Operation Manual

Goodrive2000 Series

Medium Voltage VFD

SHENZHEN INVT ELECTRIC CO., LTD.

No.	Release date	Change description	Version
1	July 2019	First release.	V1.0
2	April 2020	1. Updated certain function codes and faults in chapter 5. 2. Corrected errors.	V1.1
3	February 2022	1. Updated the Figure 3-1 in section 3.4.1 2. Modified the keypad description in Chapter 4 3. Modified Chapter 6 4. Updated section 1.3 and added section 2.5	V1.2

Preface

Thank you for choosing Goodrive2000 series variable-frequency drive (VFD).

If not otherwise specified in this manual, the VFD always indicates Goodrive2000 series VFD, which is a high-performance vector VFD, used to control asynchronous AC induction motors and permanent magnet synchronous motors. The VFD can fully support the working modes of different motors. Using the most advanced technology in the world and DSP control system, the VFD has strengthened the reliability and environment adaptability and adapted customized and industrial design to improve the functions, make the application more flexible, and optimize the performance.

With modular design, the VFD can meet not only general requirements but also customized and industrial requirements by integrating various communication cards. The VFD can meet various complicated and high-accuracy driving requirements by providing enriched functions such as speed control, simplified PID water supply, simplified PLC, flexible input and output terminals, and mainstream communication settings. In addition, the VFD can help achieve highly integrated solutions for equipment manufacturers, therefore reducing cost and improving reliability.

This manual instructs you how to install, wire, set parameters for, diagnose and remove faults for, and maintain the VFD, and also lists related precautions. Before installing the VFD, read through this manual carefully to ensure the proper installation and running with the excellent performance and powerful functions into full play.

If the product is ultimately used for military affairs or manufacture of weapons, it will be listed on the export control formulated by the Foreign Trade Law of the People's Republic of China. Rigorous review and necessary export formalities are needed when the product is exported.

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 ... 1
1.3.2 Grounding ... 2
1.3.3 Delivery and installation ... 2
1.3.4 Running ... 2
1.3.5 Maintenance and component replacement ... 3
2 Product overview ... 4
2.1 Product model designation ... 4
2.2 Goodrive2000 two-quadrant VFD technical specifications ... 4
2.3 Goodrive2000 four-quadrant VFD technical specifications ... 6
2.3.1 Goodrive2000 PWM rectifier technical specifications ... 6
2.3.2 Goodrive2000 inverter technical specifications ... 6
2.4 Product ratings ... 8
2.4.1 Goodrive2000 two-quadrant VFD main ratings ... 8
2.4.2 Goodrive2000 four-quadrant VFD main ratings ... 8
2.5 Product standards ... 8
3 Installation guidelines ... 12
3.1 Unpacking inspection ... 12
3.2 Environment requirements ... 12
3.2.1 Storage environment ... 12
3.2.2 Running environment ... 13
3.3 VFD main circuit terminals ... 13
3.4 VFD control circuit terminals ... 14
3.4.1 VFD PWM rectifier control circuit ... 14
3.4.2 VFD inverter control circuit ... 16
4 HMI ... 19
4.1 LCD keypad for rectifier ... 19
4.1.1 Keypad display ... 20
4.1.2 Keypad setting and function menu selection ... 21
4.1.3 Editing function codes ... 21
4.1.4 Operation procedure ... 21
4.1.5 Explosion-proof keypad wiring ... 22
4.1.6 Keypad dimensions ... 23
4.2 LED keypad for inverter ... 23
4.2.1 Keypad display ... 26
4.2.2 Operating the inverter through the keypad ... 27
4.2.3 Explosion-proof keypad wiring ... 37
4.2.4 Keypad dimensions ... 37
5 VFD PWM rectifier ... 38
5.1 Overview ... 38
5.2 Function description ... 39
5.2.1 P00 group—Basic functions ... 39

5.2.2 P01 group—Power-on control and protection 42
5.2.3 P02 group—Master/slave control (Reserved) 44
5.2.4 P03 group—Control parameters 46
5.2.5 P04 group—Filter parameters 52
5.2.6 P05 group—Input terminals 54
5.2.7 P06 group—Output terminals 59
5.2.8 P07 group—Human-machine interface 64
5.2.9 P17 group—Overall status information 67
5.2.10 P18 group—Unit status information 68
5.2.11 P19 group—Fault information 70
5.2.12 P20 group—Serial communication 72
5.2.13 P21 group—PROFIBUS/CANopen communication 74
5.2.14 P22 group—Ethernet communication 77
5.3 Fault information and fault handling 78
5.4 Function parameter list 81
6 VFD inverter 107
6.1 Basic operation description 107
6.1.1 What this section describes 107
6.1.2 Common commissioning procedure 107
6.1.3 Vector control 110
6.1.4 SVPWM control mode 115
6.1.5 Torque control 122
6.1.6 Motor parameters 125
6.1.7 Start/stop control 130
6.1.8 Frequency setting 134
6.1.9 Analog input 137
6.1.10 Analog output 139
6.1.11 Digital input 143
6.1.12 Digital output 151
6.1.13 Simple PLC 156
6.1.14 Multi-step speed running 158
6.1.15 PID control 160
6.1.16 Running at wobbling frequency 165
6.1.17 Local encoder input 166
6.1.18 Commissioning procedures for position control and spindle positioning 167
6.1.19 Fault handling 171
6.2 Fault information and fault handling 174
6.2.1 inverter faults and solutions 174
6.2.2 Other status 182
6.3 Analysis on common faults 182
6.3.1 Motor fails to work 182
6.3.2 Motor vibrates 183
6.3.3 Overvoltage 183
6.3.4 Undervoltage 184
6.3.5 Unusual heating of motor 185
6.3.6 inverter overheating 186
6.3.7 Motor stalls during ACC 186
6.3.8 Overcurrent 187
6.4 Function parameter list 187
7 Maintenance guidelines 300

7.1 Daily maintenance.......... 300
7.2 Regular maintenance.......... 300
7.3 Replacement of wearing parts.......... 302
8 Modbus communication.......... 303
8.1 Modbus protocol overview.......... 303
8.2 Modbus protocol introduction.......... 303
8.3 Application of Modbus.......... 303
8.3.1 RS485.......... 303
8.3.2 RTU.......... 305
8.4 RTU command code and communication data.......... 308
8.4.1 Command code 03H, reading N words (continuously up to 16 words).......... 308
8.4.2 Command word 06H, writing a word.......... 309
8.4.3 Command code 08H, diagnosis.......... 310
8.4.4 Command code 10H, continuous writing (valid only for the inverter).......... 311
8.4.5 Data address definition.......... 312
8.4.6 Fieldbus scale.......... 316
8.4.7 Error message response.......... 317
8.4.8 Read/Write operation example.......... 318
8.5 Common communication faults.......... 322
8.6 Related function codes.......... 322
8.6.1 Related to the VFD PWM rectifier.......... 322
8.6.2 Related to the VFD inverter.......... 323
9 Optional peripheral accessories.......... 325
9.1 Optional cards.......... 325
9.2 Reactors.......... 327
9.3 Filters.......... 328
Appendix A EMC installation guidelines.......... 329
A.1 Installation guidelines compliable with EMC regulations.......... 329
A.1.1 EMC general knowledge.......... 329
A.1.2 EMC features.......... 329
A.1.3 EMC installation guidelines.......... 329
A.2 Interference handling.......... 331
A.2.1 Electromagnetic noise interference.......... 331
A.2.2 Harmonic interference.......... 331

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

Symbol	Name	Description
	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

	✧ Do not perform any live operation on the VFD, motor, or motor cables. ✧ Only trained and qualified professionals can operate the VFD. ✧ 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 have live contact with the VFD control part or the external circuit connected to the VFD control part, because the external control circuit may cause dangerous voltage to be generated inside the VFD even if the VFD is powered off.

	✧ Do not perform the insulation withstand voltage test on the VFD during maintenance as the VFD has already passed the test before delivery. ✧ When the motor needs to be re-connected, check whether the motor cable phase sequence is correct. ✧ Hazardous voltage is present at the motor cable connection terminals on the VFD only if the VFD is powered on, regardless of whether the motor is running or not. ✧ Hazardous DC voltage of higher than 900V is present at the DC bus terminals (+) and (-). ✧ Hazardous voltage may be present at relay output terminals. The voltage class is dependent on external circuit.
	✧ Do not refit the VFD unless authorized; otherwise fire, electric shock or other injury may result. ✧ Keep anyone who wear electronic medical devices away from VFDs, motors, or power cords during power-up, because the presence of magnetic fields may interfere with the proper operation of medical devices.
	✧ The electrical parts and components inside the VFD are electrostatic sensitive. Take measurements to prevent electrostatic discharge when performing related operations.

1.3.2 Grounding

	✧ Ensure the good grounding of the VFD, motor and related equipment to guarantee personnel safety under any conditions, and effectively reduce the VFD electromagnetic radiation. ✧ Ensure the grounding cable diameters meet safety requirements. ✧ When multiple cabinets are connected, each cabinet must be independently grounded. ✧ To further reduce electromagnetic radiation, it is recommended to use shielded cables, use 360-degree high-frequency loop connection, and connect the shielding wire directly to the PE to meet safety requirements. ✧ The cross-sectional area of grounding wire's shielding layer shall meet the safety requirements. ✧ When the working leakage current of the VFD is greater than 3.5mA (DC) or 10mA (AC), independent grounding must be used to ensure personnel safety.

1.3.3 Delivery and installation

	✧ Do not move the VFD by yourself since it is heavy. Do not move it upside down. ✧ Ensure there is sufficient heat dissipation space for the equipment after installation. ✧ Do not fix the VFD by riveting or welding. ✧ Do not tilt the VFD during installation. Otherwise it is easy to tip over.

1.3.4 Running

	✧ Before starting the VFD, make sure the connected motor and auxiliary devices meet the speed requirements for running the VFD. By adjusting the VFD, the connected motor can run in the speed ranges higher than power frequency and lower than power frequency. ✧ Do not enable the automatic fault reset function if there may be a dangerous situation. This function can enable the VFD to keep running even if the VFD has a fault.

1.3.5 Maintenance and component replacement

	✧ During maintenance and component replacement, take measures to prevent screws, cables and other conductive matters from falling into the internal of the Goodrive2000 series products. ✧ Do not touch the fiber optic conduction section (glass fiber) when handling the fiber, since the fiber optic conduction section (glass fiber) is extremely sensitive to dust and oil. The minimum allowable bend radius of the optical fiber is 35mm. ✧ When checking the insulation of Gooddrive2000 series products with the specified voltage, please ensure that the product is disconnected from the input power supply, and U, V, W output terminals are disconnected from the motor. Please note that the insulation resistance will be affected by the ambient temperature.

2 Product overview

2.1 Product model designation

GD2000-11-185G-06-XXXX

① ② ③ ④

Figure 2-1 Product model example

Table 2-1 Product model code description

No.	Field	Description
①	Medium-voltage product series	GD2000-01: Two-quadrant module product, IP00 GD2000-11: Four-quadrant module product, IP00
②	Rated power	075G: 75kW 500G: 500kW
③	Voltage class	06: 660V
④	Management number	Internal management number

2.2 Goodrive2000 two-quadrant VFD technical specifications

Table 2-2 Two-quadrant VFD technical specifications

Item		Specifications
Power input	Input voltage (V)	AC 3PH 560V–760V; Rated voltage: 660V
	Input current (A)	See 2.4 Product ratings.
	Input frequency (Hz)	50Hz or 60Hz; Allowed range: 47–63Hz
Power output	Output voltage (V)	0–Input voltage (V)
	Output current (A)	See 2.4 Product ratings.
	Output power (kW)	See 2.4 Product ratings.
	Output frequency (Hz)	0–400Hz
Technical control performance	Control mode	Space voltage vector control, sensorless vector control (SVC), and sensor vector control (VC)
	Motor type	Asynchronous motor (AM) and permanent magnetic synchronous motor (SM)
	Speed ratio	For AMs: 1:200 (SVC); for SMs, 1:20 (SVC); 1:1000 (VC)
	Speed control accuracy	± 0.2% (SVC); ± 0.02% (VC)
	Speed fluctuation	± 0.3% (SVC)
	Torque response	< 20ms (SVC); < 10ms (VC)
	Torque control accuracy	10% (SVC); 5% (VC)

Item		Specifications
	Starting torque	For AMs: 0.25Hz/150% (SVC) For SMs: 2.5Hz/150% (SVC) 0Hz/200% (VC)
	Overload capacity	150% for 1 minute, 180% for 10 seconds, and 200% for 1 second
Running control performance	Frequency setting method	Settings can be implemented through digital, analog, pulse frequency, multi-step speed running, simple PLC, PID, Modbus communication, PROFIBUS communication and so on. Settings can be combined and the setting channels can be switched.
	Automatic voltage regulation	The output voltage can be kept constant although the grid voltage changes.
	Fault protection	More than 30 protection functions, such as protection against overcurrent, overvoltage, undervoltage, overtemperature, phase loss, and overload
	Speed tracking restart	Used to implement impact-free smooth startup for rotating motors
Peripheral interface	Terminal analog input resolution	No more than 20mV
	Terminal digital input resolution	No more than 2ms
	Analog input	2 inputs; AI1: 0–10V/0–20mA; AI2: -10–10V
	Analog output	1 input; AO1: 0–10V/0–20mA
	Digital input	Four regular inputs; max. frequency: 1kHz; internal impedance: 3.3kΩ Two high-speed inputs; max. frequency: 50kHz; supporting quadrature encoder input; with speed measurement function
	Digital output	One high-speed pulse output; max. frequency: 50kHz One Y terminal open collector output
	Relay output	Two programmable relay outputs RO1A: NO; RO1B: NC; RO1C: common RO2A: NO; RO2B: NC; RO2C: common Contact capacity: 3A/AC250V, 1A/DC30V
	Extended interfaces	Three extended interfaces: SLOT1, SLOT2, and SLOT3 Supporting PG cards, programmable extension cards, communication cards, I/O cards and so on
Other	Temperature of running environment	-10 – +50°C; derating is required if the ambient temperature exceeds 40°C
	Ingress protection rating	IP00
	Pollution degree	Degree 2
	Cooling method	Forced air cooling

2.3 Goodrive2000 four-quadrant VFD technical specifications

2.3.1 Goodrive2000 PWM rectifier technical specifications

Table 2-3 Goodrive2000 PWM rectifier technical specifications

Item		Specifications
Power input	Rated input voltage (V)	AC 3PH 560V–760V; Rated voltage: 660V
	Rated input current (A)	See 2.4.2 Goodrive2000 four-quadrant VFD main ratings.
	Rated input frequency (Hz)	50Hz or 60Hz; Allowed range: 47–63Hz
	Rated input efficiency (%)	More than 95%
	Rated input power factor (%)	More than 0.99
Fault protection		More than 30 protection functions, such as protection against overcurrent, overvoltage, undervoltage, overtemperature, phase loss, and overload

2.3.2 Goodrive2000 inverter technical specifications

Table 2-4 Goodrive2000 inverter technical specifications

Item		Specifications
Power output	Output voltage (V)	0–Input voltage (V)
	Output current (A)	See 2.4 Product ratings.
	Output power (kW)	See 2.4 Product ratings.
	Output frequency (Hz)	0–400Hz
Technical control performance	Control mode	Space voltage vector control, sensorless vector control (SVC), and sensor vector control (VC)
	Motor type	Asynchronous motor (AM) and permanent magnetic synchronous motor (SM)
	Speed ratio	For AMs: 1:200 (SVC); for SMs, 1:20 (SVC); 1:1000 (VC)
	Speed control accuracy	± 0.2% (SVC); ± 0.02% (VC)
	Speed fluctuation	± 0.3% (SVC)
	Torque response	< 20ms (SVC); < 10ms (VC)
	Torque control accuracy	10% (SVC); 5% (VC)
	Starting torque	For AMs: 0.25Hz/150% (SVC) For SMs: 2.5Hz/150% (SVC) 0Hz/200% (VC)
	Overload capacity	150% for 1 minute, 180% for 10 seconds, and 200% for 1 second
Running control performance	Frequency setting method	Settings can be implemented through digital, analog, pulse frequency, multi-step speed running, simple PLC, PID, Modbus communication, PROFIBUS communication and so on. Settings can be combined and the setting channels can be switched.

Item		Specifications
	Automatic voltage regulation	The output voltage can be kept constant although the grid voltage changes.
	Fault protection	More than 30 protection functions, such as protection against overcurrent, overvoltage, undervoltage, overtemperature, phase loss, and overload
	Speed tracking restart	Used to implement impact-free smooth startup for rotating motors
Peripheral interface	Terminal analog input resolution	No more than 20mV
	Terminal digital input resolution	No more than 2ms
	Analog input	2 inputs; AI1: 0–10V/0–20mA; AI2: -10–10V
	Analog output	1 input; AO1: 0–10V/0–20mA
	Digital input	Four regular inputs; max. frequency: 1kHz; internal impedance: 3.3kΩ Two high-speed inputs; max. frequency: 50kHz; supporting quadrature encoder input; with speed measurement function
	Digital output	One high-speed pulse output; max. frequency: 50kHz One Y terminal open collector output
	Relay output	Two programmable relay outputs RO1A: NO; RO1B: NC; RO1C: common RO2A: NO; RO2B: NC; RO2C: common Contact capacity: 3A/AC250V, 1A/DC30V
	Extended interfaces	Three extended interfaces: SLOT1, SLOT2, and SLOT3 Supporting PG cards, programmable extension cards, communication cards, I/O cards and so on
Other	Temperature of running environment	-10 – +50°C; derating is required if the ambient temperature exceeds 40°C
	Ingress protection rating	IP00
	Pollution degree	Degree 2
	Cooling method	Forced air cooling

2.4 Product ratings

2.4.1 Goodrive2000 two-quadrant VFD main ratings

Table 2-5 Goodrive2000 two-quadrant VFD main ratings

VFD model	Rated power (kW)	Rated input current (A)	Rated output current (A)
GD2000-01-075G-06	75.0	85	86
GD2000-01-090G-06	90.0	95	98
GD2000-01-110G-06	110.0	118	120
GD2000-01-132G-06	132.0	145	150
GD2000-01-160G-06	160.0	165	175
GD2000-01-185G-06	185.0	190	200
GD2000-01-200G-06	200.0	210	220
GD2000-01-250G-06	250.0	255	270
GD2000-01-315G-06	315.0	334	350
GD2000-01-400G-06	400.0	411	430
GD2000-01-500G-06	500.0	518	540

2.4.2 Goodrive2000 four-quadrant VFD main ratings

Table 2-6 Goodrive2000 four-quadrant VFD main ratings

VFD model	Rated power (kW)	Rated input current (A)	Rated output current (A)
GD2000-11-075G-06	75.0	69	86
GD2000-11-090G-06	90.0	83	98
GD2000-11-110G-06	110.0	101	120
GD2000-11-132G-06	132.0	122	150
GD2000-11-160G-06	160.0	147	175
GD2000-11-185G-06	185.0	170	200
GD2000-11-200G-06	200.0	184	220
GD2000-11-250G-06	250.0	230	270
GD2000-11-315G-06	315.0	290	350
GD2000-11-400G-06	400.0	368	430
GD2000-11-500G-06	500.0	460	540

2.5 Product standards

The Goodrive3000 series medium voltage speed regulation system is designed and manufactured with reference to the latest version of national standards (GB or GB/T), International Electrotechnical Commission (IEC) standards, and

International System of Units (SI) as the minimum design specifications, and some of its relevant technical parameters can meet the requirements of GB or GB/T and IEC standards.

Some technical standards for design reference:

IEC 60071-1:2019	Insulation coordination - Part 1: definitions, principles and rules
IEC 61800-5-1:2007+A1:2016	Adjustable speed electrical power drive systems - Part 5-1: Safety requirements - Electrical, thermal and energy
IEC 61800-5-2:2016	Adjustable speed electrical power drive systems - Part 5-2: Safety requirements - Functional
IEC 60529:1989+A1:1999+A2:2013	Degrees of protection provided by enclosure (IP code)
IEC 61000-4 SER	EMC testing and measurement techniques. (series standards)
IEC 61800-3:2017	Adjustable speed electrical power drive systems--Part 3:EMC requirements and specific test methods
IEC 61800-2:2021	Adjustable speed electrical power drive systems - Part 2: General requirements - Rating specifications for adjustable speed AC power drive systems
IEC 61800-9-2:2017	Adjustable speed electrical power drive systems - Part 9-2: Ecodesign for power drive systems, motor starters, power electronics and their driven applications - Energy efficiency indicators for power drive systems and motor starters
IEC 60038:2009+A1:2021	IEC standard voltage
IEC 60196:2009	IEC standard frequencies
IEC 60034-9:2021	Rotating electrical machines - Part 9: Noise limits
IEC 60146-1-1:2009	Semiconductor converters - General requirements and line commutated converters - Part 1-1: Specification of basic requirements
IEC 60068-2:2021 SER	Environmental testing - Part 2: Tests - ALL PARTS
IEC 60204-1:2016+A1:2021	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
IEC 60204-11:2018	Safety of machinery - Electrical equipment of machines - Part 11: Requirements for HV equipment for voltages above 1000 V a.c. or 1500 V d.c. and not exceeding 36 kV
IEC 60721-3-1:2018	Classification of environmental conditions - Part 3-1: Classification of groups of environmental parameters and their severities - Storage
IEC 60721-3-2:2018	Classification of environmental conditions - Part 3-2: Classification of groups of environmental parameters and their severities - Transportation and Handling
IEC 60721-3-3:2019	Classification of environmental conditions - Part 3-3: Classification of groups of environmental parameters and their severities - Stationary use at weatherprotected locations
IEC 60228:2004	Conductors of insulated cables

IEEE 519-2014	Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems
GB/T 311.1-2012	Insulation co-ordination　Part 1: Definitions, principle and rules
GB/T 12668.501-2013	Adjustable speed electrical power drive systems　Part 5-1: Safety requirements—Electrical, thermal and energy
GB/T 12668.502-2013	Adjustable speed electrical power drive systems　Part 5-2: Safety requirements—Function
GB/T 4208-2017	Degree of protection provided by enclosure (IP code)
GB/T 17626	Electromagnetic compatibility　Testing and measurement techniques (series standards)
GB/T 12668.3-2012	Adjustable speed electrical power drive systems　Part 3: EMC requirements and specific test methods
GB/T 12668.2-2002	Adjustable speed electrical power drive systems　Part 2: General requirements—Rating specifications for low voltage adjustable frequency a.c. power drive systems
GB 12668.4-2006	Adjustable speed electrical power drive systems　Part 4: General requirements—Rating specifications for a.c.power drive systems above 1000Va.c.and not exceeding 35kV
GB/T 12668.902-2021	Adjustable speed electrical power drive systems　Part 9-2: Ecodesign for power drive systems, motor starters, power electronics and their driven applications—Energy efficiency indicators for power drive systems and motor starters
GB/T 156-2017	Standard Voltages
GB/T 1980-2005	Standard frequencies
GB/T 10069.3-2008	Measurement of airborne noise emitted by rotating electrical machines and the noise limits　Part 3: Noise limits
GB/T 3859.1-2013	Semiconductor converters.General requirements and line commutated converters　Part 1-1: Specification of basic requirements
GB/T 2423	Environmental testing　Part 2: Test methods (series standards)
GB/T 5226.1-2019	Electrical safety of machinery—Electrical equipment of machines　Part 1:General requirements
GB 5226.3-2005	Sefety of machinery.Eletrical equipment of machines　Part 11: Requirements for HV equipment for voltages above 1000Va.c.or 1500Vd.c.and not exceeding 36kV
GB/T 4798.1-2019	Classification of environmental conditions—Classification of groups of environmental parameters and their severities　Part 1: Storage
GB/T 4798.2-2021	Classification of environmental conditions—Classification of groups of environmental parameters and their severities　Part 2: Transportation and handling

GB/T 4798.3-2007	Environmental conditions existing in the application of electric and electronic products Part 3: Stationary use at weather-protected locations
GB/T 3956-2008	Conductors of insulated cables
GB/T 14549-1993	Quality of electric energy supply harmonics in public supply network
GB/T 19212.1-2016	Safety of transformers, reactors, power supply units and combinations thereof Part 1: General requirements and tests
GB/T 30843.1-2014	Variable-frequency drive above 1 kV and not exceeding 35 kV Part 1: Technical conditions
GB/T 30843.2-2014	Variable-frequency drive above 1 kV and not exceeding 35 kV Part 2: Test methods
GB/T 30843.3-2017	Variable-frequency drive above 1 kV and not exceeding 35 kV Part 3: Safety requirements
DL-T 994-2006	High voltage variable frequency drive used in draft fan and pump of power plant
JB/T 9659.1-1999	Terminal blocks for low-oltage switchgear and controlgear assemblies Part 1: Sectional type and closed-back type terminal blocks
JB/T 9660-1999	Wiring duct

3 Installation guidelines

3.1 Unpacking inspection

• Package inspection

Please check the package carefully before unpacking. Check whether there is any damage or unpacking clue.

In addition, check whether the package is soaked or moistened. If any problem is found, contact the local dealer or INVT office.

• Unpacking inspection

Please check as follows after unpacking:

The appearance of the product is good, and there are no related accessories falling off; the product manual, keypad and other accessories are complete; there is no other foreign matter except foam in the package. If any problem is found, contact the local dealer or INVT office.

3.2 Environment requirements

3.2.1 Storage environment

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

Table 3-1 Temporary storage environment requirements

<table>
<tr><th>Item</th><th colspan="2">Specifications</th></tr>
<tr><td>Storage temperature</td><td>-40°C–70°C</td><td rowspan="3">No condensation or icing, which may be caused by sudden temperature change</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, avoid the situations which can cause condensation and icing due to sudden temperature change.</td></tr>
<tr><td>Atmosphere</td><td colspan="2">Store the VFD in a place free of dust, direct sunshine, flammable gas, oil pollution, steam and vibration.</td></tr>
</table>

(2) Permanent storage environment

If the VFD cannot be used at present due to project change or other reasons after it is bought, 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 performance of the electrolytic capacitors 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 recommend you to remove it and store in a place in good conditions.

The performances of the electrolytic capacitor will degrade if not used for a long period. When the VFD is stored for a long period of time, we recommend you to power on it at least once every year.

3.2.2 Running environment

Table 3-2 Operating environment requirements

Item	Specifications
Running environment temperature	-10°C – +50°C. Derate 3% for every increase of 1°C when the temperature is above 40°C.
Relative humidity	5%–95%
Atmosphere	Store the VFD in a place free of dust, direct sunshine, flammable gas, oil pollution, steam and vibration.
Altitude	Lower than 1000 meters. Derating is required when the altitude exceeds 1000 meters. See Table 3-3 Altitude derating for the specific derating factors.
Vibration amplitude	2–9Hz: displacement of 3mm; 9–20Hz: acceleration of 9.8m/s^2; 20–55Hz: acceleration of 2m/s^2; 55–200Hz: acceleration of 1m/s^2

Table 3-3 Altitude derating

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

3.3 VFD main circuit terminals

The VFD contains multiple main modules and the main circuit terminals are listed in the following table.

Table 3-4 Main circuit terminals

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

3.4 VFD control circuit terminals

3.4.1 VFD PWM rectifier control circuit

3.4.1.1 Control circuit wiring

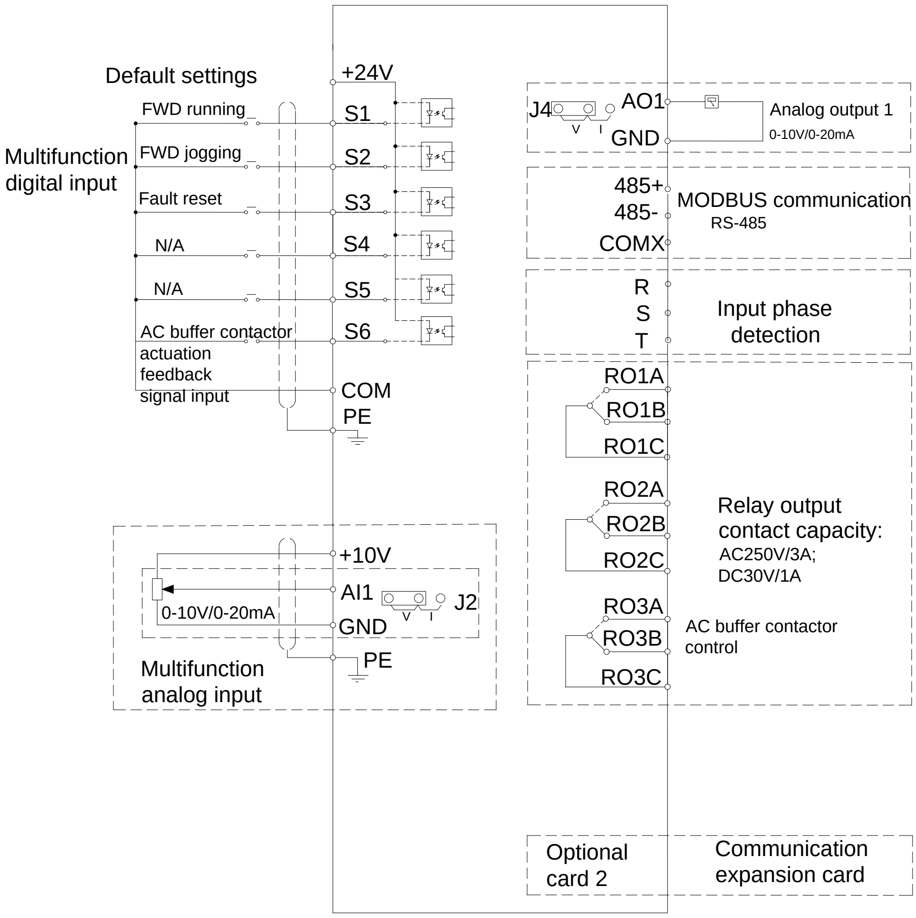


Figure 3-1 Control circuit wiring

3.4.1.2 Control circuit terminals

The control circuit terminal layout is as follows.

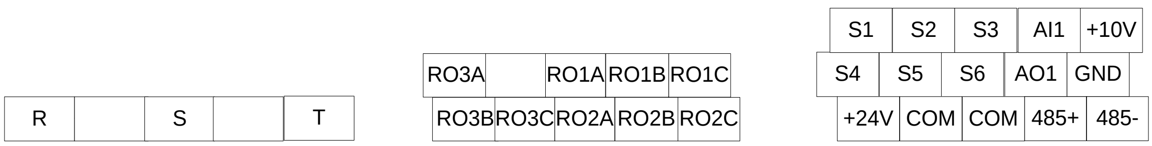


Figure 3-2 Control circuit terminals

The control circuit terminals are described in the following table.

Table 3-5 Control circuit terminals

Category	Terminal	Name	Description
Power supply	10V	10V reference power supply	Used to externally provide 10V reference power supply. Max. output current: 50mA Generally used as the regulation power supply of the external potentiometer whose impedance is greater than 5kΩ.

