensation)	0–2	2
P12.27	Motor 2 overload protection coefficient	20.0%–120.0%	20.0–120.0	100.0%
P12.28	Motor 2 power correction coefficient	0.00–3.00	0.00–3.00	1.00
P12.31	Motor 2 parameter display	0: Display according to motor type 1: Display all parameters	0–1	0

For the parameter settings of synchronous motor 2, refer to the settings of synchronous motor 1 in P02 group.

P14 group—Serial communication

Function code	Name	Description	Setting range	Default
P14.00	Local communication address	1–247 0 is broadcast communication address.	1–247	1

When the master is at write frame and the communication address of the slave is set to 0 (broadcast communication address), all the slaves of the MODBUS will accept the frame without response.

Local communication address is unique in communication network and it is the foundation to achieve point-to-point communication between the upper computer and VFD.

Note: The address of the slave cannot be set to 0.

Function code	Name	Description	Setting range	Default
P14.01	Communication baud rate	0: 1200BPS 1: 2400BPS 2: 4800BPS 3: 9600BPS 4: 19200BPS 5: 38400BPS 6: 57600BPS	0–6	4

Set the data baud rate between the upper computer and VFD.

Note: The baud rates set by the upper computer and VFD should agree with each other; otherwise, the communication is disabled. The larger the baud rate is, the faster the communication is.

Function code	Name	Description	Setting range	Default
P14.02	Data bit checkout	0: No check (N, 8, 1) for RTU 1: Even check (E, 8, 1) for RTU 2: Odd check (O, 8, 1) for RTU 3: No check (N, 8, 2) for RTU 4: Even check (E, 8, 2) for RTU 5: Odd check (O, 8, 2) for RTU	0–5	1

The data formats set by the upper computer and VFD should agree with each other; otherwise, the communication is disabled.

Function code	Name	Description	Setting range	Default
P14.03	Communication response delay	0–200ms	0–200	5

The function code refers to the interval when the VFD receives data and sends response to the upper computer. If the response delay is shorter than the processing time, take the processing time as the standard. If the response delay is longer than the processing time, delay and wait to send data to the upper computer until the response delay arrival after the system finishes processing data.

Function code	Name	Description	Setting range	Default
P14.04	Fault time of communication timeout	0.1–60.0s 0.0: Invalid	0.0–60.0	0.0s

When the function code is set to 0.0, the parameter will be invalid.

When the function code is set to non-zero and the interval between the current and next communication exceeds the communication timeout, the system will alarm 485 communication fault (CE).

Generally, set the parameter to be invalid. The parameter setting can monitor communication state in continuous communication system.

Function code	Name	Description	Setting range	Default
P14.05	Transmission fault processing	0: Alarm and coast to stop 1: Continue to run without alarm 2: Stop according to stop way without alarm (only in communication control mode) 3: Stop according to stop way without alarm (in all control modes)	0–3	0

Set the processing ways for transmission fault.

Function code	Name	Description	Setting range	Default
P14.06	Communication processing action	LED ones: 0: With response to write operation 1: Without response to write operation LED tens: 0: Communication encryption setting	0x00–0x11	0x00

Function code	Name	Description	Setting range	Default
		is invalid 1: Communication encryption setting is valid		

Select communication processing actions.

LED ones:

0: With response to write operation: there are responses to write and read commands of the upper computer.

1: Without response to write operation: there is response only to read command and no response to the write command, which can improve the communication efficiency.

P15 group—PROFIBUS function

Function code	Name	Description	Setting range	Default
P15.00	Module type	0: PROFIBUS	0–1	0

Select the communication protocol.

Function code	Name	Description	Setting range	Default
P15.01	PROFIBUS/CANopen module address	0–127	0–127	2

The function code is used to identify the address of the VFD during serial communication.

Note: 0 is the broadcast address only for receiving and carrying out broadcast command of upper computer rather than response.

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Setting range</th><th>Default</th></tr>
<tr><td>P15.02</td><td>Received PZD2</td><td rowspan="11">0: Invalid
1: Set frequency (0–Fmax; unit: 0.01Hz)
2: PID reference (range: 0–1000, 1000 corresponding to 100.0%)
3: PID feedback (range: 0–1000, 1000 corresponding to 100.0%)
4: Torque setting (-3000–3000, 1000 corresponding to 100.0% of motor rated current)
5: Forward rotation upper-limit frequency setting (0–Fmax; unit: 0.01Hz)
6: Reverse rotation upper-limit frequency (0–Fmax; unit: 0.01Hz)
7: Electromotion torque upper limit (0–3000, 1000 corresponding to 100.0% of motor rated current)
8: Braking torque upper limit (0–2000, 1000 corresponding to 100.0% of motor rated current)
9: Virtual input terminal command (range: 0x000–0x1FF)</td><td>0–20</td><td>0</td></tr>
<tr><td>P15.03</td><td>Received PZD3</td><td>0–20</td><td>0</td></tr>
<tr><td>P15.04</td><td>Received PZD4</td><td>0–20</td><td>0</td></tr>
<tr><td>P15.05</td><td>Received PZD5</td><td>0–20</td><td>0</td></tr>
<tr><td>P15.06</td><td>Received PZD6</td><td>0–20</td><td>0</td></tr>
<tr><td>P15.07</td><td>Received PZD7</td><td>0–20</td><td>0</td></tr>
<tr><td>P15.08</td><td>Received PZD8</td><td>0–20</td><td>0</td></tr>
<tr><td>P15.09</td><td>Received PZD9</td><td>0–20</td><td>0</td></tr>
<tr><td>P15.10</td><td>Received PZD10</td><td>0–20</td><td>0</td></tr>
<tr><td>P15.11</td><td>Received PZD11</td><td>0–20</td><td>0</td></tr>
<tr><td>P15.12</td><td>Received PZD12</td><td>0–20</td><td>0</td></tr>
</table>

Function code	Name	Description	Setting range	Default
		10: Virtual output terminal command (range: 0x00–0x0F) 11: Voltage setting (special for V/F separation) (0–1000, 1000 corresponding to 100.0% of motor rated voltage) 12: AO setting 1 (-1000–1000, 1000 corresponding to 100.0%) 13: AO setting 2 (-1000–1000, 1000 corresponding to 100.0%)		

For the second PZD in PROFIBUS-DP communication and master communication (receiving), see detailed information as follows:

Function	Name	Illustration
0	Invalid	
1	Set frequency	0–Fmax (Unit: 0.01Hz)
2	PID reference	Range (0–1000, 1000 corresponds to 100.0%)
3	PID feedback	Range (0–1000, 1000 corresponds to 100.0%)
4	Torque set value	Range (-3000–3000, 1000 corresponds to 100.0% of motor rated current)
5	Set value of forward rotation upper-limit frequency	0–Fmax (Unit: 0.01Hz)
6	Set value of reverse rotation upper-limit frequency	0–Fmax (Unit: 0.01Hz)
7	Electromotion torque upper limit	0–3000, 1000 corresponds to 100.0% of motor rated current
8	Braking torque upper limit	0–2000, 1000 corresponds to 100.0% of motor rated current
9	Virtual input terminal command	Range: 0x000–0x1FF
10	Virtual output terminal command	Range: 0x00–0x0F
11	Voltage set value	Special for V/F separation, range (0–1000, 1000 corresponds to 100.0% of motor rated voltage)

Function	Name	Illustration
12	AO output set value 1	Range (-1000–1000, 1000 corresponds to 100.0%)
13	AO output set value 2	Range (-1000–1000, 1000 corresponds to 100.0%)

Function code	Name	Description	Setting range	Default
P15.13	Sent PZD2	0: Invalid 1: Running frequency 2: Set frequency 3: Bus voltage 4: Output voltage 5: Output current 6: Output torque actual value 7: Output power actual value 8: Running rotating speed 9: Running linear speed 10: Ramp reference frequency 11: Fault code 12: AI1 value 13: AI2 value 14: AI3 value 15: PULSE frequency 16: Input state of terminals 17: Output state of terminals 18: PID reference 19: PID feedback 20: Motor rated torque	0–20	0
P15.14	Sent PZD3		0–20	0
P15.15	Sent PZD4		0–20	0
P15.16	Sent PZD5		0–20	0
P15.17	Sent PZD6		0–20	0
P15.18	Sent PZD7		0–20	0
P15.19	Sent PZD8		0–20	0
P15.20	Sent PZD9		0–20	0
P15.21	Sent PZD10		0–20	0
P15.22	Sent PZD11		0–20	0
P15.23	Sent PZD12		0–20	0

For the second PZD in PROFIBUS-DP communication and master communication (sending), see detailed information as follows:

Function	Name	Illustration
0	Invalid	
1	Running frequency	(*100, Hz)
2	Set frequency	(*100, Hz)
3	Bus voltage	(*10, V)

Function	Name	Illustration
4	Output voltage	(*1, V)
5	Output current	(*10, A)
6	Output torque actual value	(*10, %)
7	Output power actual value	(*10, %)
8	Running rotating speed	(*1, RPM)
9	Running linear speed	(*1, m/s)
10	Ramp reference frequency	
11	fault code	
12	AI1 value	(*100, V)
13	AI2 value	(*100, V)
14	AI3 value	(*100, V)
15	PULSE frequency	(*100, kHz)
16	Input state of terminals	
17	Output state of terminals	
18	PID reference	(*100, %)
19	PID feedback	(*100, %)
20	Motor rated torque	

Function code	Name	Description	Setting range	Default
P15.24	Temporary variable 1 for PZD sending	0–65535	0–65535	0

The function code is use as the temporary variable when PZD sends data.

The function code P15.24 is enabled to write at any state.

Function code	Name	Description	Setting range	Default
P15.25	Fault time of DP communication overtime	0.1–60.0s 0.0: Invalid	0.0–60.0	0.0s

When the function code is set to 0.0s, the fault time of communication timeout will be invalid.

When the function code is set to non-zero (actual value, unit: second) and the interval between the current and next communication exceeds the communication timeout, the system will alarm DP communication fault (E-dP).

Function code	Name	Description	Setting range	Default
P15.26	Fault time of CANopen communication timeout	0.0 (invalid) 0.1–60.0s	0.0–60.0	0.0

When the function code=0.0s, the communication timeout fault will be invalid.

When the function code=non-zero and the interval between the current and next communication exceeds the communication timeout, the system will alarm communication fault (E-CAN). Generally, set the parameter to be invalid. The parameter setting can monitor the state in continuous communication system.

Function code	Name	Description	Setting range	Default
P15.27	CANopen baud rate	0: 1000k 1: 800k 2: 500k 3: 250k 4: 125k 5: 100k 6: 50k 7: 20k	0–7	0

Function code	Name	Description	Setting range	Default
P15.28	CAN communication address	0–127 0 is broadcast communication address.	0–127	1
P15.29	CAN baud rate	0: 1000k 1: 500k 2: 250k 3: 125k 4: 100k	0–4	1

P16 group—Ethernet function

Function code	Name	Description	Setting range	Default
P16.00	Ethernet communication speed setting	0: Self-adapting 1: 100M full-duplex 2: 100M half-duplex 3: 10M full-duplex 4: 10M half-duplex	0–4	3

The function code is used for Ethernet communication speed setting. Generally, select the default value.

Function code	Name	Description	Setting range	Default
P16.01	IP address 1	0–255	0–255	192
P16.02	IP address 2	0–255	0–255	168
P16.03	IP address 3	0–255	0–255	0
P16.04	IP address 4	0–255	0–255	1
P16.05	Subnet mask 1	0–255	0–255	255
P16.06	Subnet mask 2	0–255	0–255	255
P16.07	Subnet mask 3	0–255	0–255	255
P16.08	Subnet mask 4	0–255	0–255	0

The function codes are used to set the IP addresses and subnet masks for Ethernet communication.

IP address format: P16.01. P16.02. P16.03. P16.04 For example: IP address is 192.168.0.1.

Subnet mask format: P16.05. P16.06. P16.07. P16.08 For example: Subnet mask is 255.255.255.0.

Function code	Name	Description	Setting range	Default
P16.09	Gateway 1	0–255	0–255	192
P16.10	Gateway 2	0–255	0–255	168
P16.11	Gateway 3	0–255	0–255	1
P16.12	Gateway 4	0–255	0–255	1

Set the gateway for Ethernet communication.

P17 group—State view 1

Function code	Name	Description	Setting range	Default
P17.00	Setting frequency	Display current set frequency of the VFD Range: 0.00Hz–P00.03	0.00–P00.03	0.00Hz
P17.01	Output frequency	Display current output frequency of the VFD Range: 0.00Hz–P00.03	0.00–P00.03	0.00Hz
P17.02	Ramp reference frequency	Display current ramp given frequency of the VFD Range: 0.00Hz–P00.03	0.00–P00.03	0.00Hz
P17.03	Output voltage	Display current output voltage of the VFD Range: 0–4000V	0–4000	0V
P17.04	Output current	Display current output current of the VFD Range: 0.0–3000.0A	0.0–3000.0	0.0A
P17.05	Motor speed	Display the rotation speed of the motor. Range: 0–65535RPM	0–65535	0 RPM
P17.06	Torque current	Display current torque current of the VFD Range: -3000.0–3000.0A	-3000.0–3000.0A	0.0A
P17.07	Exciting current	Display current exciting current of the VFD Range: -3000.0–3000.0A	-3000.0–3000.0A	0.0A
P17.08	Motor power	Display current power of the motor. Setting range: -300.0%–300.0% (the rated current of the motor)	-300.0–300.0	0.0%
P17.09	Output torque	Display the current output torque of the VFD. Range: -250.0–250.0%	-250.0–250.0	0.0%
P17.10	Evaluated motor frequency	Evaluate the motor rotor frequency on open loop vector Range: 0.00– P00.03	0.00–P00.03	0.00Hz

Function code	Name	Description	Setting range	Default
P17.11	DC bus voltage	Display current DC bus voltage of the VFD Range: 0.0–6000.0V	0.0–6000.0	0V
P17.12	Digital input terminals state	Display current switch input terminals state of the VFD 0000–00FF	0000–00FF	0
P17.13	Digital output terminals state	Display current switch output terminals state of the VFD 0000–000F	0000–000F	0
P17.14	Digital adjustment	Display the adjustment through the keypad of the VFD. Range : 0.00Hz–P00.03	0.00Hz–P00.03	0.00Hz
P17.15	Torque reference	Display the torque given, the percentage to the current rated torque of the motor. Setting range: -300.0%–300.0% (the rated current of the motor)	-300.0–300.0	0.0%
P17.19	AI1 input voltage	Display analog AI1 input signal Range: 0.00–10.00V	0.00–10.00	0.00V
P17.20	AI2 input voltage	Display analog AI2 input signal Range: -10.00–10.00V	-10.00–10.00	0.00V
P17.21	AI3 input voltage	Display analog AI3 input signal Range: 0.00–10.00V	0.00–10.00	0.00V
P17.22	HDI input frequency	Display HDI input frequency Range: 0.00–50.00kHz	0.00–50.00	0.00 kHz
P17.23	PID reference	Display PID given value Range: -100.0–100.0%	-100.0–100.0	0.0%
P17.24	PID feedback	Display PID response value Range: -100.0–100.0%	-100.0–100.0	0.0%
P17.25	Power factor of the motor	Display the current power factor of the motor. Range: -1.00–1.00	-1.00–1.00	0.0
P17.26	Current running time	Display the current running time of	0–65535	0min

Function code	Name	Description	Setting range	Default
		the VFD. Range:0–65535m		
P17.27	Simple PLC and the current step of the multi-step speed	Display simple PLC and the current stage of the multi-step speed Range: 0–15	0–15	0
P17.28	ASR controller output	The percentage of the rated torque of the relative motor, display ASR controller output Range: -300.0%–300.0% (the rated current of the motor)	-300.0–300.0	0.0%
P17.32	Magnetic flux linkage	Display the magnetic flux linkage of the motor. Range: 0.0%–200.0%	0.0–200.0	0.0%
P17.33	Exciting current reference	Display the exciting current reference in the vector control mode. Range: -3000.0–3000.0A	-3000.0–3000.0	0.0A
P17.34	Torque current reference	Display the torque current reference in the vector control mode. Range: -3000.0–3000.0A	-3000.0–3000.0	0.0A
P17.35	AC current	Display the value of inlet current in AC side. Range: 0.0–5000.0A	0.0–5000.0	0.0A
P17.36	Output torque	Display the output torque. Positive value is in the electromotion state, and negative is in the power generating state. Range : -3000.0Nm–3000.0Nm	0–65535	0.0Nm
P17.37	Count value of motor overload	0–100(100 reports OL1 fault)	0–100	0
P17.38	PID output	-100.00–100.00%	-100.00–100.0	0.00%
P17.39	Wrong download of parameters	0.00–99.99	0.00–99.99	0.00

P18 group—State view 2

Function code	Name	Description	Setting range	Default
P18.00	Encoder actual frequency	-327.7–327.7Hz	-327.7–327.7	0.00Hz
P18.01	Count value of encoder position	0–65535	0–65535	0
P18.02	Count value of encoder Z pulse	0–65535	0–65535	0
P18.03	Rotary count value	0–65535	0–65535	
P18.04	Rotary angle	0–359.99	0–359.99	
P18.05	Pole angle	0–359.99	0–359.99	
P18.06	Motor temperature display	-200.0–200.0°C	-200.0–200.0°C	0.0°C
P18.07	Frequency reference sent by master	-100.00–100.00% (Max. frequency of the VFD)	-100.00–100.00	
P18.08	Speed loop output sent by master	-300.00–300.00% (motor rated current)	-300.00–300.00	
P18.09	Frequency command received by slave	-100.00–100.00% (Max. frequency of the VFD)	-100.00–100.00	
P18.10	Torque command received by slave	-300.00–300.00% (motor rated current)	-300.00–300.00	
P18.13	FPGA software version	1.00–655.35		

P19 group—External temperature detection

Function code	Name	Description	Setting range	Default
P19.00	Motor temperature detection	0: Invalid 1: PT100 2: PTC 3: Reserved 4: Reserved	0–4	0
P19.01	Motor temperature pre-alarm point	0°C–200°C (0°C: pre-alarm invalid)	0°C–200°C	125°C
P19.02	Motor overtemperature fault point	0°C–200°C (0°C: pre-alarm invalid)	0°C–200°C	150°C
P19.03	Motor overtemperature action	0: Alarm fault and coast to stop 1: No alarm and keep running 2: No alarm and stop	0–2	0
P19.04	Starting temperature of motor temperature compensation	0–60.0°C	0–60.0	40.0°C
P19.05	Motor temperature compensation coefficient	0.0–200.0%	0.0–200.0	100.0%

P20 group—Encoders

Function code	Name	Description	Setting range	Default
P20.00	Encoder type	0: Increment encoder 1: Reserved 2: Rotary encoder 3: Reserved	0–3	0

Select the encoder type.

Note: It is necessary to select the optional card.

Function code	Name	Description	Setting range	Default
P20.01	Encoder pulse number	0–60000	0–60000	1024

Set the encoder pulse number per rotation.

Function code	Name	Description	Setting range	Default
P20.02	Encoder direction	LED ones: AB direction 0: Forward 1: Reverse LED tens: Z pulse direction 0: Forward 1: Reverse	0–0x11	0x00

Note: Please set the encoder pulse number correctly under the closed loop vector control mode (P20.01); otherwise, the motor will not run properly. If it still cannot run properly after parameter setting of the encoder, change the encoder direction (P20.02).

Function code	Name	Description	Setting range	Default
P20.03	Encoder offline detection time	0.0–100.0s	0.0–100.0	0.5s
P20.04	Encoder reverse detection time	0.0–100.0s	0.0–100.0	0.8s
P20.05	Encoder detection	Ones: Low-speed filter times	0–0x99	0x23

Function code	Name	Description	Setting range	Default
	filter times	Tens: High-speed filter times		

P20.03 defines encoder offline detection time. When the offline time exceeds the set time, the VFD will alarm encoder offline fault (ENCIO). P20.04 defines encoder reverse detection time. When the reverse detection time exceeds the set time, the VFD will alarm encoder reverse fault (ENCID).

Note: Adjusting above parameters will influence the flexibility of encoder fault protection and sometimes abnormal actions may occur, so adjust carefully.

Function code	Name	Description	Setting range	Default
P20.06	Speed ratio between motor and encoder	0.000–65.535	0.000–65.535	1.000

Set the speed ratio between motor and encoder according to actual conditions.

Function code	Name	Description	Setting range	Default
P20.10	Magnetic pole initial angle	0.00–359.99	0.00–359.99	0.00
P20.11	Magnetic pole initial angle autotuning	0–2 0: No operation 1: Rotation autotuning 2: Static autotuning (suitable for rotary encoder feedback)	0–2	0

P21 group—Master-slave control

Function code	Name	Description	Setting range	Default
P21.00	Master-slave control mode	0: Invalid 1: The local is the master 2: The local is the slave	0–2	0

Select the master-slave control mode.

Function code	Name	Description	Setting range	Default
P21.01	Master-slave communication data	0: CAN 1: RS485	0–1	0

Select the master-slave communication data.

Function code	Name	Description	Setting range	Default
P21.02	Master-slave control mode	0: Master-slave mode 0 1: Master-slave mode 1	0–1	0

0: Master-slave mode 0; the master and slave should adopt speed control and droop control for power balance.

1: Master-slave mode 1; the master and slave should be the same type of vector control, speed control mode for the master and torque control mode for the slave.

Function code	Name	Description	Setting range	Default
P21.03	Slave reference signal gain	0.0–500.0%	0.0–500.00	1.00

During master-slave control, slave reference signal=master reference signal×P23.03, facilitate the users adjust the power of the master and slave flexibly.

6.2 Fault information and solution

Code	Fault	Cause	Solution
OUt1	IGBT U phase protection	The acceleration is too fast; There is damage to the internal to IGBT of the phase; Interference causes faulty action; The grounding is not good	Increase ACC time; Ask for support; Check if there is strong interference to the external equipment
OUt2	IGBT U phase protection		
OUt3	IGBT U phase protection		
OC1	Accelerating overcurrent	The acceleration is too fast; The voltage of the grid is too low; The power of the VFD is too low	Increase the ACC time; Check the input power; Select the VFD with a larger power
OC2	Decelerating overcurrent	The deceleration is too fast; The load inertia is large; The power of the VFD is too low	Increase the DEC time; Add proper energy consumption braking components; Select the VFD with a larger power
OC3	Constant overcurrent	The load transients or is abnormal; The voltage of the grid is too low; The power of the VFD is too low; The encoding disk offline or fault when running at high speed in closed loop vector control	Check load or reduce load transients; Check the input power; Select the VFD with a larger power; Check the encoding disk and the wiring
OV1	Accelerating overvoltage	The input voltage is abnormal; Restart the rotating motor after sudden power off	Check the input power; Avoid restart after stop
OV2	Decelerating overvoltage	The deceleration is too fast; The load inertia is large; The input voltage is abnormal	Increase the DEC time; Enlarge the energy braking components; Check the input power
OV3	Constant overvoltage	The input voltage changes abnormally; The load inertia is large	Install input reactors; Add proper energy braking components
UV	Bus undervoltage fault	The voltage of the grid is too low	Check the input power
OL1	Motor overload	The voltage of the power supply is too low; The setting rated current of the motor	Check the power of the supply line; Reset the rated current of the motor;

<table>
<tr><th>Code</th><th>Fault</th><th>Cause</th><th>Solution</th></tr>
<tr><td></td><td></td><td>is incorrect;
The motor stall or load transient is too strong;
The encoding disk is reverse and running at low speed for a long time in closed loop vector control;
The motor power is much larger than load power</td><td>Check the load and adjust the torque lift;
Adjust the direction of the encoding disk;
Select the proper motor</td></tr>
<tr><td>OL2</td><td>VFD overload</td><td>The acceleration is too fast;
Reset the rotating motor;
The voltage of the power supply is too low;
The load is too heavy;
The encoding disk is reverse and running at low speed for a long time in closed loop vector control</td><td>Increase the ACC time;
Avoid the restarting after stopping;
Check the voltage of the supply line;
Select an VFD with bigger power;
Adjust the direction of the encoding disk</td></tr>
<tr><td>SPI</td><td>Input phase loss</td><td>Phase loss of input R,S,T</td><td>Check input power;
Check installation distribution</td></tr>
<tr><td>SPO</td><td>Output phase loss</td><td>U, V, W phase loss output (or three phases of the load are seriously asymmetrical);
The pre-excitation cannot be completed if the motor is not connected</td><td>Check the output distribution;
Check the motor and cable</td></tr>
<tr><td>OH1</td><td>Rectifying module overheat</td><td rowspan="2">Sudden overcurrent of the VFD;
Interphase or grounding short circuit of three phases;
Air duct jam or fan damage;
Ambient temperature is too high;
The connection of control board is not good or the plug-ins are loose;
The auxiliary power supply damage and the drive undervoltage;
The power module bridge is straight-through;
The control board is abnormal</td><td rowspan="2">Refer to solutions to overcurrent;
Re-wiring;
Dredge the air duct or change the fan;
Low the ambient temperature;
Check and reconnect;
Ask for service;
Ask for service;
Ask for service</td></tr>
<tr><td>OH2</td><td>Inverter module overheat</td></tr>
<tr><td>EF</td><td>External fault</td><td>SI external fault input terminals action</td><td>Check the external device input</td></tr>
</table>

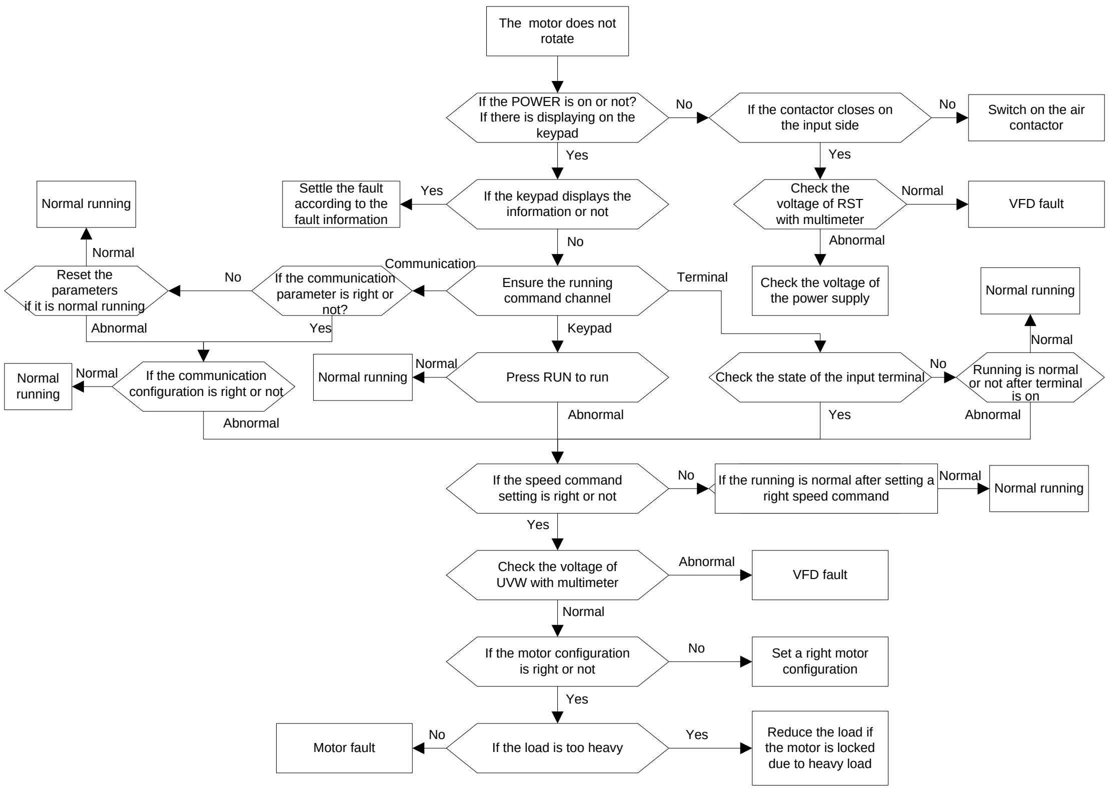
Code	Fault	Cause	Solution
CE	Communication fault	The baud rate setting is incorrect; Communication error to serial communication; Communication interrupt for a long time	Set proper baud rate; Press STOP/RST to reset and ask for service; Check the communication connection distribution
ItE	Current detection fault	The connection of the control board is not good; The auxiliary power supply is broken; Hoare component is broken; The modifying circuit is abnormal	Check the connector and repatch; Ask for service; Ask for service; Ask for service
tE	Motor autotuning fault	The motor capacity does not comply with the VFD capacity; The rated parameter of the motor does not set correctly; The offset between the parameters from autotune and the standard parameter is huge; Autotune overtime	Change the VFD model; Set the rated parameter according to the motor name plate; Empty the motor load and reidentify; Check the motor connection and set the parameter
EEP	EEPROM operation fault	Error of controlling the write and read of the parameters; Damage to EEPROM	Press STOP/RST to reset and ask for service; Ask for service
PIDE	PID feedback outline fault	PID feedback offline; PID feedback source disappear	Check the PID feedback signal; Check the PID feedback source
bCE	Braking unit fault	Braking circuit fault or damage to the braking pipes; The external braking resistor is not sufficient	Check the braking unit and change new braking pipe; Increase the braking resistor
END	Running time arrival	The actual running time of the VFD is above the internal setting running time.	Ask for the supplier and adjust the setting running time.
OL3	Electrical overload	The VFD will report overload pre-alarm according to the set value.	Check the load and the overload pre-alarm point.
PCE	Keypad communication fault	The connection of the keypad wires is not good or broken; The keypad wire is too long and affected by strong interference; There is circuit fault on the	Check the keypad wires and ensure whether there is mistake; Check the environment and avoid the interference source; Change the hardware and ask for