Category	Terminal	Name	Description
	24V	24V power supply	Used to externally provide 24V±10% power supply. Max. output current: 200mA Generally used as the working power supply of digital input/output or the external sensor power supply
	COM	Common terminal	10V common terminal
	GND	Common terminal	24V common terminal
Analog input/output	AI1	Analog input 1	• Input range: 0–10V or 0–20mA • Input impedance: 20kΩ for voltage input or 500Ω for current input • Whether voltage or current is used for input is set through the jumper. • Resolution: 5mV when 10V corresponds to 50Hz • Deviation: ±1%, 25°C
	AO1	Analog output 1	• Output range: 0–10V or 0–20mA • Whether voltage or current is used for output is set through the jumper. • Resolution: 12 bits, accurate to 1% • Deviation: ±1%, 25°C
Digital input/output	S1	Digital input 1	• Internal impedance: 3.3kΩ • Max. input frequency: 1kHz
	S2	Digital input 2	
	S3	Digital input 3	
	S4	Digital input 4	
	S5	Digital input 5	
	S6	AC buffer contactor actuation feedback signal input	
Communication	485+	RS485 communication	RS485 communication terminal, using the Modbus protocol
	485-		
Relay output	RO1A	NO contact of relay 1	• Contact capacity: 3A/AC250V, 1A/DC30V • Cannot be used as high frequency digital output
	RO1B	NC contact of relay 1	
	RO1C	Common contact of relay 1	
	RO2A	NO contact of relay 2	
	RO2B	NC contact of relay 2	
	RO2C	Common contact of relay 2	
	RO3A	NO contact of relay 3 (controlled by the AC buffer contactor)	
	RO3B	NC contact of relay 3	

Category	Terminal	Name	Description
	RO3C	Common contact of relay 3 (controlled by the AC buffer contactor)	
Input voltage detection	R	Phase R of input	3PH voltage (660V) of input
	S	Phase S of input	
	T	Phase T of input	

Note: You can choose communication cards as required. For details, see 9.1 Optional cards.

3.4.2 VFD inverter control circuit

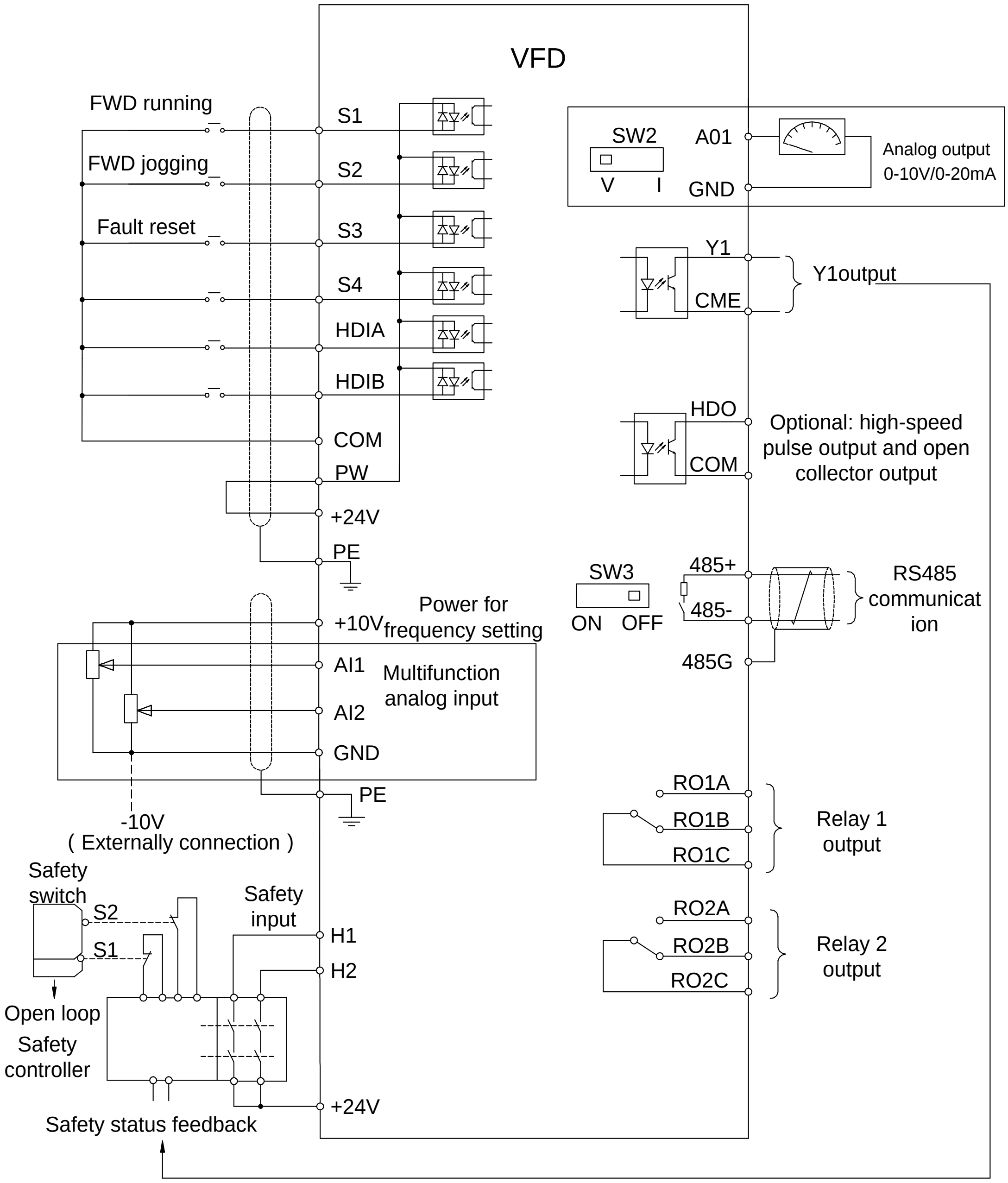


Figure 3-3 Control circuit wiring

<table>
<tr><th>Terminal</th><th colspan="2">Description</th></tr>
<tr><td>+10V</td><td colspan="2">Locally provided +10.5V power supply</td></tr>
<tr><td>AI1</td><td colspan="2" rowspan="2">• Input range: For AI1, 0–10V or 0–20mA
For AI2, -10V – +10V
• Input impedance: 20kΩ for voltage input or 250Ω for current input
• Whether voltage or current is used for input of AI1 is set through P05.50
• Resolution: 5mV when 10V corresponds to 50Hz
• Deviation: ±0.5% at 25°C, when input is above 5V/10mA</td></tr>
<tr><td>AI2</td></tr>
<tr><td>GND</td><td colspan="2">Reference zero potential of +10.5V</td></tr>
<tr><td>AO1</td><td colspan="2">• Output range: 0–10V or 0–20mA
• Whether voltage or current is used for output is set through the DIP switch SW2
• Deviation: ±0.5% at 25°C, when output is above 5V/10mA</td></tr>
<tr><td>RO1A</td><td colspan="2" rowspan="3">RO1 output; RO1A: NO; RO1B: NC; RO1C: common
Contact capacity: 3A/AC250V, 1A/DC30V</td></tr>
<tr><td>RO1B</td></tr>
<tr><td>RO1C</td></tr>
<tr><td>RO2A</td><td colspan="2" rowspan="3">RO2 output; RO2A: NO; RO2B: NC; RO2C: common
Contact capacity: 3A/AC250V, 1A/DC30V</td></tr>
<tr><td>RO2B</td></tr>
<tr><td>RO2C</td></tr>
<tr><td>HDO</td><td colspan="2">Switch capacity: 200mA/30V
Output frequency range: 0–50kHz
Duty ratio: 50%</td></tr>
<tr><td>COM</td><td colspan="2">+24V common terminal</td></tr>
<tr><td>CME</td><td colspan="2">Common terminal of open collector output; short connected to COM by default</td></tr>
<tr><td>Y1</td><td colspan="2">Switch capacity: 200mA/30V
Output frequency range: 0–1kHz</td></tr>
<tr><td>485+</td><td colspan="2" rowspan="2">RS485 communication port, RS485 differential signal port and standard RS485 communication port must use twisted shielded pairs; the 120ohm terminal matching resistor for RS485 communication is connected through the DIP switch SW3.</td></tr>
<tr><td>485-</td></tr>
<tr><td>PE</td><td colspan="2">Grounding terminal</td></tr>
<tr><td>PW</td><td colspan="2">Used to provide input digital working power from the external to the internal
Voltage range: 12–24V</td></tr>
<tr><td>24V</td><td colspan="2">User power supply provided by the VFD. Max. output current: 200mA</td></tr>
<tr><td>COM</td><td colspan="2">+24V common terminal</td></tr>
<tr><td>S1</td><td>Digital input 1</td><td rowspan="4">• Internal impedance: 3.3kΩ
• 12–30V voltage input is acceptable
• Bi-direction input terminal, supporting both NPN and PNP
• Max. input frequency: 1kHz
• All are programmable digital input terminals, the functions of which can be set through function codes</td></tr>
<tr><td>S2</td><td>Digital input 2</td></tr>
<tr><td>S3</td><td>Digital input 3</td></tr>
<tr><td>S4</td><td>Digital input 4</td></tr>
</table>

<table>
<tr><th>Terminal</th><th colspan="2">Description</th></tr>
<tr><td>HDIA</td><td colspan="2" rowspan="2">In addition to S1–S4 functions, the terminals can also act as high frequency pulse input channels.
• Max. input frequency: 50kHz
• Duty ratio: 30%–70%
• Supporting quadrature encoder input; with the speed measurement function</td></tr>
<tr><td>HDIB</td></tr>
<tr><td>+24V—H1</td><td>STO input 1</td><td rowspan="2">• Safe torque off (STO) redundant input, connected to the external NC contact. When the contact opens, STO acts and the VFD stops output.
• Safety input signal wires use shielded wires whose length is within 25m
• The H1 and H2 terminals are short connected to +24V by default. Remove the short connectors from the terminals before using STO function.</td></tr>
<tr><td>+24V—H2</td><td>STO input 2</td></tr>
</table>

4 HMI

4.1 LCD keypad for rectifier

The LCD keypad has been provided for the VFD PWM rectifier as standard configuration. The following figures show the keypad appearances.

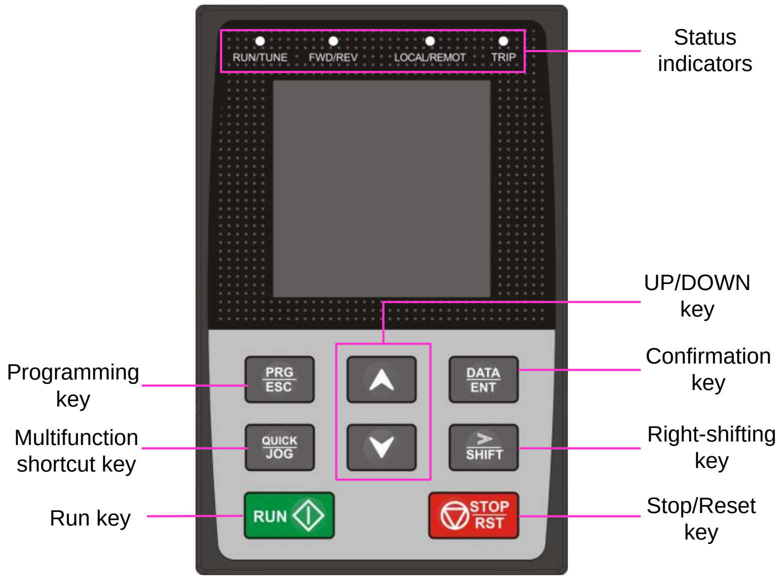


Figure 4-1 LCD keypad

Table 4-1 Description of keys

Key	Name	Description
PRG ESC	Programming key	Press it to enter or exit level-1 menus or delete a parameter.
DATA ENT	Confirmation key	Press it to enter menus in cascading mode or confirm the setting of a parameter.
∧	Up key	Press it to increase data or move upward.
∨	Down key	Press it to decrease data or move downward.
SHIFT	Shifting key	Press it to select displaying parameters in the interface for the VFD in stopped or running state or to select digits to change during parameter setting.
RUN	Run key	Press it to run the VFD when using the keypad for control.
STOP RST	Stop/ Reset key	Press it to stop the VFD that is running. The function of this key is restricted by P07.04. In fault alarm state, this key can be used for reset in any control modes. In this case, its function is not restricted by P07.04.
QUICK JOG	Multifunction shortcut key	The function is determined by P07.03. 0: Jogging (only apply to keypad control) 1: Switch between forward and reverse rotations (only apply to keypad control)

Key	Name	Description
 + 	Combination	Press RUN and STOP/RST simulteniously to make the VFD coast to stop.

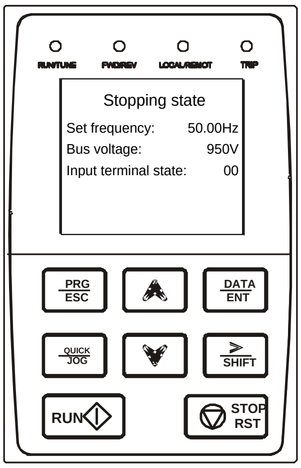
Table 4-2 Indicators of keypad

Indicator	Name	Description
RUN/TUNE	State indicator	OFF: The VFD is stopped. Blinking: The VFD is autotuning parameters. ON: The VFD is running.
FWD/REV	Forward or reverse running indicator	OFF: The VFD is running forward. ON: The VFD is running reversely.
LOCAL/REMOT	Control mode indicator	Indicates whether the VFD is controlled through the keypad, terminals, or communication. OFF: The VFD is controlled through the keypad. Blinking: The VFD is controlled through terminals. ON: The VFD is controlled through remote communication.
TRIP	Fault indicator	OFF: The VFD is in normal state. Blinking: The VFD is in pre-alarm state. ON: The VFD is in faulty state.

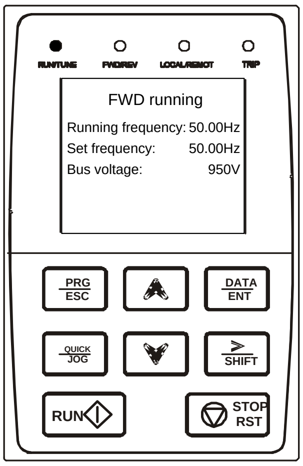
4.1.1 Keypad display

The LCD keypad displays information such as the stopped-state parameters, running-state parameters, and fault status, and allows you to modify function codes.

4.1.1.1 Displaying stopped-state parameters

	When the VFD is in stopped state, the keypad displays stopped-state parameters. In the stopped state, various kinds of parameters can be displayed. You can determine which parameters are displayed by setting the binary bits of P07.05. For definitions of the bits, see the description of P07.05 for the VFD PWM rectifier. You can press 》/SHIFT to shift selected parameters from left to right or press QUICK/JOG to shift selected parameters from right to left.

4.1.1.2 Displaying running-state parameters

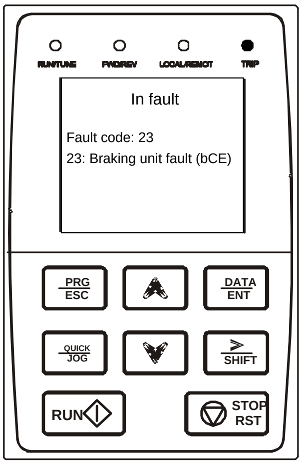


After receiving a valid running command, the VFD enters the running state, and the keypad displays running-state parameters, with the RUN/TUNE indicator on. The on/off state of the FWD/REV indicator is determined by the current running direction. See the figure.

In the running state, various kinds of parameters can be displayed. You can determine which parameters are displayed by setting the binary bits of P07.05. For definitions of the bits, see the description of P07.05 for the VFD PWM rectifier.

You can press 》/SHIFT to shift selected parameters from left to right or press QUICK/JOG to shift selected parameters from right to left.

4.1.1.3 Displaying fault information



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

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

4.1.2 Keypad setting and function menu selection

Press and hold the SHIFT and DOWN keys for 3 seconds when the keypad is powered on. The keypad then enters the function menu selection mode.

1. Hardware test: used to check the keys, displays and indicators.
2. Flash date program: used only when the FLASH configuration table is updated.
3. Language select: used to select the language (English).
4. Keypad SW ver: used to check the MCU and Flash software versions.
5. Converter Type Select: VFD series selection. Option 1: GD2000; Other: reserved.

4.1.3 Editing function codes

You can press the PRG/ESC key to enter the editing mode in stopped, running, or fault alarm state (if a user password is used, see the description of P07.00 for the VFD PWM rectifier and for the VFD inverter). You can press the DATA/ENT key to enter the function parameter display interface. On the function parameter display interface, you can press the DATA/ENT key to save parameter settings or press the PRG/ESC key to exit the parameter display interface.

4.1.4 Operation procedure

You can operate the VFD by using the keypad.

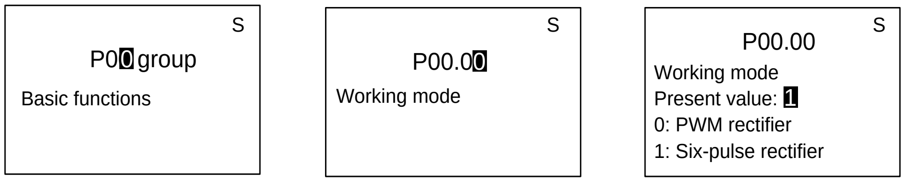
The VFD provides three levels of menus, including:

• Function code group number (level-1 menu)

• Function code number (level-2 menu)

• Function code setting (level-3 menu)

Note: When performing operations on the level-3 menu, you can press the PRG/ESC or DATA/ENT key to return to the level-2 menu. If you press the DATA/ENT key, the set value of the parameter is saved to the control board first, and then the level-2 menu is returned, displaying the next function code. If you press the PRG/ESC key, the level-2 menu is returned directly, without saving the set value of the parameter, and the current function code is displayed.



Level-1 menu Level-2 menu Level-3 menu

Figure 4-2 Three-level menu operation flowchart

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

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

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

4.1.5 Explosion-proof keypad wiring

If you need install the keypad externally (that is, on another position rather than on the inverter), you can use M3 screws to fix the keypad, or you can use a keypad installation bracket. When installing the keypad externally, use an extension cable with a standard RJ45 crystal head for connection. The following figure shows the electrical wiring diagram of the explosion-proof keypad for rectifiers.

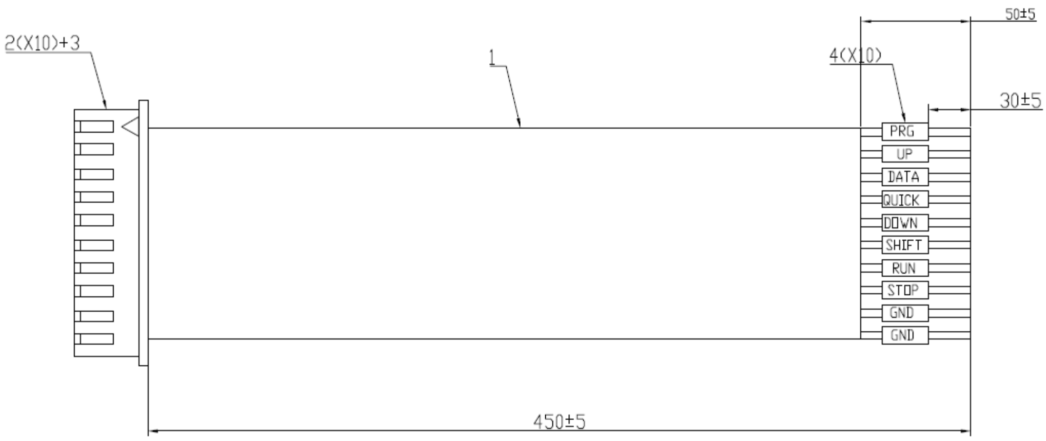


Figure 4-3 Wiring diagram of the explosion-proof keypad

4.1.6 Keypad dimensions

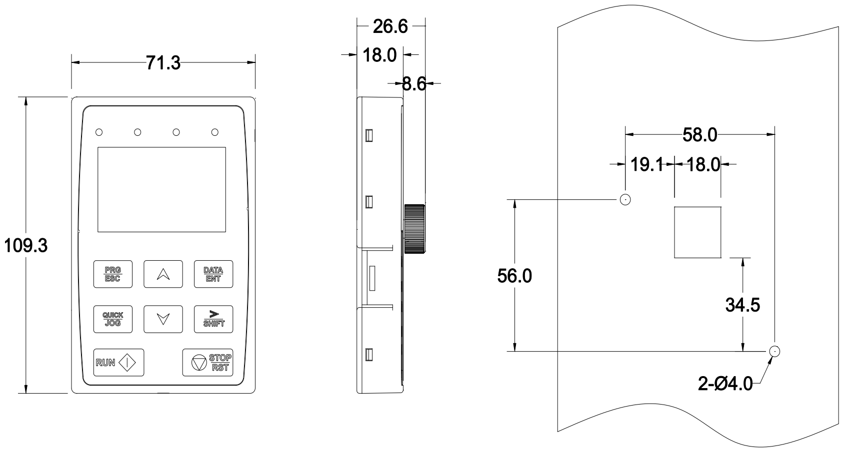


Figure 4-4 LCD keypad dimensions

4.2 LED keypad for inverter

The VFD inverter has been equipped with a LCD keypad as a standard configuration part.

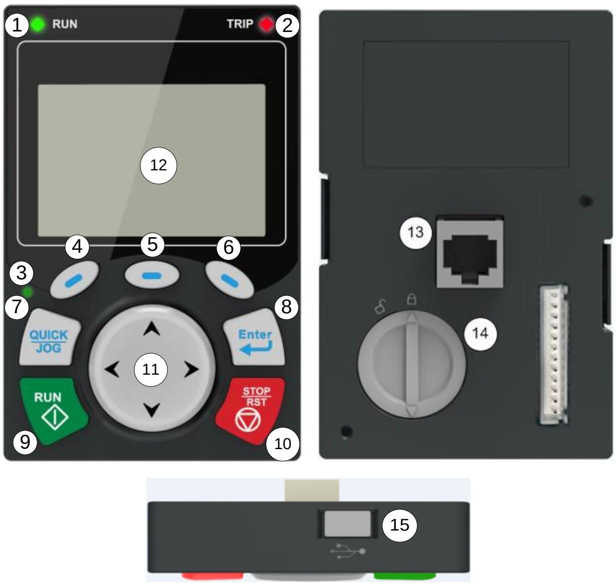


Figure 4-5 Keypad diagram

Note:

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

Item	Instruction		
State indicator	(1)	RUN	Running indicator; LED off – the VFD is stopped; LED blinking – the inverter is in parameter autotune LED on – the inverter is running

Item	Instruction			
	2)	TRIP		Fault indicator; LED on – in fault state LED off – in normal state LED blinking – in pre-alarm state
	(3)	QUICK/JOG		Short-cut key indicator, which displays different state under different functions, see definition of QUICK/JOG key for details
Key area	(4)		Function key	The function of function key varies with the menu; The function of function key is displayed in the footer
	(5)			
	(6)			
	(7)		Short-cut key	Re-definable. It is defined as JOG function by default, namely jogging. The function of short-cut key can be set by the ones of P07.02, as shown below. 0: No function 1: Jogging (linkage indicator (3); logic : NO); 2: Reserved 3: FWD/REV switchover (linkage indicator (3); logic: NC) 4: Clear UP/DOWN setting (linkage indicator (3) logic: NC) 5: Coast to stop (linkage indicator (3); logic: NC) 6: Switching running command reference mode in order (linkage indicator (3); logic: NC) 7: Reserved **Note: After restoring to default values, the default function of short-cut key (7) is 1.**
	(8)		Confirmation key	The function of confirmation key varies with menus, such as confirming parameter setup, confirming parameter selection, and entering the next menu.
	(9)		Running key	Under keypad operation mode, the running key is used for running operation or autotuning operation.
	(10)		Stop/ Reset key	During running state, press the Stop/Reset key can stop running or autotuning; this key is limited by P07.04. During fault alarm state, all the control modes can be reset by this key.
	(11)		Direction key UP:  DOWN:  LEFT:  RIGHT: 	UP: The function of UP key varies with interfaces, such as shifting up the displayed item, shifting up the selected item, and changing digits; DOWN: The function of DOWN key varies with interfaces, such as shifting down the displayed item, shifting down the selected item, changing digits; LEFT: The function of LEFT key varies with

Item	Instruction			
				interfaces, such as switch over the monitoring interface, such as shifting the cursor leftward, exiting current menu and returning to previous menu; RIGHT: The function of RIGHT key varies with interfaces, such as switch over the monitoring interface, shifting the cursor rightward, enter the next menu etc.
Display area	(12)	LCD	Display screen	240×160 dot-matrix LCD; display three monitoring parameters or six sub-menu items simultaneously
Others	(13)	RJ45 interface	RJ45 interface	RJ45 interface is used to connect to the inverter.
	(14)	Battery cover	Clock battery cover	Remove this cover when replacing or installing clock battery, and close the cover after battery is installed
	(15)	USB terminal	Mini USB terminal	Mini USB terminal is used to connect to the USB flash drive through an adapter.

The LCD has different display areas, which displays different contents under different interfaces. The figure below is the main interface of stop state.

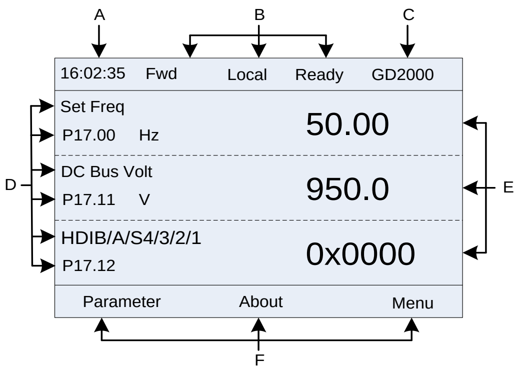


Figure 4-6 Main interface of LCD

Area	Name	Used to
Header A	Real-time display area	Display the real-time; clock battery is not included; the time needs to be reset when powering on the inverter
Header B	inverter running state display area	Display the running state of the inverter: 1. Display motor rotating direction: "Forward" – Run forward during operation; Reverse – Run reversely during operation; "Forbid" – Reverse running is forbidden; 2. Display inverter running command channel: "Local" – Keypad; "Terminal" – Terminal; "Remote" - Communication 3. Display current running state of the inverter : "Ready" – The inverter is in stop state (no fault); "Run" – The inverter is in running state; "Jog" – The inverter is in jogging state; "Pre-alarm" – the inverter is under pre-alarm state during running; "Fault" – inverter fault occurred.
Header C	VFD model display area	VFD model display: "GD2000" – current VFD is GD2000 series VFD

Area	Name	Used to
Display D	Parameter names and function codes on the inverter homepage	Display a maximum of three parameter names and function codes on the homepage. The parameters diplayed on the homepage can be managed.
Display E	Values of parameters on the inverter homepage	Display the values of parameters on the inverter homepage, which are updated in real time.
Footer F	Corresponding menus of function keys (4), (5) and (6)	Indicate the menus corresponding to function keys (4), (5) and (6). The corresponding menus of function keys (4), (5) and (6) vary with interfaces, and the content displayed in this area varies also.

4.2.1 Keypad display

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

4.2.1.1 Displaying stopped-state parameters

When the inverter is in stopped state, the keypad displays stopped-state parameters, and this interface is the main interface during power-up by default. In stopped state, parameters in various states can be displayed. Press or to shift the displayed parameter up or down.

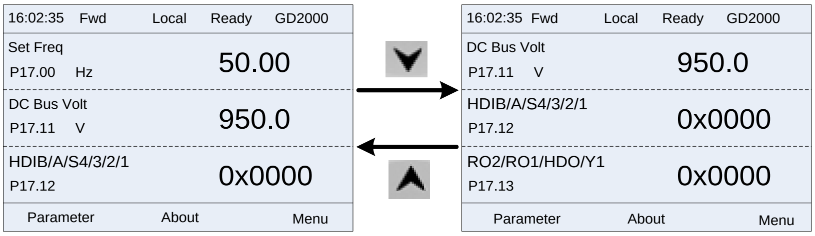


Figure 4-7 Stopped-state parameter display 1

Press or to switch between different display styles, including list display style and progress bar display style.

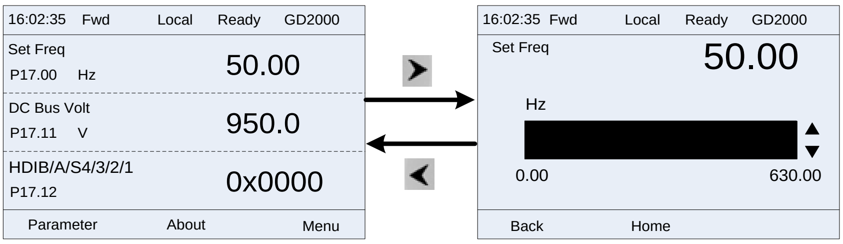


Figure 4-8 Stopped-state parameter display 2

The stopped-state parameter display list is user defined, and each state variable function code can be added to the stopped-state parameter display list as needed. A function code which has been added to the stopped-state parameter display list can also be deleted or shifted.

4.2.1.2 Displaying running-state parameters

After receiving valid running command, the inverter will enter running state, and the keypad displays running state parameter with RUN indicator on the keypad turning on. In running state, multiple kinds of state parameters can be displayed. Press or to shift up or down.

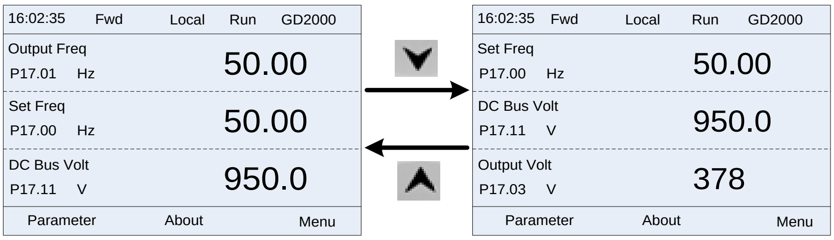


Figure 4-9 Running parameter display state

Press  or  to switch between different display styles, including list display style and progress bar display style.

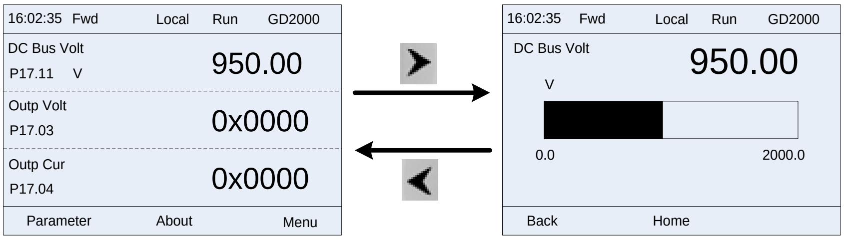


Figure 4-10 Running parameter display state

In running state, multiple kinds of state parameters can be displayed. The running display parameter list is user defined, and each state variable function code can be added to the running display parameter list as needed. A function code which has been added to the running display parameter list can also be deleted or shifted.

4.2.1.3 Displaying fault information

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

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

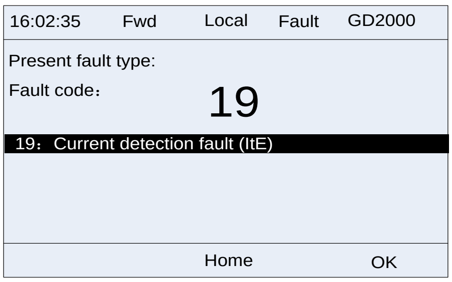


Figure 4-11 Fault alarm display state

4.2.2 Operating the inverter through the keypad

Various operations can be performed on the inverter, including entering/exiting menu, parameter selection, list modification and parameter addition.

4.2.2.1 Enter/exit menu

The keypad displays three main menus at the home interface by default: **Parameter**, **About**, and **Menu**. The following figure shows how to enter the **Parameter** main menu and how to operate under this main menu.

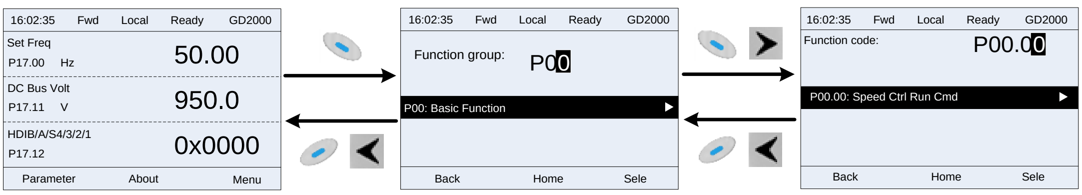


Figure 4-12 Enter/exit menu diagram 1

The following figure shows how to enter the **Menu** main menu and how to operate under this main menu.

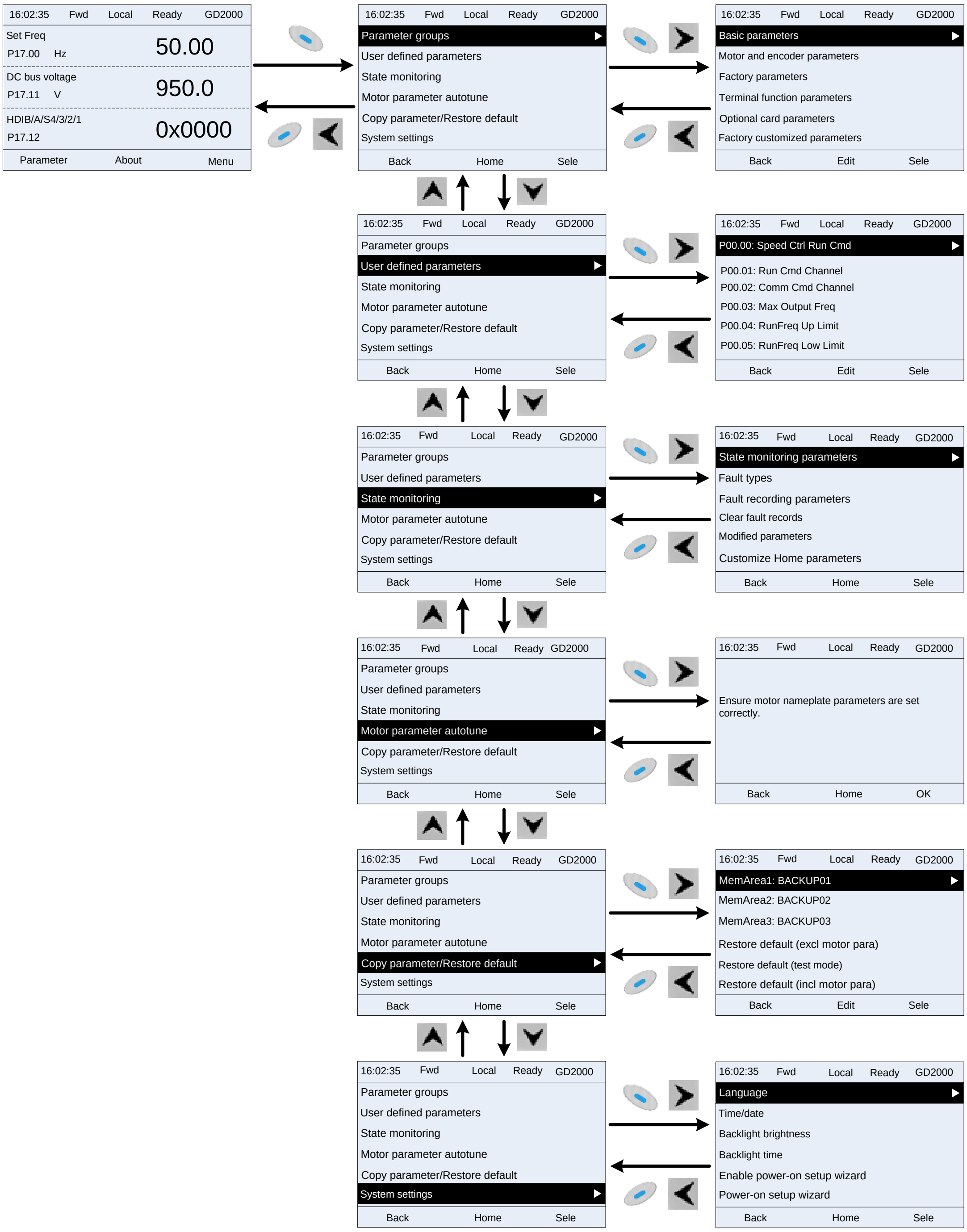


Figure 4-13 Enter/exit menu diagram 2

The keypad menu setup is shown as follows.

Level 1	Level 2	Level 3	Level 4
Parameter groups	Basic parameters	P00: Basic Function	P00.xx
		P01: Start/stop control	P01.xx
		P03: Motor1 Vector Ctrol	P03.xx
		P04: V/F Control	P04.xx
		P07: HMI	P07.xx
		P08: Enhanced Function	P08.xx

Level 1	Level 2	Level 3	Level 4
		P09: PID Control	P09.xx
		P10: PLC&Mul-stepSpCtrl	P10.xx
		P11: Protection Param	P11.xx
		P13: SM Ctrl Param	P13.xx
		P14: Serial Comm Func	P14.xx
		P21: Position Ctrl	P21.xx
		P22: Spdl Positioning	P22.xx
		P23: Motor 2 Vector Ctrl	P23.xx
	Motor and encoder parameters	P02: Motor 1 Param	P02.xx
		P12: Motor 2 Param	P12.xx
		P20: Motor 1 EEncoder	P20.xx
		P24: Motor 2 Encoder	P24.xx
	Factory parameters	P99: Factory Func	P99.xx
	Terminal function parameters	P05: Input Terminals	P05.xx
		P06: Output Terminals	P06.xx
		P98: AIAO Calibration	P98.xx
	Optional card parameters	P15: Comm Ex-card 1	P15.xx
		P16: Comm Ex-card 2	P16.xx
		P25: Ex I/OCard InpFunc	P25.xx
		P26: Ex I/OCard OutpFunc	P26.xx
		P27: PLC Func	P27.xx
		P28: Master/slave Ctrl	P28.xx
	Factory customized parameters	P90: Tension control speed mode	P90.xx
		P91: Tension control torque	P91.xx
		P92: Tension control optimization	P92.xx
User defined parameters	/	/	Pxx.xx ...
State monitoring	State monitoring parameters	P07: HMI	P07.xx
		P17: State Viewing Func	P17.xx
		P18: CI-IpCtrlStateView	P18.xx
		P19: Ex-card StateView	P19.xx
		P93: Tension control state viewing func	P93.xx

Level 1	Level 2	Level 3	Level 4
	Fault types	/	P07.27: TypeofLatelyFault
			P07.28: Typeof1stLastFault
			P07.29: Typeof2ndLastFault
			P07.30: Typeof3rdLastFault
			P07.31: Typeof4thLastFault
			P07.32: Typeof5thLastFault
	Fault recording parameters	/	P07.33: RunFreq atLatelyFault ... P07.xx: xx state of fault xx
	Clear fault records	/	Sure to clear fault records?
	Modified parameters	/	Pxx.xx: Modified parameter 1
			Pxx.xx: Modified parameter 2
			Pxx.xx: Modified parameter xx
	Customize Home parameters	Stopped-state parameters	/
		Running-state parameters	/
Motor parameter autotune	/	Ensure motor nameplate parameters are set correctly.	Complete para rotary autotune
			Complete para static autotune
			Partial para static autotune
			Complete para rotary autotune 2 (for AM)
			Partial para static autotune 2 (for AM)
Copy parameter/ Restore default	/	MemArea1: BACKUP01	Upload local func para to keypad
			Download all func para from keypad
			Download NonMotor func para from keypad
			Download motor func para from keypad
		MemArea2: BACKUP012	Upload local func para to keypad
			Download all func para from keypad
			Download NonMotor func para from keypad
			Download motor func para from keypad

Level 1	Level 2	Level 3	Level 4
		MemArea3: BACKUP03	Upload local func para to keypad
			Download all func para from keypad
			Download NonMotor func para from keypad
			Download motor func para from keypad
		Restore default (excl motor para)	Sure to restore defaults (excl motor para)?
		Restore default (test mode)	Sure to restore default (test mode)?
		Restore default (incl motor para)	Sure to restore default (incl motor para)?
System settings	/	/	Language
			Time/date
			Backlight brightness
			Backlight time
			Enable power-on setup wizard
			Power-on setup wizard
			Keypad programming
			Fault time setting
			Control board programming
			Up/Down key sensitivity

4.2.2.2 Editing a parameter list

The parameters in the parameter list in stopped state can be added as needed (through the menu of user defined home parameters), and the list can also be edited such as "Move up", "Move down", "Delete from the list", and "Restore default". The edit function is shown in the following.

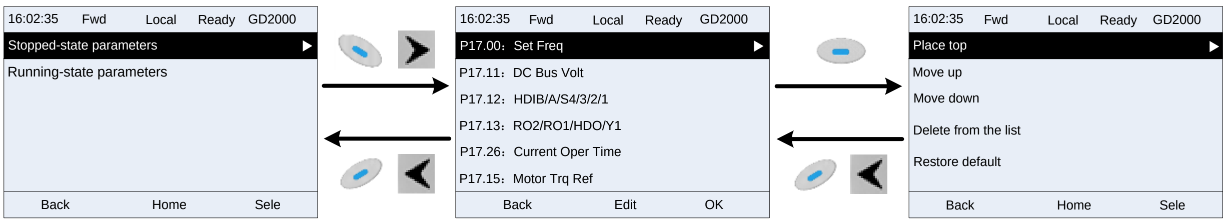


Figure 4-14 List edit diagram 1

Press key to enter edit interface, select the operation needed, and press the key, key or key to confirm the edit operation and return to the previous menu (parameter list), the returned list is the list edited. If the key or key is pressed in edit interface without selectingan edit operation, it will return to the previous menu (parameter list remain unchanged).

Note: For the parameter objects in the list header, move-up operation will be invalid, and the same principle can be applied to the parameter objects in the list footer; after deleting a certain parameter, the parameter objects under it will be moved up automatically.

The items in the parameter list in running state can be added as needed (through the menu of user defined home parameters), and the list can also be edited such as "Move up", "Move down", "Delete from the list", and "Restore default parameters". The edit function is shown in the interface below.

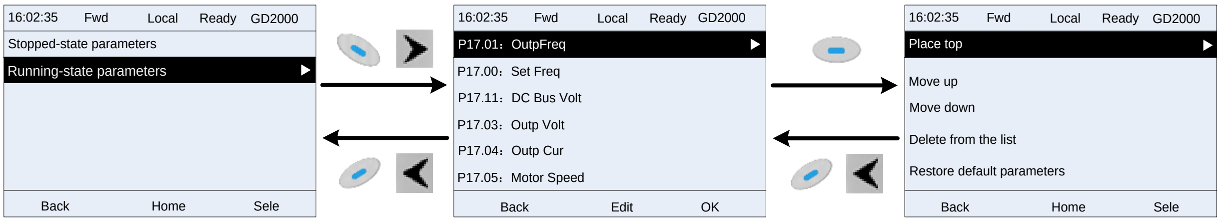


Figure 4-15 List edit diagram 2

The parameters of user defined parameter setting can be added, deleted or adjusted as needed, such as "Move up", "Move down", "Delete from the list", and "Restore default parameters"; the adding function can be set in a certain function code in a function group. The edit function is shown in the figure below.

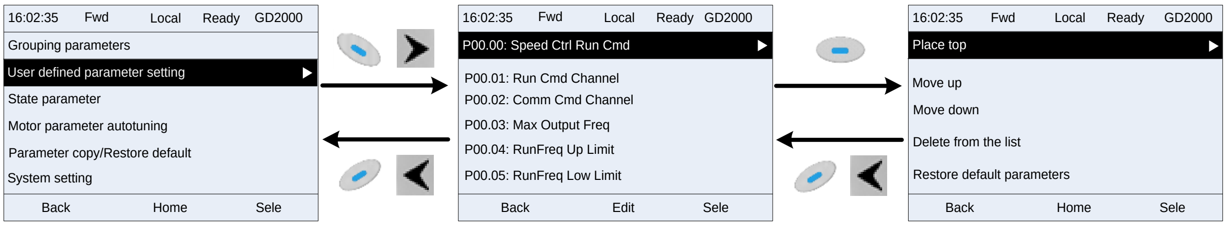


Figure 4-16 List edit diagram 3

4.2.2.3 Adding parameters to the parameter list displayed in stopped/running state

You can choose **Menu** > **State monitoring,** choose a submenu, and enter a specific function group and then a specific function code to add the parameter to the list of parameters displayed in stopped state or parameters displayed in running state.

Figure 4-17 Adding parameter diagram 1

Aftering selecting a specific function code, press key to enter parameter addition interface, and press key, key or key to confirm the addition operation. If this parameter is not included in the list of parameters displayed in stopped state or list of parameters displayed in running state, the parameter added will be at the end of the list; if the parameter is already in the list of parameters displayed in stopped state or list of parameters displayed in running state, the addition operation will be invalid. If key or key is pressed without selecting addition operation in "Addition" interface, it will return to monitoring parameter list menu.

Part of the monitoring parameters in P07 HMI group can be added to the "parameter displayed in stop state" list or "parameter displayed in running state" list; All the parameters in P17, P18 and P19 group can be added to the "parameter displayed in stop state" list or "parameter displayed in running state" list.

Up to 16 monitoring parameters can be added to the list of parameters displayed in stopped state; and up to 32 monitoring parameters can be added to the list of parameters displayed in running state.

4.2.2.4 Adding parameters to the user defined parameter list

You can choose **Menu** > **Parameter groups**, choose a submenu, and enter a specific function group and then a specific function code to add the parameter to the user defined parameter list.

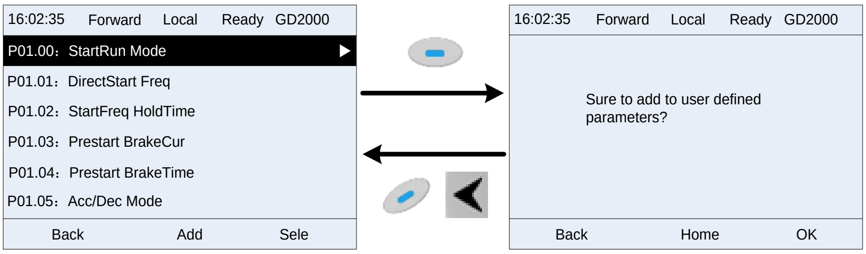


Figure 4-18 Add parameter diagram 2

Press key to enter addition interface, and press key, key or key to confirm the addition operation. If this parameter is not included in the original user defined parameter list, the newly-added parameter will be at the end of the list; if this parameter is already in the user defined parameter list, the addition operation will be invalid. If key or key is pressed without selecting addition operation, it will return to parameter setup list menu.

All the function code groups under parameter setup sub-menu can be added to user defined parameter list. Up to 64 function codes can be added to the user defined parameter list.

4.2.2.5 Editing user defined parameters

After accessing a specific function code under the **User defined parameters** menu, you can press the key, key or key to enterthe parameter edit interface. After entering the edit interface, the present value is highlighted. Press the key and key to edit the parameter value, and the corresponding parameter item of current value will be highlighted automatically. After the edit operation is completed, press key or key to save the selected parameter and return to the previous menu; or press key to maintain the parameter value and return to the previous menu.

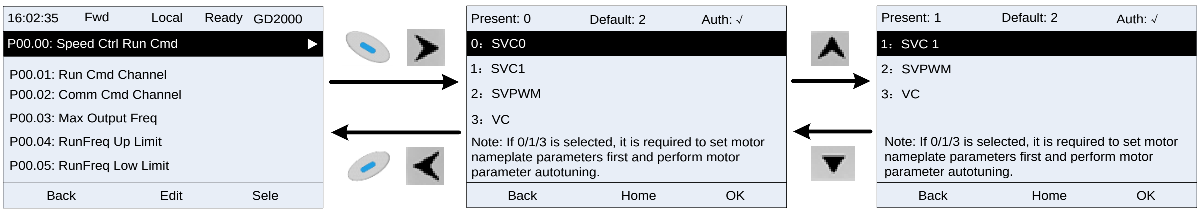


Figure 4-19 Editing user defined parameters

In parameter selection edit interface, the "Auth" field on the top right indicates whether this parameter is editable or not.

" √ " indicates the set value of this parameter can be modified under the present state.

"×" indicates the set value of this parameter cannot be modified under the present state.

"Present" indicates the present value.

"Default" indicates the default value of this parameter.

4.2.2.6 Editing parameters in parameter groups

You can choose **Menu** > **Parameter groups**, enter a specific function group and then a specific function code, and then press key, key or key to edit the parameter setting interface. After entering edit interface, set the parameter from low bit to high bit, and the bit under setting will be highlighted. Press key or key to increase or decrease theparameter value (this operation is valid until the parameter value exceeds the max. value or min.value); press or to shift the editing bit. After parameters are set, press key or key to save the set parameters and return to the previous menu; press to maintain the original parameter value and return to the previous menu.

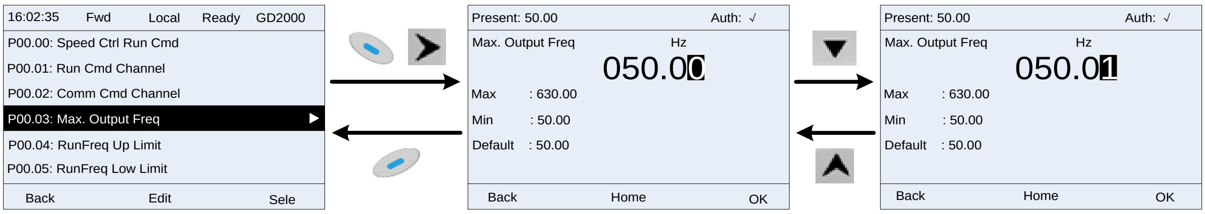


Figure 4-20 Editing parameters in parameter groups

In the parameter edit interface, the "Auth" field on the top right indicates whether this parameter can be modified or not.

" √ " indicates the set value of this parameter can be modified under the present state.

"×" indicates the set value of this parameter cannot be modified under the present state.

"Present" indicates the present value.

"Default" indicates the default value of this parameter.

4.2.2.7 Monitoring states

You can choose **Menu** > **State monitoring** > **State monitoring parameter**, enter a specific function group and then a specific function code, and press key, key or key to enter the state monitoring interface. After entering the state monitoring interface, the actual parameter value will be displayed in real time, this value is the actually detected value which cannot be modified.

In the state monitoring interface, you can press key or key to return to the previous menu.

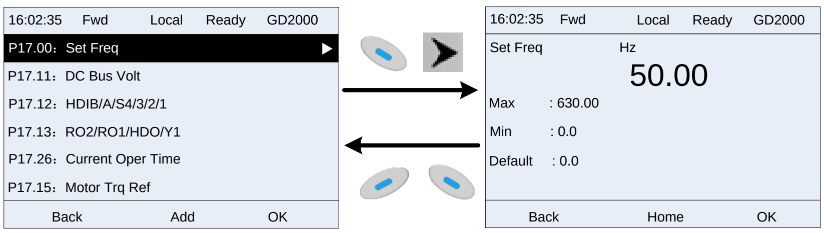


Figure 4-21 State monitoring interface

4.2.2.8 Autotuning motor parameters

You can choose **Menu** > **Motor parameter autotune** and press key, key or key to enter motor parameter autotuning interface. However, before entering the motor parameter autotuning interface, you must set the motor nameplate parameters correctly. After entering the interface, select a motor autotuning type to carry out motor parameter autotuning. In motor parameter autotuning interface, you can press key or key to return to the previous menu.

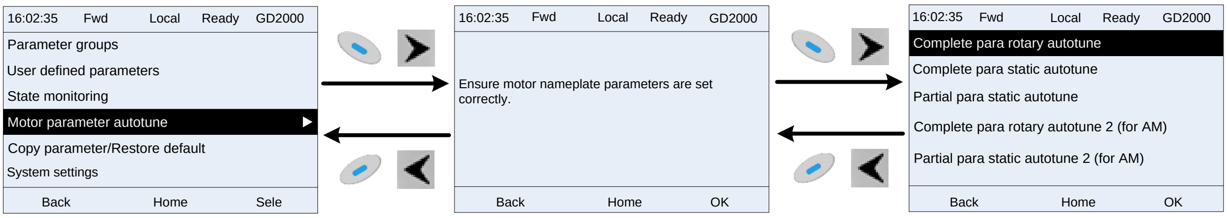


Figure 4-22 Selecting a parameter autotuning type

After selecting a motor autotuning type, enter motor parameter autotuning interface, and press RUN key to start motor parameter autotuning. After autotuning is done, a message will pop up indicating autotuning is succeeded, and then it will return to the main interface of stop. During autotuning, you can press STOP/RST key to terminate autotuning; if any fault occur during autotuning, the keypad will display a fault interface.

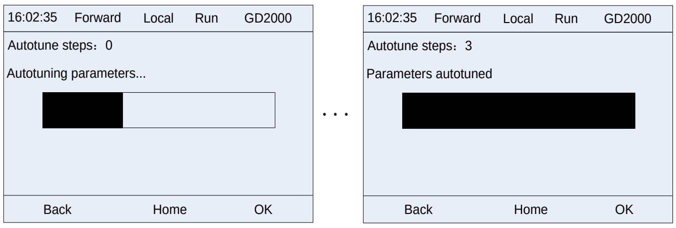


Figure 4-23 Parameter autotuning

4.2.2.9 Backing up parameters

You can choose **Menu** > **Copy parameter/Restore default**, and press key, key or key to enter the function parameter backup interface and function parameter restoration interface to upload/download inverter parameters, or restore inverter parameters to default values. The keypad has three different storage areas for parameter backup, and each storage area can save the parameters of one inverter, which means the keyapd can save parameters of three inverters in total.

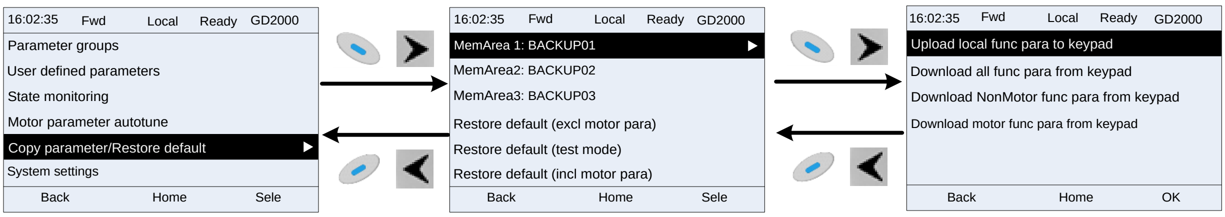


Figure 4-24 Parameter backup

4.2.2.10 System settings

You can choose **Menu** > **System settings**, and press key, key or key to enter system setting interface to set the keypad language, time/date, backlight brightness, backlight time and restore parameters.

Note: Clock battery is not included, and the keypad time/date needs to be reset after power off. If time-keeping after power off is needed, you should purchase the clock batteries separately.

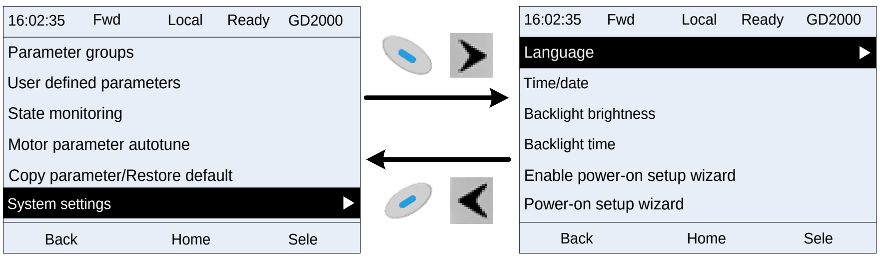


Figure 4-25 System setting diagram

4.2.2.11 Power-on setup wizard

The keypad supports the power-on setup wizard function, mainly for the first power-on situation, instructing you to enter the setting menu, and gradually implementing basic functions such as basic parameter setting, direction judgment, mode setting and autotuning.

For first power-on, the keypad automatically enters the setup wizard interface. See the following.

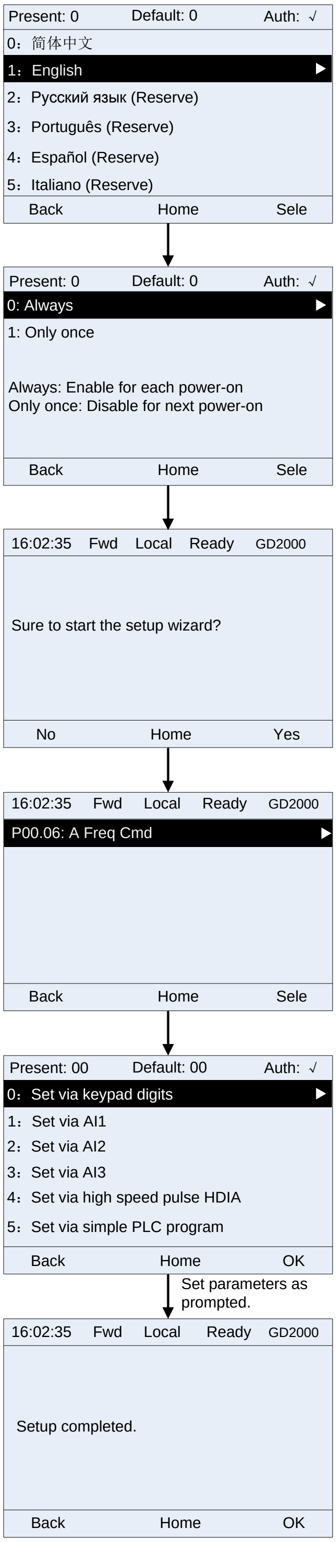


Figure 4-26 Power-up setup wizard

If you want to change the guiding settings, you can choose **Menu** > **System settings**, and then choose **Enable power-on setup wizard** or **Power-on setup wizard**, and then make changes.

4.2.3 Explosion-proof keypad wiring

If you need install the keypad externally (that is, on another position rather than on the inverter), you can use M3 screws to fix the keypad, or you can use a keypad installation bracket. When installing the keypad externally, use an extension cable with a standard RJ45 crystal head for connection. The following figure shows the electrical wiring diagram of the explosion-proof keypad for inverters.

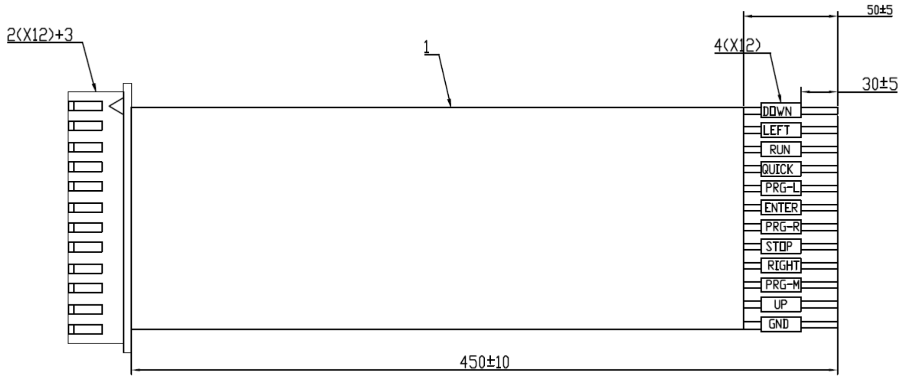


Figure 4-27 Wiring diagram of the explosion-proof keypad

4.2.4 Keypad dimensions

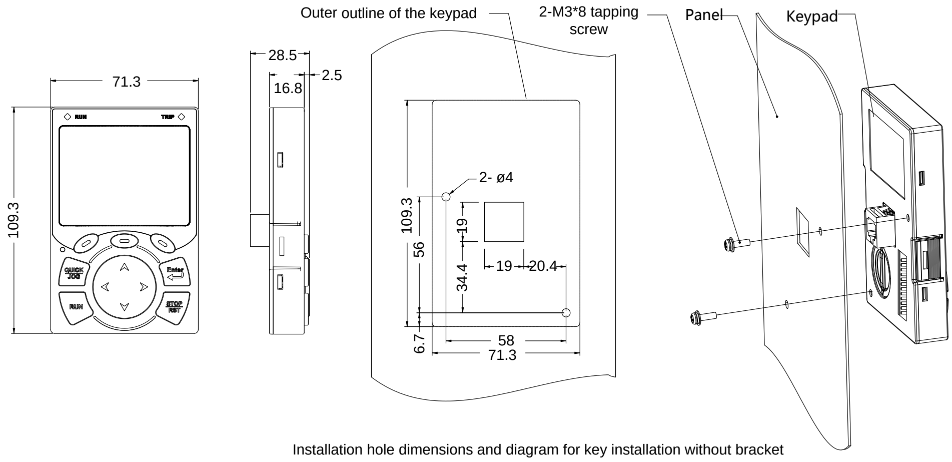


Figure 4-28 Keypad dimensions

5 VFD PWM rectifier

Note: Chapter 5 is applicable only for four-quadrant VFD PWM rectifier.

5.1 Overview

The main circuit of the PWM rectifier consists of the main contactor, pre-charge circuit, LC filtering circuit, main reactor of input, IGBT power module, and film capacitors. It uses the dual closed loop control structure, in which the outer loop is the bus voltage loop and the inner is the current loop. The active and reactive components of the grid input current are separately controlled by means of phase detection on power voltage, coordinate change, and PI regulator. When the controlled reactive current component is 0, the rectifier power factor can be close to 1 and the energy can flow in both directions.

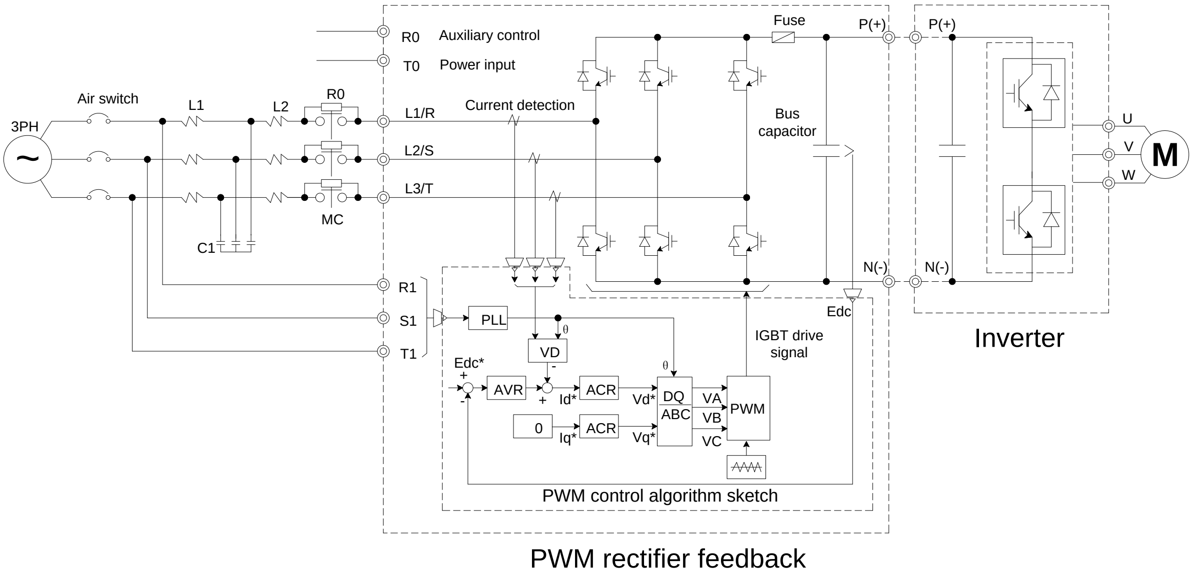


Figure 5-1 PWM rectifier working principle

Note: In Figure 5-1, AVR is the auto voltage regulator module; ACR is the auto current regulator module; VD is the vector control module; PWM refers to pulse-width modulation; PLL is the phase-locked loop; L1 and C1 are power supply filters; L2 is the boost inductor; R0 is the power-on buffer resistor; MC is the power-on buffer contactor; and Edc is the bus voltage. Those with "*" indicate set values, and those without the asterisk indicate detected values. θ is the phase angle of the voltage on the grid side.