Code	Fault	Cause	Solution
		communication of the keypad and main board	service
UPE	Parameters uploading fault	The connection of the keypad wires is not good or broken; The keypad wire is too long and affected by strong interference; Communication fault	Check the keypad wires and ensure whether there is mistake; Change the hardware and ask for service; Change the hardware and ask for service
DNE	Parameters downloading fault	The connection of the keypad wires is not good or broken; The keypad wire is too long and affected by strong interference; There is mistake on the data storage of the keypad	Check the keypad wires and ensure whether there is mistake; Change the hardware and ask for service; Repack-up the data in the keypad
E-DP	PROFIBUS communication fault	Communication address is not correct; Corresponding resistor is not dialed; The files of main stop GSD does not set sound	Check related setting; Check the environment and avoid the interference
E-NET	Ethernet communication fault	The Ethernet address is not set right; The Ethernet communication is not selected to right; The ambient interference is too strong	Check the relative setting; Check the communication method selection; Check the environment and avoid the interference
E-CAN	CANopen communication fault	The connection is not sound; Corresponding resistor is not dialed; The communication is uneven	Check the connection; Draw out the correspond resistor; Set the same baud rate
ETH1	Grounding short circuit fault 1	The output of the VFD is short circuited with the ground; There is fault in the current detection circuit	Check if the connection of the motor is normal or not; Change the hoare; Change the main control board
dEu	Speed deviation fault	The load is too heavy or stalled.	Check the load and ensure it is normal. Increase the detection time. Check whether the control parameters are normal.
STo	Maladjustment	The control parameters of the	Check the load and ensure it is

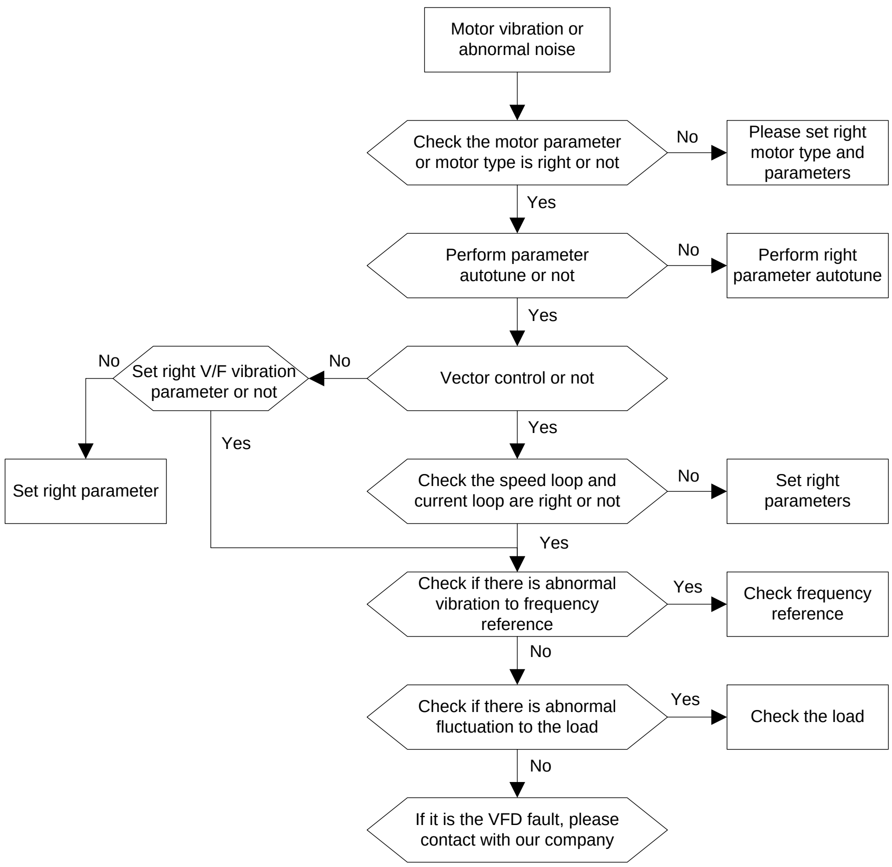
Code	Fault	Cause	Solution
	fault	synchronous motors not set properly; The autotune parameter is not right; The VFD is not connected to the motor	normal; Check whether the control parameter is set properly or not; Increase the maladjustment detection time
LL	Electronic underload fault	The VFD will report the underload pre-alarm according to the set value.	Check the load and the underload pre-alarm point.
ENC1O	Encoder offline fault	Closed loop vector control, the encoder signal is offline; Encoder damage	Check the wiring of the encoder and reconnect; Check whether the encoder has output or not
ENC1D	Encoder reverse fault	Closed loop vector control, the encoder is not connected or damaged or the wiring of the VFD is incorrect.	Check the wiring of the encoder and adjust wiring.
ENC1Z	Encoder Z pulse offline fault	Closed loop vector control, Z pulse signal of the encoder is offline; Encoder damage	Check the wiring of the encoder and reconnect; Check whether the encoder has output or not
Ot	Motor overtemperature fault	The motor runs at overload for a long time or the motor is abnormal; The temperature detection resistor is abnormal; The motor overtemperature protection is set improperly	Detect and maintain the motor; Check whether the temperature sensor is normal or not; Reset motor overtemperature protection point
SCE	SCR fault	SCR damage; SCR drive board damage; SCR drive cable is connected reversely	Change SCR and drive board; Change the drive cable

6.3 Common fault analysis

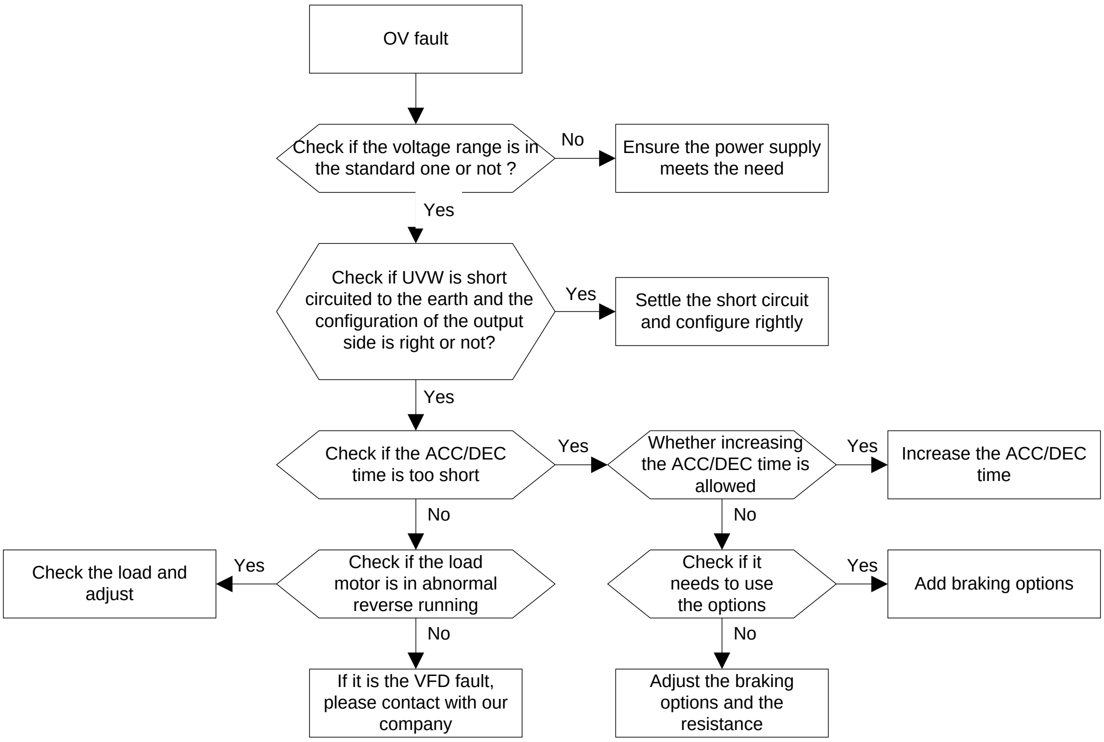
6.3.1 The motor does not work



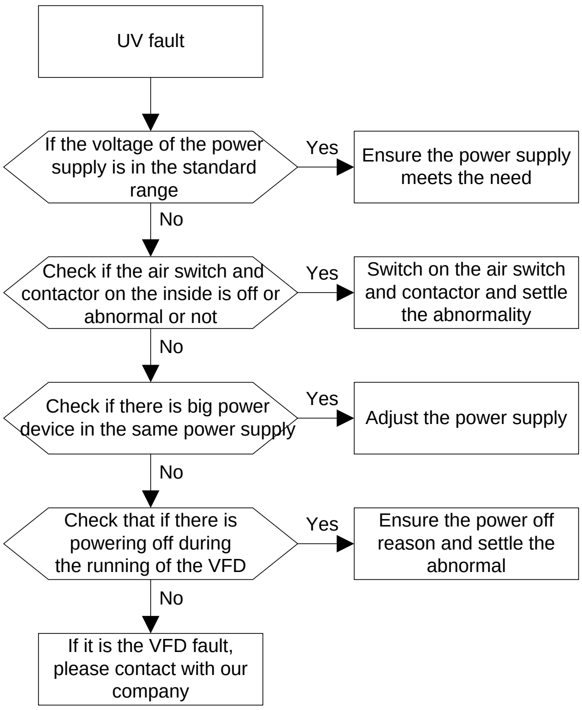
6.3.2 Motor vibration



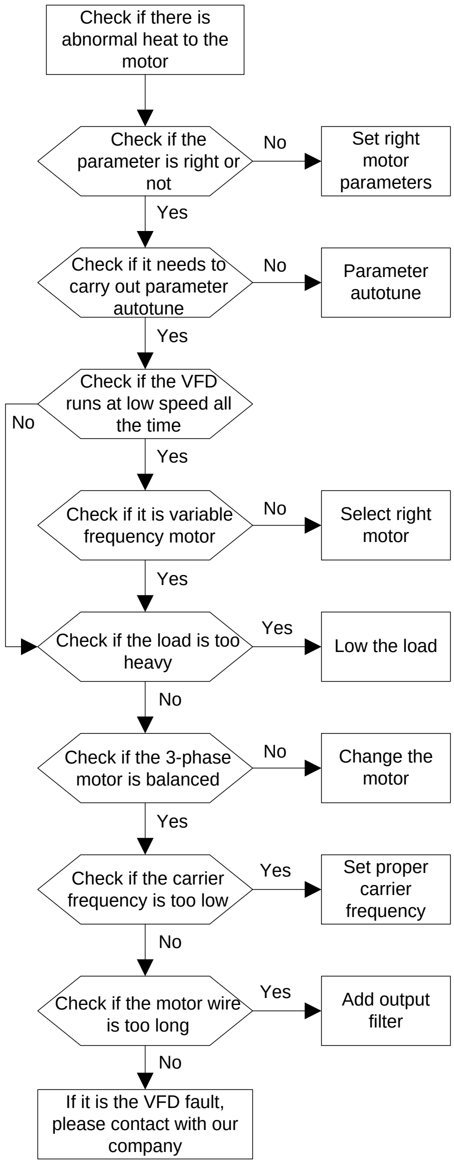
6.3.3 Overvoltage



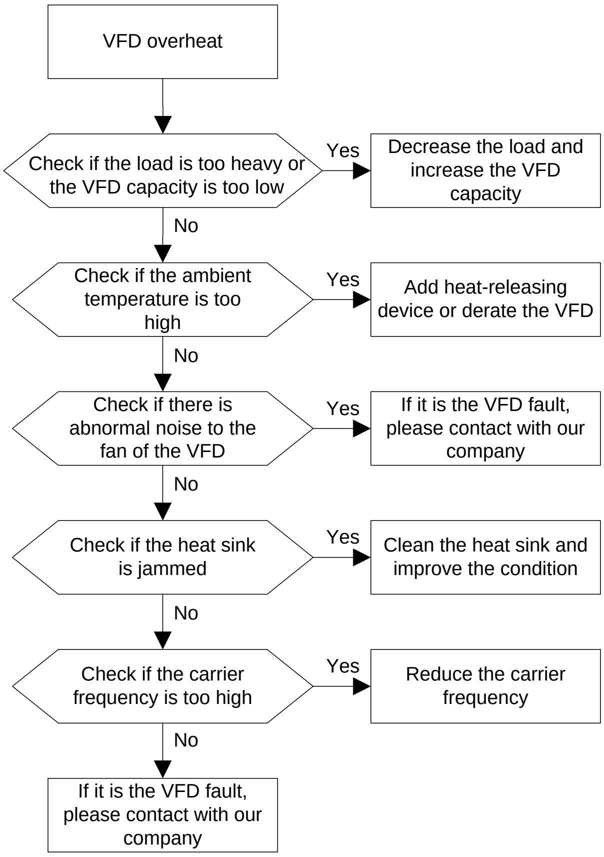
6.3.4 Undervoltage fault



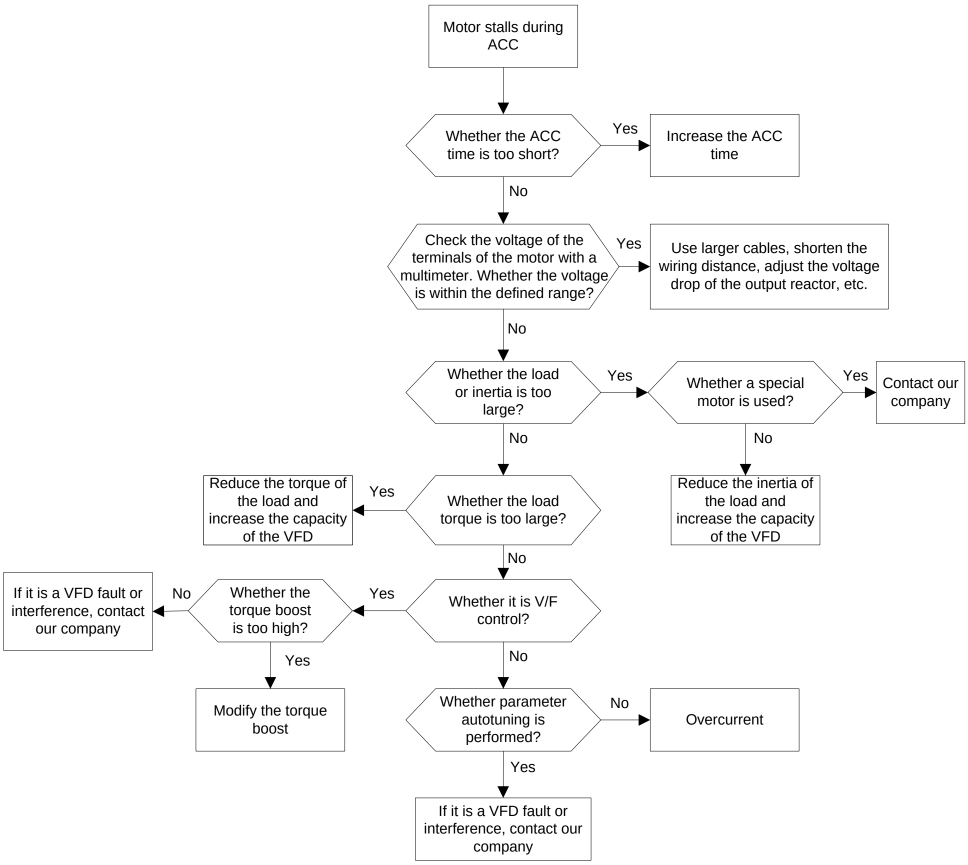
6.3.5 Abnormal heat of the motor



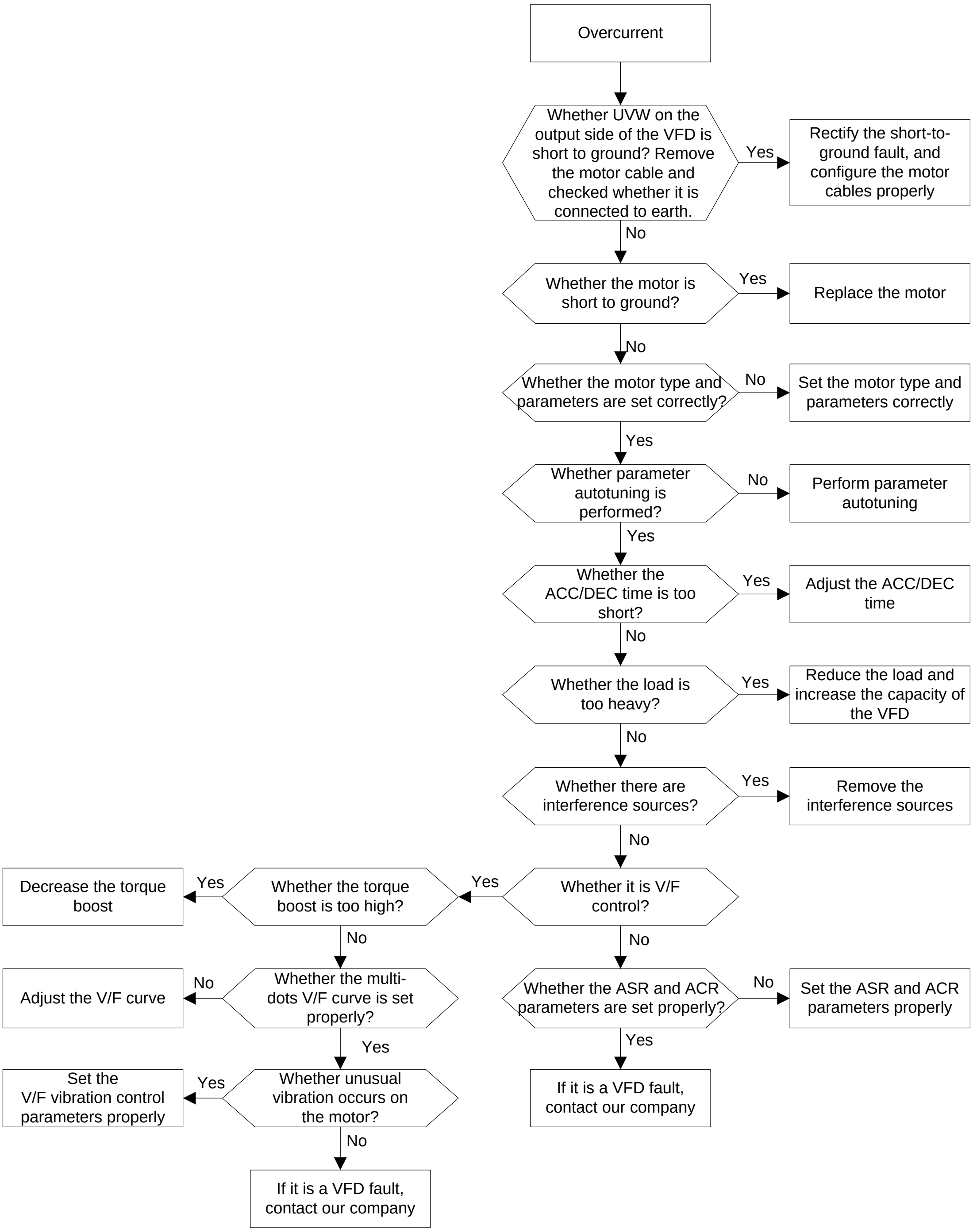
6.3.6 Overheat of the VFD



6.3.7 Motor stall during ACC



6.3.8 Overcurrent



6.4 List of function parameters

The function parameters of Goodrive3000 VFDs have been divided into 22 groups (P00–P21) according to the function. Each function group contains certain function codes applying 3-level menus. For example, "P08.08" means the eighth function code in the P08 group function, P29 group is factory reserved, and users are forbidden to access these parameters.

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

1. Below is the instruction of the function lists:

The first line "Function code": codes of function parameter group and parameters

The second line "Name": full name of function parameters

The third line "Description": Detailed illustration of the function parameters

The forth line "Setting range": valid setting range of the function parameters

The fifth line "Default value": the original factory set value of the function parameters

The sixth line "Modify": the modifying character of function codes (the parameters can be modified or not and the modifying conditions), below are the instructions:

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

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

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

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

The seventh column "Fieldbus ratio": the ratio between the displayed value on the screen and the actual value;

The eighth column "No.": the serial number of the function code in the whole function parameters, or register address during communication;

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

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

4. For a better parameter protection, the VFD provides password protection to the parameters. After setting the password (set P07.00 to any non-zero number), the system will come into the state of password verification firstly after the user press PRG/ESC to come into the function code editing state. And then "0.0.0.0.0." will be displayed. Unless the user input right password, they cannot enter into the system. For the factory setting parameter zone, it needs correct factory password (remind that the users cannot modify the factory parameters by themselves, otherwise, if the parameter setting is incorrect, damage to the VFD may occur). If the password protection is unlocked, the user can modify the password freely and the VFD will work as the last setting one. When P07.00 is set to 0, the password can be canceled. If P07.00 is not 0 during powering on, then the parameter is protected by the password. When modify the parameters by serial communication, the function of the password follows the above rules, too.

5. When using serial communication to modify the function parameters, the functions of the user password follow the above rules.

Function code	Name	Description	Setting range	Default	Modify
P00 group—Basic function					
P00.00	Speed control mode	0: Reserved 1: Sensorless vector control mode 1 (applicable to AM) 2: V/F control 3: Closed loop vector control mode (applicable to AM and SM) **Note**: AM-Asynchronous motor SM-Synchronous motor	0–3	2	◎
P00.01	Run command channel	0: Keypad running command (LED off) 1: Terminal running command channel (LED flickering) 2: Communication running command channel (LED on)	0–2	0	○
P00.02	Communication running commands	0: MODBUS communication channel 1: PROFIBUS/CANopen communication channel 2: Ethernet communication channel 3: Reserved	0–3	0	○
P00.03	Max. output frequency	P00.04–400.00Hz	P00.04–400.00	50.00Hz	◎
P00.04	Upper limit of running frequency	P00.05– P00.03(Max. frequency)	P00.05–P00.03	50.00Hz	◎
P00.05	Lower limit of running frequency	0.00Hz–P00.04 (Upper limit of running frequency)	0.00–P00.04	0.00Hz	◎
P00.06	A frequency command	0: Keypad data setting 1: AI1 setting 2: AI2 setting 3: AI3 setting 4: HDI setting 5: Simple PLC program setting 6: Multi-step speed running setting 7: PID control setting	0–11	0	○

Function code	Name	Description	Setting range	Default	Modify
		8: MODBUS communication setting 9: PROFIBUS/CANopen communication setting 10: Ethernet communication setting 11: Reserved			
P00.07	B frequency command		0–11	1	○
P00.08	B frequency command reference	0: Max. output frequency 1: A frequency command	0–1	0	○
P00.09	Setting source combination	0: A 1: B 2: (A+B) 3: (A-B) 4: Max(A, B) 5: Min(A, B)	0–5	0	○
P00.10	Keypad set frequency	0.00Hz–P00.03 (Max. frequency)	0.00–P00.03	50.00Hz	○
P00.11	ACC time1	0.0–3600.0s	0.0–3600.0	Depends on model	○
P00.12	DEC time1	0.0–3600.0s	0.0–3600.0	Depends on model	○
P00.13	Running direction	0: Run in default direction 1: Run in opposite direction 2: Forbid reverse running	0–2	0	○
P00.14	Carrier frequency setting	1.0–2.0kHz	1.0–2.0	Depends on model	○
P00.15	Motor parameter autotuning	0: No operation 1: Rotation autotuning 2: Static autotuning 1 3: Static autotuning 2	0–3	0	◎
P00.16	AVR function	0: Invalid 1: Valid during the whole process	0–1	1	○

Function code	Name	Description	Setting range	Default	Modify
P00.17	Reserved				◎
P00.18	Function parameter restoring	0: No operation 1: Restore the default value 2: Cancel the fault record	0–2	0	◎
P01 group—Start-up and stop control					
P01.00	Start-up mode	0: Start-up directly 1: Start-up after DC braking 2: Start-up after rotating speed tracking	0–2	0	◎
P01.01	Starting frequency of direct start-up	0.00–50.00Hz	0.00–50.00	0.50Hz	◎
P01.02	Retention time of starting frequency	0.0–50.0s	0.0–50.0	0.0s	◎
P01.03	Braking current before start-up	0.0–100.0% (VFD rated current)	0.0–100.0	0.0%	◎
P01.04	Braking time before start-up	0.0–50.0s	0.00–50.00	0.00s	◎
P01.05	ACC/DEC type	0: Linear type 1: S curve type	0–1	0	◎
P01.06	S curve beginning proportion	0.0–50.0% (ACC/DEC time)	0.0–50.0	30.0%	◎
P01.07	S curve end proportion	0.0–50.0% (ACC/DEC time)	0.0–50.0	30.0%	◎
P01.08	Stop mode	0: Decelerate to stop 1: Coast to stop	0–1	0	○
P01.09	Starting frequency of DC braking	0.00–P00.03 (Max. frequency)	0.00–P00.03	0.00Hz	○
P01.10	Waiting time before DC braking	0.0–50.0s	0.0–50.0	0.0s	○

Function code	Name	Description	Setting range	Default	Modify
P01.11	DC braking current	0.0–100.0% (Motor rated current)	0.0–100.0	0.0%	○
P01.12	DC braking time	0.0–50.0s	0.0–50.0	0.0s	○
P01.13	Dead time of FWD/REV rotation	0.0–3600.0s	0.0–3600.0	0.0s	○
P01.14	Shifting between FWD/REV rotation	0: Switch after 0 frequency 1: Switch after starting frequency 2: Switch after delay at stop speed (Reserved)	0–2	0	◎
P01.15	Stop speed	0.00–100.00Hz	0.00–100.00	0.50 Hz	◎
P01.16	Detection of stop speed	0: Speed set value (delay without stopping) 1: Speed detecting value (only valid under vector control)	0–1	1	◎
P01.17	Detection time of feedback speed	0.0–100.0s (only valid for P01.16=1)	0.00–100.00	0.50s	◎
P01.18	Terminal running protection when power on	0: Terminal running command is invalid when power on 1: Terminal running command is valid when power on	0–1	0	○
P01.19	The running frequency is lower than the lower limit one (valid if the lower limit frequency is above 0)	0: Run at the lower-limit frequency 1: Stop 2: Hibernation	0–2	0	◎
P01.20	Hibernation restore delay time	0.0–3600.0s (valid when P01.19=2)	0.0–3600.0	0.0s	○
P01.21	Restart after power off	0: Disabled 1: Enabled	0–1	0	○
P01.22	Waiting time of restart after power off	0.0–3600.0s	0.0–3600.0	1.0s	○

Function code	Name	Description	Setting range	Default	Modify
P01.23	Start delay time	0.0 – 60.0s	0.0–60.0	0.0s	○
P01.24	Delay time of stop speed	0.0 – 100.0s	0.0–100.0	0.0s	○
P01.25	0Hz output selection	0: Output without voltage 1: Output with voltage 2: Output according to DC braking current at stopping	0–2	0	○
P02 group—Motor 1 parameters					
P02.00	Motor 1 type	0: Asynchronous motor 1: Reserved	0–1	0	◎
P02.01	Asynchronous motor 1 rated power	0.1–3000.0kW	0.1–3000.0	Depends on model	◎
P02.02	Asynchronous motor 1 rated frequency	0.01Hz–P00.03 (Max. frequency)	0.01–P00.03	50.00Hz	◎
P02.03	Asynchronous motor 1 rated speed	1 – 36000rpm	1–36000	Depends on model	◎
P02.04	Asynchronous motor 1 rated voltage	0 – 4000V	0–4000	Depends on model	◎
P02.05	Asynchronous motor 1 rated current	0.8 – 6000.0A	0.8–6000.0	Depends on model	◎
P02.06	Asynchronous motor 1 stator resistor	0.001–65.535Ω	0.001–65.535	Depends on model	○
P02.07	Asynchronous motor 1 rotor resistor	0.001–65.535Ω	0.001–65.535	Depends on model	○
P02.08	Asynchronous motor 1 leakage inductance	0.1 – 6553.5mH	0.1–6553.5	Depends on model	○
P02.09	Asynchronous motor 1 mutual	0.1 – 6553.5mH	0.1–6553.5	Depends	○

Function code	Name	Description	Setting range	Default	Modify
	inductance			on model	
P02.10	Asynchronous motor 1 non-load current	0.1–6553.5A	0.1–6553.5	Depends on model	○
P02.11	Magnetic saturation coefficient 1 for the iron core of AM 1	0.0–100.0%	0.0–100.0	80.0%	○
P02.12	Magnetic saturation coefficient 2 for the iron core of AM 1	0.0–100.0%	0.0–100.0	68.0%	○
P02.13	Magnetic saturation coefficient 3 for the iron core of AM 1	0.0–100.0%	0.0–100.0	57.0%	○
P02.14	Magnetic saturation coefficient 4 for the iron core of AM 1	0.0–100.0%	0.0–100.0	40.0%	○
P02.15	Reserved				◎
P02.16	Reserved				◎
P02.17	Reserved				◎
P02.18	Reserved				◎
P02.19	Reserved				◎
P02.20	Reserved				○
P02.21	Reserved				○
P02.22	Reserved				○
P02.23	Reserved				○
P02.24	Reserved				●