The PWM rectifier regulates the output bus voltage of rectifier through AVR, keeping the bus voltage a constant set value. The output of AVR is the input of ACR, and the PWM rectifier controls the output of ACR based on the detected 3PH current. The PWM rectifier detects the 3PH input voltage and calculates the real-time phases of the grid through PLL, which ensures that the output voltage phases of the PWM rectifier are synchronized with the actual phases of the grid. The output of ACR is converted, through space voltage vector modulation, into drive signals for controlling the IGBT to implement the control of the PWM rectifier.

The typical application scenarios of the VFD are those with potential loads, such as hoisters, locomotive traction, oil field pump jacks, and centrifuges. In some large-power application scenarios, four-quadrant variable-frequency is needed to reduce the harmonic interference on the grid. The VFD with the PWM rectifier can provide the four-quadrant running function, meet the speed regulation requirements of various potential loads, convert the regenerated energy into electric energy, and feed the energy back to the grid, which conserves energy to the largest extent.

The PWM rectifier monitors the AC power supply for overvoltage and phase loss, the IGBT module for overtemperature, overcurrent, and overload, and the rectifier control power supply before pre-charge. It locks driving pulse and sends a fault signal when detecting a fault. The fault can be reset after the re-switch on of the AC or control power supply.

5.2 Function description

5.2.1 P00 group—Basic functions

Function code	Name	Description	Setting range	Default
P00.00	Working mode	0: PWM rectifier 1: Six-pulse rectifier	0–1	1

The function code is used to set the working mode of the local device.

Function code	Name	Description	Setting range	Default
P00.01	Channel of running commands	0: Keypad (the indicator is off) 1: Terminal (the indicator blinks) 2: Communication (the indicator is on)	0–2	0

The function code is used to select the channel of PWM rectifier control commands, including the start, stop, and fault reset commands.

0: Keypad (the indicator is off)

The running commands are controlled through keypad keys, such as the RUN and STOP/RST keys.

1: Terminal (the indicator blinks)

The running commands are controlled through multi-function input terminals.

2: Communication (the indicator is on)

The running commands are controlled by the upper computer in communication mode.

Function code	Name	Description	Setting range	Default
P00.02	Communication mode of running commands	0: RS485 1: PROFIBUS 2: Ethernet	0–2	0

The function code is used to select the mode that PWM rectifier controls communication commands.

Note: The options 1, 2, 3, and 4 are add-on functions and are available only when corresponding expansion cards are configured.

Function code	Name	Description	Setting range	Default
P00.03	Communication mode for setting DC bus voltage	0: RS485 1: PROFIBUS/CANopen 2: Ethernet 3: Reserved 4: DEVICE_NET	0–4	0

The function code is used to select the communication mode for setting the PWM rectifier DC bus voltage.

Function code	Name	Description	Setting range	Default
P00.04	DC bus voltage setting method	0: Automatic 1: Keypad 2: Communication	0–2	1
P00.05	DC bus voltage setting	300.0–4000.0V	300.0–4000.0V	AC400V: 680V; AC690: 1050V

When P00.04=1, P00.05 is set through the keypad.

When P00.04=2, P00.03 is used to select the communication mode for setting DC bus voltage.

Mapping between voltages and DC bus voltages

Model	Factory default DC bus voltage (P00.05)	Overvoltage point
380V	680V	800V
660V	1050V	1200V

Function code	Name	Description	Setting range	Default
P00.06	Active current mode	0: DC bus closed-loop mode 1: Active current closed-loop mode	0–1	0

P00.06 Active current mode

0: DC bus closed-loop mode (The voltage loop PI output is used as the active current reference.)

1: Active current closed-loop mode. The active reference is set based on function codes from P03.00 to P03.04.

Function code	Name	Description	Setting range	Default
P00.07	Reactive current mode	0: COS mode 1: Reactive current closed-loop mode	0–1	1

P00.07 Reactive current mode

0: COS mode. The reactive reference is set based on (Active current *tan). (Valid only when function codes from P03.19 to P03.23 are set.)

1: Closed-loop mode. The reactive reference is set based on function codes from P03.00 to P03.04. (Invalid when function codes from P03.19 to P03.23 are set.)

Function code	Name	Description	Setting range	Default
P00.08	Current zero-drift setting mode	0: Automatic 1: Manual	0–1	0
P00.09	Current zero-drift setting	-100.0%–100.0%	-100.0%–100.0%	0

P00.08 Current zero-drift setting mode

0: Automatic. After power-on, the 3PH current zero-point value is automatically detected and calculated.

1: Manual. The 3PH current zero point is used as the middle point, which can be regulated through P00.09. In this situation, the current zero-point detection fault is screened out.

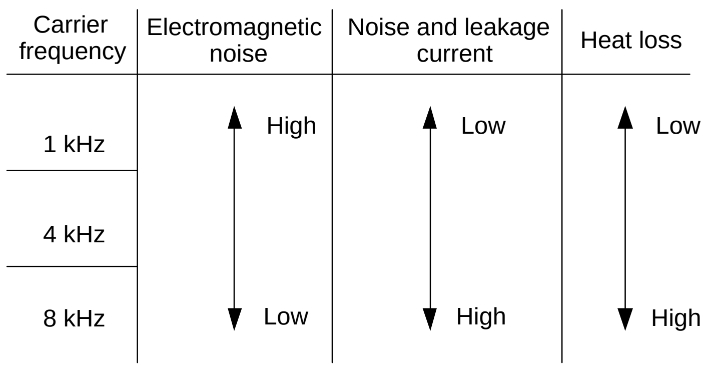
Function code	Name	Description	Setting range	Default
P00.10	Cooling-fan running mode	0: Normal mode 1: Permanent running after power-on	0–1	0

Cooling-fan running mode

0: Normal mode. The fan runs when the rectifier runs, and the fan stops within 30 seconds after the rectifier stops. In stopped state, when the IGBT module temperature is higher than 50°C, the fan starts running again; when the temperature lower than 50°C, the fan stops running with a delay of 30 seconds.

1: Permanent running after power-on. The fan keeps running after power-on.

Function code	Name	Description	Setting range	Default
P00.11	Current loop decoupling	0: Invalid 1: Valid	0–1	1
P00.12	Voltage feedforward filter coefficient	0–12	0–12	8
P00.13	Enabling filter-capacitor reactive compensation	0: Disable 1: Enable	0–1	0
P00.14	Carrier frequency	1.0–8.0kHz	1.0–8.0kHz	3.0



Advantages of high carrier frequencies: The current wave is ideal, and the current harmonic is low.

Disadvantages of high carrier frequencies: The switching loss is higher, and the temperature rise of the PWM rectifier is higher, affecting the output capacity of the PWM rectifier. When the carrier frequency is high, the PWM rectifier needs to be derated, and more electromagnetic noise is generated.

On the contrary, an extremely-low a carrier frequency may cause system instability and even current and voltage oscillation.

The carrier frequency has been properly set in the factory before the PWM rectifier is delivered. In general, you do not need to modify it.

Function code	Name	Description	Setting range	Default
P00.15	Function parameter restore	0: No operation 1: Restore default values 2: Clear fault records 3: Clear accumulative electricity consumption	0–3	0

0: No operation

1: Restore default values. The PWM rectifier restores default values for parameters.

2: Clear fault records. The PWM rectifier clears recent fault records.

3: Clear accumulative power consumption. The PWM rectifier clears accumulative electricity consumption.

Note:

1. After the selected operation is performed, the function code is automatically restored to 0.
2. Restoring the default values may delete the user password. Exercise caution when using this function.

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

Note: When P00.16=1, all other function codes except P00.16 are read only and no other operations can be performed.

5.2.2 P01 group—Power-on control and protection

Function code	Name	Description	Setting range	Default
P01.00	Unit valid bit control	0x00–0x3F Each bit stands for a unit. If BIT0 is 1, unit 1 is valid. The function code is restricted by P08.03. The unit specified by the function code is valid only when the bit specified by P08.03 is 1.	0x01–0x3F	0x3F
P01.01	Detecting main contactor actuation feedback	0: Not detect 1: Detect	0–1	1
P01.02	Power-on buffer control mode (buffer contactor)	0: Automatic actuation after power-on 1: Terminal control 2: Communication control	0–2	0
P01.03	Communication mode of power-on buffer control	0: RS485 1: PROFIBUS/CANopen 2: Ethernet 3: Reserved 4: DEVICE_NET	0–4	0

Function code	Name	Description	Setting range	Default
P01.04	Power-on buffer timeout time 1	When the buffer charge duration exceeds the time specified by the function code, but the DC voltage does not reach 50% of the rated AC voltage, the buffer charge half-voltage timeout fault is reported.	0.01–10.00s	1.00s
P01.05	Power-on buffer timeout time 2	When the buffer charge duration exceeds the time specified by the function code, but the DC voltage does not reach 85% of the rated AC voltage, the buffer charge half-voltage timeout fault is reported.	0.01–10.00s	3.00s

Note: The system automatically performs power-on buffer after switch-on.

When the buffer charge duration exceeds the time specified by the function code P01.04, but the DC voltage does not reach 50% of the rated AC voltage, the buffer charge half-voltage timeout fault (PC- t1) is reported.

When the buffer charge duration exceeds the time specified by the function code P01.05, but the DC voltage does not reach 85% of the rated AC voltage, the buffer charge half-voltage timeout fault (PC- t2) is reported.

The system performs buffering again after the reported fault is reset.

Function code	Name	Description	Setting range	Default
P01.06	Auto-running wait time	Time to wait for the system to become stable (such as phase-locked loop) before automatic running. When P01.06 is set to 0.0s, automatic running is invalid.	0.0–3600.0s	0.0s

The function code indicates the duration from self-check success to automatic running.

When P01.06 is set to 0.0s, automatic running is invalid.

When P01.06 is set to a value but not 0.0s: In rectifier working mode, after self-check is successful, and the AC power and control power are on, the system performs phase locking. If the phase locking is successful, the system runs automatically.

The automatic running function is valid only during power-on. If the self-check during power-on fails (due to a fault) or has been performed, the function becomes invalid automatically. If the system encounters a fault or is shut down, automatic running is invalid, and the system needs to be restarted manually. If the control power is switched on again, the function is enabled again.

Note: Regardless of whether automatic running is valid, the diode rectifier mode is always valid, and the DC bus is always live.

Function code	Name	Description	Setting range	Default
P01.07	Delay of auto fault reset	0.0–3600.0s	0.0–3600.0	1.0s

Function code	Name	Description	Setting range	Default
P01.08	Auto fault reset count	When P01.08 is 0, automatic fault reset is invalid. When P01.08 is not 0, automatic fault reset is valid and is performed after the time specified by P01.07. Automatic fault reset is inapplicable to the following faults: Slave communication fault (E_ASC), slave fault (E_SLE), external fault (EF), rectifier not enabled (dIS), power-on buffer half-voltage timeout fault (PC_t1), power-on buffer timeout fault (PC_t2), phase-U Vce check fault (oUt1), phase-V Vce check fault (oUt2), phase-W Vce check fault (oUt3), rectifier bridge overheating fault (oH1), IGBT overheating fault (oH2), and external-fault (EF).	0–10	0

P01.07 is valid when P01.08 is not 0.

Note: A fault is reported when the successive reset count exceeds the count specified by P01.08.

5.2.3 P02 group—Master/slave control (Reserved)

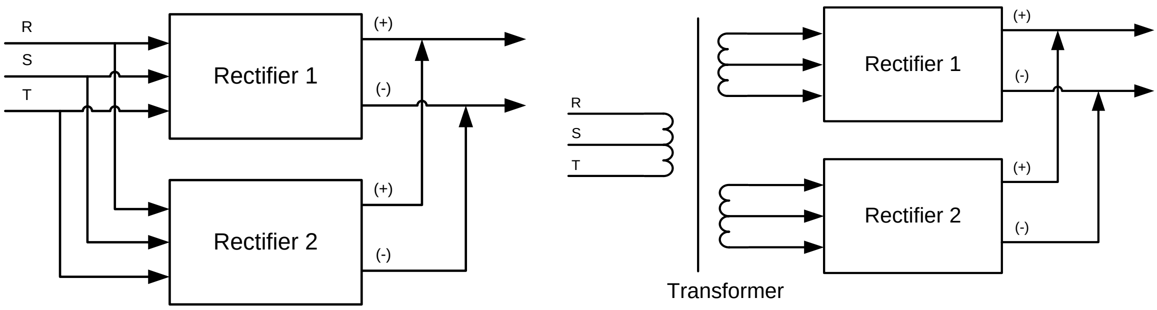
Function code	Name	Description	Setting range	Default
P02.00	Master/slave mode	0: Single-node mode 1: Master/slave mode 1 2: Master/slave mode 2 **Note:** Single-node mode: Master/slave mode is invalid. Master/slave mode 1: Applicable to the scenarios without input isolation transformers (only optical fiber can be used for communication). Master/slave mode 2: Applicable to the scenarios with input isolation transformers.	0–2	0

The function code is used to select the rectifier control mode.

Single-node mode: Master/slave mode is invalid.

Master/slave mode 1: Applicable to the scenarios without input isolation transformers

Master/slave mode 2: Applicable to the scenarios with input isolation transformers



a) Wiring diagram for master/slave mode 1 b) Wiring diagram for master/slave mode 2

Function code	Name	Description	Setting range	Default
P02.01	Master/slave setting	Indicates whether the current device is the master or slave in master/slave mode. 0: Master 1: Slave	0–1	0

When P02.00 is not 0, P02.01 specifies whether the current device is the master or slave in master/slave mode.

Function code	Name	Description	Setting range	Default
P02.02	Master/slave communication mode	0: Optical fiber 1: RS485 2: PROFIBUS/CANopen 3: Ethernet 4: Reserved 5: DEVICE_NET Note: Master/slave mode 1 supports only optical-fiber communication. Master/slave mode 2 supports all the options 0–5. The options 2–5 are available only when corresponding communication cards are configured.	0–5	0
P02.03	Active-current partition coefficient	0.0%–200.0% Valid only for Master/slave mode 2	0–200.0%	100.0%

When P02.00=2 (master/slave mode 2), the active current setting of the slave is the active current setting of the master multiplied by P02.03.

Function code	Name	Description	Setting range	Default
P02.04	Slave running command control mode	0: Locally controlled 1: Master controlled	0–1	0

The running, stop, and reset of the slave can be controlled by the master or slave itself. If it is master controlled, the running status of the salve is synchronized with the master.

Note: In master/slave mode 1, the fault reset function cannot be synchronized.

Function code	Name	Description	Setting range	Default
P02.05	Slave fault handling	0: Stop 1: Keep running	0–1	0

The function code is valid only for the master in master/slave mode 2.

For the master, the function code indicates whether the master stops when receiving the slave fault (the slave stops only if the master stops).

Function code	Name	Description	Setting range	Default
P02.06	Slave bypassing	0: Not bypass 1: Bypass	0–1	0

The function code is valid only for the slave in master/slave mode 2.

If a slave node reports a fault and the fault cannot be reset when multi-slave nodes are used, the faulty slave node can be bypassed to ensure the normal running of the entire system.

Function code	Name	Description	Setting range	Default
P02.07	Slave count	0–16; Number of slave nodes that the master controls.	0–16	0

The function code displays the number of slave nodes that the master controls in master/slave mode 2. The function code is valid only for the master in master/slave mode 2.

5.2.4 P03 group—Control parameters

Function code	Name	Description	Setting range	Default
P03.00	Active current setting channel	0: Keypad 1: AI1 2: AI2 3: AI3 4: Communication **Note:** It is applicable only to the current closed-loop running mode.	0–4	0

When P00.06=1 (active current closed-loop mode), set the function code to select the active current setting channel.

Function code	Name	Description	Setting range	Default
P03.01	Active current setting on keypad	-150.0%–150.0% (of the rectifier rated current)	-150.0–150.0	0.0%

When P00.06=1 and P03.00=0, active current is set on the keypad. (A negative value indicates feedback, while a positive value indicates electromotive.)

Function code	Name	Description	Setting range	Default
P03.02	Communication mode for setting active current	0: RS485 1: PROFIBUS/CANopen 2: Ethernet 3: Reserved 4: DEVICE_NET	0–4	0

When P00.06=1 and P03.00=4 (set through communication), set the function code to select a communication mode.

Function code	Name	Description	Setting range	Default
P03.03	Reactive current setting channel	0: Keypad 1: AI1 2: AI2 3: AI3 4: Communication **Note:** It is applicable only to the reactive power compensation running mode.	0–4	0

When P00.07=1 (reactive power compensation running mode and current closed-loop mode), set the function code to select the reactive current setting channel.

Function code	Name	Description	Setting range	Default
P03.04	Reactive current setting on keypad	-150.0%–150.0% (of the rectifier rated current) Reactive current setting is used for reactive compensation. (A negative value indicates capacitive, while a positive value indicates inductive.)	-150.0–150.0%	0.0%

When P00.07=1 and P03.03=0 (set on the keypad), reactive current is set on the keypad. Reactive current setting is used for reactive compensation. (A negative value indicates capacitive, while a positive value indicates inductive.).

Function code	Name	Description	Setting range	Default
P03.05	Communication mode for setting reactive current	0: RS485 1: PROFIBUS/CANopen 2: Ethernet 3: Reserved 4: DEVICE_NET	0–4	0

When P00.03=1 and P03.03=4 (set through communication), set the function code to select a communication mode.

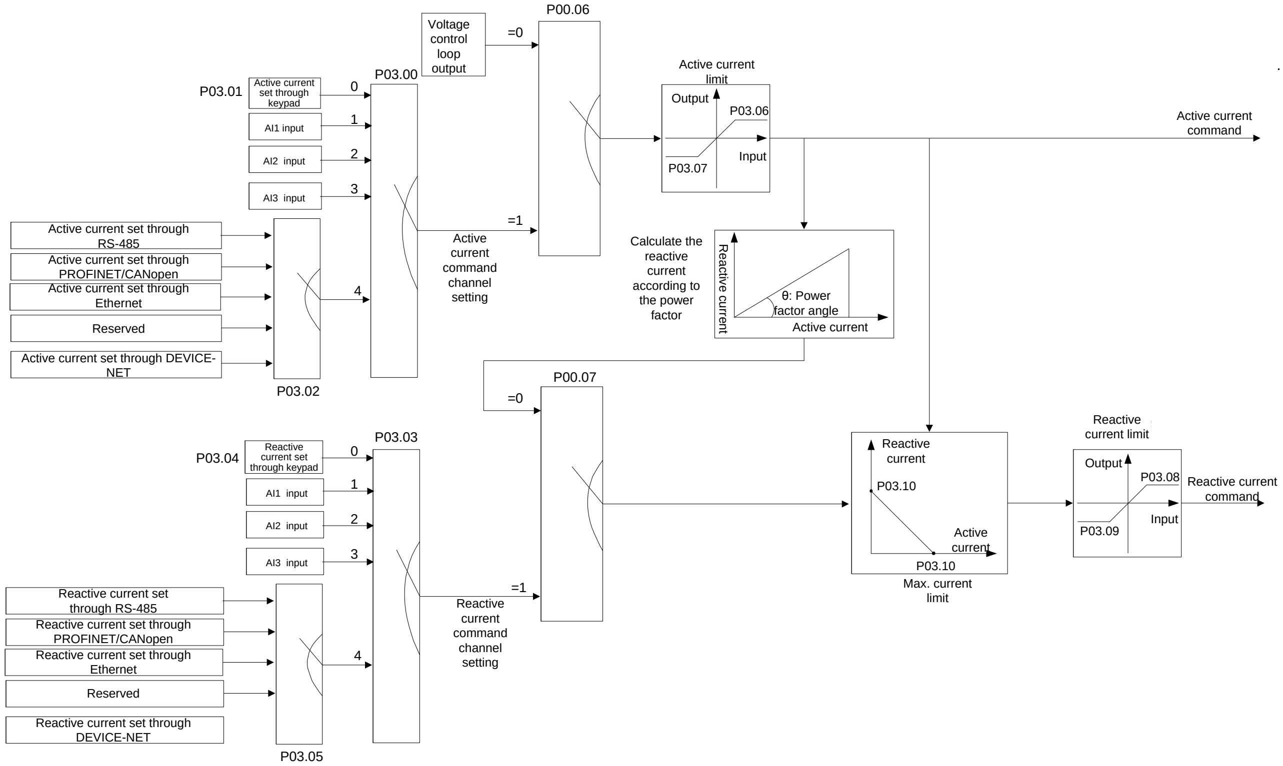
Function code	Name	Description	Setting range	Default
P03.06	Positive limit on active current	0.0–200.0% (of the rectifier rated current) P03.06 indicates the maximum active current at rectifier output. It is valid only for the COSφ running mode and reactive power compensation mode.	0.0–200.0%	150.0%
P03.07	Negative limit on active current	0.0–200.0% (of the rectifier rated current) P03.07 indicates the maximum active current at energy feedback. It is valid only for the COSφ running mode and reactive power compensation mode.	0.0–200.0%	150.0%
P03.08	Positive limit on reactive current	0.0–200.0% (of the rectifier rated current) P03.08 indicates the maximum reactive current at rectifier output. It is valid only for the COSφ running mode and reactive power compensation mode.	0.0–200.0%	150.0%
P03.09	Negative limit on reactive current	0.0–200.0% (of the rectifier rated current) P03.09 indicates the maximum reactive current at energy feedback. It is valid only for the COSφ running mode and reactive power compensation mode.	0.0–200.0%	150.0%
P03.10	Max. current setting	0–250.0% (of the rectifier rated current) If the combination of the active current and reactive current exceeds the maximum current setting, the reactive current component setting is automatically reduced to ensure the current is within the range. Note: It is valid only in the reactive power compensation running mode and COSφ running mode.	0–250.0%	0–200.0%

P03.06 indicates the maximum active current at rectifier output.

P03.07 indicates the maximum active current at energy feedback.

P03.08 indicates the maximum reactive current at rectifier output.

P03.09 indicates the maximum reactive current at energy feedback.



When P00.07=0 (COSφ running mode) or 1 (reactive current compensation running mode), if the combination of the active current and reactive current exceeds the maximum current setting, the reactive current component setting is automatically reduced to ensure the current is within the range.

Function code	Name	Description	Setting range	Default
P03.11	Voltage-loop proportional coefficient 1	The absolute value of the difference between the DC voltage setting for the PI regulation in the voltage loop and the DC voltage feedback is Δ. When Δ is less than the PI parameter switching voltage, PI parameter 1 is used. When Δ is equal to or greater than the PI parameter switching voltage, PI parameter 2 is used.	0.001–30.000	1.500
P03.12	Voltage-loop integral coefficient 1		0.01–300.00	5.00
P03.13	Voltage-loop proportional coefficient 2		0.001–30.000	2.000
P03.14	Voltage-loop integral coefficient 2		0.01–300.00	5.00
P03.15	PI parameter switching voltage		0.01–30.00	20.00V

The absolute value of the difference between the DC voltage setting for the PI regulation in the voltage loop and the DC voltage feedback is Δ.

When Δ is less than the PI parameter switching voltage, PI parameter 1 is used. When Δ is equal to or greater than the PI parameter switching voltage, PI parameter 2 is used.

Function code	Name	Description	Setting range	Default
P03.16	DC bus filter cut-off frequency	50–4000Hz	50–4000Hz	2000Hz

The function code specifies the first-order low-pass filter center frequency of DC bus voltage.

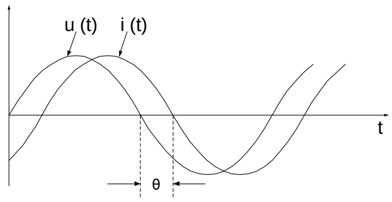
Function code	Name	Description	Setting range	Default
P03.17	Current-loop proportional coefficient P	0.001–30.000	0.001–30.000	0.800
P03.18	Current-loop integral coefficient I	0.01–300.00	0.01–300.00	0.40

Note: The two function codes impact the dynamic response speed and control accuracy of the system. Generally, you do not need to modify the two function codes.

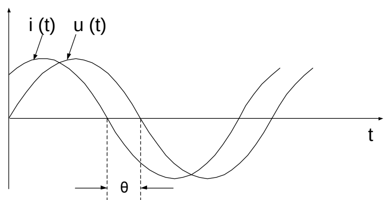
Function code	Name	Description	Setting range	Default
P03.19	Power factor setting method	0: Angle based 1: Direct setting Note: The power factor setting method is valid only in the COSφ running mode and current closed-loop running mode.	0–1	0
P03.20	Rectifier power factor angle (COSφ)	-90.0°–90.0° A positive value indicates inductive, while a negative value indicates capacitive.	-90.0°–90.0°	0.0°
P03.21	Feedback power factor angle (COSφ)			0.0°
P03.22	Rectifier power factor (fundamental)	-100.0%–100.0% A positive value indicates inductive, while a negative value indicates capacitive.	-100.0%–100.0%	100.0%
P03.23	Feedback power factor (fundamental)			100.0%

Note: The power factor setting is valid only in the COSφ running mode.

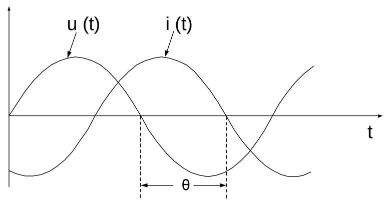
P03.19–P03.23 are used to set the power factor in COSφ running mode by using the angle between voltage and current or by direct setting. The following figures show the relationship between the power factor and the angle. When the angle is used for power factor setting, this function code group is used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



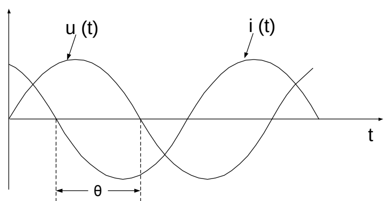
(1) Current lagging voltage, θ<90°



(2) Current leading voltage, θ<90°



(3) Current lagging voltage, θ>90°



(4) Current leading voltage, θ>90°

Figures (1) and (3) correspond to inductive and figures (2) and (4) correspond to capacitive.

1. When P03.19=0, the rectifier power factor is cos(P03.20), and the feedback power factor is cos(P03.21).

   If P03.20>=0, figure (1) shows the relationship and the angle is θ.

   If P03.20<0, figure (2) shows the relationship and the angle is θ. The negative sign of P03.20 indicates capacitive.

   If P03.21>=0, figure (3) shows the relationship and the angle is θ.

   If P03.21<0, figure (4) shows the relationship and the angle is θ. The negative sign of P03.21 indicates capacitive.

2. When P03.19=1, the rectifier power factor is P03.22, and the feedback power factor is P03.23.

   If P03.22>=0, figure (1) shows the relationship and the power factor is cosθ.

   If P03.22<0, figure (2) shows the relationship and the power factor is cosθ. The negative sign of P03.22 indicates capacitive.

   If P03.23>=0, figure (3) shows the relationship and the power factor is cosθ.

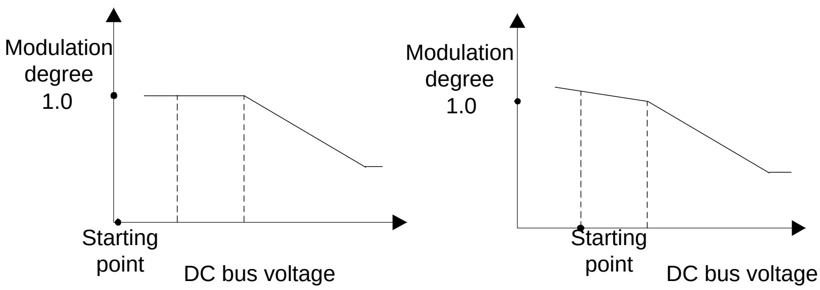
   If P03.23<0, figure (4) shows the relationship and the power factor is cosθ. The negative sign of P03.21 indicates capacitive.

Function code	Name	Description	Setting range	Default
P03.24	Neutral-point balancing control	0: Disable 1: Enable	0–1	1
P03.25	Neutral-point balancing control mode	0: Hysteresis mode 1: Proportional mode	0–1	0
P03.26	Neutral-point balancing control proportion	0–10.00	0–10.00	0.10
P03.27	Phase-lock loop proportion	10.0–1000.0	10.0–1000.0	100.0
P03.28	Phase-lock loop integral	0.20–30.00	0.20–30.00	0.50
P03.29	Overmodulation	0–1	0–1	1

Enable overmodulation when the bus voltage is less than (√2 * Actual input voltage).

Note: It is not recommended that overmodulation be enabled in most cases.

During the PWM rectifier startup, the space vector exhibits overmodulation characteristics due to the low DC bus voltage. The overmodulation is to sacrifice a part of harmonic suppression to ensure the fundamental current output. In the case of loaded startup, if the load is heavy, startup may fail, in which it is recommended to enable overmodulation. The difference between the overmodulation validity and invalidity is shown in the following figure.



Function code	Name	Description	Setting range	Default
P03.30	Enabling high grid voltage	0: Disable 1: Enable	0–1	0
P03.31	High grid voltage adjustment Kp	0.00–10.00	0–10.00	0.20
P03.32	High grid voltage adjustment Ki	0.00–100.00	0–100.00	4.00
P03.33	Impedance adjustment coefficient (for Ualpha and Ubeta)	0.000–5.000	0–5.000	0.000
P03.34	PI output limit of current loop Idq	0.000–2.000	0.000–2.000	0.600
P03.35	Virtual damping factor	0.000–2.000	0.000–2.000	0.200

5.2.5 P04 group—Filter parameters

Function code	Name	Description	Setting range	Default
P04.00	Phase-lock frequency	10–1000	10–1000	50

The function code specifies the grid frequency of the rectifier phase-lock loop. It is 50Hz in power frequency by default.

Function code	Name	Description	Setting range	Default
P04.01	Phase-lock 1st-order filter damping factor	0.000–5.000	0.000–5.000	1.414
P04.02	Phase-lock 2nd-order filter damping factor	0.000–5.000	0.000–5.000	0.141

The phase-lock input of the phase-lock loop passes through two-order band-pass filters. P04.01 and P04.02 are the damping coefficients of the first- and second-order filters respectively, and the band-pass filter center frequency is P04.00.

Function code	Name	Description	Setting range	Default
P04.03	Bus power feedforward filter frequency	0–2000	0–2000	200
P04.04	Bus power feedforward damping factor	0.000–5.000	0.000–5.000	1.414

Setting DC bus power feedforward filter parameters can help suppress bus voltage sudden change.

Function code	Name	Description	Setting range	Default
P04.05	Low-pass filter cut-off frequency in current-loop Idq feedback	0–5000	0–5000	2000

The function code indicates the first-order low-pass filter cut-off frequency in the feedback current D-axis and Q-axis.