Function code	Name	Description	Setting range	Default	Modify
P02.25	Reserved				●
P02.26	Motor 1 overload protection	0: No protection 1: Common motor (with low speed compensation) 2: Frequency conversion motor (without low speed compensation)	0–2	2	◎
P02.27	Motor 1 overload protection coefficient	20.0%－120.0%	20.0–120.0	100.0%	○
P02.28	Motor 1 power correction coefficient	0.00–3.00	0.00–3.00	1.00	○
P02.29	Motor 1 parameter display	0: Display according to motor type 1: Display all parameters	0–1	0	○
P03 group—Vector control					
P03.00	Speed loop proportional gain 1	0–200.0	0–200.0	20.0	○
P03.01	Speed loop integral time 1	0.000–10.000s	0.000–10.000	1.000s	○
P03.02	Switching low frequency	0.00Hz–P03.05	0.00–P03.05	5.00Hz	○
P03.03	Speed loop proportional gain 2	0–200.0	0–200.0	20.0	○
P03.04	Speed loop integral time 2	0.001–10.000s	0.000–10.000	1.000s	○
P03.05	Switching high frequency	P03.02–P00.03(Max. frequency)	P03.02–P00.03	10.00Hz	○
P03.06	Speed loop output filter	0–8 (corresponding to 0–2^8/10ms)	0–8	0	○
P03.07	Vector control slip compensation coefficient	50–200%	50–200	100%	○

Function code	Name	Description	Setting range	Default	Modify
	(Electromotion)				
P03.08	Vector control slip compensation coefficient (Power generation)	50–200%	50–200	100%	○
P03.09	Current loop proportional coefficient P	0–65535	0–65535	1000	○
P03.10	Current loop integral coefficient I	0–65535	0–65535	1000	○
P03.11	Torque setting method	0: Invalid torque control 1: Keypad setting (P03.12) 2: AI1 setting 3: AI2 setting 4: AI3 setting 5: HDI pulse frequency setting 6: Multi-step setting 7: MODBUS communication setting 8: PROFIBUS/CANopen communication setting 9: Ethernet communication setting 10: Reserved	0–10	0	○
P03.12	Keypad setting torque	-300.0%–300.0% (Motor rated current)	-300.0–300.0	50.0%	○
P03.13	Torque given filter time	0.000–10.000s	0.000–10.000s	0.100s	○
P03.14	Torque control forward rotation upper-limit frequency setting source selection	0: Keypad setting (P03.16 sets P03.14 and P03.17 sets P03.15) 1: AI1 setting 2: AI2 setting 3: AI3 setting 4: HDI pulse frequency setting 5: Multi-step setting	0–9	0	○
P03.15	Torque control reverse rotation upper-limit		0–9	0	○

Function code	Name	Description	Setting range	Default	Modify
	frequency setting source selection	6: MODBUS communication setting 7: PROFIBUS/CANopen communication setting 8: Ethernet communication setting 9: Reserved			
P03.16	Keypad defined value of torque control forward rotation upper-limit frequency	0.00Hz–P00.03	0.00–P00.03	50.00 Hz	○
P03.17	Keypad defined value of torque control reverse rotation upper-limit frequency	0.00Hz–P00.03	0.00–P00.03	50.00Hz	○
P03.18	Electromotion torque upper-limit setting source	0: Keypad setting (P03.20 sets P03.18 and P03.21 sets P03.19) 1: AI1 setting 2: AI2 setting 3: AI3 setting 4: HDI pulse frequency setting 5: MODBUS communication setting 6: PROFIBUS/CANopen communication setting 7: Ethernet communication setting 8: Reserved	0–8	0	○
P03.19	Braking torque upper-limit setting source		0–8	0	○
P03.20	Electromotion torque upper-limit keypad setting	0.0–300.0% (Motor rated current)	0.0–300.0	180.0%	○
P03.21	Braking torque upper-limit keypad setting	0.0–300.0% (Motor rated current)	0.0–300.0	180.0%	○
P03.22	Weakening coefficient in constant power field	0.1–2.0	0.1–2.0	0.3	○

Function code	Name	Description	Setting range	Default	Modify
P03.23	Lowest weakening point in constant power field	10%–100%	10–100	20%	○
P03.24	Max. voltage limit	0.0–120.0% (Motor rated voltage)	0.0–120.0	100.0%	◎
P03.25	Pre-exciting time	0.000–10.000s	0.000–10.000s	0.300s	○
P03.26	Weak magnetic proportional gain	0－4000	0–4000	1200	○
P03.27	Vector control speed display	0: Display the actual value 1: Display the set value	0–1	0	○
P03.28	Reserved				●
P03.29	Reserved				●
P04 group—V/F control					
P04.00	Motor 1 V/F curve setting	0: Straight line V/F curve 1: Multi-dot V/F curve 2: Torque step-down V/F curve (power of 1.3) 3: Torque step-down V/F curve (power of 1.7) 4: Torque step-down V/F curve (power of 2.0) 5: Customized V/F curve (V/F separation)	0–5	0	◎
P04.01	Motor 1 torque boost	0.0%: (Automatic) 0.1%–10.0%	0.0–10.0	0.0%	○
P04.02	Motor 1 torque boost close	0.0%–50.0% (Relative to motor 1 rated frequency)	0.0–50.0	20.0%	○
P04.03	Motor 1 V/F frequency point 1	0.00Hz–P04.05	0.00–P04.05	0.00Hz	○
P04.04	Motor 1 V/F voltage point 1	0.0%–110.0% (Rated voltage of motor 1)	0.0–110.0	00.0%	○
P04.05	Motor 1 V/F frequency point 2	P04.03－ P04.07	P04.03–P04.07	00.00Hz	○

Function code	Name	Description	Setting range	Default	Modify
P04.06	Motor 1 V/F voltage point 2	0.0%–110.0% (Rated voltage of motor 1)	0.0–110.0	00.0%	○
P04.07	Motor 1 V/F frequency point 3	P04.05–P02.02 (Rated frequency of motor 1)/ P04.05 – P02.16 (Rated frequency of motor 1)	P04.05–Rated frequency of motor 1	00.00Hz	○
P04.08	Motor 1 V/F voltage point 3	0.0%–110.0% (Rated voltage of motor 1)	0.0–110.0	00.0%	○
P04.09	Motor 1 V/F slip compensation gain	0.0–200.0%	0.0–200.0	100.0%	○
P04.10	Motor 1 low frequency oscillation control factor	0–100	0–100	10	○
P04.11	Motor 1 high frequency oscillation control factor	0–100	0–100	10	○
P04.12	Motor 1 oscillation control threshold	0.00Hz–P00.03 (Max. frequency)	0.00Hz–P00.03	30.00 Hz	○
P04.13	Motor 2 V/F curve setting	0: Straight line V/F curve 1: Multi-dot V/F curve 2: Torque step-down V/F curve (power of 1.3) 3: Torque step-down V/F curve (power of 1.7) 4: Torque step-down V/F curve (power of 2.0) 5: Customized V/F curve (V/F separation)	0–5	0	◎
P04.14	Motor 2 V/F torque boost	0.0%: (Automatic) 0.1%–10.0%	0.0–10.0	0.0%	○
P04.15	Motor 2 V/F torque boost close	0.0%–50.0% (Relative to rated frequency of motor 2)	0.0–50.0	20.0%	○

Function code	Name	Description	Setting range	Default	Modify
P04.16	Motor 2 V/F frequency point 1	0.00Hz–P04.18	0.00–P04.18	0.00Hz	○
P04.17	Motor 2 V/F voltage point 1	0.0%–110.0% (Rated voltage of motor 2)	0.0–110.0	00.0%	○
P04.18	Motor 2 V/F frequency point 2	P04.16–P04.20	P04.16–P04.20	00.00Hz	○
P04.19	Motor 2 V/F voltage point 2	0.0%–110.0% (Rated voltage of motor 2)	0.0–110.0	00.0%	○
P04.20	Motor 2 V/F frequency point 3	P04.18–P12.02 (Rated frequency of motor 2)/P04.18–P12.16 (Rated frequency of motor 2)	P04.18–P12.02 Or P04.18–P12.16	00.00Hz	○
P04.21	Motor 2 V/F voltage point 3	0.0%–110.0%(Rated voltage of the motor 2)	0.0–110.0	00.0%	○
P04.22	Motor 2 V/F slip compensation gain	0.0–200.0%	0.0–200.0	100.0%	○
P04.23	Motor 2 low frequency oscillation control factor	0–100	0–100	10	○
P04.24	Motor 2 high frequency oscillation control factor	0–100	0–100	10	○
P04.25	Motor 2 oscillation control threshold	0.00Hz–P00.03(Max. frequency)	0.00Hz–P00.03	30.00 Hz	○
P04.26	Energy-saving operation	0: No action 1: Automatic energy-saving operation	0–1	0	◎
P04.27	Voltage setting channel	0: Keypad setting (Determined by P04.28) 1: AI1 setting 2: AI2 setting 3: AI3 setting 4: HDI pulse setting	0–10	0	○

Function code	Name	Description	Setting range	Default	Modify
		5: Multi-step setting (Determined by the multi-step speed parameter of P10) 6: PID setting 7: MODBUS communication setting 8: PROFIBUS/CANopen communication setting 9: Ethernet communication setting 10: Reserved			
P04.28	Keypad setting voltage	0.0%–100.0% (Motor rated voltage)	0.0–100.0	100.0%	○
P04.29	Voltage increasing time	0.0–3600.0s	0.0–3600.0	5.0s	○
P04.30	Voltage decreasing time	0.0–3600.0s	0.0–3600.0	5.0s	○
P04.31	Max. output voltage	P04.32–100.0% (Motor rated voltage)	0.0–100.0	100.0%	◎
P04.32	Min output voltage	0.0%–P04.31 (Motor rated voltage)	0.0–100.0	0.0%	◎
P04.33	Reserved				●
P04.34	Reserved				●
P04.35	Reserved				●
P05 group—Input terminals					
P05.00	HDI input type	0: HDI is pulse input. 1: HDI is switch input.	0–1	0	◎
P05.01	S1 terminal function	0: No function 1: Forward rotation operation 2: Reverse rotation operation 3: 3-wire control operation 4: Forward rotation jogging 5: Reverse rotation jogging 6: Coast to stop 7: Fault reset 8: Operation pause	0–63	1	◎
P05.02	S2 terminal function		0–63	4	◎
P05.03	S3 terminal function		0–63	7	◎
P05.04	S4 terminal function		0–63	0	◎
P05.05	S5 terminal		0–63	0	◎

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Setting range</th><th>Default</th><th>Modify</th></tr>
<tr><td></td><td>function</td><td rowspan="5">9: External fault input
10: Increasing frequency setting (UP)
11: Decreasing frequency setting (DOWN)
12: Cancel the frequency change setting
13: Shift between A setting and B setting
14: Shift between combination setting and A setting
15: Shift between combination setting and B setting
16: Multi-step speed terminal 1
17: Multi-step speed terminal 2
18: Multi-step speed terminal 3
19: Multi-step speed terminal 4
20: Multi- step speed pause
21: ACC/DEC time option 1
22: ACC/DEC time option 2
23: Simple PLC stop reset
24: Simple PLC pause
25: PID control pause
26: Reserved
27: Reserved
28: Reserved
29: Torque control prohibition
30: ACC/DEC prohibition
31: Reserved
32: Reserved
33: Cancel the frequency change setting temporarily
34: DC brake
35: Shift motor 1 to motor 2
36: Shift the command to the keypad
37: Shift the command to the terminals
38: Shift the command to the</td><td></td><td></td><td></td></tr>
<tr><td>P05.06</td><td>S6 terminal function</td><td>0–63</td><td>0</td><td>◎</td></tr>
<tr><td>P05.07</td><td>S7 terminal function</td><td>0–63</td><td>0</td><td>◎</td></tr>
<tr><td>P05.08</td><td>S8 terminal function</td><td>0–63</td><td>0</td><td>◎</td></tr>
<tr><td>P05.09</td><td>HDI terminal function</td><td>0–63</td><td>0</td><td>◎</td></tr>
</table>

Function code	Name	Description	Setting range	Default	Modify
		communication 39: Pre-exciting command 40: Consumption power clear 41: Consumption power holding 42: External fault input 2 43–63: Reserved			
P05.10	Polarity of input terminals	0x000–0x1FF	0x000–0x1FF	0x000	○
P05.11	ON-OFF filter time	0.000–1.000s	0.000–1.000	0.010s	○
P05.12	Virtual terminal setting	0: Virtual terminals are invalid. 1: MODBUS communication virtual terminals are valid. 2: PROFIBUS/CANopen communication virtual terminals are valid. 3: Ethernet communication virtual terminals are valid. 4: Reserved	0–4	0	◎
P05.13	Terminal control running mode	0: 2-wire control 1 1: 2-wire control 2 2: 3-wire control 1 3: 3-wire control 2	0–3	0	◎
P05.14	S1 terminal switching-on delay time	0.000–50.000s	0.000–50.000	0.000s	○
P05.15	S1 terminal switching-off delay time	0.000–50.000s	0.000–50.000	0.000s	○
P05.16	S2 terminal switching-on delay time	0.000–50.000s	0.000–50.000	0.000s	○
P05.17	S2 terminal switching-off delay time	0.000–50.000s	0.000–50.000	0.000s	○

Function code	Name	Description	Setting range	Default	Modify
P05.18	S3 terminal switching-on delay time	0.000–50.000s	0.000–50.000	0.000s	○
P05.19	S3 terminal switching-off delay time	0.000–50.000s	0.000–50.000	0.000s	○
P05.20	S4 terminal switching-on delay time	0.000–50.000s	0.000–50.000	0.000s	○
P05.21	S4 terminal switching-off delay time	0.000–50.000s	0.000–50.000	0.000s	○
P05.22	S5 terminal switching-on delay time	0.000–50.000s	0.000–50.000	0.000s	○
P05.23	S5 terminal switching-off delay time	0.000–50.000s	0.000–50.000	0.000s	○
P05.24	S6 terminal switching-on delay time	0.000–50.000s	0.000–50.000	0.000s	○
P05.25	S6 terminal switching-off delay time	0.000–50.000s	0.000–50.000	0.000s	○
P05.26	S7 terminal switching-on delay time	0.000–50.000s	0.000–50.000	0.000s	○
P05.27	S7 terminal switching-off delay time	0.000–50.000s	0.000–50.000	0.000s	○
P05.28	S8 terminal switching-on delay time	0.000–50.000s	0.000–50.000	0.000s	○
P05.29	S8 terminal switching-off delay time	0.000–50.000s	0.000–50.000	0.000s	○
P05.30	HDI terminal	0.000–50.000s	0.000–50.000	0.000s	○

Function code	Name	Description	Setting range	Default	Modify
	switching-on delay time				
P05.31	HDI terminal switching-off delay time	0.000–50.000s	0.000–50.000	0.000s	○
P05.32	AI1 lower limit	0.00V–P05.34	0.00–P05.34	0.00V	○
P05.33	Corresponding setting of AI1 lower limit	-100.0%–100.0%	-100.0–100.0	0.0%	○
P05.34	AI1 upper limit	P05.32–10.00V	P05.23–10.00	10.00V	○
P05.35	Corresponding setting of AI1 upper limit	-100.0%–100.0%	-100.0–100.0	100.0%	○
P05.36	AI1 input filter time	0.000s–10.000s	0.000–10.000	0.100s	○
P05.37	AI2 lower limit	-10.00V–P05.39	-10.00V–P05.39	-10.00V	○
P05.38	Corresponding setting of AI2 lower limit	-100.0%–100.0%	-100.0–100.0	-100.0%	○
P05.39	AI2 middle value	P05.37–P05.41	P05.37–P05.41	0.00V	
P05.40	Corresponding setting of AI2 middle value	-100.0%–100.0%	-100.0–100.0	0.0%	
P05.41	AI2 upper limit	P05.39–10.00V	P05.39–10.00	10.00V	○
P05.42	Corresponding setting of AI2 upper limit	-100.0%–100.0%	-100.0–100.0	100.0%	○
P05.43	AI2 input filter time	0.000s–10.000s	0.000–10.000	0.100s	○
P05.44	AI3 lower limit	-10.00V–P05.46	-10.00–P05.46	-10.00V	○
P05.45	Corresponding setting of AI3 lower limit	-100.0%–100.0%	-100.0–100.0	-100.0%	○

Function code	Name	Description	Setting range	Default	Modify
P05.46	Middle value of AI3	P05.44–P05.48	P05.44–P05.48	0.00V	○
P05.47	Corresponding setting of AI3 middle value	-100.0%–100.0%	-100.0–100.0	0.0%	○
P05.48	AI3 upper limit	P05.46–10.00V	P05.46–10.00	10.00V	○
P05.49	Corresponding setting of AI3 upper limit	-100.0%–100.0%	-100.0–100.0	100.0%	○
P05.50	AI3 input filter time	0.000s–10.000s	0.000–10.000	0.100s	○
P05.51	HDI pulse input function	0: Frequency setting input 1–2: Reserved	0–2	0	◎
P05.52	HDI lower-limit frequency	0.00kHz–P05.54	0.00–P05.54	0.00KHz	○
P05.53	Corresponding setting of HDI lower-limit frequency	-100.0%–100.0%	-100.0–100.0	0.0%	○
P05.54	HDI upper-limit frequency	P05.52–50.00kHz	P05.52–50.00	50.00KHz	○
P05.55	Corresponding setting of HDI upper-limit frequency	-100.0%–100.0%	-100.0–100.0	100.0%	○
P05.56	Input filter time of HDI pulse frequency	0.000s–10.000s	0.000–10.000	0.100s	○
P06 group—Output terminals					
P06.00	HDO output type	0: Open collector output 1: Reserved	0–1	0	◎
P06.01	Y1 output	0: Invalid 1: In operation 2: Forward rotation operation	0–30	0	○
P06.02	HDO output		0–30	0	○

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Setting range</th><th>Default</th><th>Modify</th></tr>
<tr><td>P06.03</td><td>Relay RO1 output</td><td rowspan="3">3: Reverse rotation operation
4: Jogging operation
5: VFD fault
6: Frequency degree test FDT1
7: Frequency degree test FDT2
8: Frequency arrival
9: Zero speed running
10: Upper limit frequency arrival
11: Lower limit frequency arrival
12: Ready for operation
13: Pre-excitation
14: Overload pre-alarm
15: Underload pre-alarm
16: Completion of simple PLC step
17: Completion of simple PLC cycle
18: Reserved
19: Reserved
20: External fault valid
21: Reserved
22: Running time arrival
23: MODBUS communication virtual terminal output
24: PROFIBUS/CANopen communication virtual terminal output
25: Ethernet communication virtual terminal output
26–28: Reserved
29: Motor overheat pre-alarm
30: Reserved</td><td>0–30</td><td>1</td><td>○</td></tr>
<tr><td>P06.04</td><td>Relay RO2 output</td><td rowspan="2">0–30</td><td rowspan="2">5</td><td rowspan="2">○</td></tr>
<tr><td>P06.05</td><td>Relay RO3 output</td></tr>
<tr><td>P06.06</td><td>Polarity of output terminals</td><td>00–1F</td><td>00–1F</td><td>00</td><td>○</td></tr>
<tr><td>P06.07</td><td>Y switching-on delay time</td><td>0.000–50.000s</td><td>0.000–50.000</td><td>0.000s</td><td>○</td></tr>
<tr><td>P06.08</td><td>Y switching-off delay time</td><td>0.000–50.000s</td><td>0.000–50.000</td><td>0.000s</td><td>○</td></tr>
</table>

Function code	Name	Description	Setting range	Default	Modify
P06.09	HDO switching-on delay time	0.000–50.000s (only valid when P06.00=1)	0.000–50.000	0.000s	○
P06.10	HDO switching-off delay time	0.000–50.000s (only valid when P06.00=1)	0.000–50.000	0.000s	○
P06.11	Relay RO1 switching-on delay time	0.000–50.000s	0.000–50.000	0.000s	○
P06.12	Relay RO1 switching-off delay time	0.000–50.000s	0.000–50.000	0.000s	○
P06.13	Relay RO2 switching-on delay time	0.000–50.000s	0.00–50.00	0.000s	○
P06.14	Relay RO2 switching-off delay time	0.000–50.000s	0.00–50.00	0.000s	○
P06.15	Relay RO3 switching-on delay time	0.000–50.000s	0.00–50.00	0.000s	○
P06.16	Relay RO3 switching-off delay time	0.000–50.000s	0.00–50.00	0.000s	○
P06.17	AO1 output	0: Running frequency 1: Set frequency 2: Ramp reference frequency 3: Running rotating speed 4: Output current (Relative to VFD) 5: Output current (Relative to motor) 6: Output voltage 7: Output power 8: Set torque value 9: Output torque 10: AI1 input value 11: AI2 input value	0–30	0	○
P06.18	AO2 output		0–30	0	○
P06.19	AO3 output		0–30	0	
P06.20	HDO pulse output		0–30	0	○

Function code	Name	Description	Setting range	Default	Modify
		12: AI3 input value 13: HDI pulse frequency input value 14: MODBUS communication set value 1 15: MODBUS communication set value 2 16: PROFIBUS/CANopen communication set value 1 17: PROFIBUS/CANopen communication set value 2 18: Ethernet communication set value 1 19: Ethernet communication set value 2 20: PID reference 21: PID feedback 22: Torque current (Relative to motor rated current) 23: Ramp reference frequency (with sign) 24–30: Reserved			
P06.21	Lower limit of AO1 output	-100.0%–P06.23	-100.0–P06.23	0.0%	○
P06.22	Corresponding AO1 output to lower limit	-10.00V–10.00V	-10.00–10.00	0.00V	○
P06.23	Upper limit of AO1 output	P06.21–100.0%	P06.21–100.0	100.0%	○
P06.24	Corresponding AO1 output to upper limit	-10.00V–10.00V	-10.00–10.00	10.00V	○
P06.25	AO1 output filter time	0.000s–10.000s	0.000–10.000	0.000s	○
P06.26	Lower limit of AO2 output	-100.0%–P06.28	-100.0–P06.28	0.0%	○
P06.27	Corresponding AO2 output to lower limit	-10.00V–10.00V	-10.00–10.00	0.00V	○

Function code	Name	Description	Setting range	Default	Modify
P06.28	Upper limit of AO2 output	P06.26–100.0%	P06.26–100.0	100.0%	○
P06.29	Corresponding AO2 output to upper limit	-10.00V–10.00V	-10.00–10.00	10.00V	○
P06.30	AO2 output filter time	0.000s–10.000s	0.000–10.000	0.000s	○
P06.31	Lower limit of AO3 output	-100.0%–P06.33	-100.0–P06.33	0.0%	○
P06.32	Corresponding AO3 output frequency to lower limit	-10.00V–10.00V	-10.00–10.00	0.00V	○
P06.33	Upper limit of AO3 output	P06.31–100.0%	P06.31–100.0	100.0%	○
P06.34	Corresponding AO3 output frequency to upper limit	-10.00V–10.00V	-10.00–10.00	10.00V	○
P06.35	AO3 output filter time	0.000s–10.000s	0.000–10.000	0.000s	○
P06.36	Lower limit of HDO output	-100.0%–P06.38	-100.0%–P06.38	0.00%	○
P06.37	Corresponding HDO output frequency to lower limit	0.00–50.00kHz	0.00–50.00	0.0kHz	○
P06.38	Upper limit of HDO output	P06.36–100.0%	P06.36–100.0	100.0%	○
P06.39	Corresponding HDO output frequency to upper limit	0.00–50.00kHz	0.00–50.00	50.00kHz	○
P06.40	HDO output filter time	0.000s–10.000s	0.000–10.000	0.000s	○
P07 group—Human-machine interface					

Function code	Name	Description	Setting range	Default	Modify
P07.00	User password	0–65535	0–65535	0	○
P07.01	Parameter copy	0: No operation 1: Upload the local function parameters to the keypad 2: Download the function parameters of the keypad to the local address (including the motor parameters) 3: Download the function parameters of the keypad to the local address (excluding the motor parameters) 4: Download the function parameters of the keypad to the local address (only for the motor parameters)	0–4	0	◎
P07.02	QUICK/JOG function selection	0: No function 1: Jogging running 2: Shift the display state by the shifting key 3: Shift between forward rotation and reverse rotation 4: Clear UP/DOWN setting 5: Coast to stop 6: Shift the running command sources in sequence 7: Quick commission mode (according to the non-factory parameter commissioning)	0–7	1	◎
P07.03	QUICK shifting sequence of running command channel	0: Keypad control→terminal control→communication control 1: Keypad control←→terminal control 2: Keypad control←→communication control 3: Terminal control←→communication control	0–3	0	○
P07.04	STOP/RST stop function	0: Only valid for keypad control 1: Both valid for keypad and terminal control 2: Both valid for keypad and	0–3	0	○

Function code	Name	Description	Setting range	Default	Modify
		communication control 3: Valid for all control modes			
P07.05	Parameter selection 1 at running state	BIT0: Running frequency (Hz on) BIT1: Set frequency (Hz flickering) 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(% flickering) BIT9: PID feedback(% on) BIT10: Input terminal state BIT11: Output terminal state BIT12: Torque set value(% on) BIT13: Pulse count value BIT14: Reserved BIT15: PLC and current step in multi-step speed	0–FFFF	0x03FF	○
P07.06	Parameter selection 2 at running state	BIT0: AI1 value (V on) BIT1: AI2 value (V on) BIT2: AI3 value (V on) BIT3: HDI frequency BIT4: Motor overload percentage (% on) BIT5: VFD overload percentage (% on) BIT6: Ramp reference frequency (Hz on) BIT7: Reserved BIT8: Reserved BIT9–15: Reserved	0000–FFFF	0x0000	
P07.07	The parameter at stop state	BIT0: Set frequency (Hz on, frequency flickering slowly) BIT1: Bus voltage (V on) BIT2: Input terminal state	0000–FFFF	0x00FF	○

Function code	Name	Description	Setting range	Default	Modify
		BIT3: Output terminal state BIT4: PID reference (% flickering) BIT5: PID feedback (% on) BIT6: Torque set value (% on) BIT7: AI1 value (V on) BIT8: AI2 value (V on) BIT9: AI3 value (V on) BIT10: HDI frequency BIT11: PLC and current step in multi-step speed BIT12: Reserved BIT13: Reserved BIT14–BIT15: Reserved			
P07.08	Frequency coefficient	0.01–10.00	0.01–10.00	1.00	○
P07.09	Rotating speed coefficient	0.1–999.9%	0.1–999.9%	100.0%	○
P07.10	Linear speed coefficient	0.1–999.9%	0.1–999.9%	1.0%	○
P07.11	Rectifier bridge module temperature	0.0–100.0°C			●
P07.12	Inverter module temperature	0.0–100.0°C			●
P07.13	Software version of control board	1.00–655.35			●
P07.14	Local accumulative running time	0–65535h			●
P07.15	High bit of power consumption	0–65535kWh(*1000)			●
P07.16	Low bit of power consumption	0.0–999.9kWh			●
P07.17	Reserved				●

Function code	Name	Description	Setting range	Default	Modify
P07.18	VFD rated power	0.4–3000.0kW			●
P07.19	VFD rated voltage	0–4000V			●
P07.20	VFD rated current	0.1–6000.0A			●
P07.21	Factory bar code 1	0x0000–0xFFFF			●
P07.22	Factory bar code 2	0x0000–0xFFFF			●
P07.23	Factory bar code 3	0x0000–0xFFFF			●
P07.24	Factory bar code 4	0x0000–0xFFFF			●
P07.25	Factory bar code 5	0x0000–0xFFFF			●
P07.26	Factory bar code 6	0x0000–0xFFFF			●
P07.27	Present fault type	0:No fault 1:IGBT U phase protection(OUt1) 2:IGBT V phase protection(OUt2) 3:IGBT W phase protection(OUt3) 4:OC1 5:OC2 6:OC3 7:OV1 8:OV2 9:OV3 10:UV 11:Motor overload(OL1) 12:The VFD overload(OL2) 13:Input side phase loss(SPI) 14:Output side phase loss(SPO) 15:Overheat of the rectifier module(OH1)			●

Function code	Name	Description	Setting range	Default	Modify
		16:Overheat fault of the VFD module(OH2) 17:External fault(EF) 18:485 communication fault(CE) 19:Current detection fault(ItE) 20:Motor antotune fault(tE) 21:EEPROM operation fault(EEP) 22:PID response offline fault(PIDE) 23:Braking unit fault(bCE) 24:Running time arrival(END) 25:Electrical overload(OL3) 26:Panel communication fault(PCE) 27:Parameter uploading fault (UPE) 28:Parameter downloading fault(DNE) 29:PROFIBUS communication fault(E-DP) 30:Ethernet communication fault(E-NET) 31: CANopen communication fault(E-CAN) 32:Grounding short circuit fault 1(ETH1) 33:Reserved 34:Speed deviation fault(dEu) 35:Maladjustment(STo) 36: Undervoltage fault(LL) 37: Encoder offline fault (ENC1O) 38: Encoder reverse fault (ENC1D) 39: Encoder Z pulse offline fault (ENC1Z) 40: Reserved 41: Reserved 42: Reserved 43: Motor overtemperature fault (Ot) 44: SCR fault (SCE) Pre-alarm 0: Motor overheat pre-alarm (A-OT)			