Function code	Name	Description	Setting range	Default
P04.06	Loop lead-lag center frequency	0–4000	0–4000	1000
P04.07	Loop lead-lag angle	-80.0°–80.0°	-80.0°–80.0°	0.0°

The function codes are used to regulate current-loop lead-lag for specific-order harmonics. P04.06 indicates the frequency setting for specific-order harmonics, and P04.07 indicates the lead-lag angle setting for specific-order harmonics. If 0° is set, the lead-lag loop is invalid.

Function code	Name	Description	Setting range	Default
P04.08	Reserved			
P04.09	Resonant high-pass filter damping factor	0.000–5.000	0.000–5.000	0.707
P04.10	LCL resonance compensation coefficient	0.00–5.00	0.00–5.00	1.50
P04.11	High-frequency harmonic compensation coefficient	0.00–10.00	0.00–10.00	0.00
P04.12	Damping high-pass filter cut-off frequency	0–5000	0–5000	810
P04.13	Damping low-pass filter cut-off frequency	0–5000	0–5000	2000

The function codes are virtual damping control parameter settings. P04.11 indicates the compensation coefficient for full harmonic bands, P04.10 indicates the harmonic compensation coefficient for specific frequency bands, P04.09 and P04.12 indicate the harmonic high-pass filter damping coefficient and cut-off frequency for specific bands, and P04.13 indicates the harmonic low-pass filter cut-off frequency for specific bands.

Function code	Name	Description	Setting range	Default
P04.14	Phase-lock method	Bit 0: 1st-order phase-lock input filter selection 0: Enable 1: Bypass Bit 1: 2nd-order filter and positive/negative sequence	0–7	0

Function code	Name	Description	Setting range	Default
		extraction selection 0: Enable 1: Bypass Bit 2: Phase lock way 0: General phase lock 1: Phase lock by means of dual synchronous coordinate system decoupling		

The function code is used for phase lock mode selection, 1st-order filter selection, 2nd-order filter selection, and positive/negative sequence extraction selection for the rectifier phase-lock loop.

Bit 2: Phase lock way. 0: General phase lock; 1: Phase lock by means of dual synchronous coordinate system decoupling

Bit 1: 2nd-order filter and positive/negative sequence extraction selection. The value 0 (Enable) indicates the phase is locked after the input passes through the 1st-order filter and 2nd-order filter and completes positive/negative sequence extraction. The value 1 (Bypass) indicates bypassing the 2nd-order filter and positive/negative sequence extraction and selecting the 1st-order filter based on bit 0.

Bit 0: indicates whether to enable 1st-order phase lock input filtering. The value 0 indicates enabling while the value 1 indicates bypassing. The setting of bit 0 is valid when bit 1 is set to 1, which indicates phase lock is directly performed for input without any processing if 1st-order phase lock input filtering is bypassed.

5.2.6 P05 group—Input terminals

Function code	Name	Description	Setting range	Default
P05.01	Function of S1	0: No function 1: Run 2: Fault reset 3: External fault 4: Slave fault 5: Enable running (DIS fault) 6: Switch between master and slave 7: Reserved 8: Enable the rectifier 9: Control power-on buffer 10: Switch the running command channel to keypad 11: Switch the running command channel to terminal 12: Switch the running command channel to communication 13: Clear accumulative electricity consumption 14: Keep accumulative electricity consumption 15: Reserved	0–15	0
P05.02	Function of S2		0–15	0
P05.03	Function of S3		0–15	0
P05.04	Function of S4		0–15	0
P05.05	Function of S5		0–15	0
P05.06	Function of S6		0–15	0
P05.07	Function of S7		0–15	0
P05.08	Function of S8		0–15	0

Terminal input is described as follows:

Setting	Function	Description
0	No function	The PWM rectifier does not act even if with signal input. Set unused terminals without functions to avoid misaction.
1	Running	External terminals are used to control PWM rectifier running.
2	Fault reset	External fault reset function, same as the reset function of the STOP/RST key on the keypad. You can use this function to reset faults remotely.
3	External fault	After receiving the external fault signal, the PWM rectifier reports the fault and stops. However, the main contactor is still connected and the diode works properly.
4	Slave fault	
5	Enable running (DIS fault)	The PWM rectifier can run only after the terminal function is enabled.
6	Switch between master and slave	When the function is enabled, the master and slave can be switched. For details, see P02.01 (Master/slave setting).
8	Enable the rectifier	The function equals the rectifier power-on or power-off signal. The rectifier can be powered on only when the terminal is valid. If the signal disappears, in any state, the rectifier immediately powers off, the main contactor and buffer contactor are also disconnected.
10	Switch the running command channel to keypad	When the function is enabled, the running command channel is switched to keypad. When the function is disabled, the running command channel is restored to the previous setting.
11	Switch the running command channel to terminal	When the function is enabled, the running command channel is switched to terminal. When the function is disabled, the running command channel is restored to the previous setting.
12	Switch the running command channel to communication	When the function is enabled, the running command channel is switched to communication. When the function is disabled, the running command channel is restored to the previous setting.
13	Clear accumulative electricity consumption	When the function is enabled, the accumulative electricity consumption (specified by P07.17 and P07.18) of the PWM rectifier is cleared.
14	Keep accumulative electricity consumption	When the function is enabled, the current running of the PWM rectifier does not affect its electricity consumption.
15	Reserved	

Function code	Name	Description	Setting range	Default
P05.09	Digital input terminal polarity	0x00–0xFF	0x00–0xFF	0x00

The function code is used to select input terminal polarity.

When a bit is 0, the input terminal is positive; when a bit is 1, the input terminal is negative.

BIT4	BIT3	BIT2	BIT1	BIT0
S5	S4	S3	S2	S1

Function code	Name	Description	Setting range	Default
P05.10	Digital input filter time	Digital input filter time	0.000–1.000s	0

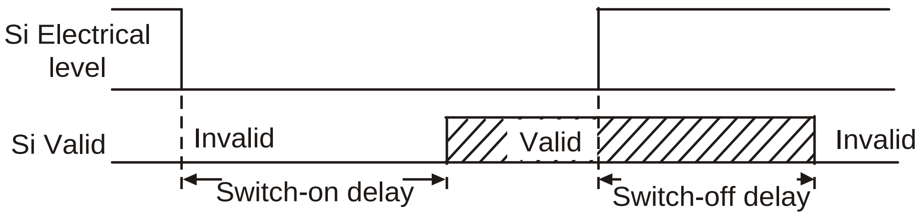
The function code is used to set the filter time for S1–S5. In strong interference cases, increase the value to avoid maloperation.

Function code	Name	Description	Setting range	Default
P05.11	Virtual input terminal setting	Specifies whether to enable the virtual input terminals in communication mode. 0: Virtual input terminals are invalid 1: MODBUS communication virtual terminals are valid 2: PROFIBUS/CANopen communication virtual terminals are valid 3: Ethernet virtual terminals are valid 4–10: Reserved	0–10	0

The function code specifies whether to enable the virtual input terminals in communication mode.

Function code	Name	Description	Setting range	Default
P.05.13	S1 switch-on delay	0.000–60.000s	0.000–60.000	0.000s
P05.14	S1 switch-off delay	0.000–60.000s	0.000–60.000	0.000s
P05.15	S2 switch-on delay	0.000–60.000s	0.000–60.000	0.000s
P05.16	S2 switch-off delay	0.000–60.000s	0.000–60.000	0.000s
P05.17	S3 switch-on delay	0.000–60.000s	0.000–60.000	0.000s
P05.18	S3 switch-off delay	0.000–60.000s	0.000–60.000	0.000s
P05.19	S4 switch-on delay	0.000–60.000s	0.000–60.000	0.000s
P05.20	S4 switch-off delay	0.000–60.000s	0.000–60.000	0.000s
P05.21	S5 switch-on delay	0.000–60.000s	0.000–60.000	0.000s
P05.22	S5 switch-off delay	0.000–60.000s	0.000–60.000	0.000s
P05.23	S6 switch-on delay	0.000–60.000s	0.000–60.000	0.000s
P05.24	S6 switch-off delay	0.000–60.000s	0.000–60.000	0.000s
P05.25	S7 switch-on delay	0.000–60.000s	0.000–60.000	0.000s
P05.26	S7 switch-off delay	0.000–60.000s	0.000–60.000	0.000s
P05.27	S8 switch-on delay	0.000–60.000s	0.000–60.000	0.000s
P05.28	S8 switch-off delay	0.000–60.000s	0.000–60.000	0.000s

The function codes specify the delay time corresponding to the electrical level changes when the programmable input terminals switch on or switch off.



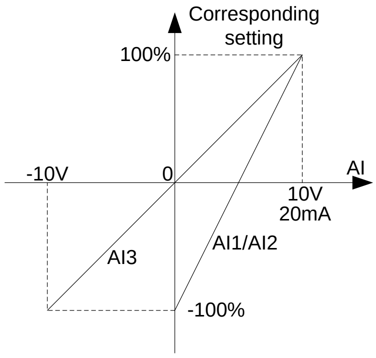
Function code	Name	Description	Setting range	Default
P05.29	AI1 lower limit	0.00V–P05.31	0.00–P05.31	0.00V
P05.30	Corresponding setting of AI1 lower limit	-100.0%–P05.32	-100.0–P05.32	0.0%
P05.31	AI1 upper limit	P05.29–10.00V	P05.29–10.00	10.00V
P05.32	Corresponding setting of AI1 upper limit	P05.30–100.0%	P05.30–100.0	100.0%
P05.33	AI1 input filter time	0.00s–10.000s	0.00–10.000	0.100s
P05.34	AI2 lower limit	0.00V–P05.36	0.00V–P05.36	0. 00V
P05.35	Corresponding setting of AI2 lower limit	-100.0%– P05.37	-100.0%– P05.37	0. 0%
P05.36	AI2 upper limit	P05.34–10.00V	P05.34–10.00V	10. 00V
P05.37	Corresponding setting of AI2 upper limit	P05.35–100.0%	P05.35–100.0%	100. 0%
P05.38	AI2 input filter time	0.00s–10.000s	0.00s–10.000s	0. 100s
P05.39	AI3 lower limit	-10.00V–P05.41	-10.00V–P05.41	-10. 00V
P05.40	Corresponding setting of AI3 lower limit	-100.0%– P05.42	-100.0%–P05.42	-100. 0%
P05.41	AI3 middle value	P05.39–P05.43	P05.39–P05.43	0. 00V
P05.42	Corresponding setting of AI3 middle value	P05.40–P05.44	P05.40–P05.44	0. 0%
P05.43	AI3 upper limit	P05.41–10.00V	P05.41–10.00V	10. 00V
P05.44	Corresponding setting of AI3 upper limit	P05.42–100.0%	P05.42–100.0%	100. 0%
P05.45	AI3 input filter time	0.000s–10.000s	0.000s–10.000s	0. 100s

The function codes define the relationship between the analog input voltage and its corresponding setting. When the analog input voltage exceeds the range from the upper limit to the lower limit, the upper limit or lower limit is used.

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. See the descriptions of each application section for details.

The following figure illustrates the cases of several settings:



Input filter time: to adjust the sensitivity of analog input. Increasing the value properly can enhance analog input anti-interference but may reduce the sensitivity of analog input.

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

Function code	Name	Description	Setting range	Default
P05.46	Input voltage valid value	Displays the present input voltage of the VFD. 0.0–2000V	0–2000	0.0V
P05.47	Input current valid value	Displays the present input current of the VFD. 0.0–6000A	0.0–6000	0.0A
P05.48	DC bus voltage	Displays the present DC bus voltage of the VFD. 0.0–2000V	0.0–2000	0.0V
P05.49	Grid frequency	Displays the present input grid frequency of the VFD. 0.00–120Hz	0.00–120	0.00Hz
P05.54	Droop starting threshold	0–500	0–500	50
P05.55	Enabling droop	0: Disable 1: Enable	0–1	1
P05.56	Bus droop quantity	0–4096	0–4096	2400
P05.57	Control step	5: Stopped 6: Running		
P05.58	Run step	0: Initialization 1: Standby 6: Normal running 10: Fault handling 14: Stopped normally 15: Stopped		

Function code	Name	Description	Setting range	Default
P05.59	Grid phase frequency	0: Standby 1: Positive sequence 2: Negative sequence		

5.2.7 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>P06.01</td><td>Y1 output</td><td rowspan="6">0: No output
1: Ready for running
2: Running
3: Fault output
4: Master mode
5: Slave mode
6: Buffer contactor actuation command
7: Main contactor actuation status
8: MODBUS communication virtual terminal output
9: PROFIBUS/CANopen communication virtual terminal output
10: Ethernet communication virtual terminal output
11–31: Reserved</td><td>0–31</td><td>0</td></tr>
<tr><td>P06.02</td><td>Y2 output</td><td>0–31</td><td>0</td></tr>
<tr><td>P06.03</td><td>RO1 output</td><td>0–31</td><td>0</td></tr>
<tr><td>P06.04</td><td>RO2 output</td><td>0–31</td><td>0</td></tr>
<tr><td>P06.05</td><td>RO3 output</td><td>0–31</td><td>0</td></tr>
<tr><td>P06.06</td><td>RO4 output</td><td>0–31</td><td>0</td></tr>
</table>

The following table lists the function code options. A same output terminal function can be repeatedly selected.

Setting	Function	Description
0	No output	The output terminal does not have any function.
1	Ready for running	The PWM rectifier is ready for running.
2	Running	When the PWM rectifier runs, output is valid.
3	Fault output	When the PWM rectifier has a fault, output is valid.
4	Master mode	In master/slave running mode, if it is the master, output is valid.
5	Slave mode	In master/slave running mode, if it is the slave, output is valid.
6	Buffer contactor actuation command	When the buffer contactor control command is valid, output is valid.
7	Main contactor actuation status	When the main contactor actuation feedback signal is valid, output is valid.
8	Modbus communication virtual terminal output	A signal is output based on the value set through Modbus. The value 1 indicates output is valid and 0 indicates output is invalid.
9	PROFIBUS/CANopen communication virtual terminal output	A signal is output based on the value set through PROFIBUS/CANopen. The value 1 indicates output is valid and 0 indicates output is invalid.

Setting	Function	Description
10	Ethernet communication virtual terminal output	A signal is output based on the value set through Ethernet. The value 1 indicates output is valid and 0 indicates output is invalid.
11–31	Reserved	

Function code	Name	Description	Setting range	Default
P06.07	Digital output terminal polarity	0x00–0x3F; When a bit is 0, the output terminal is positive. Bit 0 corresponds to Y1. Bit 1 corresponds to Y2. Bit 2 corresponds to RO1. Bit 3 corresponds to RO2. Bit 4 corresponds to RO3. Bit 5 corresponds to RO4. BIT6–BIT7: Reserved	0x00–0x3F	0x00

The function code is used to select output terminal polarity.

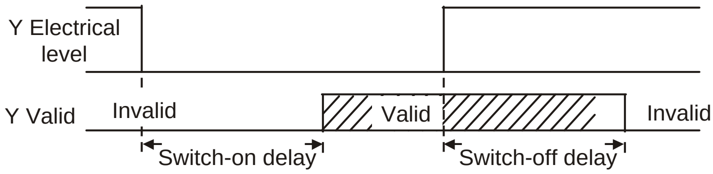
When a bit is 0, the output terminal is positive; when a bit is 1, the output terminal is negative.

BIT4	BIT3	BIT2
RO3	RO2	RO1

Function code	Name	Description	Setting range	Default
P06.08	Y1 switch-on delay	0.000–60.000s	0.000–60.000s	0.000s
P06.09	Y1 switch-off delay	0.000–60.000s	0.000–60.000s	0.000s
P06.10	Y2 switch-on delay	0.000–60.000s	0.000–60.000s	0.000s
P06.11	Y2 switch-off delay	0.000–60.000s	0.000–60.000s	0.000s
P06.12	RO1 switch-on delay	0.000–60.000s	0.000–60.000	0.000s
P06.13	RO1 switch-off delay	0.000–60.000s	0.000–60.000	0.000s
P06.14	RO2 switch-on delay	0.000–60.000s	0.000–60.000	0.000s
P06.15	RO2 switch-off delay	0.000–60.000s	0.000–60.000	0.000s
P06.16	RO3 switch-on delay	0.000–60.000s	0.000–60.000	0.000s
P06.17	RO3 switch-off delay	0.000–60.000s	0.000–60.000	0.000s

Function code	Name	Description	Setting range	Default
P06.18	RO4 switch-on delay	0.000–60.000s	0.000–60.000	0.000s
P06.19	RO4 switch-off delay	0.000–60.000s	0.000–60.000	0.000s

The function codes specify the delay time corresponding to the electrical level changes when the programmable output terminals switch on or switch off.



Function code	Name	Description	Setting range	Default
P06.20	AO1 output	0: None 1: DC voltage setting 2: DC voltage actual value 3: Input voltage valid value 4: Input current valid value 5: Input power 6: Input power factor 7: Grid frequency 8: Active current reference 9: Active current feedback 10: Reactive current reference 11: Reactive current feedback 12: Value 1 set through Modbus communication 13: Value 2 set through Modbus communication 14: Value 1 set through PROFIBUS/CANopen communication 15: Value 2 set through PROFIBUS/CANopen communication 16: Value 1 set through Ethernet communication 17: Value 2 set through Ethernet communication 18: AI1 input 19: AI2 input 20: AI3 input	0–20	0
P06.21	AO2 output		0–20	0

Terminal output is described as follows:

Setting	Function	Description
0	None	
1	DC voltage setting	For 380V models: 100% corresponds to 1000V; For 660V models: 100% corresponds to 1500V
2	DC voltage actual value	For 380V models: 100% corresponds to 1000V; For 660V models: 100% corresponds to 1500V
3	Input voltage valid value	100% corresponds to double the rectifier rated voltage.
4	Input current valid value	100% corresponds to double the rectifier rated current.
5	Input power	100% corresponds to double the rectifier rated power.
6	Input power factor	100% corresponds to 100.0% power factor.
7	Grid frequency	100% corresponds to 100Hz, while -100% corresponds to -100Hz. The value is an AC value. For positive sequence input, the value is positive. For negative sequence input, the value is negative.
8	Active current reference	100% corresponds to double the rectifier rated current.
9	Active current feedback	100% corresponds to double the rectifier rated current.
10	Reactive current reference	100% corresponds to double the rectifier rated current.
11	Reactive current feedback	100% corresponds to double the rectifier rated current.
12	Value 1 set through Modbus communication	1000 corresponds to 100.0%.
13	Value 2 set through Modbus communication	1000 corresponds to 100.0%.
14	Value 1 set through PROFIBUS/CANopen communication	1000 corresponds to 100.0%.
15	Value 2 set through PROFIBUS/CANopen communication	1000 corresponds to 100.0%.
16	Value 1 set through Ethernet communication	1000 corresponds to 100.0%.
17	Value 2 set through Ethernet communication	1000 corresponds to 100.0%.
18	AI1 input	0–10V/0–20mA

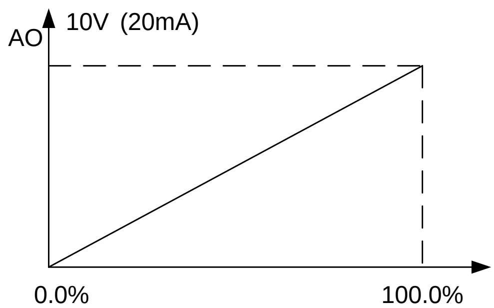
Setting	Function	Description
19	AI2 input	0–10V/0–20mA
20	AI3 input	-10–10V

Function code	Name	Description	Setting range	Default
P06.23	AO1 output lower limit	0.0%–P06.25	0.0–P06.25	0.0%
P06.24	AO1 output corresponding to lower limit	0.00– P06.26 V	0.00– P06.26	0.00V
P06.25	AO1 output upper limit	P06.25–100.0%	P06.25–100.0	100.0%
P06.26	AO1 output corresponding to upper limit	P06.24–10.00V	P06.24–10.00	10.00V
P06.27	AO1 output filter time	0.000–10.000s	0.000–10.000	0.000s
P06.28	AO2 output lower limit	-100.0% – P06.30	-100.0%–P06.30	0.0%
P06.29	AO2 output corresponding to lower limit	-10.00 – P06.31 V	-10.00–P06.31 V	0.00V
P06.30	AO2 output upper limit	P06.28 – 100.0%	P06.28–100.0%	100.0%
P06.31	AO2 output corresponding to upper limit	P06.29 – 10.00V	P06.29–10.00V	10.00V
P06.32	AO2 output filter time	0.000 – 10.000s	0.000–10.000s	0.000s

The function codes define the relationship between the output value and analog output. When the output value exceeds the allowed range, the output uses the lower limit or upper limit.

When the analog output is current output, 1mA equals 0.5V.

In different cases, the corresponding analog output of 100% of the output value is different. See each application for detailed information.



Function code	Name	Description	Setting range	Default
P06.41	Enabling SD card	0: Enable 1: Disable	0–1	0
P06.42	SD card connection success flag	0: Failed 1: Successful	0–1	0
P06.43	File address high-order bits read when SD card power-on	0–65535	0–65535	0
P06.44	File address low-order bits read when SD card power-on	0–65535	0–65535	0
P06.45	File address high-order bits when SD card running	0–65535	0–65535	0
P06.46	File address low-order bits when SD card running	0–65535	0–65535	0
P06.47	SD card power-on count	0–65535	0–65535	0

5.2.8 P07 group—Human-machine interface

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

When you set the function code to a non-zero number, password protection is enabled.

If you set the function code to 00000, the previous user password is cleared and password protection is disabled.

After the user password is set and takes effect, you cannot enter the parameter menu if you enter an incorrect password. Please remember your password and save it in a secure place.

After you exit the function code editing interface, the password protection function is enabled within 1 minute. If password protection is enabled, "0.0.0.0.0" is displayed when you press the PRG/ESC key again to enter the function code editing interface. You need to enter the correct user password to enter the interface.

Note: Restoring the default values may delete the user password. Exercise caution when using this function.

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

The function code is used to set the parameter copy mode.

Note: After the operation corresponding to 1 or 2 is complete, the function code restores to 0.

Function code	Name	Description	Setting range	Default
P07.02	Function of QUICK/JOG	0: No function 1: Switch displayed function codes from right to left by pressing QUICK/JOG 2: Switch command channels in sequence by pressing QUICK/JOG 3: Quick commissioning mode (based on non-factory parameter settings)	0–3	0

The function code is used to set the function of the QUICK/JOG key.

Function code	Name	Description	Setting range	Default
P07.03	Sequence of switching running-command channels by pressing QUICK/JOG	0: Keypad→Terminal→Communication 1: Keypad←→Terminal 2: Keypad←→Communication 3: Terminal←→Communication	0–3	0

When P07.02=2, set the sequence of switching running-command channels by pressing QUICK/JOG.

Function code	Name	Description	Setting range	Default
P07.04	Stop function validity of STOP/RST	0: Valid only for keypad control 1: Valid both for keypad and terminal control 2: Valid both for keypad and communication control 3: Valid for all control modes	0–3	3

The function code specifies the stop function validity of STOP/RST. For fault reset, STOP/RST is valid in any conditions.

Function code	Name	Description	Setting range	Default
P07.05	Parameters displayed in rectifying state	0x0000–0xFFFF	0–0xFFFF	0x000F

In rectifying state, there are 15 parameters to be selected, including DC bus voltage (V), grid frequency (Hz), input voltage (V), input current (A), input power factor (%), active current component (%), reactive current component (%), input terminal status, output terminal status, AI1 (V), input apparent power (kVA), input active power (kW), and input reactive power (kVar).

This function code determines parameter display. The value is a 16-bit binary number. If a bit is 1, the parameter corresponding to this bit can be viewed through >>/SHIFT during running. If this bit is 0, the parameter corresponding to this bit is not displayed. When setting P02.03, convert the binary number to a hex number before the input to the function code. The content is shown in the following table.

BIT15	BIT14	BIT13	BIT12	BIT11	BIT10	BIT9	BIT8
Reserved	Input reactive power	Input active power	Input apparent power	AI3	AI2	AI1	Output terminal status
BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
Input terminal status	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 bar code 1	0x0000–0xFFFF		
P07.08	Factory bar code 2	0x0000–0xFFFF		
P07.09	Factory bar code 3	0x0000–0xFFFF		
P07.10	Factory bar code 4	0x0000–0xFFFF		
P07.11	Factory bar code 5	0x0000–0xFFFF		
P07.12	Factory bar code 6	0x0000–0xFFFF		

The function codes are used to display the factory bar codes of devices.

Function code	Name	Description	Setting range	Default
P07.17	Accumulative electricity consumption high-order bits	0–65535 kWh	0–65535	0kWh
P07.18	Accumulative electricity consumption low-order bits	0.0–999.9 kWh	0.0–999.9	0.0kWh

The function codes are used to display the accumulative electricity consumption. Accumulative electricity consumption for running = P07.17*1000 + P07.18

Function code	Name	Description	Setting range	Default
P07.19	Control board software version	1.00–655.35	1.00–655.35	Actual value

The function code displays the control board software version.

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

The function code displays the local accumulative running time.

5.2.9 P17 group—Overall status information

This group is used to view overall status information.

Function code	Name	Description	Setting range	Default
P17.00	Rectifier rated power	Displays the rectifier rated power. 4–6000kW	4–6000	Model depended
P17.01	Rectifier rated current	Displays the rectifier rated power. 0.0–6000.0A	0.0–6000.0	Model depended
P17.04	Valid unit count	Displays the number of valid rectifier units. 0x00–0x3F	0x00–0x3F	0x00
P17.05	DC voltage	Displays the DC voltage of the rectifier. 0.0–2000.0V	0.0–2000.0	0.0V
P17.06	Grid frequency	Displays the grid frequency. 0.00–120.0Hz	0.00–120.0	0.0Hz
P17.07	Grid voltage	Displays the grid voltage. 0.0–2000.0V	0.0–2000.0	0.0V
P17.08	Grid input current	Displays the grid input current. 0.0–6000.0A	0.0–6000.0	0.0A
P17.09	Power factor	Displays the power factor of the rectifier. -1.00–1.00	-1.00–1.00	0.00
P17.10	Active current percentage	Displays the active current percentage of the rectifier. -200.0–200.0%	-200.0–200.0	0.0%
P17.11	Reactive current percentage	Displays the reactive current percentage of the rectifier. -200.0–200.0%	-200.0–200.0	0.0%
P17.12	Digital input terminal status	Displays the present digital input terminal status. 0x00–0xFF	0x00–0xFF	0x00
P17.13	Digital output terminal status	Displays the present digital output terminal status. 0x00–0xFF	0x00–0xFF	0x00
P17.14	AI1 input voltage	Displays the AI1 input signal. 0.00–10.00V	0.00–10.00	0.00V
P17.17	Input apparent power	Displays the input apparent power of the rectifier. 0–6000.0kVA	0–6000.0	0.0kVA

Function code	Name	Description	Setting range	Default
P17.18	Input active power	Displays the input active power of the rectifier. 0–6000.0kW	0–6000.0	0.0kW
P17.19	Input reactive power	Displays the input reactive power of the rectifier. 0–6000.0kVar	0–6000.0	0.0kVar
P17.20	3PH voltage unbalance factor	Displays the three-phase voltage unbalance factor of the rectifier. It is the ratio of the max. rectifier input voltage to the min. value. 1.00–10.00	1.00–10.00	0.00
P17.21	Rectifier bridge temperature	Displays the rectifier bridge temperature. -20.0–120.0°C	-20.0–120.0°C	0.0°C
P17.22	IGBT temperature	Displays the IGBT temperature of the rectifier. -20.0–120.0°C	-20.0–120.0°C	0.0°C

5.2.10 P18 group—Unit status information

Function code	Name	Description	Setting range	Default
P18.07	Six-pulse mode enabling compensation angle	-90.0°–90.0°	-90°–90°	00.0

When P00.00 is 1, the six-pulse rectifier mode is used, and the rectifier runs the IGBT conduction compensation angle.

Function code	Name	Description	Setting range	Default
P18.08	Register BPRD viewing variable	3125–25000	3125–25000	
P18.09	Analog current	0.0–200.0	0.0–200.0%	0.0

When P18.13 is 1 but P18.09 is not 0, analog current is valid, otherwise, it is the actual rectifier current. The setting is a percentage of the rated current.

Function code	Name	Description	Setting range	Default
P18.10	Analog voltage	0.0–200.0	0.0–200.0%	0.0

When P18.13 is 1 but P18.10 is not 0, analog voltage is valid, otherwise, it is the actual rectifier input voltage. The setting is a percentage of the rated voltage. Analog input voltage frequency is set through P18.15.

Function code	Name	Description	Setting range	Default
P18.13	Analog grid selection	0: Normal mode 1: Test mode	0–1	0

P18.13 specifies whether to enable the test mode.

0: Normal mode. Actual rectifier parameters are used.

1: Test mode. P18.09, P18.10, P18.14, and P18.15 can be used to simulate related parameters.

Function code	Name	Description	Setting range	Default
P18.14	Analog DC voltage	0–6553.5	0–6553.5	0.0

Analog DC voltage is the simulated AD sampling value.

Function code	Name	Description	Setting range	Default
P18.15	Analog grid frequency	0.0–200.0HZ	0.0–200.0	50.0Hz

The setting of analog grid frequency is valid when P18.13 is 1 but P18.10 is not 0.

Function code	Name	Description	Setting range	Default
P18.16	Virtual damping cut-in factor	0.00–10.00	0.00–10.00	0.00
P18.17	Frequency filter coefficient at SPI fault	0–15	0–15	05
P18.18	Pulse waves sent in commissioning	0–40	0–40	0

Number of pulse waves that can be sent in commissioning mode. That is, the automatic stop time setting in commissioning mode. The device stops when the running time specified by P18.18 is reached.

Function code	Name	Description	Setting range	Default
P18.19	Voltage sampling compensation angle	-90.0°–90.00°	-90.0°–90.0°	5.0

The function code specifies the compensation angle for input voltage sampling delay. A positive value indicates lead compensation, while a negative value indicates lag compensation.

5.2.11 P19 group—Fault information

Function code	Name	Description	Setting range	Default
P19.00	Present fault type	00: No fault 01: Input overcurrent (oC) 02: Grid undervoltage (LvI) 03: Grid overvoltage (ovI) 04: Grid phase loss (SPI) 05: Phase lock failure (PLLF) 06: DC undervoltage (Lv) 07: DC overvoltage (ov) 08: Current detection fault (ItE) 09: PROFIBUS communication fault (E_dP) 10: RS485 communication fault (E_485) 11: CANopen communication fault (E_CAN) 12: Ethernet communication fault (E_NEt) 13: DEVICE_NET communication fault (E_dEv) 14: Power unit with uneven current (UIU) 15: Rectifier overload (oL) 16: EEPROM operation error (EEP) 17: Main contactor actuation failure (tbE) 18: STO fault (E_Sto) 19: DSP-FPGA communication fault (dF_CE) 20: External fault (EF) 21: Rectifier disabled (dIS) 22: Keypad or panel communication fault (PCE) (Reserved) 23: Parameter upload fault (UPE) 24: Parameter download fault (dNE) 25: Running time reached (ENd) 26: Power-on buffer half-voltage timeout (PC_t1) 27: Power-on buffer timeout (PC_t2) 28: Slave communication fault (E_ASC) 29: Slave fault (E_SLE) 30: Control power fault (CPoE)	0–32	0
P19.01	Last fault type			0
P19.02	2nd-last fault type			0
P19.03	3rd-last fault type			0
P19.04	4th-last fault type			0
P19.05	5th-last fault type			0

For details, see fault information.