Function code	Name	Description	Setting range	Default	Modify
		1: Overload pre-alarm (A-OL) 2–7: Reserved			
P07.28	Last fault type				●
P07.29	2nd-last fault type				●
P07.30	3rd-last fault type				●
P07.31	4th-last fault type				●
P07.32	5th-last fault type				●
P07.33	Running frequency at present fault			0.00Hz	●
P07.34	Ramp reference frequency at present fault			0.00Hz	●
P07.35	Output voltage at present fault			0V	●
P07.36	Output current at present fault			0.0A	●
P07.37	Bus voltage at present fault			0.0V	●
P07.38	The Max. temperature at present fault			0.0°C	●
P07.39	Input terminals state at present fault			0	●
P07.40	Output terminals state at present fault			0	●
P07.41	Running frequency at last fault			0.00Hz	●
P07.42	Ramp reference frequency at last fault			0.00Hz	●

Function code	Name	Description	Setting range	Default	Modify
P07.43	Output voltage at last fault			0V	●
P07.44	The output current at last fault			0.0A	●
P07.45	Bus voltage at last fault			0.0V	●
P07.46	The Max. temperature at last fault			0.0°C	●
P07.47	Input terminals state at last fault			0	●
P07.48	Output terminals state at last fault			0	●
P07.49	Running frequency at 2nd-last fault			0.00Hz	●
P07.50	Ramp reference frequency at 2nd-last fault			0.00Hz	●
P07.51	Output voltage at 2nd-last faults			0V	●
P07.52	Output current at 2nd-last faults			0.0A	●
P07.53	Bus voltage at 2nd-last fault			0.0V	●
P07.54	The Max. temperature at 2nd-last fault			0.0°C	●
P07.55	Input terminals state at 2nd-last fault			0	●
P07.56	Output terminals state at 2nd-last fault			0	●

Function code	Name	Description	Setting range	Default	Modify
P08 group—Enhanced functions					
P08.00	ACC time 2	0.0–3600.0s	0.0–3600.0	Depends on model	○
P08.01	DEC time 2	0.0–3600.0s	0.0–3600.0	Depends on model	○
P08.02	ACC time 3	0.0–3600.0s	0.0–3600.0	Depends on model	○
P08.03	DEC time 3	0.0–3600.0s	0.0–3600.0	Depends on model	○
P08.04	ACC time 4	0.0–3600.0s	0.0–3600.0	Depends on model	○
P08.05	DEC time 4	0.0–3600.0s	0.0–3600.0	Depends on model	○
P08.06	Jogging frequency	0.00–P00.03 (Max. frequency)	0.00–P00.03	5.00Hz	○
P08.07	Jogging ACC time	0.0–3600.0s	0.0–3600.0	Depends on model	○
P08.08	Jogging DEC time	0.0–3600.0s	0.0–3600.0	Depends on model	○
P08.09	Jumping frequency 1	0.00–P00.03 (Max. frequency)	0.00–P00.03	0.00Hz	○
P08.10	Jumping frequency range 1	0.00–P00.03 (Max. frequency)	0.00–P00.03	0.00Hz	○
P08.11	Jumping frequency 2	0.00–P00.03 (Max. frequency)	0.00–P00.03	0.00Hz	○
P08.12	Jumping frequency range 2	0.00–P00.03 (Max. frequency)	0.00–P00.03	0.00Hz	○
P08.13	Jumping frequency 3	0.00–P00.03 (Max. frequency)	0.00–P00.03	0.00Hz	○
P08.14	Jumping frequency range 3	0.00–P00.03 (Max. frequency)	0.00–P00.03	0.00Hz	○

Function code	Name	Description	Setting range	Default	Modify
P08.15	Reserved				○
P08.16	Reserved				○
P08.17	Reserved				○
P08.18	Reserved				○
P08.19	Reserved				○
P08.20	Reserved				●
P08.21	Reserved				○
P08.22	Reserved				○
P08.23	Reserved				○
P08.24	Reserved				○
P08.25	Reserved				○
P08.26	Reserved				○
P08.27	Set running time	0–65535min	0–65535	0min	○
P08.28	Fault reset times	0–10	0–10	0	○
P08.29	Interval time of automatic fault reset	0.1–3600.0s	0.1–3600.0	1.0s	○
P08.30	Frequency decreasing velocity of dropping control	0.00–50.00Hz	0.00–50.00	0.00Hz	○
P08.31	Shifting channel of motors	0: Terminal shifting 1: MODBUS communication shifting 2: PROFIBUS/CANopen communication shifting 3: Ethernet communication shifting 4: Reserved	0–4	0	◎
P08.32	FDT1 electrical level detection value	0.00–P00.03 (Max. frequency)	0.00–P00.03	50.00Hz	○
P08.33	FDT1 retention	0.0–100.0% (FDT1 electrical level)	0.0–100.0	5.0%	○

Function code	Name	Description	Setting range	Default	Modify
	detection value				
P08.34	FDT2 electrical level detection value	0.00–P00.03 (Max. frequency)	0.00–P00.03	50.00Hz	○
P08.35	FDT2 retention detection value	0.0–100.0% (FDT2 electrical level)	0.0–100.0	5.0%	○
P08.36	Frequency arrival detection value	0.0–P00.03 (Max. frequency)	0.0–P00.03	0.00Hz	○
P08.37	Energy braking enable	0: Disabled 1: Enabled	0–1	0	○
P08.38	Threshold voltage of energy braking	600.0–6000.0V	600.0–6000.0	1950.0V	○
P08.39	Running mode of cooling fan	0: Normal running mode 1: The fan keeps running after power on all the time.	0–1	0	○
P08.40	Reserved				◎
P08.41	Over modulation selection	0: Invalid 1: Valid	0–1	1	◎
P08.42	Keypad data control	0x0000–0x1223 LED ones: Frequency enabling selection 0: Both ∧/∨ and digital potentiometer adjustments are effective. 1: Only ∧/∨ is effective. 2: Only digital potentiometer adjustment is effective. 3: Neither ∧/∨ nor digital potentiometer adjustments is effective. LED tens: Frequency control selection 0: Only effective when P00.06=0 or P00.07=0 1: Effective for all frequency setting manners 2: Ineffective for multi-step speed when	0000–1223	0x0000	○

Function code	Name	Description	Setting range	Default	Modify
		multi-step speed has the priority LED hundreds: Action selection during stopping 0: Effective setting 1: Effective during running, cleared after stopping 2: Effective during running, cleared after receiving the stop command LED thousands: ∧/∨ and digital potentiometer integral function 0: Effective integral function 1: Ineffective integral function			
P08.43	Integral ratio of the keypad potentiometer	0.01 - 10.00s	0.01–10.00	0.10s	○
P08.44	UP/DOWN terminal control	0x000–0x221 LED ones: Frequency control selection 0: UP/DOWN terminal setting effective 1: UP/DOWN terminal setting ineffective LED tens: Frequency control selection 0: Only effective when P00.06=0 or P00.07=0 1: Effective for all frequency setting manners 2: Ineffective for multi-step speed when multi-step speed has the priority LED hundreds: Action selection during stopping 0: Effective setting 1: Effective during running, cleared after stopping 2: Effective during running, cleared after receiving the stop command	000–221	0x000	○
P08.45	UP terminal frequency changing ratio	0.01–50.00s	0.01–50.00	0.50s	○
P08.46	DOWN terminal	0.01–50.00s	0.01–50.00	0.50s	○

Function code	Name	Description	Setting range	Default	Modify
	frequency changing ratio				
P08.47	Action when the frequency setting is at power off	0x000–0x111 LED ones: Action selection when the digital adjusting frequency is at power off 0: Save when the power is off 1: Clear when the power is off LED tens: Action selection when MODBUS setting frequency is at power off 0: Save when the power is off 1: Clear when the power is off LED hundreds: Action selection when other communication setting frequency is at power off 0: Save when the power is off 1: Clear when the power is off	0x000–0x111	0x000	○
P08.48	Reserved				○
P08.49	Reserved				○
P08.50	Magnetic flux braking	0: Invalid 100–150	0–150	0	○
P08.51	Input power factor of the VFD	0.00–1.00	0.00–1.00	0.56	○
P09 group—PID control					
P09.00	PID reference source	0: Keypad digital setting (P09.01) 1: AI1 setting 2: AI2 setting 3: AI3 setting 4: HDI pulse setting 5: Multi-step speed setting 6: MODBUS communication setting 7: PROFIBUS/CANopen communication setting 8: Ethernet communication setting	0–9	0	○

Function code	Name	Description	Setting range	Default	Modify
		9: Reserved			
P09.01	Keypad PID preset	-100.0%–100.0%	-100.0–100.0	0.0%	○
P09.02	PID feedback source	0: AI1 feedback 1: AI2 feedback 2: AI3 feedback 3: HDI pulse feedback 4: MODBUS communication feedback 5: PROFIBUS/CANopen communication feedback 6: Ethernet communication feedback 7: Reserved	0–7	0	○
P09.03	PID output feature	0: PID output is positive. 1: PID output is negative.	0–1	0	○
P09.04	Proportional gain (Kp)	0.00–100.00	0.00–100.00	1.00	○
P09.05	Integral time(Ti)	0.00–10.00s	0.00–10.00	0.10s	○
P09.06	Differential time(Td)	0.00–10.00s	0.00–10.00	0.00s	○
P09.07	Sampling cycle (T)	0.001–10.000s	0.001–10.000	0.100s	○
P09.08	PID control deviation limit	0.0–100.0%	0.0–100.0	0.0%	○
P09.09	Upper limit of PID output	P09.10–100.0% (Max. frequency or voltage)	P09.10–100.0	100.0%	○
P09.10	Lower limit of PID output	-100.0%–P09.09 (Max. frequency or voltage)	-100.0–P09.09	0.0%	○
P09.11	Feedback offline detection value	0.0–100.0%	0.0–100.0%	0.0%	○
P09.12	Feedback offline detection time	0.0–3600.0s	0.0–3600.0	1.0s	○
P09.13	PID adjustment	0x0000–0x1111 LED ones:	0000–1111	0x0001	○

Function code	Name	Description	Setting range	Default	Modify
		0: Keep the integral adjustment when the frequency reaches the upper and lower limit 1: Stop the integral adjustment when the frequency reaches the upper and lower limit LED tens: 0: The same with the setting direction 1:Opposite to the setting direction LED hundreds: 0: Limit to the maximum frequency 1: Limit to frequency A LED thousands: 0: A+B frequency, the buffer of A frequency is invalid 1: A+B frequency, the buffer of A frequency is valid ACC/DEC is determined by ACC time 4 of P08.04			
P09.14	Proportional gain at low frequency (Kp)	0.00–100.00	0.00–100.00	1.00	○
P09.15	PID command of ACC/DEC time	0.0–1000.0s	0.0–1000.0s	0.0s	○
P09.16	PID output filter time	0.000–10.000s	0.000–10.000s	0.000s	○
P10 group—Simple PLC and multi-step speed control					
P10.00	Simple PLC	0: Stop after running once 1: Run at the final value after running once 2: Cycle running	0–2	0	○
P10.01	Simple PLC memory	0: Power loss without memory 1: Power loss with memory	0–1	0	○
P10.02	Multi-step speed 0	-100.0–100.0%	-100.0–100.0	0.0%	○

Function code	Name	Description	Setting range	Default	Modify
P10.03	Running time of step 0	0.0–6553.5s (min)	0.0–6553.5	0.0s	○
P10.04	Multi-step speed 1	-100.0–100.0%	-100.0–100.0	0.0%	○
P10.05	Running time of step 1	0.0–6553.5s (min)	0.0–6553.5	0.0s	○
P10.06	Multi-step speed 2	-100.0–100.0%	-100.0–100.0	0.0%	○
P10.07	Running time of step 2	0.0–6553.5s (min)	0.0–6553.5	0.0s	○
P10.08	Multi-step speed 3	-100.0–100.0%	-100.0–100.0	0.0%	○
P10.09	Running time of step 3	0.0–6553.5s (min)	0.0–6553.5	0.0s	○
P10.10	Multi-step speed 4	-100.0–100.0%	-100.0–100.0	0.0%	○
P10.11	Running time of step 4	0.0–6553.5s (min)	0.0–6553.5	0.0s	○
P10.12	Multi-step speed 5	-100.0–100.0%	-100.0–100.0	0.0%	○
P10.13	Running time of step 5	0.0–6553.5s (min)	0.0–6553.5	0.0s	○
P10.14	Multi-step speed 6	-100.0–100.0%	-100.0–100.0	0.0%	○
P10.15	Running time of step 6	0.0–6553.5s (min)	0.0–6553.5	0.0s	○
P10.16	Multi-step speed 7	-100.0–100.0%	-100.0–100.0	0.0%	○
P10.17	Running time of step 7	0.0–6553.5s (min)	0.0–6553.5	0.0s	○
P10.18	Multi-step speed 8	-100.0–100.0%	-100.0–100.0	0.0%	○
P10.19	Running time of step 8	0.0–6553.5s (min)	0.0–6553.5	0.0s	○

Function code	Name	Description	Setting range	Default	Modify
P10.20	Multi-step speed 9	-100.0–100.0%	-100.0–100.0	0.0%	○
P10.21	Running time of step 9	0.0–6553.5s (min)	0.0–6553.5	0.0s	○
P10.22	Multi-step speed 10	-100.0–100.0%	-100.0–100.0	0.0%	○
P10.23	Running time of step 10	0.0–6553.5s (min)	0.0–6553.5	0.0s	○
P10.24	Multi-step speed 11	-100.0–100.0%	-100.0–100.0	0.0%	○
P10.25	Running time of step 11	0.0–6553.5s (min)	0.0–6553.5	0.0s	○
P10.26	Multi-step speed 12	-100.0–100.0%	-100.0–100.0	0.0%	○
P10.27	Running time of step 12	0.0–6553.5s (min)	0.0–6553.5	0.0s	○
P10.28	Multi-step speed 13	-100.0–100.0%	-100.0–100.0	0.0%	○
P10.29	Running time of step 13	0.0–6553.5s (min)	0.0–6553.5	0.0s	○
P10.30	Multi-step speed 14	-100.0–100.0%	-100.0–100.0	0.0%	○
P10.31	Running time of step 14	0.0–6553.5s (min)	0.0–6553.5	0.0s	○
P10.32	Multi-step speed 15	-100.0–100.0%	-100.0–100.0	0.0%	○
P10.33	Running time of step 15	0.0–6553.5s (min)	0.0–6553.5	0.0s	○
P10.34	Simple PLC 0–7 step ACC/DEC time	0x0000–0xFFFF	00000–FFFF	0x0000	○
P10.35	Simple PLC 8–15 step ACC/DEC time	0x0000–0xFFFF	00000–FFFF	0x0000	○

Function code	Name	Description	Setting range	Default	Modify
P10.36	PLC restart	0: Restart from the first step 1: Continue to run from the stop frequency	0–1	0	◎
P10.37	Multi-step time unit	0: Second 1: Minute	0–1	0	◎
P11 group—Protective parameters					
P11.00	Phase loss protection	0x00–0x11 LED ones: 0: Disable input phase loss protection 1: Enable input phase loss protection LED tens: 0: Disable output phase loss protection 1: Enable output phase loss protection	00–11	11	○
P11.01	Instantaneous power loss frequency decreasing	0: Disabled 1: Enabled	0–1	0	○
P11.02	Frequency decreasing velocity of instantaneous power loss	0.00Hz/s–P00.03Hz/s (Max. frequency)	0.00Hz–P00.03	10.00Hz/s	○
P11.03	Overvoltage speed loss protection	0: Disabled 1: Enabled	0–1	1	○
P11.04	Voltage protection of overvoltage stall	120–150% (standard bus voltage)	120–150%	130%	○
P11.05	Current limit action	Ones: current limit 0: Invalid 1: Valid Tens: overload alarm of hardware current limit (for factory commissioning) 0: Valid 1: Invalid	00–11	01	◎

Function code	Name	Description	Setting range	Default	Modify
P11.06	Automatic current limit level	50.0–200.0% (100% corresponds to rated current)	50.0–200.0	G型机: 160.0%	◎
P11.07	Frequency decreasing velocity during current limit	0.00–50.00Hz/s	0.00–50.00	10.00Hz/s	◎
P11.08	VFD/Motor underload and overload pre-alarm	0x000–0x131 LED ones: 0: Motor underload and overload pre-alarm, relative to motor rated current 1: VFD underload and overload pre-alarm, relative to VFD rated current LED tens: 0: VFD continues running after underload and overload pre-alarm 1: VFD continues running after underload pre-alarm and stop running after overload fault 2: VFD continues running after overload pre-alarm and stop running after underload fault 3: VFD stops running after underload and overload alarm LED hundreds: 0: Detect all the time 1: Detect in constant running	000–131	0x000	○
P11.09	Detection level of overload pre-alarm	P11.11–200%	P11.11–200	150%	○
P11.10	Detection time of overload pre-alarm	0.1–60.0s	0.1–60.0	1.0s	○
P11.11	Detection level of underload pre-alarm	0%–P11.09	0–P11.09	50%	○
P11.12	Detection time of underload	0.1–60.0s	0.1–60.0	1.0s	○

Function code	Name	Description	Setting range	Default	Modify
	pre-alarm				
P11.13	Output terminal action during undervoltage and auto-reset	0x00–0x11 LED ones: 0: Action at undervoltage 1: No action at undervoltage LED tens: 0: Action during auto-reset 1: No action during auto-reset	00–11	0x00	○
P11.14	Detection value of speed deviation	0.0–50.0%	0.0–50.0	10.0%	○
P11.15	Detection time of speed deviation	0.0–10.0s (No speed deviation protection at 0.0)	0.0–10.0	0.5s	○
P11.16	Automatic frequency-decreasing at voltage drop	0: Invalid 1: Valid	0–1	0	○
P12 group—Motor 2 parameters					
P12.00	Motor 2 type	0: Asynchronous motor 1: Reserved	0–1	0	◎
P12.01	Asynchronous motor 2 rated power	0.1–3000.0kW	0.1–3000.0	Depends on model	◎
P12.02	Asynchronous motor 2 rated frequency	0.01Hz–P00.03 (Max. frequency)	0.01–P00.03	50.00Hz	◎
P12.03	Asynchronous motor 2 rated speed	1–36000rpm	1–36000	Depends on model	◎
P12.04	Asynchronous motor 2 rated voltage	0–4000V	0–4000	Depends on model	◎
P12.05	Asynchronous motor 2 rated current	0.8–6000.0A	0.8–6000.0	Depends on model	◎

Function code	Name	Description	Setting range	Default	Modify
P12.06	Asynchronous motor 2 stator resistor	0.001–65.535Ω	0.001–65.535	Depends on model	○
P12.07	Asynchronous motor 2 rotor resistor	0.001–65.535Ω	0.001–65.535	Depends on model	○
P12.08	Asynchronous motor 2 leakage inductance	0.1–6553.5mH	0.1–6553.5	Depends on model	○
P12.09	Asynchronous motor 2 mutual inductance	0.1–6553.5mH	0.1–6553.5	Depends on model	○
P12.10	Asynchronous motor 2 non-load current	0.1–6553.5A	0.1–6553.5	Depends on model	○
P12.11	Magnetic saturation coefficient 1 for the iron core of AM 2	0.0–100.0%	0.0–100.0	80.0%	◎
P12.12	Magnetic saturation coefficient 2 for the iron core of AM 2	0.0–100.0%	0.0–100.0	68.0%	◎
P12.13	Magnetic saturation coefficient 3 for the iron core of AM 2	0.0–100.0%	0.0–100.0	57.0%	◎
P12.14	Magnetic saturation coefficient 4 for the iron core of AM 2	0.0–100.0%	0.0–100.0	40.0%	◎
P12.15	Reserved				◎
P12.16	Reserved				◎
P12.17	Reserved				◎

Function code	Name	Description	Setting range	Default	Modify
P12.18	Reserved				◎
P12.19	Reserved				◎
P12.20	Reserved				○
P12.21	Reserved				○
P12.22	Reserved				○
P12.23	Reserved				○
P12.24	Reserved				●
P12.25	Reserved				●
P12.26	Motor 2 overload protection	0: No protection 1: Common motor (with low speed compensation) 2: Frequency conversion motor (without low speed compensation)	0–2	2	◎
P12.27	Motor 2 overload protection coefficient	20.0%–120.0%	20.0–120.0	100.0%	○
P12.28	Motor 2 power correction coefficient	0.00–3.00	0.00–3.00	1.00	○
P12.29	Motor 2 parameter display	0: Display according to motor type 1: Display all parameters	0–1	0	○
P14 group—Serial communication					
P14.00	Local communication address	1–247 0 is broadcast communication address.	1–247	1	○
P14.01	Communication baud rate	0: 1200BPS 1: 2400BPS 2: 4800BPS 3: 9600BPS 4: 19200BPS 5: 38400BPS 6: 57600BPS	0–6	4	○

Function code	Name	Description	Setting range	Default	Modify
P14.02	Data bit checkout	0: No check (N, 8, 1) for RTU 1: Even check (E, 8, 1) for RTU 2: Odd check (O, 8, 1) for RTU 3: No check (N, 8, 2) for RTU 4: Even check (E, 8, 2) for RTU 5: Odd check (O, 8, 2) for RTU	0–5	1	○
P14.03	Communication response delay	0–200ms	0–200	5	○
P14.04	Fault time of communication timeout	0.1–60.0s 0.0: Invalid	0.0–60.0	0.0s	○
P14.05	Transmission fault processing	0: Alarm and coast to stop 1: Continue to run without alarm 2: Stop according to stop way without alarm (only in communication control mode) 3: Stop according to stop way without alarm (in all control modes)	0–3	0	○
P14.06	Communication processing action	LED ones: 0: With response to write operation 1: Without response to write operation LED tens: 0: Communication encryption setting is invalid 1: Communication encryption setting is valid	0x00–0x11	0x00	○
P14.07	Reserved				●
P14.08	Reserved				●
P15 group—PROFIBUS function					
P15.00	Module type	0: PROFIBUS	0–1	0	◎
P15.01	PROFIBUS/CAN open module address	0–127	0–127	2	◎
P15.02	Received PZD2	0: Invalid	0–20	0	

Function code	Name	Description	Setting range	Default	Modify
P15.03	Received PZD3	1: Set frequency (0–Fmax; unit: 0.01Hz) 2: PID reference (range: 0–1000, 1000 corresponding to 100.0%) 3: PID feedback (range: 0–1000, 1000 corresponding to 100.0%) 4: Torque setting (-3000–3000, 1000 corresponding to 100.0% of motor rated current) 5: Forward rotation upper-limit frequency setting (0–Fmax; unit: 0.01Hz) 6: Reverse rotation upper-limit frequency (0–Fmax; unit: 0.01Hz) 7: Electromotion torque upper limit (0–3000, 1000 corresponding to 100.0% of motor rated current) 8: Braking torque upper limit (0–2000, 1000 corresponding to 100.0% of motor rated current) 9: Virtual input terminal command (range: 0x000–0x1FF) 10: Virtual output terminal command (range: 0x00–0x0F) 11: Voltage setting (special for V/F separation) (0–1000, 1000 corresponding to 100.0% of motor rated voltage) 12: AO setting 1 (-1000–1000, 1000 corresponding to 100.0%) 13: AO setting 2 (-1000–1000, 1000 corresponding to 100.0%)	0–20	0	○
P15.04	Received PZD4		0–20	0	○
P15.05	Received PZD5		0–20	0	○
P15.06	Received PZD6		0–20	0	○
P15.07	Received PZD7		0–20	0	○
P15.08	Received PZD8		0–20	0	○
P15.09	Received PZD9		0–20	0	○
P15.10	Received PZD10		0–20	0	○
P15.11	Received PZD11		0–20	0	○
P15.12	Received PZD12		0–20	0	○
P15.13	Sent PZD2	0: Invalid 1: Running frequency 2: Set frequency 3: Bus voltage 4: Output voltage 5: Output current 6: Output torque actual value	0–20	0	○
P15.14	Sent PZD3		0–20	0	○
P15.15	Sent PZD4		0–20	0	○
P15.16	Sent PZD5		0–20	0	○
P15.17	Sent PZD6		0–20	0	○
P15.18	Sent PZD7		0–20	0	○

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Setting range</th><th>Default</th><th>Modify</th></tr>
<tr><td>P15.19</td><td>Sent PZD8</td><td rowspan="5">7: Output power actual value
8: Rotating speed during running
9: Running linear speed
10: Ramp reference frequency
11: Fault code
12: AI1 value
13: AI2 value
14: AI3 value
15: PULSE frequency
16: Input state of terminals
17: Output state of terminals
18: PID reference
19: PID feedback
20: Motor rated torque</td><td>0–20</td><td>0</td><td>○</td></tr>
<tr><td>P15.20</td><td>Sent PZD9</td><td>0–20</td><td>0</td><td>○</td></tr>
<tr><td>P15.21</td><td>Sent PZD10</td><td>0–20</td><td>0</td><td>○</td></tr>
<tr><td>P15.22</td><td>Sent PZD11</td><td>0–20</td><td>0</td><td>○</td></tr>
<tr><td>P15.23</td><td>Sent PZD12</td><td>0–20</td><td>0</td><td>○</td></tr>
<tr><td>P15.24</td><td>Temporary variable 1 for PZD sending</td><td>0–65535</td><td>0–65535</td><td>0</td><td>○</td></tr>
<tr><td>P15.25</td><td>DP communication timeout fault duration</td><td>0.0: Invalid
0.1–60.0s</td><td>0.0–60.0</td><td>0.0s</td><td>○</td></tr>
<tr><td>P15.26</td><td>CANopen communication timeout fault duration</td><td>0.0 (invalid)
0.1–60.0s</td><td>0.0–60.0</td><td>0.0s</td><td>○</td></tr>
<tr><td>P15.27</td><td>CANopen baud rate</td><td>0: 1000k
1: 800k
2: 500k
3: 250k
4: 125k
5: 100k
6: 50k
7: 20k</td><td>0–7</td><td>0</td><td>◎</td></tr>
<tr><td>P15.28</td><td>CAN communication address</td><td>0–127
0 is broadcast communication address</td><td>0–127</td><td>1</td><td>◎</td></tr>
</table>

Function code	Name	Description	Setting range	Default	Modify
P15.29	CAN baud rate	0: 1000k 1: 500k 2: 250k 3: 125k 4: 100k	0–4	1	
P16 group—Ethernet function					
P16.00	Ethernet communication speed setting	0: Self-adapting 1: 100M full-duplex 2: 100M half-duplex 3: 10M full-duplex 4: 10M half-duplex	0–4	3	◎
P16.01	IP address 1	0–255	0–255	192	◎
P16.02	IP address 2	0–255	0–255	168	◎
P16.03	IP address 3	0–255	0–255	0	◎
P16.04	IP address 4	0–255	0–255	1	◎
P16.05	Subnet mask 1	0–255	0–255	255	◎
P16.06	Subnet mask 2	0–255	0–255	255	◎
P16.07	Subnet mask 3	0–255	0–255	255	◎
P16.08	Subnet mask 4	0–255	0–255	0	◎
P16.09	Gateway 1	0–255	0–255	192	◎
P16.10	Gateway 2	0–255	0–255	168	◎
P16.11	Gateway 3	0–255	0–255	1	◎
P16.12	Gateway 4	0–255	0–255	1	◎
P16.13	Reserved				●
P16.14	Reserved				●
P17 group—State view 1					
P17.00	Setting frequency	0.00Hz–P00.03	0.00–P00.03	0.00Hz	●
P17.01	Output frequency	0.00Hz–P00.03	0.00–P00.03	0.00Hz	●

Function code	Name	Description	Setting range	Default	Modify
P17.02	Ramp reference frequency	0.00Hz–P00.03	0.00–P00.03	0.00Hz	●
P17.03	Output voltage	0–4000V	0–4000	0V	●
P17.04	Output current	0.0–3000.0A	0.0–3000.0	0.0A	●
P17.05	Motor speed	0–65535RPM	0–65535	0 RPM	●
P17.06	Torque current	-3000.0–3000.0A	3000.0–3000.0	0.0A	●
P17.07	Exciting current	-3000.0–3000.0A	3000.0–3000.0	0.0A	●
P17.08	Motor power	-300.0–300.0% (the rated current of the motor)	-300.0–300.0	0.0%	●
P17.09	Output torque	-250.0–250.0%	-250.0–250.0	0.0%	●
P17.10	Evaluated motor frequency	0.00–P00.03	0.00–600.00	0.00Hz	●
P17.11	DC bus voltage	0.0–6000.0V	0.0–6000.0	0V	●
P17.12	Digital input terminals state	0000–00FF	0000–00FF	0	●
P17.13	Digital output terminals state	0000–000F	0000–000F	0	●
P17.14	Digital adjustment	0.00Hz–P00.03	0.00–P00.03	0.00Hz	●
P17.15	Torque reference	-300.0%–300.0% (the rated current of the motor)	-300.0–300.0	0.0%	●
P17.16	Reserved				●
P17.17	Reserved				●
P17.18	Reserved				●
P17.19	AI1 input voltage	0.00–10.00V	0.00–10.00	0.00V	●
P17.20	AI2 input voltage	-10.00–10.00V	-10.00–10.00	0.00V	●
P17.21	AI3 input voltage	0.00–10.00V	0.00–10.00V	0.00V	●
P17.22	HDI input frequency	0.00–50.00kHz	0.00–50.00	0.00 kHz	●
P17.23	PID reference	-100.0–100.0%	-100.0–100.0	0.0%	●

Function code	Name	Description	Setting range	Default	Modify
P17.24	PID feedback	-100.0–100.0%	-100.0–100.0	0.0%	●
P17.25	Power factor of the motor	-1.00–1.00	-1.00–1.00	0.0	●
P17.26	Current running time	0–65535min	0–65535	0min	●
P17.27	Simple PLC and the current step of the multi-step speed	0–15	0–15	0	●
P17.28	ASR controller output	-300.0%–300.0% (the rated current of the motor)	-300.0–300.0	0.0%	●
P17.29	Reserved				●
P17.30	Reserved				●
P17.31	Reserved				●
P17.32	Magnetic flux linkage	0.0%–200.0%	0.0–200.0	0.0%	●
P17.33	Exciting current reference	-3000.0–3000.0A	-3000.0–3000.0	0.0A	●
P17.34	Torque current reference	-3000.0–3000.0A	-3000.0–3000.0	0.0A	●
P17.35	AC current	0.0–5000.0A	0.0–5000.0	0.0A	●
P17.36	Output torque	-3000.0Nm–3000.0Nm	-3000.0–3000.0	0.0Nm	●
P17.37	Count value of motor overload	0–100 (100 reports OL1 fault)	0–100	0	●
P17.38	PID output	-100.00–100.00%	-100.00–100.0	0.00%	●
P17.39	Wrong download of parameters	0.00–99.99	0.00–99.99	0.00	●
P18 group—State view 2					
P18.00	Encoder actual frequency	-327.7–327.7Hz	-327.7–327.7	0.0Hz	●
P18.01	Count value of encoder position	0–65535	0–65535	0	●

Function code	Name	Description	Setting range	Default	Modify
P18.02	Count value of encoder Z pulse	0–65535	0–65535	0	●
P18.03	Rotary count value	0–65535	0–65535		●
P18.04	Rotary angle	0–359.99	0–359.99		●
P18.05	Pole angle	0–359.99	0–359.99		●
P18.06	Motor temperature display	-200.0–200.0	-200.0–200.0		●
P18.07	Frequency reference sent by master	-100.00–100.00% (Max. frequency of the VFD)	-100.00–100.00		●
P18.08	Speed loop output sent by master	-300.00–300.00% (motor rated current)	-300.00–300.00		●
P18.09	Frequency command received by slave	-100.00–100.00% (Max. frequency of the VFD)	-100.00–100.00		●
P18.10	Torque command received by slave	-300.00–300.00% (motor rated current)	-300.00–300.00		●
P18.11	Reserved				●
P18.12	Reserved				●
P18.13	FPAG software version	1.00–655.35			●
P18.14	Reserved				●
P18.15	Reserved				●
P18.15	Reserved				●
P18.16	Reserved				●
P18.17	Reserved				●
P18.18	Reserved				●
P18.19	Reserved				●
P19 group—External temperature detection					

Function code	Name	Description	Setting range	Default	Modify
P19.00	Motor temperature detection	0: Invalid 1: PT100 2: PTC 3: Reserved 4: Reserved	0–4	0	○
P19.01	Motor temperature pre-alarm point	0°C–200°C	0–200.0	125.0°C	○
P19.02	Motor overtemperature fault point	0°C–200°C	0–200.0	150.0°C	○
P19.03	Motor overtemperature action	0: Alarm fault and coast to stop 1: No alarm and keep running 2: No alarm and stop	0–2	0	○
P19.04	Starting temperature of motor temperature compensation	0–60.0°C	0–60.0	40.0°C	○
P19.05	Motor temperature compensation coefficient	0.0–200.0%	0.0–200.0	100.0%	○
P19.06	Reserved				●
P19.07	Reserved				●
P19.08	Reserved				●
P19.09	Reserved				●
P20 group—Encoders					
P20.00	Encoder type	0: Increment encoder 1: Reserved 2: Rotary encoder 3: Reserved	0–3	0	◎
P20.01	Encoder pulse number	0–60000	0–60000	1024	◎

Function code	Name	Description	Setting range	Default	Modify
P20.02	Encoder direction	LED ones: AB direction 0: Forward 1: Reverse LED tens: Z pulse direction 0: Forward 1: Reverse	0–0x11	0x00	◎
P20.03	Encoder offline detection time	0.0–100.0s	0–100.0	0.5s	○
P20.04	Encoder reverse detection time	0.0–100.0s	0–100.0	0.8s	○
P20.05	Encoder detection filter times	Ones: Low-speed filter times Tens: High-speed filter times	0–0x99	0x23	○
P20.06	Speed ratio between motor and encoder	0.000–65.535	0.000–65.535	1.000	○
P20.07	Reserved				○
P20.08	Reserved				○
P20.09	Reserved				○
P20.10	Magnetic pole initial angle	0.00–359.99	0.00–359.99	0	○
P20.11	Magnetic pole initial angle autotuning	0–2 0: No operation 1: Rotation autotuning 2: Static autotuning (suitable for rotary encoder feedback)	0–2	0	◎
P20.12	Reserved variable	0–65535	0–65535	0	○
P20.13	Reserved variable	0–65535	0–65535	0	○
P20.14	Reserved variable	0–65535	0–65535	0	○
P21 group—Master-slave control					

Function code	Name	Description	Setting range	Default	Modify
P21.00	Master-slave control mode	0: Invalid 1: The local is the master 2: The local is the slave	0–2	0	◎
P21.01	Master-slave communication data	0: CAN 1: RS485	0–1	0	◎
P21.02	Master-slave control mode	0: Master-slave mode 0 1: Master-slave mode 1	0–1	0	◎
P21.03	Slave reference signal gain	0.0–500.0%	0.0–500.0	100.0%	○
P21.04	Reserved variable	0–65535	0–65535	0	●
P21.05	Reserved variable	0–65535	0–65535	0	●
P21.06	Reserved variable	0–65535	0–65535	0	●
P21.07	Reserved variable	0–65535	0–65535	0	●
P21.08	Reserved variable	0–65535	0–65535	0	●
P21.09	Reserved variable	0–65535	0–65535	0	●

7 Maintenance guidelines

●Electricians must carry out maintenance as the specified methods.

●Only qualified electricians are allowed to perform the maintenance.

●Disconnect all power supplies to the VFD before maintenance. After 25 minutes, ensure the CHARGE LEDs of all modules are off and the DC bus voltage of the VFD detected by multimeter is lower than 25V.

●Do not touch the components on the PCB board, otherwise electrostatic discharge may cause damage to the VFD.

●After maintenance, ensure all screws have been tightened securely.

7.1 Daily maintenance

To avoid faults, ensure normal running and prolong service life, the inverter needs daily maintenance, as shown below:

Check item	Check content
Temperature/humidity	Environmental temperature: -10°C–40°C, humidity: 5–95%
Oil fog and dust	No oil fog, dust or condensation inside the VFD
VFD	No abnormal overheat or vibration to the VFD
Fan	The fan runs normally and no blockage
Input power	The voltage and frequency of input power in allowed range
Motor	No abnormal vibration, overheat, noise or phase loss to the motor

7.2 Regular maintenance

To avoid faults and ensure the VFD runs smoothly in high performance for a long time, users must inspect the VFD regularly, as shown below:

Check item	Check content	Check method	Criterion
Environment	1. Check the ambient temperature, humidity, vibration and atmosphere (including dust, oil fog and water drops) 2. Ensure there are no tools or other foreign or dangerous objects	1. Visual examination and instrument test 2. Visual	1. Conform to the standards 2. There are no tools or dangerous objects

Check item		Check content	Check method	Criterion
			examination	
Voltage		Check the AC voltage and DC voltage are normal	Multimeter or other instruments	Conform to the standards
Display		1. Ensure the display is clear enough 2. Ensure the characters are displayed totally	Visual examination	The characters are displayed normally
Casing, cover and other structural parts		1. No abnormal noise and vibration 2. No loose fasteners 3. No distortion or crackles 4. No color-changing caused by overheat 5. No dust or other surface adhesive materials	1. Visual examination 2. Tighten up again 3. Visual examination 4. Visual examination 5. Visual examination	NA
Main circuit	For public use	1. No loose or missing fastening screws 2. No distortion, crackles, damage or color-changing caused by overheating and aging to the machine and insulator 3. No dust or other surface adhesive materials	1. Tighten up 2. Visual examination 3. Visual examination	NA **Note**: if the color of the copper blocks change, it does not mean that there is something wrong with the features.
	Conductor and cable	1. No distortion or color-changing of the conductors caused by overheat 2. No damage, crackles or color-changing to the protective layers	Visual examination	NA
	Terminal block	The terminal block is not broken	Visual examination	NA
	Bus capacitor	1. No weeping, color-changing, crackles and casing expansion 2. The safety valve is in the right place 3. If necessary, measure the capacitance.	1, 2. Visual examination	1. NA 2. NA The capacitance is above or equal to the original

Check item		Check content	Check method	Criterion
				value*0.85.
	Transformer and reactor	No abnormal vibration, noise and odor	Hearing, visual examination, smelling	NA
	Contactor and relay	1. No abnormal sound when the relay and contactor act 2. The contacts are not rough	1. Hearing 2. Visual examination	NA
Control circuit	Control board and terminal	1. No loose screws and connecting cables 2. No abnormal odor and color-changing parts 3. No collision, crackles, distortion or obvious rust 4. No capacitors in weeping and distortion	1. Tighten up 2. Smelling, visual examination 3. Visual examination 4. Visual examination	NA
Cooling system	Cooling fan	1. No abnormal noise or overheat 2. No loose fasteners 3. No color-changing caused by overheating	1. Hearing, visual examination, rotate the fan by manual after power off 2. Tighten up 3. Visual examination	1. The fan runs smoothly 2. NA 3. NA
	Air duct	No foreign objects in the ventilating air duct	Visual examination	NA

7.3 Replacement of wearing parts

The fans and electrolytic capacitors are wearing parts. To ensure long-term safe operation without faults, the wearing parts should be replaced regularly. The periods for replacement are:

- Fan: replace it after using 20000 hours
- Electrolytic capacitor: replace it after using 30000 – 40000 hours

8 MODBUS protocol

8.1 Overview of MODBUS protocol

This chapter describes the communication protocol of Goodrive3000 series VFDs.

The Goodrive3000 series medium voltage VFDs provide RS485 communication interface. It adopts international standard Modbus communication protocol to perform master-slave communication. The user can realize centralized control through PC/PLC, upper control PC, etc. (set the control command, running frequency of the VFD, modify relevant function codes, monitor and control the operating state and fault information of the VFD and so on) to adapt specific application requirements.

8.2 Brief introduction to MODBUS

Modbus protocol is a software protocol and common language which is applied in the electrical controller. With this protocol, the controller can communicate with other devices via network (the channel of signal transmission or the physical layer, such as RS485). And with this industrial standard, the controlling devices of different manufacturers can be connected to an industrial network for the convenience of being monitored.

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

Modbus network is a controlling network with single-master and multiple slaves, which means that there is only one device performs as the master and the others are the slaves on one Modbus network. The master can communicate with any single slave or with all slaves. For the single-visiting command, the slave should feedback a response message; for the broadcasting message from the master, the slave does not need to feedback the response message.

8.3 Application of the VFD

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

8.3.1 RS485

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

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

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

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

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

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

8.3.1.1 Single application

Figure 8.1 is the site Modbus connection figure of single VFD and PC. Generally, the computer does not have RS485 interface, the RS232 or USB interface of the computer should be converted into RS485 by converter. Connect the A terminal of RS485 to the 485+ terminal of the VFD and B to the 485- terminal. It is recommended to use the shield twisted pairs. When applying RS232-RS485 converter, if the RS232 interface of the computer is connected to the RS232 interface of the converter, the wire length should be as short as possible within the length of 15m. It is recommended to connect the RS232-RS485 converter to the computer directly. If using USB-RS485 converter, the wire should be as short as possible, too.

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

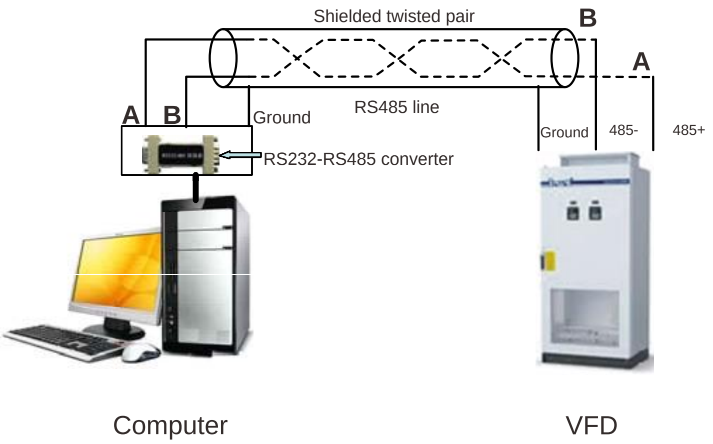


Figure 8.1 RS485 physical connection in single application

8.3.1.2 Multi-application

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

Chrysanthemum chain connection is required in the RS485 industrial fieldbus standards. The two ends are connected to terminal resistors of 120Ω which is shown as Figure 8.2. Figure 8.3 is the simply connection figure and Figure 8.4 is the real application figure.

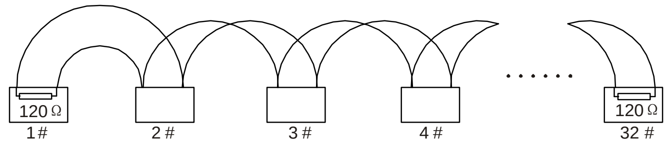


Figure 8.2 Chrysanthemum connection

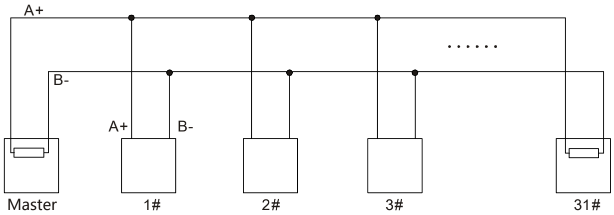


Figure 8.3 Chrysanthemum connection

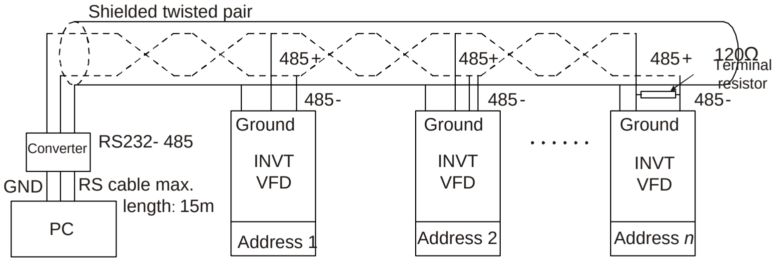


Figure 8.4 Chrysanthemum connection applications

Figure 8.5 is the star connection. Terminal resistor should be connected to the two devices which have the longest distance. (1# and 15#device)

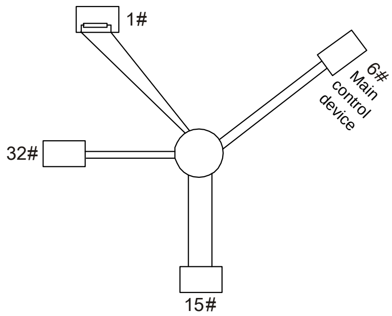


Figure 8.5 Star connection

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

8.3.2 RTU mode

8.3.2.1 RTU communication frame format

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

Code system

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

Error detection field

- CRC

The data format is illustrated as follows:

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

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

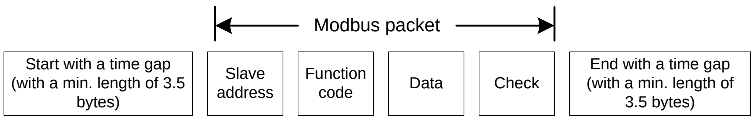
10-bit character frame (BIT1 – BIT7 are the data bits)

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

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

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

RTU data frame format



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

The standard structure of RTU frame:

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

8.3.2.2 RTU communication frame error checkout

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

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

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

Bit checkout of the byte

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

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

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

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

CRC check

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

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

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

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

Here provided a simple function of CRC calculation for the reference (programmed with C language):

```
unsigned int crc_cal_value(unsigned char*data_value,unsigned char data_length)
{
 int i;
 unsigned int crc_value=0xffff;
```

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

In ladder logic, CKSM calculated the CRC value according to the frame with the table inquiry. The method is advanced with easy program and quick calculation speed. But the ROM space the program occupied is huge. So use it with caution according to the program required space.

8.4 RTU command code and communication data illustration

8.4.1 Command code: 03H, read N words (continuously up to 16 words)

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

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

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

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

START	T1-T2-T3-T4 (transmission time of 3.5 bytes)
ADDR	01H
CMD	03H
High bit of the start bit	00H
Low bit of the start bit	04H
High bit of data number	00H
Low bit of data number	02H
CRC low bit	85H
CRC high bit	CAH
END	T1-T2-T3-T4 (transmission time of 3.5 bytes)

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

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

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

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

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

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

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

START	T1-T2-T3-T4 (transmission time of 3.5 bytes)
ADDR	01H
CMD	03H
Byte number	04H
Data high bit of address 0004H	13H
Data low bit of address 0004H	88H
Data high bit of address 0005H	00H
Data low bit of address 0005H	00H
CRC low bit	7EH
CRC high bit	9DH
END	T1-T2-T3-T4 (transmission time of 3.5 bytes)

The meaning of the response is that:

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

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

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

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

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

8.4.2 Command code: 06H, write one word

The command means that the master write data to the VFD and one command can write one data other than multiple data. The effect is to change the working mode of the VFD.

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

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

START	T1-T2-T3-T4 (transmission time of 3.5 bytes)
ADDR	02H
CMD	06H
High bit of writing data address	00H
Low bit of writing data address	04H
High bit of data content	13H
Low bit of data content	88H
CRC low bit	C5H
CRC high bit	6EH
END	T1-T2-T3-T4 (transmission time of 3.5 bytes)

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

START	T1-T2-T3-T4 (transmission time of 3.5 bytes)
ADDR	02H
CMD	06H
High bit of writing data address	00H
Low bit of writing data address	04H
High bit of data content	13H
Low bit of data content	88H
CRC low bit	C5H
CRC high bit	6EH
END	T1-T2-T3-T4 (transmission time of 3.5 bytes)

Note: Sections 8.4.1 and 8.4.2 mainly describe the command formats, and the detailed application will be mentioned in 8.4.7 Example of writing and reading with examples.

8.4.3 Command code: 08H, diagnosis function

Meaning of sub-function codes:

Sub-function code	Description
0000	Return to inquire information data

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

The RTU request command is:

START	T1-T2-T3-T4 (transmission time of 3.5 bytes)
ADDR	01H
CMD	08H
High bit of sub-function code	00H
Low bit of sub-function code	00H
High bit of data content	12H
Low bit of data content	ABH
CRC CHK low bit	ADH
CRC CHK high bit	14H
END	T1-T2-T3-T4 (transmission time of 3.5 bytes)

The RTU response command is:

START	T1-T2-T3-T4 (transmission time of 3.5 bytes)
ADDR	01H
CMD	08H
High bit of sub-function code	00H
Low bit of sub-function code	00H
High bit of data content	12H
Low bit of data content	ABH
CRC CHK low bit	ADH
CRC CHK high bit	14H
END	T1-T2-T3-T4 (transmission time of 3.5 bytes)

8.4.4 The definition of data address

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

8.4.4.1 The rules of parameter address of the function codes

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

Function code	Name	Description	Setting range	Default	Modify
P10.00	Simple PLC	0: Stop after running once 1: Run at the final value after running once 2: Cycle running	0–2	0	○
P10.01	Simple PLC memory	0: Power loss without memory 1: Power loss with memory	0–1	0	○

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

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

8.4.4.2 The address instruction of other function in MODBUS

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

Table 8.1 is the MODBUS function address of Goodrive3000 rectifier and Table 8.2 is the MODBUS function address of Goodrive3000 inverter.

Table 8.1 MODBUS function address of Goodrive3000 rectifier

Function instruction	Address definition	Data meaning instruction	R/W characteristics
Communication control command	2000H	0001H:running	W
		0002H:reserved	
		0003H:reserved	
		0004H:reserved	
		0005H:stop	
		0006H:reserved	
		0007H:fault reset	
		0008H:reserved	

Function instruction	Address definition	Data meaning instruction	R/W characteristics
		0009H:power-on buffering	
The address of communication setting	2001H	Reserved	W
	2002H	Reserved	
	2003H	Reserved	W
	2004H	DC bus voltage reference (unit: 0.1V)	W
	2005H	Reserved	W
	2006H	Reserved	W
	2007H	Reserved	W
	2008H	Reserved	W
	2009H	Reserved	W
	200AH	Reserved	W
	200BH	Reserved	W
	200CH	Reserved	W
	200DH	AO output setting 1 (-1000–1000, 1000 corresponds to 100.0%)	W
	200EH	AO output setting 2 (-1000–1000, 1000 corresponds to 100.0%)	W
SW 1 of the VFD	2100H	0001H: running	R
		0002H: reserved	
		0003H: stop	
		0004H: fault	
		0005H: POFF state	
SW 2 of the VFD	2101H	Bit0: =0: bus voltage is not established =1: bus voltage is established Bit4: =0: pre-alarm without overload =1:overload pre-alarm	R
Fault code of the VFD	2102H	See the fault type instruction	R

Function instruction	**Address definition**	**Data meaning instruction**	**R/W characteristics**
Identifying code of the VFD	2103H	GD3000-----0x0111	R
Factory bar code 1	6000H	Range: 0000–FFFF	W
Factory bar code 2	6001H	Range: 0000–FFFF	W
Factory bar code 3	6002H	Range: 0000–FFFF	W
Factory bar code 4	6003H	Range: 0000–FFFF	W
Factory bar code 5	6004H	Range: 0000–FFFF	W
Factory bar code 6	6005H	Range: 0000–FFFF	W

Table 8.2 MODBUS function address of Goodrive3000 inverter

Function instruction	**Address definition**	**Data meaning instruction**	**R/W characteristics**
Communication control command	2000H	0001H:forward running	W
		0002H:reverse running	
		0003H:forward jogging	
		0004H:reverse jogging	
		0005H:stop	
		0006H:coast to stop (emergency stop)	
		0007H:fault reset	
		0008H:jogging stop	
		0009H: pre-excitation	
The address of communication setting	2001H	Communication setting frequency (0–Fmax(unit: 0.01Hz))	W
	2002H	PID reference, range (0–1000, 1000 corresponds to 100.0%)	
	2003H	PID feedback, range (0–1000, 1000 corresponds to 100.0%)	W
	2004H	Torque setting value (-3000–3000, 1000 corresponds to the 100.0% of the rated current of the motor)	W

Function instruction	Address definition	Data meaning instruction	R/W characteristics
	2005H	The upper limit frequency setting during forward rotation (0–Fmax(unit: 0.01Hz))	W
	2006H	The upper limit frequency setting during reverse rotation (0–Fmax(unit: 0.01Hz))	W
	2007H	The upper limit torque of electromotion torque (0–3000, 1000 corresponds to the 100.0% of the rated current of the motor)	W
	2008H	The upper limit torque of braking torque (0–3000, 1000 corresponds to the 100.0% of the rated current of the motor)	W
	2009H	Special control command word Bit0–1:=00: motor 1 =01: motor 2 =10: motor 3 =11: motor 4 Bit2:=1 torque control prohibit =0: torque control	W
	200AH	Virtual input terminal command , range: 0x000–0x1FF	W
	200BH	Virtual output terminal command , range: 0x00–0x0F	W
	200CH	Voltage setting value (special for V/F separation) (0–1000, 1000 corresponds to the 100.0%)	W
	200DH	AO output setting 1 (-1000–1000, 1000 corresponds to 100.0%)	W
	200EH	AO output setting 2 (-1000–1000, 1000 corresponds to 100.0%)	W
SW 1 of the VFD	2100H	0001H:forward running	R
		0002H:forward running	
		0003H:stop	
		0004H:fault	
		0005H: POFF state	
SW 2 of the VFD	2101H	Bit0: =0: ready for operation =1: not ready for operation	R

Function instruction	Address definition	Data meaning instruction	R/W characteristics
		Bit1–2: =00:motor 1 =01:motor 2 =10:motor 3 =11:motor 4 Bit3: =0:asynchronous motor =1:synchronous motor Bit4: =0:pre-alarm without overload =1:overload pre-alarm Bit5: =0: motor without pre-excitation =1: motor in pre-excitation Bit0: =0: ready for operation =1: not ready for operation Bit1–2: =00:motor 1 =01:motor 2 =10:motor 3 =11:motor 4 Bit3: =0:asynchronous motor =1:synchronous motor Bit4: =0:pre-alarm without overload =1:overload pre-alarm Bit5: =0: motor without excitation =1: motor in excitation	
Fault code of the VFD	2102H	See the fault type instruction	R
Identifying code of the VFD	2103H	GD3000-----0x0110	R
Pre-alarm sign	2014H	Bit 0: motor overheat pre-alarm (A-OT) Bit 1: overload pre-alarm (A-OL) Bit 2–Bit7: reserved	
Operation frequency	3000H	0–Fmax(unit: 0.01Hz)	R
Setting frequency	3001H	0–Fmax(unit: 0.01Hz)	R
Bus voltage	3002H	0.0–2000.0V(unit: 0.1V)	R
Output voltage	3003H	0–1200V(unit: 1V)	R
Output current	3004H	0.0–3000.0A(unit: 0.1A)	R
Rotation speed	3005H	0–65535(unit: 1RPM)	R

Function instruction	Address definition	Data meaning instruction	R/W characteristics
Output power	3006H	-300.0 – 300.0%(unit: 0.1%)	R
Output torque	3007H	-250.0 – 250.0%(unit: 0.1%)	R
Closed loop setting	3008H	-100.0 – 100.0%(unit: 0.1%)	R
Closed loop feedback	3009H	-100.0 – 100.0%(unit: 0.1%)	R
Input IO state	300AH	000 – 1FF	R
Output IO state	300BH	000 – 1FF	R
Analog input 1	300CH	0.00 – 10.00V(unit: 0.01V)	R
Analog input 2	300DH	0.00 – 10.00V(unit: 0.01V)	R
Analog input 3	300EH	-10.00 – 10.00V(unit: 0.01V)	R
Analog input 4	300FH		R
Read input of high-speed pulse 1	3010H	0.00 – 50.00kHz(unit: 0.01Hz)	R
Read input of high-speed pulse 2	3011H		R
Read the current step of multi-step speed	3012H	0 – 15	R
External length	3013H	0 – 65535	R
External counting	3014H	0 – 65535	R
Torque setting	3015H	-300.0 – 300.0%(unit: 0.1%)	R
Identifying code of the VFD	3016H		R
Fault code	5000H		R

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

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

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

High 8 bit	Meaning	Low 8 bit	Meaning
01	GD	0x0110	GD3000 PWM VFD

8.4.5 Fieldbus ratio values

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

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

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

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

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

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

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

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

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

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

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

8.4.6 Fault message response

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

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

Table 8.3 Meaning of fault messages

Code	Name	Meaning
01H	Illegal command	The command from master cannot be executed. The reason may be: 1. This command is only for new device; 2. Slave is in fault state and cannot execute it.
02H	Illegal data address	Some of the operation addresses are invalid or not allowed to access. Especially the combination of the register and the transmitting bytes are invalid.
03H	Illegal value	When there are invalid data in the message framed received by slave. **Note:** This error code does not indicate the data value to write exceed the range, but indicate the message frame is an illegal frame.
04H	Operation failed	The parameter setting in parameter writing is invalid. For example, the function input terminal cannot be set repeatedly.
05H	Password error	The password written to the password check address is not same as the password set by 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	Parameters only for read	It only happens in write command
08H	Parameters cannot be changed during running	The modified parameter in the writing of the upper computer cannot be modified during running.
09H	Password protection	When the upper computer is writing or reading and the user password is set without password unlocking, it will report that the system is locked.

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

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

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

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

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

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

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

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

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

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

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

8.4.7 Example of writing and reading

See sections 8.4.1 Command code: 03H, read N words (continuously up to 16 words) and 8.4.2 Command code: 06H, write one word for the command formats.

8.4.7.1 Example of reading command 03H

Example 1: Read the state word 1 of the VFD with the address of 01H (referring to the function address tables in 8.4.4.2). According to the tables, the parameter address of the state word 1 of the VFD is 2100H.

The command sent to the VFD:

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

If the response message is as follows:

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

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

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

The command sent to the VFD:

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

If the response message is as follows:

03	03	0C	00 23	00 23	00 23	00 23	00 23	00 23	5F D2
VFD address	Read command	Number of bytes	Present fault type	Last fault type	2nd-last fault type	3rd-last fault type	4th-last fault type	5th-last fault type	CRC

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

8.4.7.2 Example of writing command 06H

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

Function instruction	Address definition	Data meaning instruction	R/W characteristics
Communication control command	2000H	0001H:forward running	W
		0002H:reverse running	
		0003H:forward jogging	
		0004H:reverse jogging	
		0005H:stop	
		0006H:coast to stop (emergency stop)	
		0007H:fault reset	
		0008H:jogging stop	
		0009H: pre-excitation	

The command sent by the master:

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

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

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

Example 2: Set the Max. output frequency of the VFD with the address of 03H as 100Hz.