Function code	Name	Description	Setting range	Default
P19.06	Input terminal status at present fault	0x00–0xFF	0x00–0xFF	0x00

The function code is used to record the input terminal status when the present fault occurs.

Function code	Name	Description	Setting range	Default
P19.07	Output terminal status at present fault	0x00–0xFF	0x00–0xFF	0x00

The function code is used to record the output terminal status when the present fault occurs.

Function code	Name	Description	Setting range	Default
P19.08	DC voltage at present fault	0.0–2000.0V	0.0–2000.0	0.0V

The function code is used to record the DC voltage when the present fault occurs.

Function code	Name	Description	Setting range	Default
P19.09	Grid voltage at present fault	0.0–2000.0V	0.0–2000.0	0.0V

The function code is used to record the grid voltage when the present fault occurs.

Function code	Name	Description	Setting range	Default
P19.10	Input current at present fault	0.0–6000.0A	0.0–6000.0	0.0A

The function code is used to record the input current when the present fault occurs.

Function code	Name	Description	Setting range	Default
P19.22	Input terminal status at last fault	0x00–0xFF	0x00–0xFF	0x00
P19.23	Output terminal status at last fault	0x00–0xFF	0x00–0xFF	0x00
P19.24	DC voltage at last fault	0.0–2000.0V	0.0–2000.0	0.0V
P19.25	Grid voltage at last fault	0.0–2000.0V	0.0–2000.0	0.0V
P19.26	Input current at last fault	0.0–6000.0A	0.0–6000.0	0.0A

The function codes are used to record display information when the last fault occurs. For details, see P19.06–P19.10.

Function code	Name	Description	Setting range	Default
P19.38	Input terminal status at 2nd-last fault	0x00–0xFF	0x00–0xFF	0x00
P19.39	Output terminal status at 2nd-last fault	0x00–0xFF	0x00–0xFF	0x00
P19.40	DC voltage at 2nd-last fault	0.0–2000.0V	0.0–2000.0	0.0V
P19.41	Grid voltage at 2nd-last fault	0.0–2000.0V	0.0–2000.0	0.0V
P19.42	Input current at 2nd-last fault	0.0–6000.0A	0.0–6000.0	0.0A

The function codes are used to record display information when the 2nd-last fault occurs. For details, see P19.06–P19.10.

5.2.12 P20 group—Serial communication

Function code	Name	Description	Setting range	Default
P20.00	Local communication address	1–247; 0 indicates a broadcast address	1–247	1

When the master writes the slave communication address to 0 indicating a broadcast address in a frame, all the salves on the Modbus bus receive the frame but do not respond to it.

The communication addresses on the communication network are unique, which is the basis of the point-to-point communication.

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

Function code	Name	Description	Setting range	Default
P20.01	Communication baud rate	0: 1200BPS 1: 2400BPS 2: 4800BPS 3: 9600BPS 4: 19200BPS 5: 38400BPS	0–5	4

The function code is used to set the rate of data transmission between the upper computer and rectifier.

Note: The baud rate set on the rectifier must be consistent with that on the upper computer. Otherwise, the communication fails. A greater baud rate indicates faster communication.

Function code	Name	Description	Setting range	Default
P20.02	Data bit check	0: No check (N, 8, 1) for RTU 1: Even check (E, 8, 1) for RTU	0–5	1

Function code	Name	Description	Setting range	Default
		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		

The data format set on the rectifier must be consistent with that on the upper computer. Otherwise, the communication fails.

Function code	Name	Description	Setting range	Default
P20.03	Communication response delay	0–200ms	0–200	5

The function code indicates the communication response delay, that is, the interval from when the PWM rectifier completes receiving data to when it sends response data to the upper computer. If the response delay is shorter than the rectifier processing time, the rectifier sends response data to the upper computer after processing data. If the delay is longer than the rectifier processing time, the rectifier does not send response data to the upper computer until the delay is reached although data has been processed.

Function code	Name	Description	Setting range	Default
P20.04	Communication timeout time	0.0 (invalid); 0.1–60.0s	0.0–60.0	0.0s

When the function code is set to 0.0, the communication timeout time is invalid.

When the function code is set a non-zero value, the rectifier reports the "485 communication fault" (E_485) if the communication interval exceeds the value.

In general, the function code is set to 0.0. When continuous communication is required, you can set the function code to monitor communication status.

Function code	Name	Description	Setting range	Default
P20.05	Transmission error processing	0: Report an alarm and coast to stop 1: Keep running without reporting an alarm 2: Stop in enabled stop mode without reporting an alarm (applicable only to communication mode) 3: Stop in enabled stop mode without reporting an alarm (applicable to any mode)	0–3	0

The function code is used to set the method for processing transmission errors.

Function code	Name	Description	Setting range	Default
P20.06	Communication processing action	0x00–0x11 LCD ones place:	00–11	0x00

Function code	Name	Description	Setting range	Default
		0: Respond to write operations 1: Not respond to write operations LCD tens place: 0: Reserved 1: Reserved		

The function code is used to select the communication processing action.

0: Respond to write operations. The PWM rectifier responds to both read and write commands from the upper computer.

1: Not respond to write operations. The PWM rectifier does not respond to the write commands, but responds only to the read commands from the upper computer. This setting can improve the communication efficiency.

5.2.13 P21 group—PROFIBUS/CANopen communication

Function code	Name	Description	Setting range	Default
P21.00	Module type	0: PROFIBUS/CANopen	0–1	0

The function code is used to select a communication protocol.

Function code	Name	Description	Setting range	Default
P21.01	PROFIBUS/CANopen module address	0–127	0–127	2

The function code is used to identify the address of the current PWM rectifier in serial communication.

Note: The option 0 indicates a broadcast address, which means the rectifier only receives and runs the broadcast commands from the upper computer but not respond to the upper computer.

Function code	Name	Description	Setting range	Default
P21.02	Received PZD2	0: Invalid 1: DC voltage setting 2: Active current reference 3: Reactive current reference 4: Virtual input terminal command 5: AO setting 1 6: AO setting 2 7: Positive active-current limit 8: Negative active-current limit 9: Positive reactive-current limit 10: Negative reactive-current limit 11–13: Reserved	0–13	0
P21.03	Received PZD3		0–13	0
P21.04	Received PZD4		0–13	0
P21.05	Received PZD5		0–13	0
P21.06	Received PZD6		0–13	0
P21.07	Received PZD7		0–13	0
P21.08	Received PZD8		0–13	0
P21.09	Received PZD9		0–13	0
P21.10	Received PZD10		0–13	0
P21.11	Received PZD11		0–13	0
P21.12	Received PZD12		0–13	0

The following table describes the PZD words in the PROFIBUS-DP communication with the master. For the PWM filter, the words are received.

Function code	Name	Description
0	Invalid	
1	DC voltage setting	0–20000; Unit: 0.1V
2	Active current reference	-1500–1500, 1000 corresponding to 100.0% of the rectifier rated current
3	Reactive current reference	-1500–1500, 1000 corresponding to 100.0% of the rectifier rated current
4	Virtual input terminal command	0x00–0xFF
5	AO setting 1	-1000–1000, 1000 corresponding to 100.0%
6	AO setting 2	-1000–1000, 1000 corresponding to 100.0%
7	Positive active-current limit	0–2000, 1000 corresponding to 100.0% of the rectifier rated current
8	Negative active-current limit	0–2000, 1000 corresponding to 100.0% of the rectifier rated current
9	Positive reactive-current limit	0–2000, 1000 corresponding to 100.0% of the rectifier rated current
10	Negative reactive-current limit	0–2000, 1000 corresponding to 100.0% of the rectifier rated current
11–13	Reserved	

P21.02–P21.12 can be modified in any state.

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Setting range</th><th>Default</th></tr>
<tr><td>P21.13</td><td>Sent PZD2</td><td rowspan="11">0: Invalid
1: DC voltage
2: DC voltage feedback
3: Input voltage valid value
4: Input current valid value
5: Input power
6: Input power factor
7: Grid frequency
8: Active current feedback
9: Reactive current feedback
10: Fault code
11: AI1 input
12–13: Reserved
14: Terminal input status
15: Terminal output status
16: Running status word
17–20: Reserved</td><td>0–20</td><td>0</td></tr>
<tr><td>P21.14</td><td>Sent PZD3</td><td>0–20</td><td>0</td></tr>
<tr><td>P21.15</td><td>Sent PZD4</td><td>0–20</td><td>0</td></tr>
<tr><td>P21.16</td><td>Sent PZD5</td><td>0–20</td><td>0</td></tr>
<tr><td>P21.17</td><td>Sent PZD6</td><td>0–20</td><td>0</td></tr>
<tr><td>P21.18</td><td>Sent PZD7</td><td>0–20</td><td>0</td></tr>
<tr><td>P21.19</td><td>Sent PZD8</td><td>0–20</td><td>0</td></tr>
<tr><td>P21.20</td><td>Sent PZD9</td><td>0–20</td><td>0</td></tr>
<tr><td>P21.21</td><td>Sent PZD10</td><td>0–20</td><td>0</td></tr>
<tr><td>P21.22</td><td>Sent PZD11</td><td>0–20</td><td>0</td></tr>
<tr><td>P21.23</td><td>Sent PZD12</td><td>0–20</td><td>0</td></tr>
</table>

The following table describes the PZD words in the PROFIBUS-DP communication with the master. For the PWM filter, the words are sent.

Function code	Name	Description
0	Invalid	
1	DC voltage	*10, V
2	DC voltage feedback	*10, V
3	Input voltage valid value	*1, V
4	Input current valid value	*10, A
5	Input power	*10, kW
6	Input power factor	*100
7	Grid frequency	*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 input	*100, V
12	Reserved	
13	Reserved	
14	Terminal input status	
15	Terminal output status	
16	Running status word	
17–20	Reserved	

P21.13–P21.23 can be modified in any state.

Function code	Name	Description	Setting range	Default
P21.24	Temporary variable 1 for PZD sending	0–65535	0–65535	0

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

P21.24 can be written in any state.

Function code	Name	Description	Setting range	Default
P21.25	DP communication timeout time	0.0 (invalid); 0.1–60.0s	0.0–60.0	0.0s

When the function code is set to 0.0s, DP communication timeout is not considered as a fault. When it is set to a non-zero value, the rectifier reports a DP communication fault (E_dP) if the communication interval exceeds the value.

Function code	Name	Description	Setting range	Default
P21.29	CANopen communication baud rate	0: 1000k 1: 800k 2: 500k 3: 250k 4: 125k 5: 100k 6: 50k 7: 20k	0–7	2

The function code is used to set the rate of data transmission between two VFDs that are configured with the CANopen bus.

Function code	Name	Description	Setting range	Default
P21.30	CANopen communication timeout time	0.0 (invalid) 0.1–100.0s	0.1–100.0	0.0s

When the function code is set to 0.0, the CANopen communication timeout time is invalid.

When the function code is set a non-zero value, the rectifier reports the "Communication fault" (E_CAN) if the communication interval exceeds the value. In general, the function code is set to 0.0. When continuous communication is required, you can set the function code to monitor communication status.

Function code	Name	Description	Setting range	Default
P21.31	CANopen communication protocol	0: Common control protocol 1: Internal master/salve communication protocol	0–1	0

The function code is used to select a CANopen communication protocol.

Function code	Name	Description	Setting range	Default
P21.32	Enabling active/reactive current limit	0: Disable 1: Enable	0–1	0

When the function is enabled, active and reactive currents are restricted both by P03.06–P03.09 but also the active and reactive current limits for PZD receiving in group P21.

5.2.14 P22 group—Ethernet communication

Function code	Name	Description	Setting range	Default
P22.00	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

The function code is used to set the Ethernet communication rate. Generally, the default value is retained.

Function code	Name	Description	Setting range	Default
P22.01	IP address 1	0–255	0–255	192
P22.02	IP address 2	0–255	0–255	168
P22.03	IP address 3	0–255	0–255	0
P22.04	IP address 4	0–255	0–255	1
P22.05	Subnet mask 1	0–255	0–255	255
P22.06	Subnet mask 2	0–255	0–255	255
P22.07	Subnet mask 3	0–255	0–255	255
P22.08	Subnet mask 4	0–255	0–255	0

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

IP address format: P22.01.P22.02.P22.03.P22.04

IP address example: 192.168.0.1

Subnet mask format: P22.05.P22.06.P22.07.P22.08

Subnet mask example: 255.255.255.0

Function code	Name	Description	Setting range	Default
P22.09	Gateway address 1	0–255	0–255	192
P22.10	Gateway address 2	0–255	0–255	168
P22.11	Gateway address 3	0–255	0–255	1
P22.12	Gateway address 4	0–255	0–255	1

The function codes are used to set gateways for Ethernet communication.

5.3 Fault information and fault handling

Fault code	Fault type	Possible cause	Solution
oC	Input overcurrent	Incorrect current or voltage loop parameter setting Hardware circuit exception Rectifier overload	Adjust the current or voltage loop parameter setting. Ask for technical support. Adjust the load or select a higher-level rectifier.
LvI	Grid undervoltage	Abnormal input power outage Input voltage detection circuit exception	Check the input power for recovery. Ask for technical support.
ovI	Grid overvoltage	Input power exception Interference Input voltage detection circuit exception	Check the input power for recovery. Check for and remove the external interference source. Ask for technical support.

Fault code	Fault type	Possible cause	Solution
SPI	Grid phase loss	Input power cable disconnection or power exception Power phase loss detection circuit exception Interference	Check the input power for recovery. Ask for technical support. Check for and remove the external interference source.
PLLF	Phase lock failure	Grid environment exception, such as the sudden change of grid frequency or voltage Grid voltage sampling board circuit exception	Check for and remove the interference source. Ask for technical support.
Lv	DC undervoltage	Input power exception Bus voltage detection circuit exception Interference	Check the input power for recovery. Ask for technical support. Check for and remove the external interference source.
ov	DC overvoltage	Input power exception Bus voltage detection circuit exception Interference	Check the input power for recovery. Ask for technical support. Check for and remove the external interference source.
ItE	Current detection fault	Hall component damage, circuit exception, or interference	Check for and remove the interference source.
E_dP	PROFIBUS communication fault	PROFIBUS communication disconnection Incorrect PROFIBUS communication settings	Check and restore the connection. Set parameters correctly.
E_485	RS485 communication fault	Incorrect baud rate Serial communication error Long period of communication interruption	Set a proper baud rate. Press STOP/RST for reset or ask for technical support. Check the communication port cable.
E_CAN	CANopen communication fault	Incorrect baud rate Serial communication error Long period of communication interruption	Set a proper baud rate. Press STOP/RST for reset or ask for technical support. Check the communication port cable.
E_Net	Ethernet communication fault	Communication disconnection Incorrect parameter settings	Check and restore the connection. Set parameters correctly.
E_dEv	DEVICE_NET communication fault	Communication disconnection Incorrect parameter settings	Check and restore the connection. Set parameters correctly.

Fault code	Fault type	Possible cause	Solution
UIU	Power unit with uneven current	The fault is reported when the average-current difference between power units reached 20%. The possible causes are as follows: Power unit with filter unit wires in poor contact or disconnected Power unit with reactor damaged or aged	Consult us. Check the filter unit wiring of the power unit. Replace the reactor.
oL	Rectifier overload	Allowed load exceeded	Adjust the load or select a higher-level rectifier.
EEP	EEPROM operation error	Error in reading or writing control parameters DPRAM chip damage	Press STOP/RST for reset or ask for technical support. Ask for technical support.
tbE	Main contactor fault	Contactor damage or contactor coil power exception Auxiliary contact exception Interference	Check whether the contactor can actuate properly. Check whether the auxiliary contact loop is normal. Check for and remove the external interference source.
E_Sto	STO fault	STO terminal disconnection	Check the external controller.
EF	External fault	SI external faulty input terminal action	Check external device input.
dIS	Rectifier disabled	External digital terminal no action though rectifier enabling is selected in the digital output function	Press the corresponding digital terminal, enter group P5, and cancel the function.
PCE	Keypad/panel communication fault	Keypad cable connected improperly or disconnected Keypad cable too long, causing strong interference Keypad or mainboard communication circuit error	Check the keypad cable to determine whether a fault occurs. Check for and remove the external interference source. Replace the hardware and seek maintenance services.
UPE	Parameter upload fault	Keypad cable connected improperly or disconnected Keypad cable too long, causing strong interference Keypad or mainboard communication circuit error	Check for and remove the external interference source. Replace the hardware and seek maintenance services. Replace the hardware and seek maintenance services.
dNE	Parameter download fault	Keypad cable connected improperly or disconnected Keypad cable too long, causing strong interference Keypad data storage error	Check for and remove the external interference source. Replace the hardware and seek maintenance services. Re-back up the data on the keypad.

Fault code	Fault type	Possible cause	Solution
ENd	Running time reached	Preset running time reached	Change the time or ask for technical support.
PC_t1	Power-on buffer half-voltage timeout	Unit disabled Abnormal optical fiber connection Power-on buffer timeout time 1 set improperly Buffer resistor damage Buffer contactor fault	Ensure the rectifier enabling bit is set correctly. Ensure the optical fiber is connected properly. Increase the value of power-on buffer timeout time 1. Ensure the buffer resistor without damage is used. Ensure the buffer contactor without fault is used.
PC_t2	Power-on buffer timeout	Power-on buffer timeout time 2 set improperly Buffer resistor damage Buffer contactor fault	Increase the value of power-on buffer timeout time 2. Ensure the buffer resistor without damage is used. Ensure the buffer contactor without fault is used.
E-ASC	Slave communication fault	Improper optical fiber connection for master/slave communication Aged optical fiber for master/slave communication	Check whether the master/slave communication optical fiber is connected properly. Check whether the master/slave communication optical fiber is aged.
E-SLE	Slave fault	Fault occurring to the slave	Check slave settings and ambient environment.
CPoE	Control power fault	Switch power with improper working voltage (too high, too low, or damaged)	Check whether the switch power is normal and whether the power board is normal.

5.4 Function parameter list

The function parameters are divided into groups by function, and each group includes several function codes (each function code identifies a function parameter). A three-level menu style is applied to function codes. For example, "P00.08" indicates the 8th function code in the P00 group. The P29 group consists of factory function parameters, which are user inaccessible.

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

The content of the function code table is as follows:

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

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

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

Column 4 "Setting range": Setting range of the function parameter

Column 5 "Default": Initial value set in factory

Column 6 "Modify": Whether the function parameter can be modified, and conditions for the modification

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

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

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

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

The parameters adopt the decimal system (DEC). If the hexadecimal system is adopted, all bits are mutually independent during parameter editing, and the setting ranges at some bits can be hexadecimal (0–F).

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

To better protect parameters, the VFD provides the password protection function. After a password is set (that is, P07.00 is set to a non-zero value), "0.0.0.0.0" is displayed when you press the PRG/ESC key to enter the function code editing interface. You need to enter the correct user password to enter the interface. For the factory parameters, you need to enter the correct factory password to enter the interface. (You are not advised to modify the factory parameters. Incorrect parameter setting may cause operation exceptions or even damage to the VFD.) If password protection is not in locked state, you can change the password any time. You can set P07.00 to 0 to cancel the user password. When P07.00 is set to a non-zero value during power-on, parameters are prevented from being modified by using the user password function.

When you modify function parameters through serial communication, the user password protection function is also applicable and compliant with the same rule.

Function code	Name	Description	Setting range	Default	Modify
P00 group—Basic functions					
P00.00	Working mode	0: PWM rectifier 1: Six-pulse rectifier	0–1	1	◎
P00.01	Channel of running commands	0: Keypad (the indicator is off) 1: Terminal (the indicator blinks) 2: Communication (the indicator is on)	0–2	0	◎
P00.02	Communication mode of running commands	0: RS485 1: PROFIBUS 2: Ethernet	0–2	0	◎
P00.03	Communication mode for setting DC bus voltage	0: RS485 1: PROFIBUS/CANopen 2: Ethernet 3: Reserved 4: DEVICE_NET	0–4	0	◎
P00.04	DC bus voltage setting method	0: Automatic 1: Keypad 2: Communication	0–2	1	◎

Function code	Name	Description	Setting range	Default	Modify
P00.05	DC bus voltage setting	300.0–4000.0V	300.0–4000.0V	AC400V: 680V; AC690: 1050V	○
P00.06	Active current mode	0: DC bus closed-loop mode 1: Active current closed-loop mode	0–1	0	◎
P00.07	Reactive current mode	0: COS mode 1: Reactive current closed-loop mode	0–1	1	◎
P00.08	Current zero-drift setting mode	0: Automatic 1: Manual	0–1	0	◎
P00.09	Current zero-drift setting	-100.0%–100.0%	-100.0%–100.0%	0	◎
P00.10	Cooling-fan running mode	0: Normal mode 1: Permanent running after power-on	0–1	0	○
P00.11	Current loop decoupling	0: Invalid 1: Valid	0–1	1	●
P00.12	Voltage feedforward filter coefficient	0–12	0–12	8	●
P00.13	Enabling filter-capacitor reactive compensation	0: Disable 1: Enable	0–1	0	◎
P00.14	Carrier frequency	1.0–8.0kHZ	1.0–8.0kHZ	3.0	◎
P00.15	Function parameter restore	0: No operation 1: Restore default values 2: Clear fault records 3: Clear accumulative electricity consumption	0–3	0	◎
P00.16	Function parameter property	0: Invalid 1: Read only	0–1	0	○
P01 group—Power-on control and protection					
P01.00	Unit valid bit control	0x00–0x3F Each bit stands for a unit. If BIT0 is 1, unit 1 is valid. The function code is restricted by P08.03. The unit specified by the function code is valid only when the bit specified by P08.03 is 1.	0x01–0x3F	0x3F	◎
P01.01	Detecting main contactor actuation feedback	0: Not detect 1: Detect	0–1	1	◎

Function code	Name	Description	Setting range	Default	Modify
P01.02	Power-on buffer control mode (buffer contactor)	0: Automatic actuation after power-on 1: Terminal control 2: Communication control	0–2	0	◎
P01.03	Communication mode of power-on buffer control	0: RS485 1: PROFIBUS/CANopen 2: Ethernet 3: Reserved 4: DEVICE_NET	0–4	0	◎
P01.04	Power-on buffer timeout time 1	When the buffer charge duration exceeds the time specified by the function code, but the DC voltage does not reach 50% of the rated AC voltage, the buffer charge half-voltage timeout fault is reported.	0.01–10.00s	1.00s	○
P01.05	Power-on buffer timeout time 2	When the buffer charge duration exceeds the time specified by the function code, but the DC voltage does not reach 85% of the rated AC voltage, the buffer charge half-voltage timeout fault is reported.	0.01–10.00s	3.00s	○
P01.06	Auto-running wait time	Time to wait for the system to become stable (such as phase-locked loop) before automatic running. When P01.06 is set to 0.0s, automatic running is invalid.	0.0–3600.0s	0.0s	○
P01.07	Delay of auto fault reset	0.0–3600.0s	0.0–3600.0s	1.0s	○
P01.08	Auto fault reset count	When P01.08 is 0, automatic fault reset is invalid. When P01.08 is not 0, automatic fault reset is valid and is performed after the time specified by P01.07. Automatic fault reset is inapplicable to the following faults: Slave communication fault (E_ASC), slave fault (E_SLE), external fault (EF), rectifier not enabled (dIS), power-on buffer half-voltage timeout fault (PC_t1), power-on buffer timeout fault (PC_t2), phase-U Vce check fault (oUt1), phase-V Vce check fault (oUt2), phase-W Vce check fault (oUt3), rectifier bridge overheating	0–10	0	○

Function code	Name	Description	Setting range	Default	Modify
		fault (oH1), IGBT overheating fault (oH2), and external-fault (EF).			
P02 group—Master/slave control (Reserved)					
P02.00	Master/slave mode	0: Single-node mode 1: Master/slave mode 1 2: Master/slave mode 2 **Note:** Single-node mode: Master/slave mode is invalid. Master/slave mode 1: Applicable to the scenarios without input isolation transformers (only optical fiber can be used for communication). Master/slave mode 2: Applicable to the scenarios with input isolation transformers.	0–2	0	◎
P02.01	Master/slave setting	Indicates whether the current device is the master or slave in master/slave mode. 0: Master 1: Slave	0–1	0	◎
P02.02	Master/slave communication mode	0: Optical fiber 1: RS485 2: PROFIBUS/CANopen 3: Ethernet 4: Reserved 5: DEVICE_NET **Note: Master/slave mode 1 supports only optical-fiber communication. Master/slave mode 2 supports all the options 0–5. The options 2–5 are available only when corresponding communication cards are configured.**	0–5	0	◎
P02.03	Active-current partition coefficient	0.0%–200.0% Valid only for master/slave mode 2	0–200.0%	100.0%	○
P02.04	Slave running command control mode	0: Locally controlled 1: Master controlled The running, stop, and reset of the slave can be controlled by the master or slave itself. If it is master controlled, the running status of the salve is synchronized with the master.	0–1	0	○

Function code	Name	Description	Setting range	Default	Modify
		Note: In master/slave mode 1, the fault reset function cannot be synchronized.			
P02.05	Slave fault handling	0: Stop 1: Keep running The function code is valid only for the master in master/slave mode 2. For the master, the function code indicates whether the master stops when receiving the slave fault (the slave stops only if the master stops).	0–1	0	○
P02.06	Slave bypassing	0: Not bypass 1: Bypass The function code is valid only for the slave in master/slave mode 2. If a slave node reports a fault and the fault cannot be reset when multi-slave nodes are used, the faulty slave node can be bypassed to ensure the normal running of the entire system.	0–1	0	○
P02.07	Slave count	0–16. The function code displays the number of slave nodes that the master controls in master/slave mode 2. The function code is valid only for the master in master/slave mode 2.	0–16	0	●
P03 group—Control parameters					
P03.00	Active current setting channel	0: Keypad 1: AI1 2: AI2 3: AI3 4: Communication **Note: It is applicable only to the current closed-loop running mode.**	0–4	0	◎
P03.01	Active current setting on keypad	-150.0%–150.0% (of the rectifier rated current)	-150.0–150.0%	0.0%	○
P03.02	Communication mode for setting active current	0: RS485 1: PROFIBUS/CANopen 2: Ethernet 3: Reserved 4: DEVICE_NET	0–4	0	◎

Function code	Name	Description	Setting range	Default	Modify
P03.03	Reactive current setting channel	0: Keypad 1: AI1 2: AI2 3: AI3 4: Communication **Note: It is applicable only to the reactive power compensation running mode.**	0–4	0	◎
P03.04	Reactive current setting on keypad	-150.0%–150.0% (of the rectifier rated current) Reactive current setting is used for reactive compensation. (A negative value indicates capacitive, while a positive value indicates inductive.)	-150.0–150.0%	0.0%	○
P03.05	Communication mode for setting reactive current	0: RS485 1: PROFIBUS/CANopen 2: Ethernet 3: Reserved 4: DEVICE_NET	0–4	0	◎
P03.06	Positive limit on active current	0.0–200.0% (of the rectifier rated current) P03.06 indicates the maximum active current at rectifier output. It is valid only for the COSφ running mode and reactive power compensation mode.	0.0–200.0%	150.0%	○
P03.07	Negative limit on active current	0.0–200.0% (of the rectifier rated current) P03.07 indicates the maximum active current at energy feedback. It is valid only for the COSφ running mode and reactive power compensation mode.	0.0–200.0%	150.0%	○
P03.08	Positive limit on reactive current	0.0–200.0% (of the rectifier rated current) P03.08 indicates the maximum reactive current at rectifier output. It is valid only for the COSφ running mode and reactive power compensation mode.	0.0–200.0%	150.0%	○
P03.09	Negative limit on reactive current	0.0–200.0% (of the rectifier rated current) P03.09 indicates the maximum reactive current at energy feedback.	0.0–200.0%	150.0%	○

Function code	Name	Description	Setting range	Default	Modify
		It is valid only for the COSφ running mode and reactive power compensation mode.			
P03.10	Max. current setting	0–250.0% (of the rectifier rated current) If the combination of the active current and reactive current exceeds the maximum current setting, the reactive current component setting is automatically reduced to ensure the current is within the range. **Note: It is valid only in the reactive power compensation running mode and COSφ running mode.**	0–250.0%	200.0%	○
P03.11	Voltage-loop proportional coefficient 1	The absolute value of the difference between the DC voltage setting for the PI regulation in the voltage loop and the DC voltage feedback is Δ. When Δ is less than the PI parameter switching voltage, PI parameter 1 is used. When Δ is equal to or greater than the PI parameter switching voltage, PI parameter 2 is used.	0. 001–30.000	1.500	○
P03.12	Voltage-loop integral coefficient 1		0. 01–300.00	5.00	○
P03.13	Voltage-loop proportional coefficient 2		0.001–30.000	2.000	○
P03.14	Voltage-loop integral coefficient 2		0.01–300.00	5.00	○
P03.15	PI parameter switching voltage		0.01–30.00	20.00V	○
P03.16	DC bus filter cut-off frequency	50–4000Hz	50–4000Hz	2000Hz	○
P03.17	Current-loop proportional coefficient P	0.001–30.000	0. 001–30.000	0.800	○
P03.18	Current-loop integral coefficient I	0. 01–300.00	0. 01–300.00	0.40	○
P03.19	Power factor setting method	0: Angle based 1: Direct setting **Note:** The power factor setting method is valid only in the COSφ running mode and current closed-loop running mode.	0–1	0	◎
P03.20	Rectifier power factor angle (COSφ)	-90.0°–90.0° A positive value indicates inductive, while a negative value indicates capacitive.	-90.0–90.0°	0.0°	○
P03.21	Feedback power factor angle (COSφ)			0.0°	○

Function code	Name	Description	Setting range	Default	Modify
P03.22	Rectifier power factor (fundamental)	-100.0%–100.0% A positive value indicates inductive, while a negative value indicates capacitive.	-100.0%–100.0%	100.0%	○
P03.23	Feedback power factor (fundamental)			100.0%	○
P03.24	Neutral-point balancing control	0: Disable 1: Enable	0–1	1	◎
P03.25	Neutral-point balancing control mode	0: Hysteresis mode 1: Proportional mode	0–1	0	◎
P03.26	Neutral-point balancing control proportion	0–10.00	0–10.00	0.10	○
P03.27	Phase-lock loop proportion	10.0–1000.0	10.0–1000.0	100.0	○
P03.28	Phase-lock loop integral	0.20–30.00	0.20–30.00	0.50	○
P03.29	Overmodulation	0–1	0–1	1	◎
P03.30	Enabling high grid voltage	0: Disable 1: Enable	0–1	0	◎
P03.31	High grid voltage adjustment Kp	0.00–10.00	0–10.00	0.20	○
P03.32	High grid voltage adjustment Ki	0.00–100.00	0–100.00	4.00	○
P03.33	Impedance adjustment coefficient (for Ualpha and Ubeta)	0.000–5.000	0–5.000	0.000	◎
P03.34	PI output limit of current loop Idq	0.000–2.000	0.000–2.000	0.600	◎
P03.35	Virtual damping factor	0.000–2.000	0.000–2.000	0.200	◎
P04 group—Filter parameters					
P04.00	Phase-lock frequency	10–1000	10–1000	50	◎
P04.01	Phase-lock 1st-order filter damping factor	0.000–5.000	0.000–5.000	1.414	◎
P04.02	Phase-lock 2nd-order filter damping factor	0.000–5.000	0.000–5.000	0.141	◎
P04.03	Bus power feedforward filter frequency	0–2000	0–2000	200	◎