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

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

The command sent by the master:

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

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

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

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

8.4.7.3 Example of MODBUS communication commissioning

A PC is used as the host, an RS232-RS485 converter is used for signal conversion, and the PC serial port used by the converter is COM1 (an RS232 port). The upper computer commissioning software is the serial port commissioning assistant Commix, which can be downloaded from the Internet. Download a version that can automatically execute the CRC check function. The following figure shows the interface of Commix.

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

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

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

Note:

Set the address (P14.00) of the VFD to 03.

Set "Channel of running commands" (P00.01) to "Communication", and set "Communication channel of running commands" (P00.02) to the Modbus communication channel.

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

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

8.5 Common communication fault

Common communication faults include the following:

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

Possible causes of no response include the following:

- The serial port is set incorrectly. For example, the converter uses the serial port COM1, but COM2 is selected for the communication.
- The settings of the baud rates, data bits, end bits, and check bits are inconsistent with those set on the VFD.
- The positive pole (+) and negative pole (-) of the RS485 bus are connected reversely.
- The RS485 wire cap on the VFD terminal block is not connected.

8.6 Relevant function codes

8.6.1 Relevant function codes of Goodrive3000 PWM rectifier

Function code	Name	Description	Setting range	Default
P11.00	Local communication address	1–247 0: broadcast address	1–247	1
P11.01	Baud rate setting	0: 1200BPS 1: 2400BPS 2: 4800BPS 3: 9600BPS 4: 19200BPS 5: 38400BPS	0–5	4
P11.02	Check bit setting	0: No check (N, 8, 1)for RTU 1: Even check (E, 8, 1)for RTU 2: Odd check (O, 8, 1)for RTU 3: No check (N, 8, 2)for RTU 4: Even check (E, 8, 2)for RTU 5: Odd check (O, 8, 2)for RTU	0–5	1
P11.03	Response delay	0–200ms	0–200	5
P11.04	Communication overtime fault	0.0 (invalid), 0.1–60.0s	0.0–60.0s	0.0s
P11.05	Transmission error processing	0: Report fault and coast to stop 1: Not to report fault and keep working 2: Not to report fault and stop (only in the communication control mode) 3: Not to report fault and stop (in all communication control modes)	0–3	0

Function code	Name	Description	Setting range	Default
P11.06	Communication processing	0x00–0x11 LED ones: 0: Response to write 1: No response to write LED tens: 0: Reserved 1: Reserved	0x00–0x11	0x00

8.6.2 Relevant function codes of Goodrive3000 inverter

Function code	Name	Description	Setting range	Default
P14.00	Local communication address	1–247, 0 is broadcast communication address	1–247	1
P14.01	Communication baud rate	0: 1200BPS 1: 2400BPS 2: 4800BPS 3: 9600BPS 4: 19200BPS 5: 38400BPS 6: 57600BPS	0–6	4
P14.02	Data bit checkout	0: No check (N, 8, 1) for RTU 1: Even check (E, 8, 1) for RTU 2: Odd check (O, 8, 1) for RTU 3: No check (N, 8, 2) for RTU 4: Even check (E, 8, 2) for RTU 5: Odd check (O, 8, 2) for RTU	0–5	1
P14.03	Communication response delay	0–200ms	0–200	5
P14.04	Fault time of communication timeout	0.0 (invalid), 0.1–60.0s	0.0–60.0	0.0s
P14.05	Transmission fault processing	0: Alarm and coast to stop 1: Continue to run without alarm 2: Stop according to stop way without alarm (only in communication control	0–3	0

Function code	Name	Description	Setting range	Default
		mode) 3: Stop according to stop way without alarm (in all control modes)		
P14.06	Communication processing action	LED ones: 0: With response to write operation 1: Without response to write operation LED tens: 0: Communication encryption setting is invalid 1: Communication encryption setting is valid	0x00–0x11	0x00

9 PROFIBUS communication

9.1 PROFIBUS introduction

PROFIBUS is an international open fieldbus standard that can implement data exchange between various automation components. It is widely applicable to automation in various industries, such as the manufacturing, process, building, transportation, and power industries. It helps provide effective solutions for implementing integrated automation and intelligentization of field equipment.

PROFIBUS consists of three mutually compatible components, namely PROFIBUS-Decentralised Peripherals (DP), PROFIBUS-Process Automation (PA), and PROFIBUS-Fieldbus Message Specification (FMS). It adopts the master-slave mode and is generally used for periodic data exchange between VFD devices.

The transmission media of a PROFIBUS fieldbus system are twisted pairs (complying with the RS485 standard), two-wire cables, or optical cables. The baud rate ranges from 9.6 kbit/s to 12 Mbit/s. The maximum length of a fieldbus cable must be within the range of 100 meters to 1200 meters, and the specific length depends on the selected transmission rate. When no repeaters are used, a maximum of 31 nodes can be connected to one PROFIBUS network segment. When repeaters are used, a maximum of 127 nodes (including the repeaters and master nodes) can be connected.

In PROFIBUS communication, tokens are transmitted between master nodes or from master nodes to slave nodes. Single- or multi-master systems are supported. Which node responds to the command of a master node is selected by the master node, generally a programmable logic controller (PLC). For cyclic master-slave user data transmission and non-cyclic master-master data transmission, a master node can also transmit commands to multiple nodes in broadcast mode. When the broadcast mode is adopted, the nodes do not need to transmit feedback signals to the master node. On PROFIBUS networks, slave nodes cannot communicate with each other.

The PROFIBUS protocol is described in details in the EN50170 standard. For more information about PROFIBUS, see the EN50170 standard.

9.2 PROFIBUS-DP communication card

The PROFIBUS-DP communication card we provide, that is, EC-TX103 communication card, is an optional part of the VFD. The VFD can be connected to a PROFIBUS network by using the communication card. Then the VFD becomes a slave node on the network. The communication card can:

- Send control commands (such as start, stop, and fault reset commands) to the VFD.
- Send speed or torque reference signals to the VFD.
- Read status values and actual values from the VFD.
- Modify VFD parameters.

Note:

EC-TX103 communication card is compatible with all Goodrive3000 series VFD models and VFDs that support PROFIBUS expansion.

EC-TX103 communication card is compatible with all master nodes that support PROFIBUS-DP.

9.2.1 Communication card model designation

Communication card model:

EC-TX 1 03

① ② ③ ④

No.	Name	Description
①	Product category	EC: Expansion card
②	Card category	TX: Communication card
③	Technical version	Indicates the generation of a technical version by using odd numbers, for example, 1, 3, 5 and 7 indicate the 1st, 2nd, 3rd and fourth generations of the technical version.
④	Distinguishing code	03: PROFIBUS + Ethernet communication card 04: Ethernet + CAN communication card

9.2.2 EC-TX103 communication card

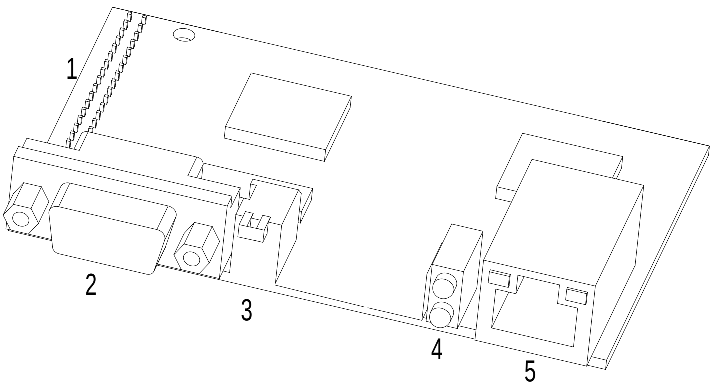


Figure 9.1 EC-TX103 communication card outline

No.	Name	Description
1	Interface with the control board	Used to connect to the control board.
2	Bus communication interface	Shielded twisted-pair copper cabls are widely used transmission media for PROFIBUS and CAN.
3	Bus terminator	Configured only when EC-TX103 communication card is used. It is valid only for PROFIBUS communication. Each fieldbus segment is configured with two bus terminators, one on each end, to prevent operation errors. Fieldbus terminators can protect the fieldbus signal against electrical reflections. If the communication card is the last or first module on the network, the bus terminator must be set to ON. When a PROFIBUS D-sub connector with a built-in terminator is used, you must disconnect the

No.	Name	Description
		communication card from the terminator.
4	Status LED	Used to indicate faults.
5	Ethernet interface	Used to connect to Ethernet.

Figure 9.2 shows the structure of connecting multiple VFDs to a PROFIBUS bus system.

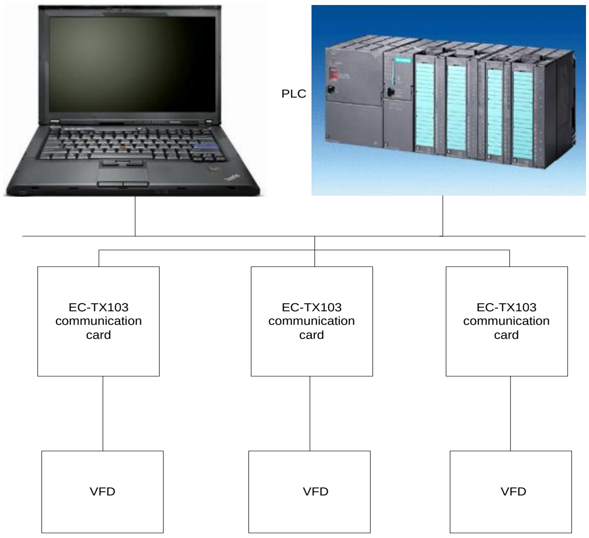


Figure 9.2 PROFIBUS communication structure

9.2.3 EC-TX103 communication card delivery list

The packaging box of EC-TX103 communication card includes:

- EC-TX103 communication card
- Three screws (M3×10)
- Communication card manual

If any omission is found, please contact us or the supplier. Manual information may be subject to change without prior notice.

9.3 PROFIBUS-DP communication card installation

9.3.1 Mechanical installation of EC-TX103 communication card

Installation enviornment

- Ambient temperature: 0°C–40°C
- Relative humidity: 5%–95%
- Other weather conditions: No condensation, ice, rain, snow, or hail; solar radiation < 700W/m^2; air pressure: 70–106kPa
- Salt spray and corrosive gas content: Pollution degree 2
- Dust and solid particle content: Pollution degree 2
- Vibration and impact: 5.9m/s^2 (0.6g) at the sine vibration of 9–200Hz

Installation procedure

Step 1 Insert EC-TX103 communication card into the designated position of the control board carefully and fasten it.

Step 2 Place the bus terminator of EC-TX103 communication card to the required position.

Note:

- Before installation, ensure that the power supply of the equipment has been cut off, wait at least 3 minutes for the capacitors to discharge completely, and cut off the dangerous voltage from the external control circuit to the unit input and output terminals.
- Some electronic components on the circuit board of EC-TX103 communication card are very sensitive to electrostatic discharge. Do not touch the circuit board with your hands. If it is unavoidable to operate the circuit board, wear a grounding wrist strap for the operating.

9.3.2 Electrical installation of EC-TX103 communication card

Node selection

The node address of a device is unique on a PROFIBUS fieldbus. The node address is a two-digit number, ranging from 00 to 99.

You can change a node address during operating, but the change takes effect only after re-initilization.

Fieldbus terminator

Each fieldbus segment is configured with two bus terminators, one on each end, to prevent operation errors. Fieldbus terminators can protect the fieldbus signal against electrical reflections. The dual in-line package (DIP) switch on EC-TX103 communication card is used to connect to a fieldbus terminator. If the communication card is the last or first module on the network, the bus terminator must be set to ON. When a PROFIBUS D-sub connector with a built-in terminator is used, you must disconnect the communication card from the terminator.

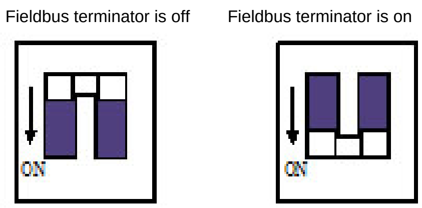


Figure 9.3 Fieldbus terminator

Fieldbus network connection of EC-TX103 communication card

The most common PROFIBUS transmission mode is the shielded twisted-pair copper cable transmission, in which shielded twisted-pair copper cables (complying with the RS-485 standard) are used.

The transmission features:

- Network topology: Linear bus with one active fieldbus terminal resistor on each end
- Transmission rate: 9.6k bit/s–12M bit/s
- Media: Shielded or unshielded twisted-pair cables, depending on the EMC environmental conditions
- Number of nodes: 32 on each network segment (without repeater); a maximum of 127 (with repeaters)
- Plug connection: 9-pin D-type plug. The following figure shows the pins of the connector.

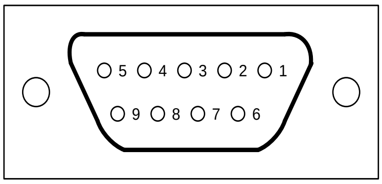


Figure 9.4 Connector pins

The connector pins are allocated as follows when PROFIBUS is applicable:

Connector pin		Description	Connector pin		Description
1	-	Unused	2	-	Unused
3	B-Line	Data+ (twisted-pair wire 1)	4	RTS	Sending requests
5	GND_BUS	Isolation ground	6	+5V BUS	Isolated 5V DC power supply
7	-	Unused	8	A-Line	Data+ (twisted-pair wire 2)
9	-	Unused	Metal housing	SHLD	PROFIBUS cable shield wire

The +5V and GND_BUS pins are used for bus terminators. Optical transceivers (RS485) and some other devices may need to obtain external power supplies through these pins.

For some devices, the transmission direction is determined by using the RTS pin. In usual application, only the A-Line, B-Line, and SHLD pins are used.

It is recommended that you use the standard DB9 connectors manufactured by Siemens. If the communication baud rate is required to be higher than 187.5 kbps, strictly follow the wiring standards stipulated by Siemens.

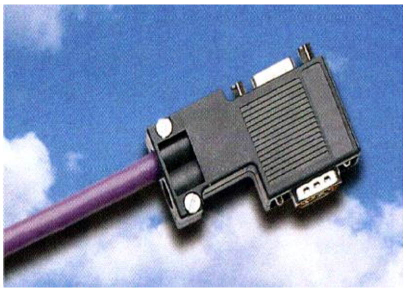


Figure 9.5 Standard PROFIBUS connector

Repeaters

A maximum of 32 nodes (including the master node) can be connected to each fieldbus segment. If the number of nodes to be connected to a fieldbus segment exceeds 32, you need to use repeaters to connect the fieldbus segment. Generally, the number of repeaters connected in series cannot exceed 3.

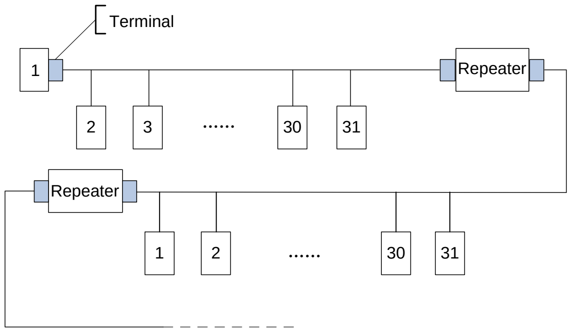


Figure 9.6 Network with repeaters

Transmission rates and maximum transmission distance

The maximum length of a cable depends on the transmission rate. Table 9.1 lists the transmission rates and transmission distances.

Table 9.1 Transmission rates and transmission distances

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

Table 9.2 Transmission wire parameters

Parameter	**A-type wire**	**B-type wire**
Impedance (Ω)	135–165	100–130
Capacitance of a unit length (pF/m)	< 30	< 60
Circuit resistance (Ω/km)	110	--------
Wire core diameter (mm)	0.64	> 0.53
Sectional area of wire core (mm2)	> 0.34	> 0.22

In addition to the shielded twisted-pair copper cables, you can also use optical fibers for transmission in a PROFIBUS system. When a PROFIBUS system is applied in an environment with strong electromagnetic interference, you can use optical fiber conductors to increase the high-speed transmission distance. Two types of optical fiber conductors can be used. One is low-cost plastic fiber conductors that can be used when the transmission distance is shorter than 50 meters; and the other is glass fiber conductors that can be used when the transmission distance is shorter than 1 kilometer.

PROFIBUS fieldbus connection diagram

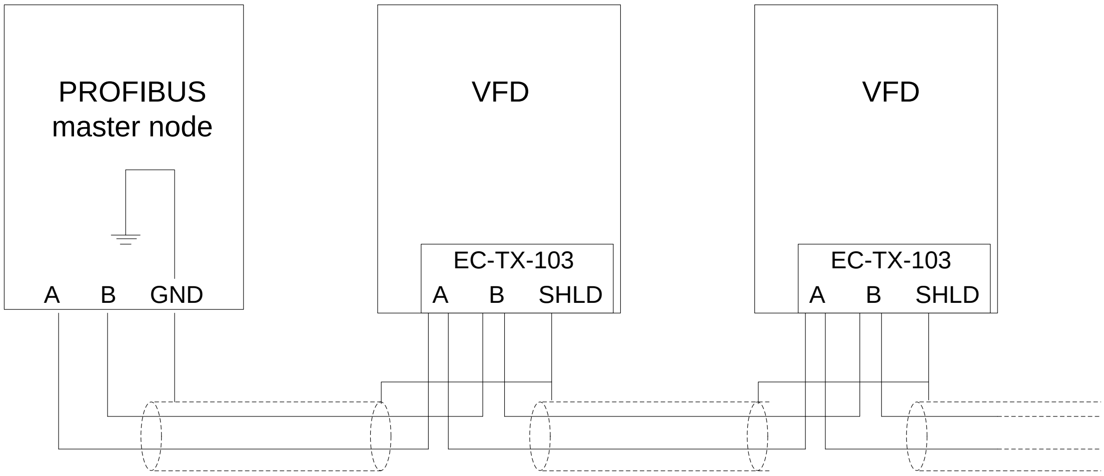


Figure 9.7 PROFIBUS fieldbus connection

Figure 9.7 PROFIBUS fieldbus connectionshows the terminal wiring. The cables are standard PROFIBUS cables, each consisting of a twisted pair and shield layer. The shield layers of PROFIBUS cables are directly grounded on all nodes. You can select a proper grounding mode based on the actual situation on site.

Note:

- When connecting the nodes, ensure that the data cables are not twisted. For systems to be used in environments with strong electromagnetic radiation, you need to use cables with shield layers to improve electromagnetic compatibility (EMC).
- If the shielded braided or shielded foiled cable is used, connect the two ends of it to the protective ground and use the 360-degree reliable grounding to ensure high conductivity. In addition, data cables need to be separated from high-voltage cables.
- When the data transmission rate is higher than 500 kbit/s, do not use short stubs, but use the plugs available in the market to connect the data input and output cables. In addition, the DB9 plug to the communication card can be connected or disconnected at any time without interrupting data communication of other nodes.

9.3.3 System configuration

1. System setup

After EC-TX103 communication card is properly installed, you need to configure the master node and VFD to enable the communication between the master node and communication card.

One device description file named GSD file is required for each PROFIBUS slave node on the PROFIBUS fieldbus. The GSD file is used to describe the characteristics of the PROFIBUS-DP device. The GSD file contains information such as the baud rate, message length, input/output data quantity, and definitions of diagnosis data.

You can download the GSD file of EC-TX103 communication card from our website to the corresponding subdirectory on the configuration tool software. For details about the operation and how to configure the PROFIBUS system, see the instructions for the related system configuration software.

No.	Parameter	Option	Default	Remarks
0	Module type	Read only	PROFIBUS-DP	It indicates the communication module type detected by the VFD,

No.	Parameter	Option	Default	Remarks
				and it is read only. If it is not defined, the module and VFD cannot establish communication.
1	Node address	0–99	2	When the node address selection switch is not set to 0, the switch is used to define node addresses, the node address parameter is only used to display the node address, and you cannot modify the node address parameter. When the node address selection switch is set to 0, the node address parameter can be used to define the node address.
2	Baud rate setting	0: 9.6kbit/s 1: 19.2 kbit/s 2: 45.45 kbit/s 3: 93.75 kbit/s 4: 187.5 kbit/s 5: 500 kbit/s 6: 1.5 Mbit/s 7: 3Mbit/s 8: 6 Mbit/s 9: 9 Mbit/s 10: 12 Mbit/s	6	
3	PZD2	0–65535	0	
4	PZD3	0–65535	0	
…	……	0–65535	0	
10	PZD12	0–65535	0	

After EC-TX103 communication card is installed properly, you need to configure the master node and VFD so that the master node can establish communication with EC-TX103 communication card.

2 Module type

This parameter displays the model of the communication card detected by the VFD. You cannot modify the value of this parameter. If the parameter is not defined, communication between the communication card and VFD cannot be established.

3. Node address

On the PROFIBUS network, each device corresponds to one unique node address. When the node address selection switch is not set to 0, the switch is used to define node addresses, the node address parameter is only used to display the node address, and you cannot modify the node address parameter. When the node address selection switch is set to 0, the node address parameter can be used to define the node address.

4. GSD file

One device description file named GSD file is required for each PROFIBUS slave node on the PROFIBUS fieldbus. The GSD file is used to describe the characteristics of the PROFIBUS-DP device. The GSD file includes all parameters defined for the device, including the supported baud rate, supported information length, input/output data quantity, and definitions of diagnosis data.

We provide a CD that contains the GSD file for the fieldbus adapter. You can copy the GSD file to the corresponding subdirectory on the configuration tool software. For details about the operation and how to configure the PROFIBUS system, see the instructions for the related system configuration software.

9.4 PROFIBUS-DP networking

PROFIBUS-DP is a distributed I/O system. It enables a master to use a large number of peripheral modules and onsite devices. Data transmission is periodic: The master reads information from a slave and transmits a feedback signal to the slave. EC-TX103 communication card supports the PROFIBUS-DP protocol.

9.4.1 SAPs

The PROFIBUS-DP system uses the services at the data link layer (layer 2) through service access points (SAPs). Functions of each SAP are clearly defined. For more information about SAPs, see the related PROFIBUS master node user manuals, that is, PROFIdrive—PROFIBUS models or EN50170 standard (PROFIBUS protocol) for variable-speed drives.

9.4.2 PROFIBUS-DP information frame data structure

The PROFIBUS-DP system allows fast data exchange between the master and VFD devices. For VFD devices, data is always read and written in the master/slave mode. VFDs always function as slave nodes, and one address is clearly defined for each slave node. The PROFIBUS system transmits 16-word packets periodically. Figure 9.8 shows the structure of the packet.

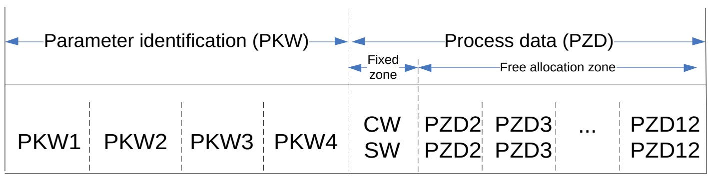


Figure 9.8 PROFIBUS-DP packet structure

PKW zone

PKW zone (parameter identification zone): The PKW zone describes the processing mode of the parameter identification interface. A PKW interface is not a physical interface but a mechanism that defines the transmission mode (such reading and writing a parameter value) of a parameter between two communication ends.

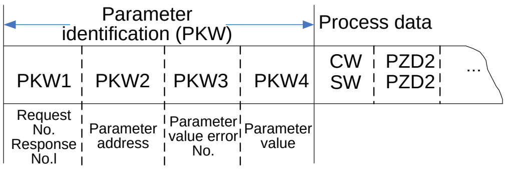


Figure 9.9 Parameter identification zone

In the periodic communication, the PKW zone consists of four 16-bit words. The following table describes the definition of each word.

Word	Bit	Defintion	Range
First word PKW1 (16 bits)	Bits 15–00	Task or response identification flag	0–7
Second word PKW2 (16 bits)	Bits 15–00	Basic parameter address	0–247
Third word PKW3 (16 bits)	Bits 15–00	Value (most significant word) of a parameter or error code of the returned value	00
Fourth word PKW4 (16 bits)	Bits 15–00	Value (low-order bits) of a parameter	0–65535

Note: If the master node requests the value of a parameter, the values in PKW3 and PKW4 of the packet that the master node transmits to the VFD are no longer valid.

Task request and response: When transmitting data to a slave node, the master node uses a request number, and the slave uses a response number to accept or reject the request.

Table 9.3 Definition of the task identification flag PKW1

Request (from master to slave)		Response signal (from slave to master)	
No.	**Function**	**Acceptance**	**Rejection**
0	No task	0	–
1	Requesting the value of a parameter	1, 2	3
2	Modifying a parameter value (one word) [modifying the value only on RAM]	1	3 or 4
3	Modifying a parameter value (two words) [modifying the value only on RAM]	2	3 or 4
4	Modifying a parameter value (one word) [modifying the value on both RAM and EEPROM]	1	3 or 4
5	Modifying a parameter value (two words) [modifying the value on both RAM and EEPROM]	2	3 or 4

Table 9.4 Definition of the response identification flag PKW1

Response (from slave to master)	
No.	**Function**
0	No response
1	Transmitting the value of a parameter (one word)
2	Transmitting the value of a parameter (two words)
3	The task cannot be executed due to a fault and the fault number is returned: 0: Invalid parameter number. 1: The parameter is read only. 2: The value is out of the setting range. 3: Incorrect sub-index number. 4: Setting is disallowed. (Only reset is allowed.) 5: Invalid data type. 6: The task cannot be executed due to the operation status. 7: Request not supported. 8: Communication error. 9: An error occurred when writing to the fixed storage area. 10: Timeout occurred. 11: The parameter cannot be allocated to the PZD. 12: The bits of the control word cannot be allocated. 13: Other fault.
4	No permission to modify parameters.

PKW examples

Example 1: Reading the value of a parameter

To read the running frequency upper limit (of which the address is 4), you can set PKW1 to 1 and PKW2 to 4. The value is returned in PKW4.

Request (from master to VFD):

	PKW1		PKW2		PKW3		PKW4		CW		PZD2		PZD3		...	PZD12	
Request	00	01	00	04	00	00	00	00	02	00	xx	xx	xx	xx	...	xx	xx

0004: Parameter address

0001: Request for reading parameter values

Response (from VFD to master)

	PKW1		PKW2		PKW3		PKW4		CW		PZD2		PZD3		...	PZD12	
Response	00	01	00	04	00	00	50	00	02	00	xx	xx	xx	xx	...	xx	xx

5000: Parameter value of address 4

0001: Response (parameter value is refreshed)

Example 2: Modifying the value of a parameter (only on the RAM)

To modify the value of the running frequency upper limit parameter (of which the address is 4), you can set PKW1 to 2 and PKW2 to 4. The to-be-modified value (50.00Hz) is in PKW4.

Request (from master to VFD):

	PKW1		PKW2		PKW3		PKW4		CW		PZD2		PZD3		...	PZD12	
Request	00	02	00	04	00	00	50	00	02	00	xx	xx	xx	xx	...	xx	xx

5000: Parameter value of address 4

0002: Modifying the value of a parameter

Response (from VFD to master)

	PKW1		PKW2		PKW3		PKW4		CW		PZD2		PZD3		...	PZD12	
Response	00	02	00	04	00	00	12	30	02	00	xx	xx	xx	xx	...	xx	xx

0001: Response (parameter value is refreshed)

Example 3: Modifying the value of a parameter (both on the RAM and EEPROM)

To modify the value of the running frequency upper limit parameter (of which the address is 4), you can set PKW1 to 2 and PKW2 to 4. The to-be-modified value (50.00Hz) is in PKW4.

Request (from master to VFD):

	PKW1		PKW2		PKW3		PKW4		CW		PZD2		PZD3		...	PZD12	
Request	00	04	04	04	00	00	50	04	02	00	xx	xx	xx	xx	...	xx	xx

5000: Parameter value of address 4

0004: Modifying the value of a parameter

Response (from VFD to master)

	PKW1		PKW2		PKW3		PKW4		CW		PZD2		PZD3		...	PZD12	
Response	00	01	00	04	00	00	50	00	02	00	xx	xx	xx	xx	...	xx	xx

0001: Response (parameter value is refreshed)

9.4.3 PZD zone

PZD zone (process data zone): The PZD zone in a communication packet is designed for controlling and monitoring VFDs. The master and slave nodes always process the received PZD with the highest priority. The processing of PZD takes priority over that of PKW, and the master and slave nodes always transmit the latest valid data on the interfaces.

CW: Control word (sent from the master node to a slave node), a basic method for the fieldbus to control VFDs. In the communication, EC-TX103 communication card functions as a gateway.

SW: Status word (sent from a slave node to the master node). The VFD responds according to the bit code information in the CW and sends back the status information to the master node by using the SW.

PZD2–**PZD12**: Process data (user defined)

Note: A PZD contains the output (that is, reference value) sent from the master node to the slave node and the input (that is, actual value) sent from the slave node to the master node.

Reference value: The VFD may receive control information from multiple channels, including analog and digital input terminals, VFD control panel, and communication modules (such as RS485 and EC-TX-103 communication cards). To enable the control over the VFD through PROFIBUS, you need to set EC-TX103 communication card as the controller of the VFD.

Actual value: An actual value is a 16-bit word that includes information about VFD operation. The monitoring function is defined through VFD parameters. The conversion scale of an integer transmitted as an actual value from the VFD to the master depends on the set function.

Note: The VFD always checks the bytes of a CW and reference value.