Function code	Name	Description	Setting range	Default	Modify
P04.04	Bus power feedforward damping factor	0.000–5.000	0.000–5.000	1.414	◎
P04.05	Low-pass filter cut-off frequency in current-loop Idq feedback	0–5000	0–5000	2000	◎
P04.06	Loop lead-lag center frequency	0–4000	0–4000	1000	◎
P04.07	Loop lead-lag angle	-80.0°–80.0°	-80.0°–80.0°	0.0°	◎
P04.08	Reserved				
P04.09	Resonant high-pass filter damping factor	0.000–5.000	0.000–5.000	0.707	◎
P04.10	LCL resonance compensation coefficient	0.00–5.00	0.00–5.00	1.50	◎
P04.11	High-frequency harmonic compensation coefficient	0.00–10.00	0.00–10.00	0.00	◎
P04.12	Damping high-pass filter cut-off frequency	0–5000	0–5000	810	◎
P04.13	Damping low-pass filter cut-off frequency	0–5000	0–5000	2000	◎
P04.14	Phase-lock method	0–7	0–7	0	◎
P05 group—Input terminals					
P05.00	Reserved				
P05.01	Function of S1	0: No function 1: Run 2: Fault reset 3: External fault 4: Slave fault 5: Enable running (DIS fault) 6: Switch between master and slave 7: Reserved 8: Enable the rectifier 9: Control power-on buffer 10: Switch the running command channel to keypad 11: Switch the running command channel to terminal	0–15	0	◎
P05.02	Function of S2			0	◎
P05.03	Function of S3			0	◎
P05.04	Function of S4			0	◎
P05.05	Function of S5			0	◎
P05.06	Function of S6			0	◎
P05.07	Function of S7			0	◎
P05.08	Function of S8			0	◎

Function code	Name	Description	Setting range	Default	Modify
		12: Switch the running command channel to communication 13: Clear accumulative electricity consumption 14: Keep accumulative electricity consumption 15: Reserved			
P05.09	Digital input terminal polarity	0x00–0xFF 0 indicates positive. BIT0: S1 BIT1: S2 … BIT7: S8	0x00–0xFF	0x00	◎
P05.10	Digital input filter time	Digital input filter time	0.000–1.000s	0s	○
P05.11	Virtual input terminal setting	Specifies whether to enable the virtual input terminals in communication mode. 0: Virtual input terminals are invalid 1: MODBUS communication virtual terminals are valid 2: PROFIBUS/CANopen communication virtual terminals are valid 3: Ethernet virtual terminals are valid 4–10: Reserved	0–10	0	◎
P05.12	Reserved				
P05.13	S1 switch-on delay	The function codes specify the delay time corresponding to the electrical level changes when the programmable input terminals switch on or switch off.	0.000–60.000s	0.000s	○
P05.14	S1 switch-off delay			0.000s	○
P05.15	S2 switch-on delay			0.000s	○
P05.16	S2 switch-off delay			0.000s	○
P05.17	S3 switch-on delay			0.000s	○
P05.18	S3 switch-off delay			0.000s	○
P05.19	S4 switch-on delay			0.000s	○
P05.20	S4 switch-off delay			0.000s	○
P05.21	S5 switch-on delay			0.000s	○
P05.22	S5 switch-off delay			0.000s	○
P05.23	S6 switch-on delay			0.000s	○
P05.24	S6 switch-off delay			0.000s	○

Function code	Name	Description	Setting range	Default	Modify
P05.25	S7 switch-on delay			0.000s	○
P05.26	S7 switch-off delay			0.000s	○
P05.27	S8 switch-on delay			0.000s	○
P05.28	S8 switch-off delay			0.000s	○
P05.29	AI1 lower limit	0.00V–P05.31	0.00V–P05.31	0.00V	○
P05.30	Corresponding setting of AI1 lower limit	-100.0%–P05.32	-100.0%–P05.32	0.0%	○
P05.31	AI1 upper limit	P05.29–10.00V	P05.29–10.00V	10.00V	○
P05.32	Corresponding setting of AI1 upper limit	P05.30–100.0%	P05.30–100.0%	100.0%	○
P05.33	AI1 input filter time	0.00s–10.000s	0.00s–10.000s	0.100s	○
P05.34	AI2 lower limit	0.00V–P05.36	0.00V–P05.36	0.00V	○
P05.35	Corresponding setting of AI2 lower limit	-100.0%–P05.37	-100.0%–P05.37	0.0%	○
P05.36	AI2 upper limit	P05.34–10.00V	P05.34–10.00V	10.00V	○
P05.37	Corresponding setting of AI2 upper limit	P05.35–100.0%	P05.35–100.0%	100.0%	○
P05.38	AI2 input filter time	0.00s–10.000s	0.00s–10.000s	0.100s	○
P05.39	AI3 lower limit	-10.00V–P05.41	-10.00V–P05.41	-10.00V	○
P05.40	Corresponding setting of AI3 lower limit	-100.0%–P05.42	-100.0%–P05.42	-100.0%	○
P05.41	AI3 middle value	P05.39–P05.43	P05.39–P05.43	0.00V	○
P05.42	Corresponding setting of AI3 middle value	P05.40–P05.44	P05.40–P05.44	0.0%	○
P05.43	AI3 upper limit	P05.41–10.00V	P05.41–10.00V	10.00V	○
P05.44	Corresponding setting of AI3 upper limit	P05.42–100.0%	P05.42–100.0%	100.0%	○

Function code	Name	Description	Setting range	Default	Modify
P05.45	AI3 input filter time	0.000s–10.000s	0.000s–10.000s	0.100s	○
P05.46	Input voltage valid value	Displays the present input voltage of the VFD. 0.0–2000V	0–2000	0.0V	●
P05.47	Input current valid value	Displays the present input current of the VFD. 0.0–6000A	0.0–6000	0.0A	●
P05.48	DC bus voltage	Displays the present DC bus voltage of the VFD. 0.0–2000V	0.0–2000	0.0V	●
P05.49	Grid frequency	Displays the present input grid frequency of the VFD. 0.00–120Hz	0.00–120	0.00Hz	●
P05.50–P05.53	Reserved				
P05.54	Droop starting threshold	0–500	0–500	50	●
P05.55	Enabling droop	0: Disable 1: Enable	0–1	1	●
P05.56	Bus droop quantity	0–4096	0–4096	2400	●
P05.57	Control step	5: Stopped 6: Running			●
P05.58	Run step	0: Initialization 1: Standby 6: Normal running 10: Fault handling 14: Stopped normally 15: Stopped			●
P05.59	Grid phase frequency	0: Standby 1: Positive sequence 2: Negative sequence			●
P06 group—Output terminals					
P06.00	Reserved				
P06.01	Y1 output	0: No output 1: Ready for running 2: Running 3: Fault output 4: Master mode	0–31	0	○
P06.02	Y2 output			0	○
P06.03	RO1 output			0	○
P06.04	RO2 output			0	○
P06.05	RO3 output			0	○

Function code	Name	Description	Setting range	Default	Modify
P06.06	RO4 output	5: Slave mode 6: Buffer contactor actuation command 7: Main contactor actuation status 8: MODBUS communication virtual terminal output 9: PROFIBUS/CANopen communication virtual terminal output 10: Ethernet communication virtual terminal output 11–31: Reserved		0	○
P06.07	Digital output terminal polarity	0x00–0x3F; When a bit is 0, the output terminal is positive. Bit 0 corresponds to Y1. Bit 1 corresponds to Y2. Bit 2 corresponds to RO1. Bit 3 corresponds to RO2. Bit 4 corresponds to RO3. Bit 5 corresponds to RO4. BIT6–BIT7: Reserved	0x00–0x3F	0x00	○
P06.08	Y1 switch-on delay	0.000–60.000s	0.000–60.000	0.000s	○
P06.09	Y1 switch-off delay	0.000–60.000s	0.000–60.000	0.000s	○
P06.10	Y2 switch-on delay	0.000–60.000s	0.000–60.000	0.000s	○
P06.11	Y2 switch-off delay	0.000–60.000s	0.000–60.000	0.000s	○
P06.12	RO1 switch-on delay	The function codes specify the delay time corresponding to the electrical level changes when the programmable output terminals switch on or switch off.	0.000–60.000	0.000s	○
P06.13	RO1 switch-off delay			0.000s	
P06.14	RO2 switch-on delay			0.000s	○
P06.15	RO2 switch-off delay			0.000s	○
P06.16	RO3 switch-on delay			0.000s	○
P06.17	RO3 switch-off delay			0.000s	○
P06.18	RO4 switch-on delay			0.000s	○
P06.19	RO4 switch-off delay			0.000s	○
P06.20	AO1 output	0: None 1: DC voltage setting (For AC400, 100% corresponds to 1000V; For AC690, 100% corresponds to 1500V.) 2: DC voltage actual value (For	0–20	0	○
P06.21	AO2 output			0	○

Function code	Name	Description	Setting range	Default	Modify
		AC400, 100% corresponds to 1000V; For AC690, 100% corresponds to 1500V.) 3: Input voltage valid value (100% corresponds to 2*Vn) 4: Input current valid value (100% corresponds to In*2) 5: Input power (100% corresponds to 2*Vn*In) 6: Input power factor (%) 7: Grid frequency (100% corresponds to 100.0Hz) 8: Active current reference (100% corresponds to double the rectifier rated current.) 9: Active current feedback (100% corresponds to double the rectifier rated current.) 10: Reactive current reference (100% corresponds to double the rectifier rated current.) 11: Reactive current feedback (100% corresponds to double the rectifier rated current.) 12: Value 1 set through Modbus communication (1000 corresponds to 100%) 13: Value 2 set through Modbus communication (1000 corresponds to 100%) 14: Value 1 set through PROFIBUS/CANopen communication (1000 corresponds to 100%) 15: Value 2 set through PROFIBUS/CANopen communication (1000 corresponds to 100%) 16: Value 1 set through Ethernet communication (1000 corresponds to 100%) 17: Value 2 set through Ethernet communication (1000 corresponds to 100%) 18: AI1 input 19: AI2 input 20: AI3 input			

Function code	Name	Description	Setting range	Default	Modify
P06.22	Reserved				
P06.23	AO1 output lower limit	0.0%–P06.25	0.0%–P06.25	0.0%	○
P06.24	AO1 output corresponding to lower limit	0.00– P06.26 V	0.00–P06.26V	0.00V	○
P06.25	AO1 output upper limit	P06.25–100.0%	P06.25–100.0%	100.0%	○
P06.26	AO1 output corresponding to upper limit	P06.24–10.00V	P06.24–10.00V	10.00V	○
P06.27	AO1 output filter time	0.000–10.000s	0.000–10.000s	0.000s	○
P06.28	AO2 output lower limit	-100.0%–P06.30	-100.0%–P06.30	0.0%	○
P06.29	AO2 output corresponding to lower limit	-10.00– P06.31 V	-10.00–P06.31 V	0.00V	○
P06.30	AO2 output upper limit	P06.28–100.0%	P06.28–100.0%	100.0%	○
P06.31	AO2 output corresponding to upper limit	P06.29–10.00V	P06.29–10.00V	10.00V	○
P06.32	AO2 output filter time	0.000–10.000s	0.000–10.000s	0.000s	○
P06.33–P06.40	Reserved				
P06.41	Enabling SD card	0: Enable 1: Disable	0–1	0	●
P06.42	SD card connection success flag	0: Failed 1: Successful			●
P06.43	File address high-order bits read when SD card power-on	0–65535	0–65535	0	●
P06.44	File address low-order bits read when SD card power-on	0–65535	0–65535	0	●
P06.45	File address high-order bits when SD card running	0–65535	0–65535	0	●

Function code	Name	Description	Setting range	Default	Modify
P06.46	File address low-order bits when SD card running	0–65535	0–65535	0	●
P06.47	SD card power-on count	0–65535	0–65535	0	●
P06.48–P06.49	Reserved				
P07 group—Human-machine interface					
P07.00	User password	0–65535 When you set the function code to a non-zero number, password protection is enabled. The value 0 indicates password protection is disabled. After the user password is set and takes effect, you cannot enter the parameter menu if you enter an incorrect password.	0–65535	0	○
P07.01	Parameter copy	Parameter copy mode. 0: No operation 1: Upload parameters from the local address to the keypad 2: Download parameters from the keypad to the local address **Note:** After the operation corresponding to 1 or 2 is complete, the function code restores to 0.	0–2	0	◎
P07.02	Function of QUICK/JOG	0: No function 1: Switch displayed function codes from right to left by Pressing QUICK/JOG 2: Switch command channels in sequence by pressing QUICK/ JOG 3: Quick commissioning mode (based on non-factory parameter settings)	0–3	0	○
P07.03	Sequence of switching running-command channels by pressing QUICK/JOG	When P07.02=2, set the sequence of switching running-command channels by pressing QUICK/JOG. 0: Keypad→Terminal→Communication 1: Keypad←→Terminal 2: Keypad←→Communication 3: Terminal←→Communication	0–3	0	○

Function code	Name	Description	Setting range	Default	Modify
P07.04	Stop function validity of STOP/RST	The function code specifies the stop function validity of STOP/RST. For fault reset, STOP/RST is valid in any conditions. 0: Valid only for keypad control 1: Valid both for keypad and terminal control 2: Valid both for keypad and communication control 3: Valid for all control modes	0–3	3	○
P07.05	Parameters displayed in rectifying state	0x0000–0xFFFF Bit 0: DC bus voltage (V) Bit 1: Grid frequency (Hz) Bit 2: Input voltage (V) Bit 3: Input current (A) Bit 4: Input power factor Bit 5: Active current component (%) Bit 6: Reactive current component (%) (% blinking) Bit 7: Input terminal status Bit 8: Output terminal status Bit 9: AI1 (V) Bit 10: AI2 (V) (V blinking) Bit 11: AI3 (V) Bit 12: Input apparent power (kVA) Bit 13: Input active power (kW) Bit 14: Input reactive power (kVar) Bit 15: Reserved	0–0xFFFF	0x000F	○
P07.06	Reserved				
P07.07	Factory bar code 1	0x0000–0xFFFF			●
P07.08	Factory bar code 2	0x0000–0xFFFF			●
P07.09	Factory bar code 3	0x0000–0xFFFF			●
P07.10	Factory bar code 4	0x0000–0xFFFF			●
P07.11	Factory bar code 5	0x0000–0xFFFF			●
P07.12	Factory bar code 6	0x0000–0xFFFF			●
P07.13–P07.16	Reserved				
P07.17	Accumulative electricity consumption high-order bits	The function codes are used to display the accumulative electricity consumption. Accumulative electricity consumption	-32767–32767kWh	0kWh	●

Function code	Name	Description	Setting range	Default	Modify
P07.18	Accumulative electricity consumption low-order bits	for running = P07.17*1000 + P07.18	-999.9–999.9 kWh	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 running time	0–65535h	0–65535h	0	●
P17 group—Overall status information					
P17.00	Rectifier rated power	0–6000.0kw	0–6000.0kw	Model depended	●
P17.01	Rectifier rated current	0.0–6000.0A	0.0–6000.0A	Model depended	●
P17.02	Valid unit count	0–6 It is determined by P02.00 and P17.03. That is, it is the bitwise AND operation result of the two function codes.	0–6	Depended on model and unit validity settings	●
P17.03	Default units	0x00–0x3F When a bit is 1, the corresponding unit is valid. When a bit is 0, the corresponding unit does not work. The function code is read only.	0x00–0x3F	0x00	●
P17.04	Valid unit count	0x00–0x3F	0x00–0x3F	0x00	●
P17.05	DC voltage	0.0–2000.0V	0.0–2000.0	0.0V	●
P17.06	Grid frequency	0.00–120.0Hz	0.00–120.0	0.0Hz	●
P17.07	Grid voltage	0–2000V	0–2000	0V	●
P17.08	Grid input current	0.0–6000.0A	0.0–6000.0	0.0A	●
P17.09	Power factor	-1.00–1.00	-1.00–1.00	0.00	●
P17.10	Active current percentage	-200.0–200.0%	-200.0–200.0	0.0%	●
P17.11	Reactive current percentage	-200.0–200.0%	-200.0–200.0	0.0%	●
P17.12	Digital input terminal status	0x00–0xFF; Bit 0 corresponds to S1; Bit 1 corresponds to S2; Bit 2 corresponds to S3. Displays the present digital input terminal status.	0x00–0xFF	0x00	●

Function code	Name	Description	Setting range	Default	Modify
P17.13	Digital output terminal status	0x00–0xFF; Bit 0 corresponds to Y1; Bit 1 corresponds to Y2; Bit 2 corresponds to RO1; Bit 3 corresponds to RO2; Bit 4 corresponds to RO3; Bit 5 corresponds to RO4. Displays the present digital output terminal status.	0x00–0xFF	0x00	●
P17.14	AI1 input voltage	0.00–10.00V	0.00–10.00	0.00V	●
P17.15	AI2 input voltage	0.00–10.00V	0.00–10.00	0.00V	●
P17.16	AI3 input voltage	-10.00V–10.00V	-10.00V–10.00	0.00V	●
P17.17	Input apparent power	0–6000.0kVA	0–6000.0	0. 0kVA	●
P17.18	Input active power	0–6000.0kW	0–6000.0	0 .0kW	●
P17.19	Input reactive power	0–6000.0kVar	0–6000.0	0. 0kVar	●
P17.20	3PH voltage unbalance factor	1.00–10.00	1.00–10.00	1	●
P17.21	Rectifier bridge temperature	-20.0–120.0°C	-20.0–120.0	0.0°C	●
P17.22	IGBT temperature	-20.0–120.0°C	-20.0–120.0	0.0°C	●
P18 group—Unit status information					
P18.00–P18.06	Reserved				
P18.07	Six-pulse mode enabling compensation angle	-90.0°–90.0°	-90–90	00.0	●
P18.08	Register BPRD viewing variable	3125–25000	3125–25000		●
P18.09	Analog current	0.0–200.0	0.0–200.0	0.0	●
P18.10	Analog voltage	0.0–200.0	0.0–200.0	0.0	●
P18.11	Reserved				
P18.12	Reserved				
P18.13	Analog grid selection	0: Normal mode 1: Test mode	0–1	0	●
P18.14	Analog DC voltage	0–6553.5	0–6553.5	0.0	●
P18.15	Analog grid frequency	0.0–200.0HZ	0.0–200.0	50.0Hz	●
P18.16	Virtual damping cut-in factor	0.00–10.00	0.00–10.00	0.00	●
P18.17	Frequency filter coefficient at SPI fault	0–15	0–15	05	●

Function code	Name	Description	Setting range	Default	Modify
P18.18	Pulse waves sent in commissioning	0–40	0–40	0	●
P18.19	Voltage sampling compensation angle	-90.0°–90°	-90.0–90	5.0	●
P19 group—Fault information					
P19.00	Present fault type	00: No fault 01: Input overcurrent (oC) 02: Grid undervoltage (LvI) 03: Grid overvoltage (ovI) 04: Grid phase loss (SPI) 05: Phase lock failure (PLLF) 06: DC undervoltage (Lv) 07: DC overvoltage (ov) 08: Current detection fault (ItE) 09: PROFIBUS communication fault (E_dP) 10: RS485 communication fault (E_485) 11: CANopen communication fault (E_CAN) 12: Ethernet communication fault (E_NEt) 13: DEVICE_NET communication fault (E_dEv) 14: Power unit with uneven current (UIU) 15: Rectifier overload (oL) 16: EEPROM operation error (EEP) 17: Main contactor actuation failure (tbE) 18: STO fault (E_Sto) 19: DSP-FPGA communication fault (dF_CE) 20: External fault (EF) 21: Rectifier disabled (dIS) 22: Keypad or panel communication fault (PCE) (Reserved) 23: Parameter upload fault (UPE) 24: Parameter download fault (dNE) 25: Running time reached (ENd) 26: Power-on buffer half-voltage timeout (PC_t1)	0–30	0	●
P19.01	Last fault type			0	●
P19.02	2nd-last fault type			0	●
P19.03	3rd-last fault type			0	●
P19.04	4th-last fault type			0	●
P19.05	5th-last fault type			0	●

Function code	Name	Description	Setting range	Default	Modify
		27: Power-on buffer timeout (PC_t2) 28: Slave communication fault (E_ASC) 29: Slave fault (E_SLE) 30: Control power fault (CPoE)			
P19.06	Input terminal status at present fault	0x00–0xFF	0x00–0xFF	0x00	●
P19.07	Output terminal status at present fault	0x00–0xFF	0x00–0xFF	0x00	●
P19.08	DC voltage at present fault	0.0–2000.0V	0.0–2000.0V	0.0V	●
P19.09	Grid voltage at present fault	0.0–2000.0V	0.0–2000.0V	0.0V	●
P19.10	Input current at present fault	0.0–6000.0A	0.0–6000.0A	0.0A	●
P19.11–P19.21	Reserved				
P19.22	Input terminal status at last fault	0x00–0xFF	0x00–0xFF	0x00	●
P19.23	Output terminal status at last fault	0x00–0xFF	0x00–0xFF	0x00	●
P19.24	DC voltage at last fault	0.0–2000.0V	0.0–2000.0V	0.0V	●
P19.25	Grid voltage at last fault	0.0–2000.0V	0.0–2000.0V	0.0V	●
P19.26	Input current at last fault	0.0–6000.0A	0.0–6000.0A	0.0A	●
P19.27–P19.37	Reserved				
P19.38	Input terminal status at 2nd-last fault	0x00–0xFF	0x00–0xFF	0x00	●
P19.39	Output terminal status at 2nd-last fault	0x00–0xFF	0x00–0xFF	0x00	●
P19.40	DC voltage at 2nd-last fault	0.0–2000.0V	0.0–2000.0V	0.0V	●
P19.41	Grid voltage at 2nd-last fault	0.0–2000.0V	0.0–2000.0V	0.0V	●
P19.42	Input current at 2nd-last fault	0.0–6000.0A	0.0–6000.0A	0.0A	●
P19.43–P19.45	Reserved				

Function code	Name	Description	Setting range	Default	Modify
P19.46	Current loop Kp switching filter coefficient	0–8	0–8	2	●
P19.47	Current loop Ki switching filter coefficient	0–8	0–8	2	●
P19.48	Voltage setting filter coefficient	0–8	0–8	7	●
P19.49	Voltage feedforward cut-in coefficient	0.000–2.000	0.000–2.000	1.545	●
P19.50	Voltage feedforward method	0: Voltage feedforward 1: Fixed feedforward, determined by P19.51	0–1	0	●
P19.51	Fixed feedforward (per unit)	0000–4500	0000–4500	3900	●
P19.52	Sudden unload coefficient	0.000–1.000	0.000–1.000	0.000	●
P19.53	High grid voltage coefficient	-1.000–1.000	-1.000–1.000	0.000	●
P20 group—Serial communication					
P20.00	Local communication address	1–247; 0 indicates a broadcast address	1–247	1	○
P20.01	Communication baud rate	0: 1200BPS 1: 2400BPS 2: 4800BPS 3: 9600BPS 4: 19200BPS 5: 38400BPS	0–5	4	○
P20.02	Data bit check	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	○
P20.03	Communication response delay	0–200ms	0–200	5	○
P20.04	Communication timeout time	0.0 (invalid); 0.1–60.0s	0.0–60.0s	0.0s	○
P20.05	Transmission error processing	0: Report an alarm and coast to stop 1: Keep running without reporting an	0–3	0	◎

Function code	Name	Description	Setting range	Default	Modify
		alarm 2: Stop in enabled stop mode without reporting an alarm (applicable only to communication mode) 3: Stop in enabled stop mode without reporting an alarm (applicable to any mode)			
P20.06	Communication processing action	0x00–0x11 LED ones place: 0: Respond to write operations 1: Not respond to write operations LED tens place: 0: Reserved 1: Reserved	0x00–0x11	0x00	◎
P20.07–P20.09	Reserved				
P21 group—PROFIBUS/CANopen communication					
P21.00	Module type	0: PROFIBUS/CANopen 1: Reserved	0–1	0	◎
P21.01	PROFIBUS/CANopen module address	0–127	0–127	2	◎
P21.02	Received PZD2	0: Invalid 1: DC voltage setting (0–20000; Unit: 0.1V) 2: Active current setting (-1500–1500, 1000 corresponding to 100.0% of the rectifier rated current) -1500–1500, 1000 corresponding to 100.0% of the rectifier rated current 4: Virtual input terminal command (0x00–0xFF) 5: AO setting 1 (-1000–1000, 1000 corresponding to 100.0%) 6: AO setting 2 (-1000–1000, 1000 corresponding to 100.0%) 7: Positive active-current limit (0–2000, 1000 corresponding to 100.0% of the rectifier rated current) 8: Negative active-current limit (0–2000, 1000 corresponding to	0–13	0	○
P21.03	Received PZD3		0–13	0	○
P21.04	Received PZD4		0–13	0	○
P21.05	Received PZD5		0–13	0	○
P21.06	Received PZD6		0–13	0	○
P21.07	Received PZD7		0–13	0	○
P21.08	Received PZD8		0–13	0	○
P21.09	Received PZD9		0–13	0	○
P21.10	Received PZD10		0–13	0	○
P21.11	Received PZD11		0–13	0	○
P21.12	Received PZD12		0–13	0	○

Function code	Name	Description	Setting range	Default	Modify
		100.0% of the rectifier rated current) 9: Positive reactive-current limit (0–2000, 1000 corresponding to 100.0% of the rectifier rated current) 10: Negative reactive-current limit (0–2000, 1000 corresponding to 100.0% of the rectifier rated current) 11–13: Reserved			
P21.13	Sent PZD2	0: Invalid 1: DC voltage (* 10, V) 2: DC voltage feedback (* 10, V) 3: Input voltage valid value (* 1, V) 4: Input current valid value (* 10, A) 5: Input power (* 10, kW) 6: Input power factor (*100) 7: Grid frequency (* 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 input (* 100, V) 12: AI2 input (* 100, V) 13: AI3 input (* 100, V) 14: Terminal input status 15: Terminal output status 16: Running status word 17–20: Reserved	0–20	0	○
P21.14	Sent PZD3		0–20	0	○
P21.15	Sent PZD4		0–20	0	○
P21.16	Sent PZD5		0–20	0	○
P21.17	Sent PZD6		0–20	0	○
P21.18	Sent PZD7		0–20	0	○
P21.19	Sent PZD8		0–20	0	○
P21.20	Sent PZD9		0–20	0	○
P21.21	Sent PZD10		0–20	0	○
P21.22	Sent PZD11		0–20	0	○
P21.23	Sent PZD12		0–20	0	○
P21.24	Temporary variable 1 for PZD sending	0–65535	0–65535	0	○
P21.25	DP communication timeout time	0.0 (invalid); 0.1–60.0s	0.0–60.0s	0.0s	○
P21.26–P21.28	Reserved				
P21.29	CANopen communication baud rate	0: 1000k 1: 800k 2: 500k 3: 250k 4: 125k	0–7	2	◎

Function code	Name	Description	Setting range	Default	Modify
		5: 100k 6: 50k 7: 20k			
P21.30	CANopen communication timeout time	0.0 (invalid); 0.1–100.0s	0 –100.0	0.0S	◎
P21.31	CANopen communication protocol	0: Common control protocol 1: Internal master/salve communication protocol	0–1	0	◎
P21.32	Enabling active/reactive current limit	0: Disable 1: Enable When the function is enabled, active and reactive currents are restricted both by P03.06–P03.09 but also the active and reactive current limits in group P21.	0–1	0	◎
P21.33	Reserved				
P21.34	Reserved				
P22 group—Ethernet communication					
P22.00	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	◎
P22.01	IP address 1	0–255	0–255	192	◎
P22.02	IP address 2		0–255	168	◎
P22.03	IP address 3		0–255	0	◎
P22.04	IP address 4		0–255	1	◎
P22.05	Subnet mask 1	0–255	0–255	255	◎
P22.06	Subnet mask 2		0–255	255	◎
P22.07	Subnet mask 3		0–255	255	◎
P22.08	Subnet mask 4		0–255	0	◎
P22.09	Gateway address 1	0–255	0–255	192	◎
P22.10	Gateway address 2		0–255	168	◎
P22.11	Gateway address 3		0–255	1	◎
P22.12	Gateway address 4		0–255	1	◎
P22.13	Reserved				
P22.14	Reserved				
P29 group—Factory parameters					

6 VFD inverter

Note: This part is applicable only to the inverters of the two-quadrant and four-quadrant VFD models.

6.1 Basic operation description

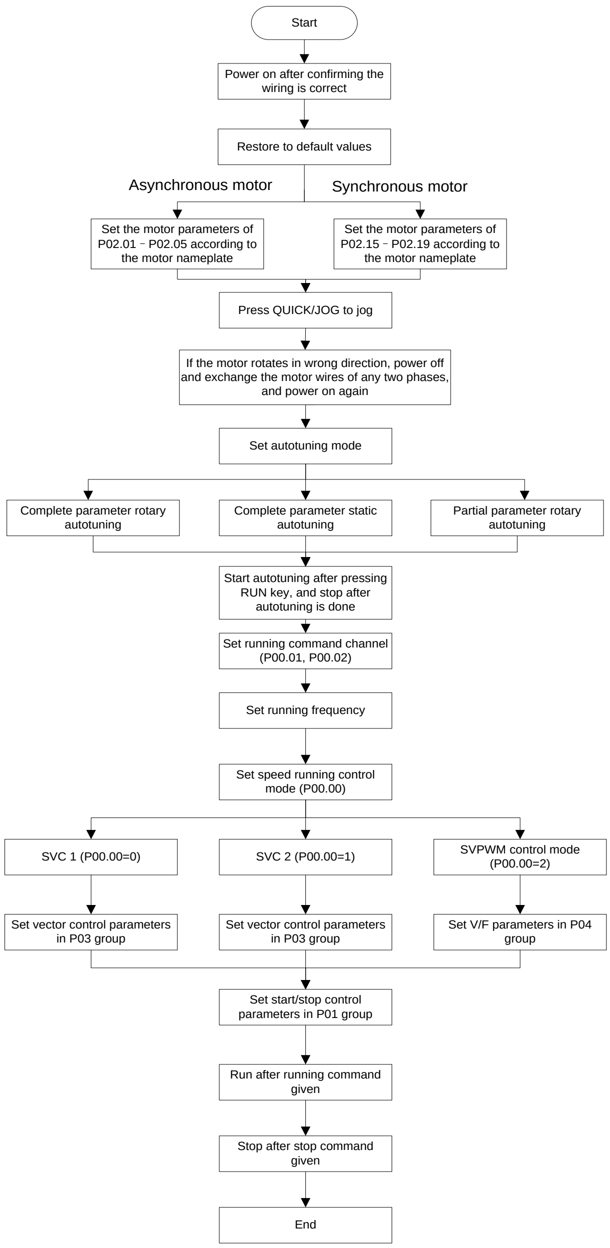
6.1.1 What this section describes

This section describes the function modules of the VFD inverter.

	✧ Ensure that all terminals have been securely connected. ✧ Ensure that the motor power matches the VFD power.

6.1.2 Common commissioning procedure

The common commissioning procedure is as follows (taking motor 1 as an example).



Note: If a fault occurred, find out the fault cause according to "fault tracking".

The running command channel can be set through terminal commands in addition to P00.01 and P00.02.

Channel of running commands P00.01	**Multifunction terminal function 36 Switch the running command channel to keypad**	**Multifunction terminal function 37 Switch the running command channel to terminal**	**Multifunction terminal function 38 Switch the running command channel to communication**
Keypad	/	Terminal	Communication
Terminal	Keypad	/	Communication
Communication	Keypad	Terminal	/

Note: "/" means this multifunction terminal is invalid under current reference channel.