Task packet (from master to rectifier)

Table 9.5 Goodrive3000 series rectifier CW

Bit	Name	Value	State to be entered/Used to
0–7	Communication-based control command	1	Run
		2	
		3	
		4	
		5	Normal stop
		6	
		7	Fault reset
		8	
		9	Power-on buffering
8	Enabling writing	1	Enable writing (mainly through PKW1 to PKW4)
9–10	Reserved		
11	Reserved		
14	Reserved		
15	Heartbeat reference	1	Enable heartbeat
		0	Disable heartbeat

Task packet (from master to VFD)

The first word in a PZD task packet is a VFD CW.

Table 9.6 Goodrive3000 series VFD CW

Bit	VFD CW		
	Name	Value	State to be entered/Used to
00	Heartbeat reference	1	Enable heartbeat.
		0	Disable heartbeat.
01	External reset	1	Perform fault reset if the fault persists.
		0	Run normally.
02	Forward running	1	Run forward.
		0	Decelerate to stop.
03	Reverse running	1	Run reversely.
		0	Decelerate to stop.
04	Exciting	1	Enable exciting.
		0	Disable exciting.
05	Torque control selection	1	Enable torque control.
		0	Disable torque control.
06	External safety switching	1	Enable external safety switching.
		0	Coast to stop.
07	Quick stop	1	Keep normal running.
		0	Cut off in an emergency manner and stop at the fastest speed.
08	Switing to motor B	1	Switch to motor B.
		0	Keep normal running.
09	Enabling writing	1	Enable writing (mainly for PKW1–PKW4).
		0	Disable writing.
10–15	Reserved	1	Reserved
		0	Reserved

Reference value (REF): The second to twelfth words in a PZD task packet are the main settings. The main frequency settings are provided by the main setting signal source.

Table 9.7 Goodrive3000 series rectifier reference values

<table>
<tr><th>Word</th><th>Value range</th><th>Function</th></tr>
<tr><td>Received PZD2</td><td rowspan="11">0: Invalid
1: DC voltage setting (0–40000; unit: 0.1V)
2–4: Reserved
5: AO output setting 1
(-1000–1000; 1000 corresponds to 100.0%.)
6: AO output setting 2
(-1000–1000; 1000 corresponds to 100.0%.)
7–13: Reserved</td><td>0</td></tr>
<tr><td>Received PZD3</td><td>0</td></tr>
<tr><td>Received PZD4</td><td>0</td></tr>
<tr><td>Received PZD5</td><td>0</td></tr>
<tr><td>Received PZD6</td><td>0</td></tr>
<tr><td>Received PZD7</td><td>0</td></tr>
<tr><td>Received PZD8</td><td>0</td></tr>
<tr><td>Received PZD9</td><td>0</td></tr>
<tr><td>Received PZD10</td><td>0</td></tr>
<tr><td>Received PZD11</td><td>0</td></tr>
<tr><td>Received PZD12</td><td>0</td></tr>
</table>

Table 9.8 Goodrive3000 series VFD reference values

Word	Name	Value sent from master to slave
PZD2	Speed reference	Master depended
PZD3	Tension reference	Master depended
PZD4	Current limit clamp	Master depended
PZD5—PZD12	Reserved	Reserved

Response packet (from VFD to master)

The first word in a PZD response packet is a VFD SW.

Table 9.9 Goodrive3000 series rectifier SW

Bit	Name	Value	State to be entered/Used to
0–7	Run status byte	1	Running
		2	
		3	The rectifier stops.
		4	The rectifier is in faulty state.
		5	The rectifier is in POFF state.
8	Bus voltage establishment	1	Ready to run.
		0	Not ready to run.
9–11	Reserved	1	
		0	
12	Overload pre-alarm feedback	1	Enable overload pre-alarm.
		0	Disable overload pre-alarm.
13–14	Reserved	1	
		0	
15	HEARTBEAT FEEDBACK Heartbeat feedback	1	Enable heartbeat feedback.
		0	Disable heartbeat feedback.

Table 9.10 VFD SW

VFD SW			
Bit	**Value**	**Name**	**State to be entered/Used to**
00	1	Heartbeat feedback	Enable heartbeat feedback.
	0		Disable heartbeat feedback.
01	1	Fault	Faulty.
	0		No fault.
02	1	Bus voltage establishment	Bus voltage established.
	0		Bus voltage not established.
03	1	Motor parameter selection	Bit 3 and Bit 14 determine which motor is selected.

VFD SW			
Bit	**Value**	**Name**	**State to be entered/Used to**
	0	feedback 1	00: Basic motor parameter group 01: Extended motor group 1 10: Extended motor group 2 12: Extended motor group 3
04	1	Quick stop feedback	Stop is invalid.
	0		Stop at the fastest speed in an emergency manner.
05	1	Drive current limit feedback	Enable drive current limit feedback.
	0		Disable drive current limit feedback.
06	1	Enabling drive	Enable drive.
	0		Disable drive.
07	1	Running forward	Running forward.
	0		Not running forward.
08	1	Running reversely	Running reversely.
	0		Not running reversely.
09	1	Motor overtemperature alarm	Enable motor overtemperature alarm.
	0		Disable motor overtemperature alarm.
10	1	Flux exciting	Exciting.
	0		Magnetic flux established.
11	1	Master mode	Master mode in master/slave control.
	0		Non master mode.
12	1	Slave mode	Slave mode in master/slave control.
	0		Non slave mode.
13	1	Torque control	Torque control.
	0		Speed control.
14	1	Motor parameter selection feedback 2	Bit 3 and Bit 14 determine which motor is selected.
	0		
15		Reserved	

The second to twelfth words in a PZD task packet are the main actual values. The main actual frequency values are provided by the main actual value signal source.

Table 9.11 Rectifier actual values

<table>
<tr><th>Word</th><th>Value range</th><th>Function selection</th></tr>
<tr><td>Sent PZD2</td><td rowspan="11">0: Invalid
1: DC voltage (*10, V)
2: DC voltage feedback (*10, V)
3: Valid value of input voltage (*10, V)
4: Valid value of input current (*10, A)
5: Input power (*10, kW)
6: Input power factor (*100)
7: Grid frequency value (*10, Hz)
8: Active current feedback (100% corresponds to the rectifier rated current)
9: Reactive current feedback(100% corresponds to the rectifier rated current)
10: Fault code
11: AI1 value (*100, V)
12: AI2 value (*100, V)
13: Reserved
14: Terminal input state
15: Terminal output state
16: Running status word
17–20: Reserved</td><td>0</td></tr>
<tr><td>Sent PZD3</td><td>0</td></tr>
<tr><td>Sent PZD4</td><td>0</td></tr>
<tr><td>Sent PZD5</td><td>0</td></tr>
<tr><td>Sent PZD6</td><td>0</td></tr>
<tr><td>Sent PZD7</td><td>0</td></tr>
<tr><td>Sent PZD8</td><td>0</td></tr>
<tr><td>Sent PZD9</td><td>0</td></tr>
<tr><td>Sent PZD10</td><td>0</td></tr>
<tr><td>Sent PZD11</td><td>0</td></tr>
<tr><td>Sent PZD12</td><td>0</td></tr>
</table>

Table 9.12 VFD actual value

Word	Name	Value sent from slave to master
PZD2	Fault code	Fault code, 0–N.
PZD3	Speed feedback	Actual value of speed.
PZD4	PG card position	PG card position.
PZD5	Drive torque feedback	Actual value of torque.
PZD6	Motor running frequency feedback	Actual value of motor running frequency.
PZD7	Drive current feedback	Actual value of drive current.

Word	Name	Value sent from slave to master
PZD8	Drive voltage feedback	Actual value of drive voltage.
PZD9	Reserved	Reserved
PZD10	Reserved	Reserved
PZD11	Reserved	Reserved
PZD12	Reserved	Reserved

PZD examples

The transmission of the PZD zone is implemented through VFD function code settings.

Example 1: Reading process data from the VFD

In this example, PZD3 is set to "8: Rotating speed during running" through the VFD parameter P15.14. This operation sets the parameter forcibly. The setting remains until the parameter is set to another option.

Response (from VFD to master)

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

Example 2: Writing process data to the VFD

In this example, PZD3 is set to "2: PID reference" through the VFD parameter P15.03. The parameter specified in each request frame is updated with the information contained in PZD3 until another parameter is specified.

Request (from master to VFD):

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

Subsequently, the information contained in PZD3 is used as tractive force reference in each request frame until another parameter is specified.

9.5 Fault information

EC-TX103 communication card has two fault LED indicators.

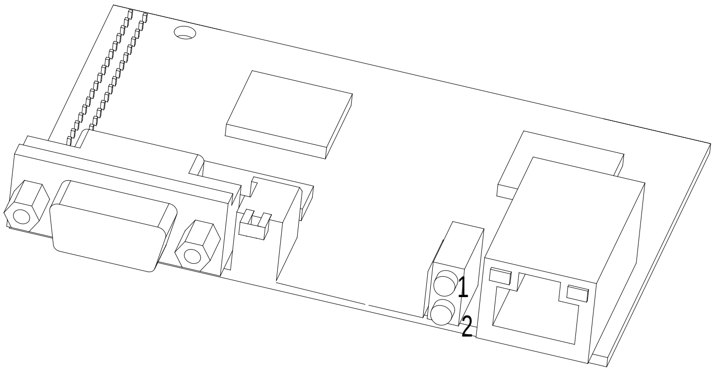


Figure 9.10 Fault indicators

Table 9.13 Fault indicators

Indicator	Name	Color	Description
LED 1	Online indicator	Green	This indicator is on when the communication card is online and data exchange can be performed. It is off when the communication card is not in the online state.
LED 2	Offline/Fault indicator	Red	This indicator is on when the communication card is offline and data exchange cannot be performed. It is off when the communication card is not in the offline state. It blinks when the communication card is not in the offline state. It blinks at the frequency of 1 Hz when a configuration error occurs: The length of the user parameter data set during the initialization of the communication card is different from that during the network configuration. It blinks at the frequency of 2 Hz when user parameter data is incorrect: The length or content of the user parameter data set during the initialization of the communication card is different from that during the network configuration. It blinks at the frequency of 4 Hz when an error occurs in the ASIC initialization of communication.

9.6 Related function codes

Rectifier related function codes

Function code	Name	Description	Setting range	Default
P12.00	Module type	0: Profibus	0	0
P12.01	Module address	0–127	0–127	2
P12.02	Received PZD2	0: Invalid 1: DC voltage setting (0–40000; unit: 0.1V) 2–4: Reserved 5: AO setting (1-1000–1000, 1000 corresponding to 100.0%) 6: AO setting 2 (1-1000–1000, 1000 corresponding to 100.0%) 7–13: Reserved	0–13	0
P12.03	Received PZD3		0–13	0
P12.04	Received PZD4		0–13	0
P12.05	Received PZD5		0–13	0
P12.06	Received PZD6		0–13	0
P12.07	Received PZD7		0–13	0
P12.08	Received PZD8		0–13	0
P12.09	Received PZD9		0–13	0
P12.10	Received PZD10		0–13	0
P12.11	Received PZD11		0–13	0
P12.12	Received PZD12		0–13	0
P12.13	Sent PZD2	0: Invalid 1: DC voltage (*10, V) 2: DC voltage feedback (*10, V) 3: Valid value of input voltage (*10, V) 4: Valid value of input current (*10, A) 5: Input power (*10, kW) 6: Input power factor (*100) 7: Grid frequency value (*10, Hz) 8: Active current feedback (100% corresponds to the rectifier rated current) 9: Reactive current feedback (100% corresponds to the rectifier rated current) 10: Fault code 11: AI1 value (*100, V)	0–20	0
P12.14	Sent PZD3		0–20	0
P12.15	Sent PZD4		0–20	0
P12.16	Sent PZD5		0–20	0
P12.17	Sent PZD6		0–20	0
P12.18	Sent PZD7		0–20	0
P12.19	Sent PZD8		0–20	0
P12.20	Sent PZD9		0–20	0
P12.21	Sent PZD10		0–20	0
P12.22	Sent PZD11		0–20	0
P12.23	Sent PZD12		0–20	0

Function code	Name	Description	Setting range	Default
		12: AI2 value (*100, V) 13: Reserved 14: Terminal input state 15: Terminal output state 16: Running status word 17–20: Reserved		
P12.24	Temporary variable 1 of sent PZD	0–65535	0–65535	0
P12.25	DP communication timeout fault duration	0.0: Invalid 0.1–60.0s	0.0–60.0s	0.0s

Rectifier related function codes

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Setting range</th><th>Default</th></tr>
<tr><td>P15.00</td><td>Module type</td><td>0: Profibus</td><td>0–1</td><td>0</td></tr>
<tr><td>P15.01</td><td>Profibus/CANopen module address</td><td>0–127</td><td>0–127</td><td>2</td></tr>
<tr><td>P15.02</td><td>Received PZD2</td><td rowspan="11">0: Invalid
1: Set frequency (0–Fmax; unit: 0.01Hz)
2: PID reference (range: 0–1000, 1000 corresponding to 100.0%)
3: PID feedback (range: 0–1000, 1000 corresponding to 100.0%)
4: Torque setting (-3000–3000, 1000 corresponding to 100.0% of motor rated current)
5: Forward rotation upper-limit frequency setting (0–Fmax; unit: 0.01Hz)
6: Reverse rotation upper-limit frequency (0–Fmax; unit: 0.01Hz)
7: Electromotion torque upper limit (0–3000, 1000 corresponding to 100.0% of motor rated current)
8: Braking torque upper limit (0–2000, 1000 corresponding to 100.0% of motor rated current)
9: Virtual input terminal command (range: 0x000–0x1FF)
10: Virtual output terminal command (range: 0x00–0x0F)
11: Voltage setting (special for V/F separation) (0–1000, 1000 corresponding to 100.0% of motor rated voltage)
12: AO setting 1 (-1000–1000, 1000 corresponding to 100.0%)
13: AO setting 2 (-1000–1000, 1000 corresponding to 100.0%)</td><td>0–20</td><td>0</td></tr>
<tr><td>P15.03</td><td>Received PZD3</td><td>0–20</td><td>0</td></tr>
<tr><td>P15.04</td><td>Received PZD4</td><td>0–20</td><td>0</td></tr>
<tr><td>P15.05</td><td>Received PZD5</td><td>0–20</td><td>0</td></tr>
<tr><td>P15.06</td><td>Received PZD6</td><td>0–20</td><td>0</td></tr>
<tr><td>P15.07</td><td>Received PZD7</td><td>0–20</td><td>0</td></tr>
<tr><td>P15.08</td><td>Received PZD8</td><td>0–20</td><td>0</td></tr>
<tr><td>P15.09</td><td>Received PZD9</td><td>0–20</td><td>0</td></tr>
<tr><td>P15.10</td><td>Received PZD10</td><td>0–20</td><td>0</td></tr>
<tr><td>P15.11</td><td>Received PZD11</td><td>0–20</td><td>0</td></tr>
<tr><td>P15.12</td><td>Received PZD12</td><td>0–20</td><td>0</td></tr>
</table>

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Setting range</th><th>Default</th></tr>
<tr><td>P15.13</td><td>Sent PZD2</td><td rowspan="11">0: Invalid
1: Running frequency (*100, Hz)
2: Set frequency (*100, Hz)
3: Bus voltage (*10, V)
4: Output voltage (*1, V)
5: Output current (*10, A)
6: Output torque actual value (*10, %)
7: Output power actual value (*10, %)
8: Rotating speed during running (*1, RPM)
9: Running linear speed (*1, m/s)
10: Ramp reference frequency
11: Fault code
12: AI1 value (*100, V)
13: AI2 value (*100, V)
14: AI3 value (*100, V)
15: PULSE frequency (*100, kHz)
16: Terminal input state
17: Terminal output state
18: PID reference (*100, %)
19: PID feedback (*100, %)
20: Motor rated torque</td><td>0–20</td><td>0</td></tr>
<tr><td>P15.14</td><td>Sent PZD3</td><td>0–20</td><td>0</td></tr>
<tr><td>P15.15</td><td>Sent PZD4</td><td>0–20</td><td>0</td></tr>
<tr><td>P15.16</td><td>Sent PZD5</td><td>0–20</td><td>0</td></tr>
<tr><td>P15.17</td><td>Sent PZD6</td><td>0–20</td><td>0</td></tr>
<tr><td>P15.18</td><td>Sent PZD7</td><td>0–20</td><td>0</td></tr>
<tr><td>P15.19</td><td>Sent PZD8</td><td>0–20</td><td>0</td></tr>
<tr><td>P15.20</td><td>Sent PZD9</td><td>0–20</td><td>0</td></tr>
<tr><td>P15.21</td><td>Sent PZD10</td><td>0–20</td><td>0</td></tr>
<tr><td>P15.22</td><td>Sent PZD11</td><td>0–20</td><td>0</td></tr>
<tr><td>P15.23</td><td>Sent PZD12</td><td>0–20</td><td>0</td></tr>
<tr><td>P15.24</td><td>Temporary variable 1 for PZD sending</td><td>0–65535</td><td>0–65535</td><td>0</td></tr>
<tr><td>P15.25</td><td>DP communication timeout fault duration</td><td>0.1–60.0s
0.0: Invalid</td><td>0.0–60.0</td><td>0.0s</td></tr>
<tr><td>P15.26</td><td>CAN communication timeout fault duration</td><td>0.1–60.0s
0.0: Invalid</td><td>0.0–60.0</td><td>0.0s</td></tr>
<tr><td>P15.27</td><td>CANopen communication baud rate</td><td>0: 1000k
1: 800k
2: 500k
3: 250k</td><td>0–7</td><td>0</td></tr>
</table>

Function code	Name	Description	Setting range	Default
		4: 125k 5: 100k 6: 50k 7: 20k		
P15.28	CAN communication address	0–127 0 is broadcast communication address.	0–127	1
P15.29	CAN communication baud rate	0: 1000k 1: 500k 2: 250k 3: 125k 4: 100k	0–4	1

10 Ethernet communication

The VFD has been integrated with Ethernet communication function. Ethernet communication can be implemented by connecting the VFD to the upper computer that hosts the Ethernet upper computer monitoring software (available at www.invt.com) with a standard Ethernet RJ45 cable.

You can easily set, upload, and download all VFD parameters by using the upper computer. You can also monitor more than 100 internal information waveforms of theVFD in real time.

10.1 Operating procedure

See the operating manual of INVT Workshop upper computer monitoring system.

The VFD provides the "black box" function. The VFD can save the waveform information generated within 0.2s before the most recent fault that causes its stop. You can obtain the waveform information from the upper computer and analyze fault causes.

10.2 Related function codes

Rectifier related function codes

Function code	Name	Description	Setting range	Default
P13.00	Ethernet communication rate	0: Self adaptive 1: 100M full duplex 2: 100M half duplex 3: 10M full duplex 4: 10M half duplex	0–4	0
P13.01	IP address 1	0–255	0–255	192
P13.02	IP address 2	0–255	0–255	168
P13.03	IP address 3	0–255	0–255	0
P13.04	IP address 4	0–255	0–255	1
P13.05	Subnet mask 1	0–255	0–255	255
P13.06	Subnet mask 2	0–255	0–255	255
P13.07	Subnet mask 3	0–255	0–255	255
P13.08	Subnet mask 4	0–255	0–255	0
P13.09	Gateway 1	0–255	0–255	192
P13.10	Gateway 2	0–255	0–255	168
P13.11	Gateway 3	0–255	0–255	1
P13.12	Gateway 4	0–255	0–255	1

Inverter related function codes

Function code	Name	Description	Setting range	Default
P16.00	Ethernet communication rate	0: Self adaptive 1: 100M full duplex 2: 100M half duplex 3: 10M full duplex 4: 10M half duplex	0–4	0
P16.01	IP address 1	0–255	0–255	192
P16.02	IP address 2	0–255	0–255	168
P16.03	IP address 3	0–255	0–255	0
P16.04	IP address 4	0–255	0–255	1
P16.05	Subnet mask 1	0–255	0–255	255
P16.06	Subnet mask 2	0–255	0–255	255
P16.07	Subnet mask 3	0–255	0–255	255
P16.08	Subnet mask 4	0–255	0–255	0
P16.09	Gateway 1	0–255	0–255	192
P16.10	Gateway 2	0–255	0–255	168
P16.11	Gateway 3	0–255	0–255	1
P16.12	Gateway 4	0–255	0–255	1

11 Peripheral options and parts

11.1 Optional card

The optional cards of Goodrive3000 series VFDs are shown below:

Table 11.1 Optional cards of Goodrive3000 series VFDs

Name	Model	Description	Remark
Comprehensive extension card	ASY01_PB12301_TF4	Can extend analog input/output, switch input/output and CAN communication	11.1.1
5V incremental encoder PG card	EC-PG101-05	5V incremental ABZ encoder, support differential input, Max. frequency 200kHz	11.1.2
12V encoder PG card	EC-PG101-12	12V incremental ABZ encoder, support differential, OC and push-pull input, Max. frequency 100kHz	
24V encoder PG card	EC-PG101-24	24V incremental ABZ encoder, support differential, OC and push-pull input, Max. frequency 100kHz	
Rotary encoder PG card	EC-PG104-00	Rotary transformer encoder, support pulse/direction differential input, Max. frequency 500kHz, 5V differential frequency division output	11.1.3
Communication extension card	EC-TX103	PROFIBUS and Ethernet communication interface	11.1.4
	EC-TX105	CANopen and Ethernet communication interface	

11.1.1 Operation instruction and wiring of comprehensive extension card

11.1.1.1 Instruction of terminals

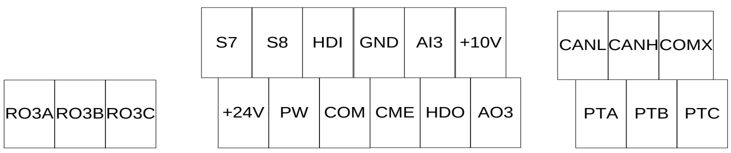


Figure 11.1 Terminals of comprehensive extension card

Table 11.2 Instruction of terminals

Type	Terminal No.	Terminal name	Description
Power supply	+10V	+10V reference power supply	GND as reference; Set point: 10.5V, Max. output current: 100mA, output shortcircuit protection, precision: 1%
	24V	24V power supply	COM as reference;

Type	Terminal No.	Terminal name	Description
			Provide working power supply inside
	PW	External power supply	COM as reference; Provide working power supply of digital input/output from outside to inside Input voltage range: DC12–30V
Analog input	AI3	Analog input 3	GND as reference; 1. Input range: 0–10V/0–20mA, 12bit resolution, error ±1%, 25°C 2. Voltage or current input is set by J13
Analog output	AO3	Analog output 1	GND as reference; 1. Output range: -10V–10V/-20mA–20mA, error ±1%, 25°C 2. Voltage or current input is set by J14
Switch input/output	S7	Switch input 7	COM as reference; 1. Internal impedance: 3.3kΩ 2. The terminal is the dual-direction input terminal supporting both NPN and PNP 3. 12 – 30V voltage input is available 4. Max. input frequency: 1kHz 5. HDI is high speed pulse input, input Max. frequency: 50kHz
	S8	Switch input 8	
	HDI	High speed pulse input	
	HDO	High speed pulse output	CME as reference; 1. Output voltage amplitude: 24V 2. Output frequency: 50kHz
Relay output	RO3A	Relay 3 NO contact	1. Contact capacity: AC250V/3A, DC30V/1A 2. Cannot be high-frequency switch output (caution)
	RO3B	Relay 3 NC contact	
	RO3C	Relay 3 common contact	
CAN communication	CANL CANH COMX	CAN communication	CAN communication used in master-slave control

Type	Terminal No.	Terminal name	Description
Motor temperature detection	PTA PTB PTC	Analog input	PT100/PT1000 detection

Note: Use the DIP switch to connect the termination resistor for CAN communication. When connecting the termination resistor, the DIP switch is switched to ON (11); when not, the switch is switched to OFF (00).

11.1.1.2 Wiring of comprehensive extension PG card

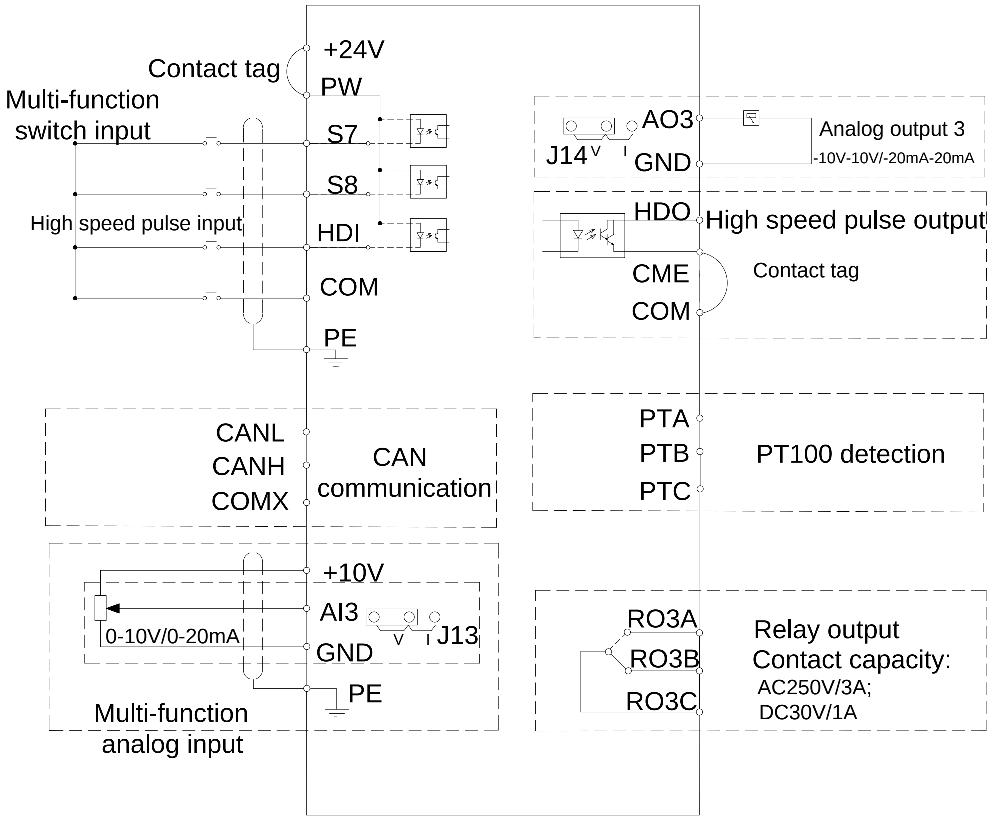


Figure 11.2 Wiring of Goodrive3000 comprehensive extension PG card

11.1.2 Operation instruction and wiring of incremental encoder PG card

Note: The lower pins of CN3 are valid if incremental encoder PG card is used on Goodrive3000 series products.

11.1.2.1 Instruction of incremental encoder PG card

It is necessary to select PG card in PG vector control. The function of the PG card includes processing circuits for two channels of orthogonal coder signals, supporting spindle positioning Z signal input, being capable of receiving signals from differential, open collector and push-pull output encoders, carrying out frequency-division output for input encoder signals which includes two channels of orthogonal signals and outputting push-pull and open collector signals by J1 and J2 users can select according to the actual conditions.

11.1.2.2 Description of terminals and DIP switch

There are 2 2*4P wiring terminal on the PG card.

IA+	IA-	IB+	IB-
PWR	COM1	IZ+	IZ-

OA+	OA-	OB+	OB-
OA	OB	COM1	

Of which, PWR and COM1 are working voltage output for the encoder; IA+, IA-, IB+, IB-, IZ+ and IZ- are signal input terminals for the encoder; OA+, OA-, OB+ and OB- are output terminals for frequency-division signals; OA, OB and COM1 are the output terminal of frequency-division push-pull signal and open collector signal; the user can grounded the PG by themselves.

The frequency division factor is determined by the DIP switch on the card. The DIP switch consists of 8 bits. When the binary digits are displayed by DIP switch pluses 1, the relative value is frequency division factor. The bit marked as "1" on the DIP switch is the lower binary bit, while "8" is the higher binary bit. When the DIP switch is switched to ON, the bit is valid, indicating "1"; otherwise, it indicates "0".

Decimal digit	Binary digit	Frequency division factor
0	00000000	1
1	00000001	2
2	00000010	3
…	…	…
m	…	m+1
255	11111111	256

11.1.2.3 Wiring diagram

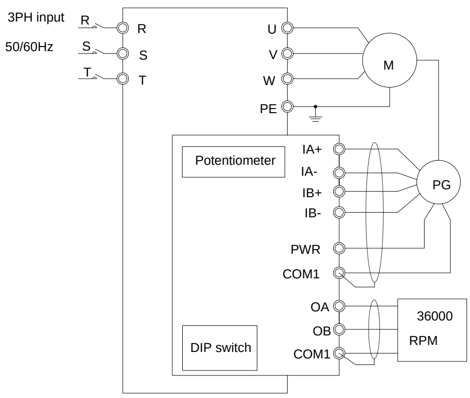


Figure 11.3 Wiring diagram of incremental encoder PG card

11.1.2.4 Wiring notes

- The signal line of PG card should be separated from the power line. Parallel wiring is forbidden.
- Select shielded cables as the signal lines of PG card to prevent coder signals from disturbance.
- The shielding layer of shielded cable of PG card should be grounded (such as terminal PE of the VFD), and furthermore, only one end is grounded, to prevent signal from disturbance.
- If the frequency-division output of PG card is connected to the user power supply, the voltage should

be less than 24V; otherwise, the PG card may be damaged.

- Users can adjust the potentiometer and set output voltage according to actual requirements. Do not rotate the potentiometer with too much force.

11.1.2.5 Input application connection

① Wiring diagram of differential output encoder

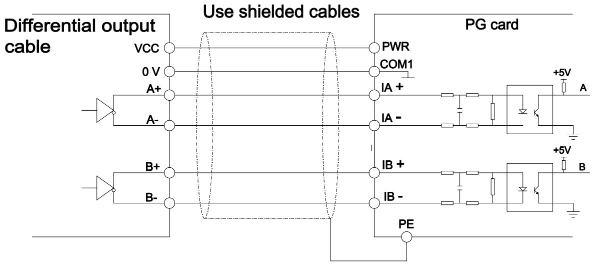


Figure 11.4 Wiring diagram of differential output encoder

② Wiring diagram of open collector output encoder

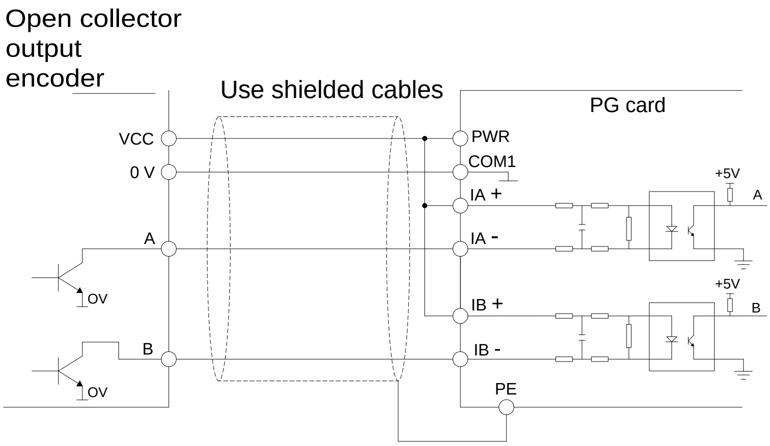


Figure 11.5 Wiring diagram of open collector output encoder

③ Wiring diagram of push-pull output encoder

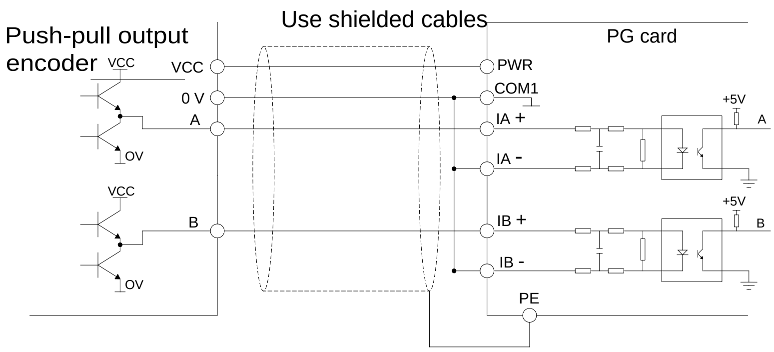


Figure 11.6 Wiring diagram of push-pull output encoder

Note: It is necessary to connect Z signal if spindle positioning VFD is supplied and the connection is the same as that of A and B signal.

11.1.2.6 Output application connection

① Wiring diagram of frequency division differential output of PG card

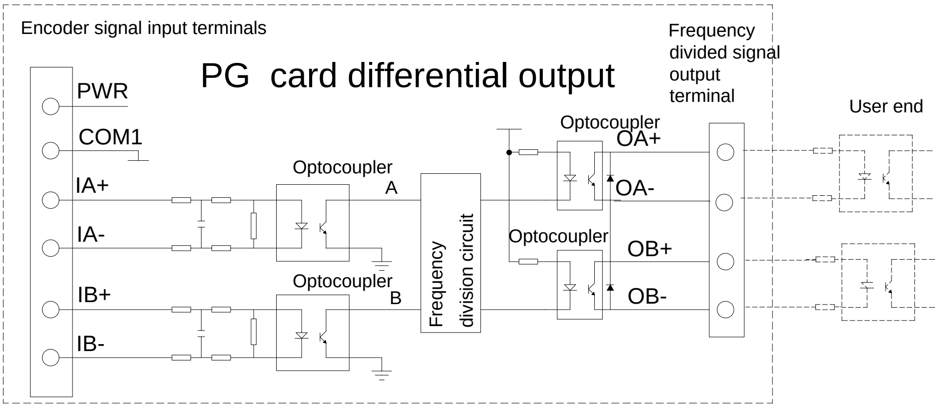


Figure 11.7 Wiring diagram of frequency division differential output of PG card

② Wiring diagram of frequency division open collector output of PG card

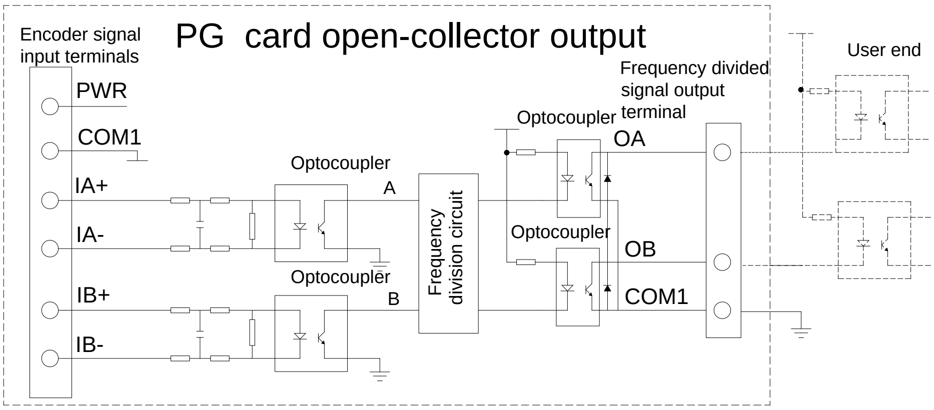


Figure 11.8 Wiring diagram of frequency division open collector output of PG card

Note: PWR at J1 and J2 are short-connected with COA and COB in open collector output.

③ Wiring diagram of push-pull output of PG card

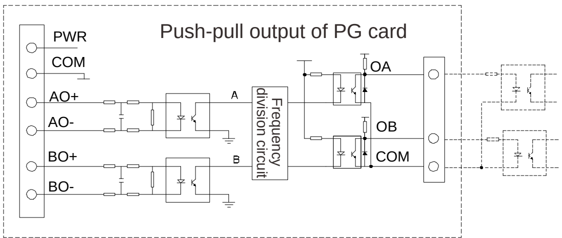


Figure 11.9 Wiring diagram of push-pull output of PG card

Note:

- Short-connect PWR on J1 and J2 with HOA and HOB in push-pull output.
- Incremental encoder PG card is mainly used on closed loop vector control for AM.
- It is necessary to connect ZO signal if spindle positioning VFD is supplied and the connection is the same as that of AO and BO signal.

11.1.3 Operation instruction and wiring of rotary encoder PG card

11.1.3.1 Arrangement of terminals

The rotary encoder PG card has 1 signal interface and 3 user wiring terminals, as shown below:

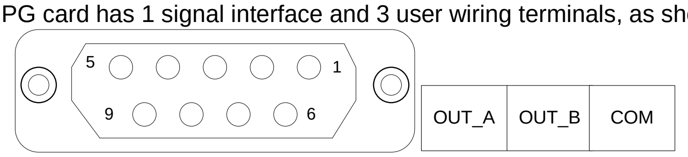


Figure 11.10 Terminals and signals of rotary encoder PG card

11.1.3.2 Instruction of terminals

Code	Terminal name	Instruction
1	SIN+	Encoder signal input
2	SIN-	
3	COS+	
4	GND	
5	Null	
6	EXC+	Encoder excitation signal
7	EXC-	
8	COS-	Encoder signal input
9	Null	

Terminal name	Instruction
OUT_A. OUT_B	Encoder signal frequency-division output

11.1.3.3 Wiring diagram

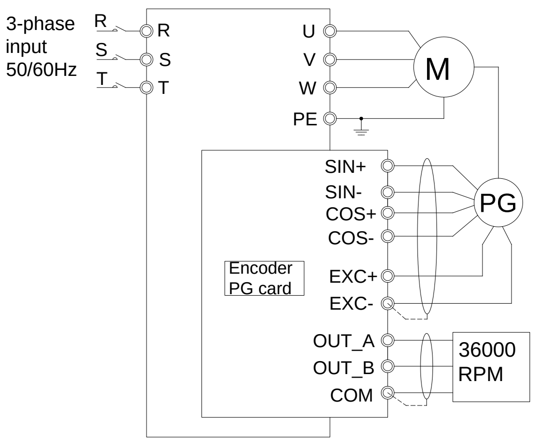


Figure 11.11 Wiring diagram of rotary encoder PG card

11.1.4 Communication extension card

Model	Description	Protocol	Baud rate	Transmission distance (in theory)
EC-TX103	PROFIBUS+Ethernet communication card	DP Ethernet	9.6kbit/s-12Mbit/s 10Mbit/s/100Mbit/s	Max. 1200m Max. 100m
EC-TX105	CANopen+Ethernet communication card	CANopen Ethernet	50kbit/s-1Mbit/s 10Mbit/s/100Mbit/s	Max. 2500m Max. 100m

Note: For PROFIBUS, Ethernet and CANopen protocols, refer to *Operation Manual of INVT Communication Cards*.

11.2 Reactors

Our company provides reactors for selection, among which four-quadrant input reactors are standard.

Model	Input reactor	Output reactor
GD3000-01-055G-12 GD3000-11-055G-12	25006-00298	25006-00395
GD3000-01-075G-12 GD3000-11-075G-12	25006-00298	25006-00395
GD3000-01-090G-12 GD3000-11-090G-12	25006-00298	25006-00395
GD3000-01-110G-12 GD3000-11-110G-12	25006-00298	25006-00395
GD3000-01-132G-12 GD3000-11-132G-12	25006-00438	25006-00072
GD3000-01-160G-12 GD3000-11-160G-12	25006-00438	25006-00072
GD3000-01-200G-12 GD3000-11-200G-12	25006-00438	25006-00072
GD3000-01-250G-12 GD3000-11-250G-12	25006-00210	25006-00431
GD3000-01-315G-12 GD3000-11-315G-12	25006-00210	25006-00431
GD3000-01-400G-12 GD3000-11-400G-12	25006-00210	25006-00431
GD3000-01-500G-12 GD3000-11-500G-12	25006-00441	25006-00440
GD3000-01-630G-12 GD3000-11-630G-12	25006-00441	25006-00440

Model	Input reactor	Output reactor
GD3000-01-800G-12 GD3000-11-800G-12	25006-00435	25006-00434
GD3000-01-1000G-12 GD3000-11-1000G-12	25006-00435	25006-00434

11.3 Filters

Our company provides high-performance filters for selection.

Model	Input filter	Output filter
GD3000-01-055G-12 GD3000-11-055G-12	FLT-P1250H-B	FLT-L1250H-B
GD3000-01-075G-12 GD3000-11-075G-12	FLT-P1250H-B	FLT-L1250H-B
GD3000-01-090G-12 GD3000-11-090G-12	FLT-P12100H-B	FLT-L12100H-B
GD3000-01-110G-12 GD3000-11-110G-12	FLT-P12100H-B	FLT-L12100H-B
GD3000-01-132G-12 GD3000-11-132G-12	FLT-P12100H-B	FLT-L12100H-B
GD3000-01-160G-12 GD3000-11-160G-12	FLT-P12100H-B	FLT-L12200H-B
GD3000-01-200G-12 GD3000-11-200G-12	FLT-P12200H-B	FLT-L12200H-B
GD3000-01-250G-12 GD3000-11-250G-12	FLT-P12200H-B	FLT-L12200H-B
GD3000-01-315G-12 GD3000-11-315G-12	FLT-P12200H-B	FLT-L12200H-B
GD3000-01-400G-12 GD3000-11-400G-12	FLT-P12300H-B	FLT-L12300H-B
GD3000-01-500G-12 GD3000-11-500G-12	FLT-P12400H-B	FLT-L12400H-B
GD3000-01-630G-12 GD3000-11-630G-12	FLT-P12400H-B	FLT-L12400H-B
GD3000-01-800G-12 GD3000-11-800G-12	FLT-P12600H-B	FLT-L12600H-B

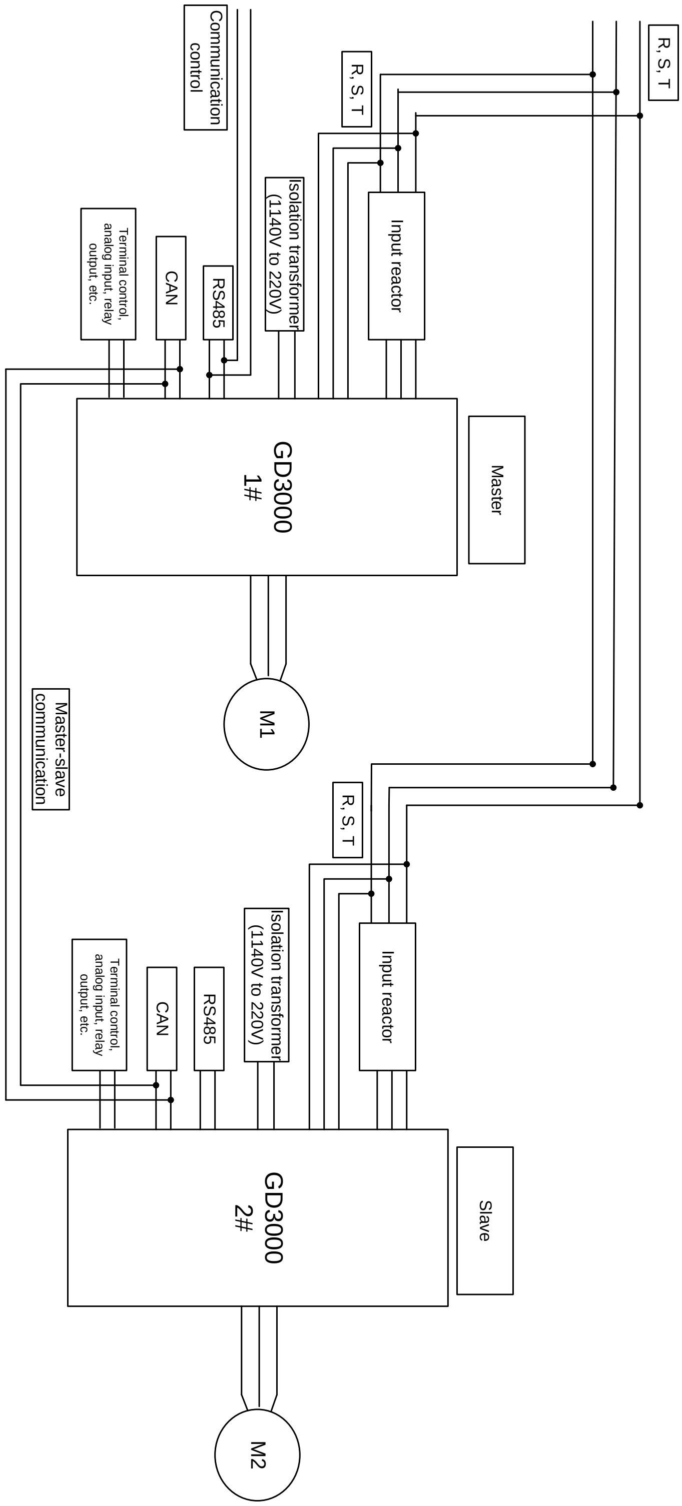
Model	Input filter	Output filter
GD3000-01-1000G-12 GD3000-11-1000G-12	FLT-P12800H-B	FLT-L12800H-B

Note:

1. If no corresponding products for selection, replace with the model at larger current degree.
2. The filters are selected according to the corresponding model or rated current. For the VFDs of other manufacturers, need fine tuning according to the rated current.
3. Two-quadrant and four-quadrant models at the same power share one type of filters.

Appendix A Debugging of master-slave control

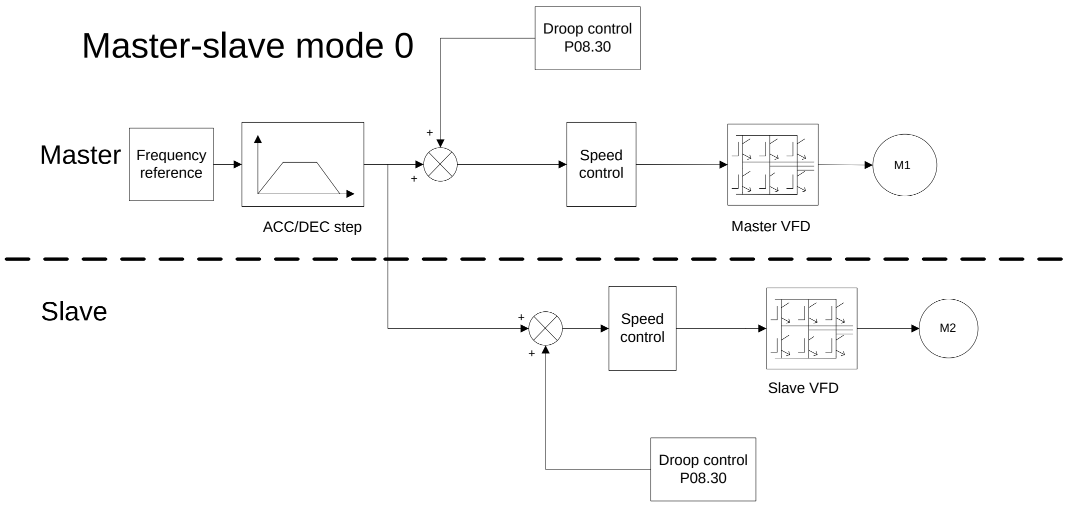
A.1 Wiring of master-slave control



A.2 Debugging procedure of master-slave control

Goodrive3000 VFD has special function group of master-slave control. Only by simple parameter settings can users realize master-slave operation and power balance among multiple motors. There are two modes of master-slave control set by P21.02.

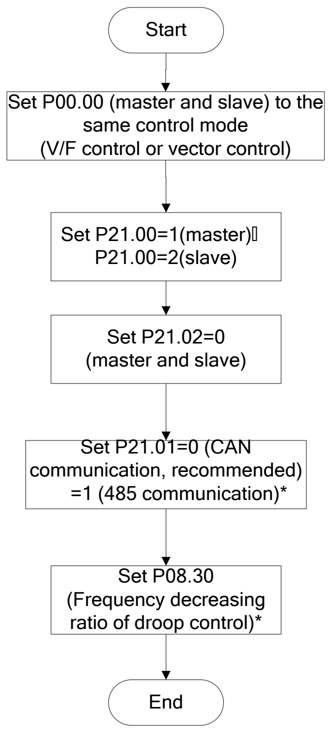
When P21.02=0, master-slave mode 0, set the master (1) and slave(s) in speed control mode and adopt droop control to realize power balance. The flow is shown as follows:



Note:

1. When the master and slave adopt speed control, apply droop control to realize power balance;
2. The master-slave mode is applicable to both rigid connection and flexible connection, generally, recommended in flexible connection.

The flow of relevant parameter settings is shown below:



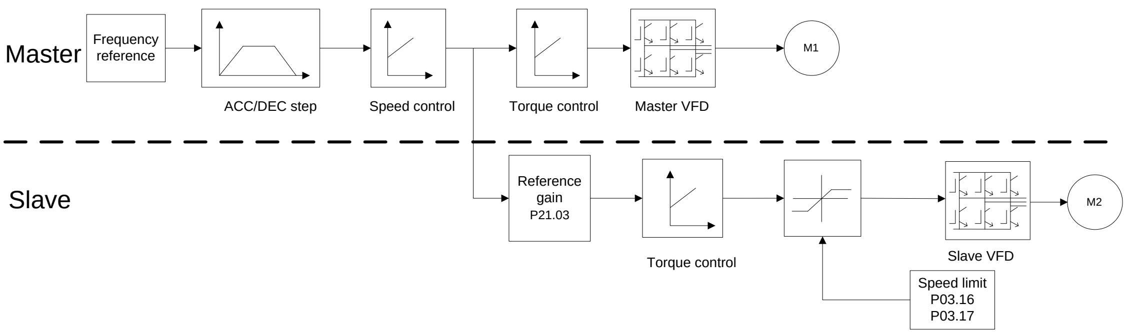
Remark:

1. The master and slave should be set the same communication mode (CAN communication or RS485 communication);
2. P08.30 is the frequency decreasing velocity of droop control. Generally, the parameter can be set the

same for the master and slave in the setting range (0.5 – 3 times of motor rated slip frequency which can be calculated according to the parameters on the name plate of the motor).

When P21.02=1, master-slave mode 1, set the master (1) and slave(s) in vector control mode, the master in speed control and the slave in torque control, and adopt internal speed loop and torque loop to realize power balance. The flow is shown as follows:

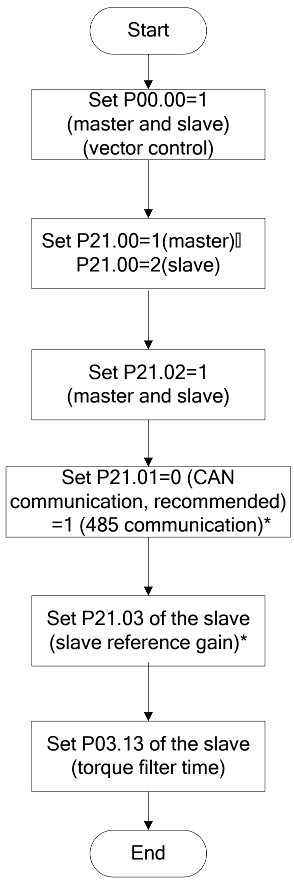
Master-slave mode 1



Note:

1. The master and slave should be set the same vector control mode, the master in speed control and the slave in torque control;
2. The master-slave mode is applicable to both rigid connection and flexible connection.

The flow of relevant parameter settings is shown below:



Remark:

1. The master and slave should be set the same communication mode (CAN communication or RS485 communication);
2. Set the slave reference gain to 1. When the motor power of the master and that of the slave are different, you need to adjust the gain to keep the actual output power and the rated power of the motor consistent in steady operation.

Appendix B EMC installation guidelines

B.1 Installation guidelines compliable with EMC regulations

B.1.1 EMC general knowledge

EMC is the abbreviation of electromagnetic compatibility, which means the device or system has the ability to work normally in the electromagnetic environment and will not generate any electromagnetic interference to other equipment. EMC includes two subjects: electromagnetic interference and electromagnetic anti-jamming.

According to the transmission mode, electromagnetic interference can be divided into two categories: conducted interference and radiated interference.

Conducted interference is the interference transmitted by conductor. Therefore, any conductors such as wire, transmission line, inductor and capacitor are the transmission channels of interference.

Radiated interference is the interference transmitted in electromagnetic waves, and the energy is inversely proportional to the square of distance.

Three necessary conditions or essentials of electromagnetic interference are: interference source, transmission channel and sensitive receiver. For customers, the solution of EMC problem is mainly in transmission channels because the device as interference source or receiver cannot be changed.

Different electric and electronic devices, because of its various EMC standards or degrees, have different EMC capacities.

B.1.2 EMC features

Like other electric or electronic devices, the VFD is not only an electromagnetic interference source but also an electromagnetic receiver. The operating principle of the VFD determines that it can produce certain electromagnetic interference noise. And the same time the VFD needs to be designed with certain anti-jamming ability to ensure the smooth working in certain electromagnetic environment. The following is its EMC features:

Input current is non-sine wave. The input current includes large amount of high-harmonic waves that can cause electromagnetic interference, decrease the grid power factor and increase the line loss.

Output voltage is high frequency PWM wave, which can increase the temperature rise and shorten the life of motor. And the leakage current will also increase, which can lead to the leakage protection device malfunction and generate strong electromagnetic interference to influence the reliability of other electric devices.

As the electromagnetic receiver, too strong interference will damage the VFD and influence the normal using.

In the system, EMS and EMI of the VFD coexist. Decrease the EMI of the VFD can increase its EMS ability.

B.1.3 EMC installation guidelines

In order to ensure all electric devices in the same VFD to work smoothly, this section, based on EMC features of the VFD, introduces general EMC principles in several aspects including noise control, site wiring and grounding for reference in site installation.

B.1.3.1 Noise control

All the connections to the control terminals must use shielded wire. And the shield layer of the wire must ground near the wire entrance of the VFD. The ground mode is 360 degree annular connection formed by cable clips. It is strictly prohibitive to connect the twisted shielding layer to the ground of the VFD, which greatly decreases or loses the shielding effect.

B.1.3.2 Site wiring

Power supply wiring: The shielding layer of power supply incoming cables of the VFD shall be grounded reliably. It is strictly prohibitive to route the power cables and control cables in parallel.

Device categorization: There are different electric devices in the same distribution system, which have different ability of emitting and withstanding electromagnetic noise. Therefore, it needs to categorize these devices into strong noise device and noise sensitive device. The same kind of devices needs to be placed in the same area, and the distance between devices in different categories needs to be more than 20cm.

Wiring in the control cabinet: During wiring, signal cables and power cables need to be arranged in different areas. It is strictly prohibitive to arrange them in parallel or interlacement at a close distance (less than 20cm) or tie them together. If the signal cables have to cross the power cables, they need to be arranged in 90 degree angle.

B.1.3.3 Grounding

The VFD must be grounded safely and reliably in operation. Grounding has the priority in all EMC methods because it does not only ensure the safety of equipment and persons, but also it is the simplest, most effective and lowest-cost solution for EMC problems.

Three categories of grounding: special pole grounding, common pole grounding and series-wound grounding. Different control system needs to use special pole grounding, different devices in the same control system needs to use common pole grounding, and different devices connected by the same power cables needs to use series-wound grounding.

B.1.3.4 Leakage current

Leakage current includes line-to-line leakage current and over-ground leakage current. Its value depends on distributed capacitances and carrier frequency of VFD. The over-ground leakage current, which is the current passing through the common ground wire, cannot only flow into VFD system but also other devices. It also can make leakage current circuit breaker, relay or other devices malfunction. The value of line-to-line leakage current, which means the leakage current passing through distributed capacitors of input output wire, depends on the carrier frequency of VFD, the length and section areas of motor cables. The higher carrier frequency of VFD, the longer of the motor cable and/or the bigger cable section area, the larger leakage current will occur.

Countermeasure:

Decreasing the carrier frequency can effectively decrease the leakage current. In the case that the motor cable is relatively long (longer than 50m), it is necessary to install AC reactor or sinusoidal wave filter at the output side, and when it is even longer, it is necessary to install one reactor at every certain distance.

B.1.3.5 EMC filter

EMC filter has a great effect of electromagnetic decoupling, so it is preferred for customer to install it.

For VFD, noise filter has following categories:

Noise filter installed at the input side of VFD;

Install noise isolation for other equipment by means of isolation transformer or power filter.

B.1.4 Compliances

- EN61000-6-4: Electromagnetic interference detection under industrial environments
- EN61800-3: Electromagnetic radiation standards (2 category environment). Fitting EMC filter can meet EN61000-6-3 electromagnetic radiation standards (residential environment) and EN61000-6-4 electromagnetic radiation standards (industrial environment).

B.2 Interference processing

There are mainly two interferences, electromagnetic noise interference and harmonic interference, which may cause interference to nearby electronic and electric devices by conduction, radiation and near-field induction, etc. and thus the devices malfunction. For different cases of interferences, you can refer to the following solutions:

B.2.1 Electromagnetic noise interference

Generally, conduction interference transmits interference via cables. When the interfered devices and the VFD use the same power or electrical connection, conduction interference may easily occur. For such interference, you can adopt the following solutions: install the high-performance power filter of our company at the power input side of the VFD; install the amorphous magnetic ring on the output motor cable and coil 2–3 turns, in the case of severe conditions, you can install the output power filter; install small amorphous magnetic ring on the signal cable and coil 2–3 turns; reduce the carrier frequency appropriately. (Cautions: Too low carrier frequency will increase harmonic and motor noise.)

Radiation interference transmits interference via space and the interfered devices are generally instruments with weak signals, such as sensors and signal controllers. When the interfered devices and the VFD are in the same control cabinet or in a short distance, radiation interference and thus malfunction may easily occur. In this case, we recommend the following solutions: Try not to put the signal devices and the VFD in the same cabinet and keep the signal devices away from the interference source; use shielded twisted pairs for the signal cables and ground the shielded layer 360 degrees reliably.

Near-field induction transmits interference via near-field inductive coupling among cables. Generally, the power cable and the signal cable are too close. In this case, you can adopt the following solutions: Arrange the signal cable and the power cable separately; keep the signal cable away from the power cable; use the shielded cables and ground the shielded layer 360 degrees reliably.

The signal devices should be grounded separately. To avoid common ground interference, do not ground the signal devices with the VFD together.

B.2.2 Harmonic interference

Harmonic interference transmits interference in two ways: interfere the motor through the output port and thus influence the service life of the motor; interfere other devices through the power port. In this case, you can be adopt the following solutions: Install the reactor at the output port of the VFD; install RC absorber at the output port of the VFD; in the case of severe conditions, suggest installing the LC sine filter at the output port; install the reactor at the input power port, for four-quadrant VFD, install the LC sine filter at the input power port; increase the carrier frequency appropriately. (Cautions: Too high carrier frequency will increase temperature rise, electromagnetic noise and leakage current.)

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