Related parameter list:

Function code	**Name**	**Description**	**Default**
P00.00	Speed control mode	0: Sensorless vector control (SVC) mode 0 1: SVC 1 2: SVPWM 3: FVC **Note:** To select 0, 1, or 3 as the control mode, enable the inverter to perform motor parameter autotuning first.	2
P00.01	Channel of running commands	0: Keypad 1: Terminal 2: Communication	0
P00.02	Communication mode of running commands	0: Modbus/Modbus TCP 1: PROFIBUS/CANopen/DeviceNet 2: Ethernet 3: EtherCAT/PROFINET/EtherNet IP 4: Programmable card 5: Bluetooth card 6: Reserved	0
P00.15	Motor parameter autotuning	0: No operation 1: Rotary autotuning 1; carry out comprehensive motor parameter autotuning; rotary autotuning is used in cases where high control precision is required; 2: Static autotuning 1 (comprehensive autotuning); static autotuning 1 is used in cases where the motor cannot be disconnected from load; 3: Static autotuning 2 (partial autotuning) ; when current motor is motor 1, only P02.06, P02.07 and P02.08 will be autotuned; when current motor is motor 2, only P12.06, P12.07 and P12.08 will be autotuned. 4: Rotary autotuning 2, which is similar to rotary autotuning 1 but is only applicable to asynchronous motors.	0

Function code	Name	Description	Default
		5: Rotary autotuning 3 (partial autotuning), which is only applicable to asynchronous motors.	
P00.18	Function parameter restoration	0: No operation 1: Restore default values (excluding motor parameters) 2: Clear fault records 3: Reserved 4: Reserved 5: Restore default values (for factory test mode) 6: Restore default values (including motor parameters) **Note:** After the selected operation is done, this parameter is automatically restored to 0. Restoring the default values may delete the user password. Exercise caution when using this function. The option 5 can be used only for factory testing.	0
P02.00	Type of motor 1	0: Asynchronous motor 1: Synchronous motor	0
P02.01	Rated power of asynchronous motor 1	0.1–3000.0kW	Model depended
P02.02	Rated frequency of asynchronous motor 1	0.01Hz–P00.03 (Max. output frequency)	50.00Hz
P02.03	Rated speed of asynchronous motor 1	1–60000rpm	Model depended
P02.04	Rated voltage of asynchronous motor 1	0–1200V	Model depended
P02.05	Rated current of asynchronous motor 1	0.8–6000.0A	Model depended
P02.15	Rated power of synchronous motor 1	0.1–3000.0kW	Model depended
P02.16	Rated frequency of synchronous motor 1	0.01Hz–P00.03 (Max. output frequency)	50.00Hz
P02.17	Number of pole pairs of synchronous motor 1	1–50	2
P02.18	Rated voltage of synchronous motor 1	0–1200V	Model depended

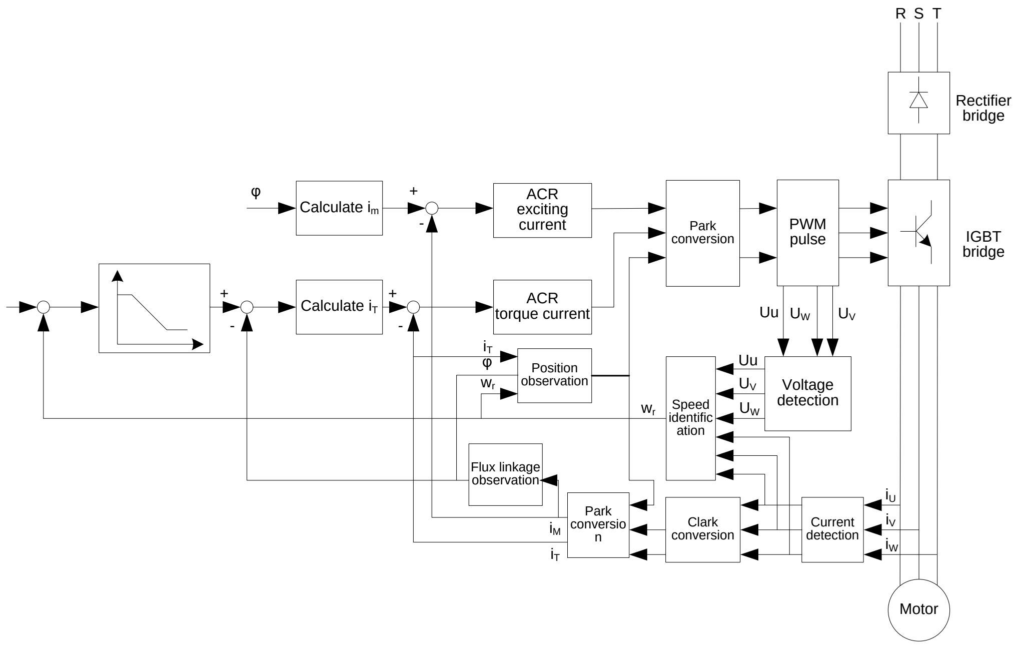
Function code	Name	Description	Default
P02.19	Rated current of synchronous motor 1	0.8–6000.0A	Model depended
P05.01–P05.06	Function of multi-function digital input terminal (S1–S4, HDIA, HDIB)	36: Command switches to keypad 37: Command switches to terminal 38: Command switches to communication	/
P07.01	Reserved	/	/
P07.02	QUICK/JOG key function	Range: 0x00–0x27 Ones: QUICK/JOG key function selection 0: No function 1: Jogging 2: Reserved 3: Switching between forward/reverse rotation 4: Clear UP/DOWN setting 5: Coast to stop 6: Switch running command reference mode by sequence 7: Reserved Tens: Reserved	0x01

6.1.3 Vector control

AMs feature high order, nonlinearity, strong coupling and multi-variables, which increase difficulty to control AMs during actual application. The vector control technology solves this situation as follows: measures and controls the stator current vector of the AM, and then decomposes the stator current vector into exciting current (current component that generates internal magnet field) and torque current (current component that generates torque) based on field orientation principle, and therefore controls the amplitude values and phase positions of the two components (namely, controls the stator current vector of the AM) to realize decoupled control on exciting current and torque current, thus achieving high-performance speed regulation of the AM.

The inverter uses the sensor-less vector control algorithm, which can be used to drive AMs and permanent-magnet SMs simultaneously. As the core algorithm of vector control is based on accurate motor parameter models, the accuracy of motor parameters affects vector control performance. It is recommended to enter accurate motor parameters and autotune motor parameters before executing vector control.

As the vector control algorithm is complicated, exercise caution before modifying vector control function parameters.



Function code	Name	Description	Default
P00.00	Speed control mode	0: Sensorless vector control (SVC) mode 0 1: SVC 1 2: SVPWM 3: FVC **Note:** To select 0, 1, or 3 as the control mode, enable the inverter to perform motor parameter autotuning first.	2
P00.15	Motor parameter autotuning	0: No operation 1: Rotary autotuning 1; carry out comprehensive motor parameter autotuning; rotary autotuning is used in cases where high control precision is required; 2: Static autotuning 1 (comprehensive autotuning); static autotuning 1 is used in cases where the motor cannot be disconnected from load; 3: Static autotuning 2 (partial autotuning); when current motor is motor 1, only P02.06, P02.07 and P02.08 will be autotuned; when current motor is motor 2, only P12.06, P12.07 and P12.08 will be autotuned. 4: Rotary autotuning 2, which is similar to rotary autotuning 1 but is only applicable to asynchronous motors. 5: Rotary autotuning 3 (partial autotuning), which is only applicable to asynchronous motors.	0
P02.00	Type of motor 1	0: Asynchronous motor 1: Synchronous motor	0
P03.00	Speed loop proportional gain 1	0–200.0	20.0
P03.01	Speed loop integral time 1	0.000–10.000s	0.200s

Function code	Name	Description	Default
P03.02	Switching low point frequency	0.00Hz–P03.05	5.00Hz
P03.03	Speed loop proportional gain 2	0–200.0	20.0
P03.04	Speed loop integral time 2	0.000–10.000s	0.200s
P03.05	Switching high point frequency	P03.02–P00.03 (Max. output frequency)	10.00Hz
P03.06	Speed loop output filter	0–8 (corresponds to 0–2^8/10ms)	0
P03.07	Electromotion slip compensation coefficient of vector control	50%–200%	100%
P03.08	Brake slip compensation coefficient of vector control	50%–200%	100%
P03.09	Current loop proportional coefficient P	0–65535	1000
P03.10	Current loop integral coefficient I	0–65535	1000
P03.11	Torque setting method	1: Keypad (P03.12) 2: AI1 3: AI2 4: AI3 5: Pulse frequency HDIA 6: Multi-step torque 7: Modbus/Modbus TCP communication 8: PROFIBUS/CANopen/DeviceNet communication 9: Ethernet communication 10: Pulse frequency HDIB 11: EtherCAT/PROFINET/EtherNet IP communication 12: Programmable card **Note:** For these settings, 100% corresponds to the motor rated current.	1
P03.12	Torque set through keypad	-300.0%–300.0% (of the motor rated current)	50.0%
P03.13	Torque reference filter time	0.000–10.000s	0.010s

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th></tr>
<tr><td>P03.14</td><td>Setting source of FWD rotation frequency upper limit in torque control</td><td>0: Keypad (P03.16)
1: AI1
2: AI2
3: AI3
4: Pulse frequency HDIA
5: Multi-step setting
6: Modbus/Modbus TCP communication
7: PROFIBUS/CANopen/DeviceNet communication
8: Ethernet communication
9: Pulse frequency HDIB
10: EtherCAT/PROFINET/EtherNet IP communication
11: Programmable card
12: Reserved
Note: For these settings, 100% corresponds to the max. frequency.</td><td>0</td></tr>
<tr><td>P03.15</td><td>Setting source of REV rotation frequency upper limit in torque control</td><td>0: Keypad (P03.17)
1–11: Same as those of P03.14</td><td>0</td></tr>
<tr><td>P03.16</td><td>FWD rotation frequency upper limit set through keypad in torque control</td><td rowspan="2">Value range: 0.00 Hz–P00.03 (Max. output frequency)</td><td>50.00Hz</td></tr>
<tr><td>P03.17</td><td>REV rotation frequency upper limit set through keypad in torque control</td><td>50.00Hz</td></tr>
<tr><td>P03.18</td><td>Setting source of electromotive torque upper limit</td><td>0: Keypad (P03.20)
1: AI1
2: AI2
3: AI3
4: Pulse frequency HDIA
5: Modbus/Modbus TCP communication
6: PROFIBUS/CANopen/DeviceNet communication
7: Ethernet communication
8: Pulse frequency HDIB
9: EtherCAT/PROFINET/EtherNet IP communication
10: Programmable card
11: Reserved</td><td>0</td></tr>
</table>

Function code	Name	Description	Default
		Note: For these settings, 100% corresponds to the motor rated current.	
P03.19	Setting source of braking torque upper limit	0: Keypad (P03.21) 1–10: Same as those for P03.18	0
P03.20	Electromotive torque upper limit set through keypad	0.0–300.0% (of the motor rated current)	180.0%
P03.21	Braking torque upper limit set through keypad		180.0%
P03.22	Flux-weakening coefficient in constant power area	0.1–2.0	0.3
P03.23	Min. flux-weakening point in constant power area	10%–100%	20%
P03.24	Max. voltage limit	0.0–120.0%	100.0%
P03.25	Pre-exciting time	0.000–10.000s	0.300s
P03.32	Enabling torque control	0:Disable 1:Enable	0
P03.33	Flux weakening integral gain	0–8000	1200
P03.35	Control optimization setting	0x0000–0x1111 Ones place: Torque command selection 0: Torque reference 1: Torque current reference Tens place: Reserved 0: Reserved 1: Reserved Hundreds place: Whether to enable ASR integral separation 0: Disable 1: Enable Thousands place: Reserved 0: Reserved 1: Reserved	0x0000
P03.36	ASR differential gain	0.00–10.00s	0.00s

Function code	Name	Description	Default
P03.37	High-frequency ACR proportional coefficient	In the FVC (P00.00=3), when the frequency is lower than the ACR high-frequency switching threshold (P03.39), the ACR PI parameters are P03.09 and P03.10; and when the frequency is higher than the ACR high-frequency switching threshold (P03.39), the ACR PI parameters are P03.37 and P03.38. Setting range of P03.37: 0–65535 Setting range of P03.38: 0–65535 Setting range of P03.39: 0.0–100.0% (in relative to the maximum frequency)	1000
P03.38	High-frequency ACR integral coefficient		1000
P03.39	ACR high-frequency switching threshold		100.0%
P17.32	Flux linkage	0.0–200.0%	0.0%

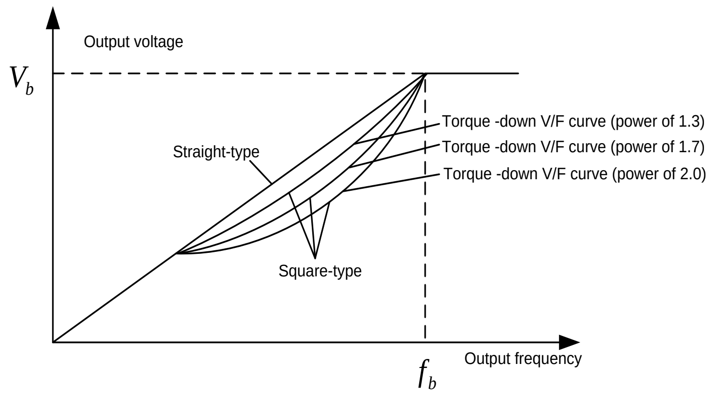
6.1.4 SVPWM control mode

The inverter also carries built-in SVPWM control function. SVPWM mode can be used in cases where mediocre control precision is enough. In cases where a inverter needs to drive multiple motors, it is also recommended to adopt SVPWM control mode.

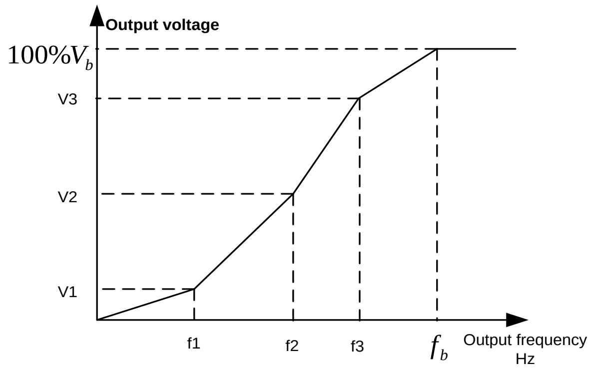
The inverter provides multiple kinds of V/F curve modes to meet different field needs. You can select corresponding V/F curve or set the V/F curve as needed.

Suggestions:

- **For the load featuring constant moment, such as conveyor belt which runs in straight line, as the whole running process requires constant moment, it is recommended to adopt the straight line V/F curve.**
- **For the load featuring decreasing moment, such as fan and water pumps, as there is a power (square or cube) relation between its actual torque and speed, it is recommended to adopt the V/F curve corresponding to the power of 1.3, 1.7 or 2.0.**



The inverter also provides multi-point V/F curves. You can change the V/F curves output by the inverter by setting the voltage and frequency of the three points in the middle. A whole curve consists of five points starting from (0Hz, 0V) and ending at (motor fundamental frequency, motor rated voltage). During setting, follow the rule: 0 ≤ f1 ≤ f2 ≤ f3 ≤ Motor fundamental frequency, and, 0 ≤ V1 ≤ V2 ≤ V3 ≤ Motor rated voltage



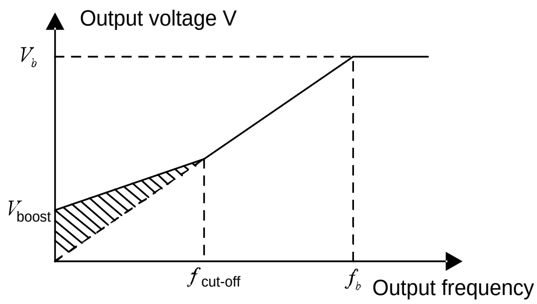
The inverter provides dedicated function codes for the space voltage control mode. You can improve the space voltage control performance by means of setting.

(1) Torque boost

The torque boost function can effectively compensate for the low-speed torque performance in space voltage control. Automatic torque boost has been set by default, which enables the inverter to adjust the torque boost value based on actual load conditions.

Note:

- **Torque boost takes effect only at the torque boost cut-off frequency.**
- **If torque boost is too large, the motor may encounter low-frequency vibration or overcurrent. If such a situation occurs, reduce the torque boost value.**



(2) Energy-saving run

During actual running, the inverter can search for the max. efficiency point to keep running in the most efficient state to save energy.

Note:

- **This function is generally used in light load or no-load cases.**
- **This function is no applicable to the cases where sudden load changes often occur.**

(3) V/F slip compensation gain

Space voltage vector control belongs to an open-loop mode. Sudden motor load changes cause motor speed fluctuation. In cases where strict speed requirements must be met, you can set the slip compensation gain to compensate for the speed change caused by load fluctuation through inverter internal output adjustment.

The setting range of slip compensation gain is 0–200%, in which 100% corresponds to the rated slip frequency.

Note: Rated slip frequency = (Rated synchronous rotation speed of motor – Rated rotation speed of motor) x (Number of motor pole pairs)/60

(4) Oscillation control

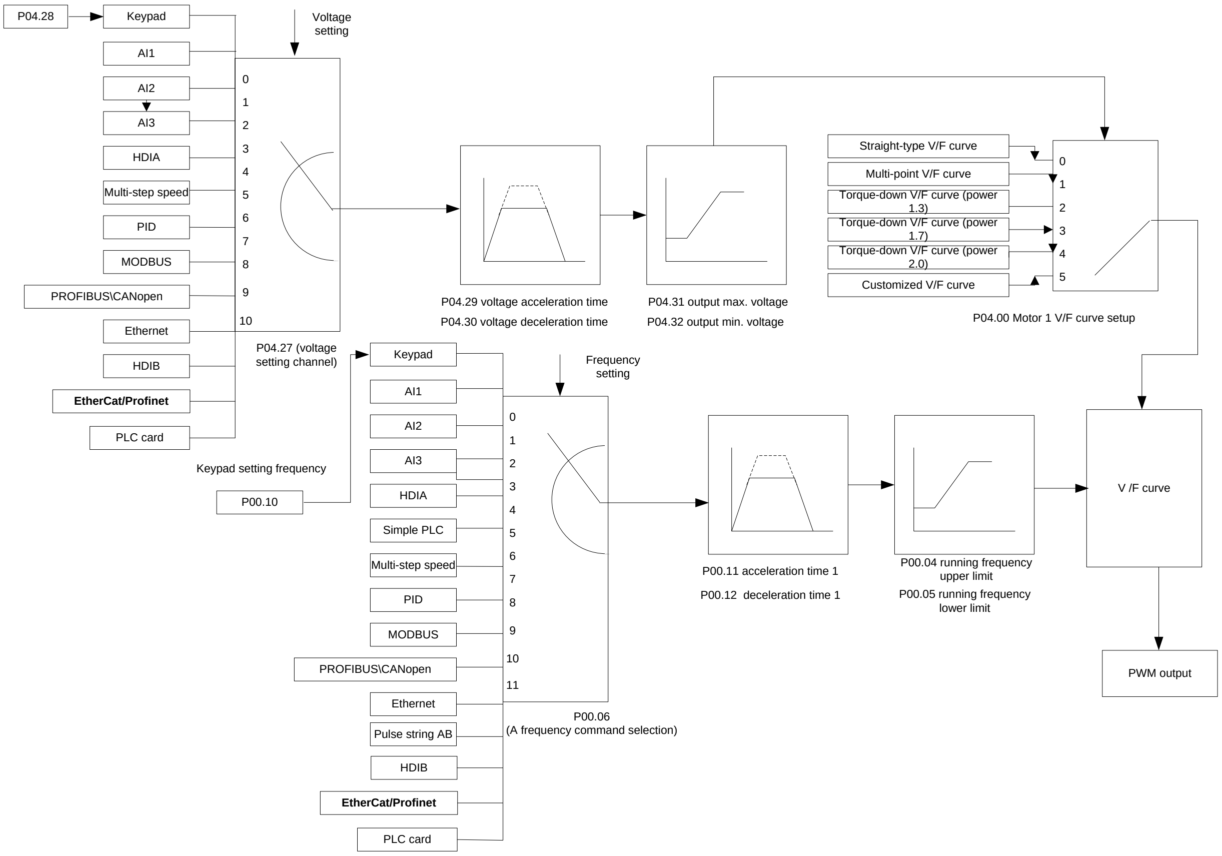
Motor oscillation often occurs in space voltage vector control in large-power driving applications. To solve this problem, the inverter provides two oscillation factor function codes. You can set the function codes based on the oscillation occurrence frequency.

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

(5) AM IF control

Generally, the IF control mode is valid for AMs. It can be used for SMs only when the frequency is extremely low. Therefore, the IF control mode described in this manual is only involved with AMs. IF control is implemented by performing closed-loop control on the total output current of the inverter. The output voltage adapts to the current reference, and open-loop control is separately performed over the frequency of the voltage and current.

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



When selecting the customized V/F curve function, you can specify the setting channels and acceleration/deceleration time of voltage and frequency respectively, which form a real-time V/F curve in combination manner.

Note: This type of V/F curve separation can be applied in various variable-frequency power sources. However, exercise caution when setting parameters as improper settings may cause equipment damage.

Function code	Name	Description	Default
P00.00	Speed control mode	0: Sensorless vector control (SVC) mode 0 1: SVC 1 2: SVPWM 3: FVC **Note:** To select 0, 1, or 3 as the control mode, enable the inverter to perform motor parameter autotuning first	2
P00.03	Max. output frequency	P00.04–400.00Hz	50.00Hz
P00.04	Upper limit of running frequency	P00.05–P00.03	50.00Hz

Function code	Name	Description	Default
P00.05	Lower limit of running frequency	0.00Hz–P00.04	0.00Hz
P00.11	Acceleration time 1	0.0–3600.0s	Model depended
P00.12	Deceleration time 1	0.0–3600.0s	Model depended
P02.00	Type of motor 1	0: Asynchronous motor 1: Synchronous motor	0
P02.02	Rated power of asynchronous motor 1	0.01Hz–P00.03 (Max. output frequency)	50.00Hz
P02.04	Rated voltage of asynchronous motor 1	0–1200V	Model depended
P04.00	V/F curve setting of motor 1	0: Straight-type V/F curve 1: Multi-point V/F curve 2: Torque-down V/F curve (power of 1.3) 3: Torque-down V/F curve (power of 1.7) 4: Torque-down V/F curve (power of 2.0) 5: Customized V/F (V/F separation)	0
P04.01	Torque boost of motor 1	0.0%: (automatic) 0.1%–10.0%	0.0%
P04.02	Motor 1 torque boost cut-off	0.0%–50.0% (rated frequency of motor 1)	20.0%
P04.03	V/F frequency point 1 of motor 1	0.00Hz–P04.05	0.00Hz
P04.04	V/F voltage point 1 of motor 1	0.0%–110.0%	0.0%
P04.05	V/F frequency point 2 of motor 1	P04.03– P04.07	0.00Hz
P04.06	V/F voltage point 2 of motor 1	0.0%–110.0%	0.0%
P04.07	V/F frequency point 3 of motor 1	P04.05– P02.02 or P04.05– P02.16	0.00Hz
P04.08	V/F voltage point 3 of motor 1	0.0%–110.0%	0.0%
P04.09	V/F slip compensation gain of motor 1	0.0–200.0%	100.0%
P04.10	Low-frequency oscillation control factor of motor 1	0–100	10
P04.11	High-frequency oscillation control factor of motor 1	0–100	10

Function code	Name	Description	Default
P04.12	Oscillation control threshold of motor 1	0.00Hz–P00.03 (Max. output frequency)	30.00Hz
P04.13	V/F curve setup of motor 2	0: Straight V/F curve 1: Multi-point V/F curve 2: Torque-down V/F curve (power of 1.3) 3: Torque-down V/F curve (power of 1.7) 4: Torque-down V/F curve (power of 2.0) 5: Customize V/F (V/F separation)	0
P04.14	Torque boost of motor 2	0.0%: (automatic) 0.1%–10.0%	0.0%
P04.15	Motor 2 torque boost cut-off	0.0%–50.0% (rated frequency of motor 1)	20.0%
P04.16	V/F frequency point 1 of motor 2	0.00Hz–P04.18	0.00Hz
P04.17	V/F voltage point 1 of motor 2	0.0%–110.0%	0.0%
P04.18	V/F frequency point 2 of motor 2	P04.16– P04.20	0.00Hz
P04.19	V/F voltage point 2 of motor 2	0.0%–110.0%	0.0%
P04.20	V/F frequency point 3 of motor 2	P04.18–P02.02 or P04.18–P02.16	0.00Hz
P04.21	V/F voltage point 3 of motor 2	0.0%–110.0%	0.0%
P04.22	V/F slip compensation gain of motor 2	0.0–200.0%	100.0%
P04.23	Low-frequency oscillation control factor of motor 2	0–100	10
P04.24	High-frequency oscillation control factor of motor 2	0–100	10
P04.25	Oscillation control threshold of motor 2	0.00Hz–P00.03 (Max. output frequency)	30.00Hz
P04.26	Energy-saving run	0: No 1: Automatic energy-saving run	0
P04.27	Voltage setting channel	0: Keypad; output voltage is determined by P04.28 1: AI1 2: AI2 3: AI3	0

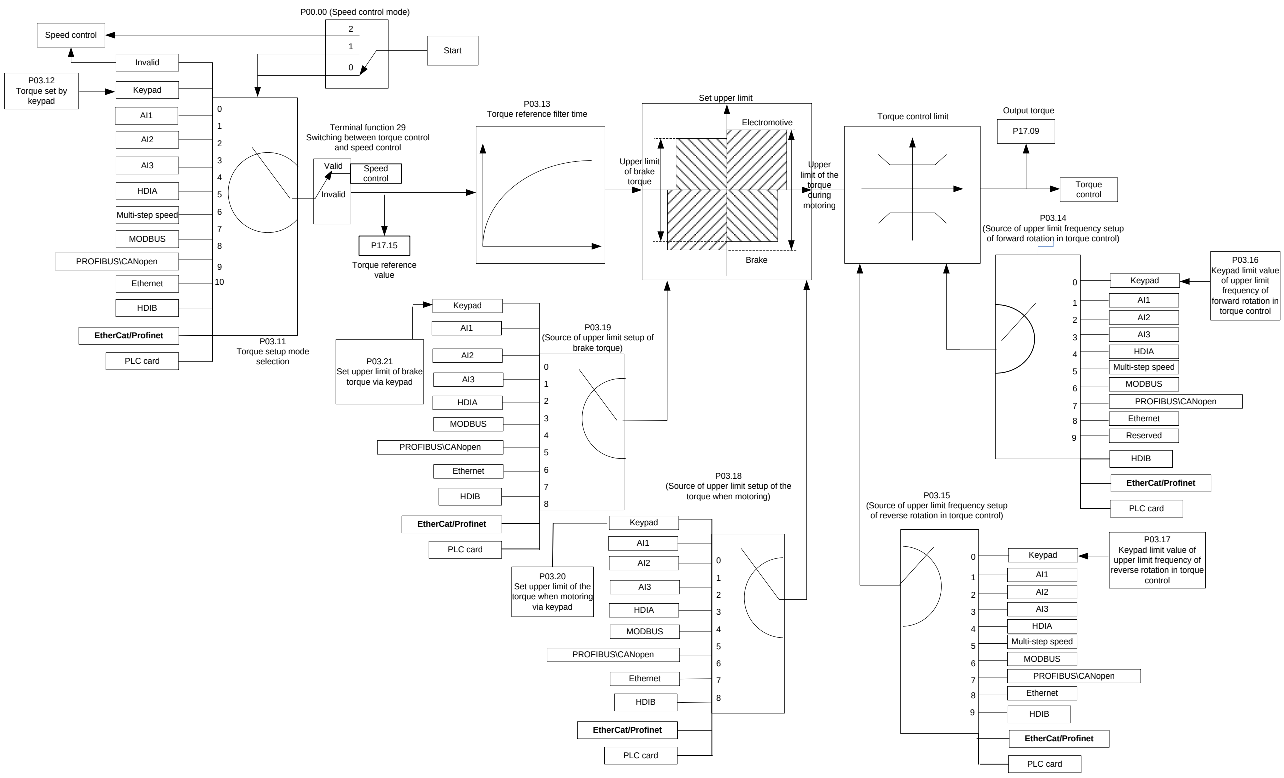
Function code	Name	Description	Default
		4: HDIA 5: Multi-step 6: PID 7: Modbus/Modbus TCP communication 8: PROFIBUS/CANopen communication 9: Ethernet communication 10: HDIB 11: EtherCAT/PROFINET/EtherNet IP communication 12: Programmable card 13: Reserved	
P04.28	Set voltage value via keypad	0.0%–100.0% (rated motor voltage)	100.0%
P04.29	Voltage increase time	0.0–3600.0s	5.0s
P04.30	Voltage decrease time	0.0–3600.0s	5.0s
P04.31	Output max. voltage	P04.32–100.0% (rated motor voltage)	100.0%
P04.32	Output min. voltage	0.0%–P04.31 (rated motor voltage)	0.0%
P04.33	Flux-weakening coefficient in the constant power zone	1.00–1.30	1.00
P04.34	Pull-in current 1 in synchronous motor VF control	When the synchronous motor VF control mode is enabled, this parameter is used to set the reactive current of the motor when the output frequency is lower than the frequency set in P04.36. Setting range: -100.0%–+100.0% (of the motor rated current)	20.0%
P04.35	Pull-in current 2 in synchronous motor VF control	When the synchronous motor VF control mode is enabled, this parameter is used to set the reactive current of the motor when the output frequency is higher than the frequency set in P04.36. Setting range: -100.0%–+100.0% (of the motor rated current)	10.0%
P04.36	Frequency threshold for pull-in current switching in synchronous motor VF control	When the synchronous motor VF control mode is enabled, this parameter is used to set the frequency threshold for the switching between input current 1 and pull-in current 2. Setting range: 0.0%–200.0% (of the motor rated frequency)	20.0%
P04.37	Reactive current closed-loop proportional coefficient in synchronous motor VF control	When the synchronous motor VF control mode is enabled, this parameter is used to set the proportional coefficient of the reactive current closed-loop control. Setting range: 0–3000	50

Function code	Name	Description	Default
P04.38	Reactive current closed-loop integral time in synchronous motor VF control	When the synchronous motor VF control mode is enabled, this parameter is used to set the integral coefficient of the reactive current closed-loop control. Setting range: 0–3000	30
P04.39	Reactive current closed-loop output limit in synchronous motor VF control	When the synchronous motor VF control mode is enabled, this parameter is used to set the output limit of the reactive current closed-loop control. A greater value indicates a higher reactive closed-loop compensation voltage and higher output power of the motor. In general, you do not need to modify this parameter. Setting range: 0–16000	8000
P04.40	Enable/disable IF mode for asynchronous motor 1	0: Disabled 1: Enabled	0
P04.41	Current setting in IF mode for asynchronous motor 1	When IF control is adopted for asynchronous motor 1, this parameter is used to set the output current. The value is a percentage in relative to the rated current of the motor. Setting range: 0.0–200.0%	120.0%
P04.42	Proportional coefficient in IF mode for asynchronous motor 1	When IF control is adopted for asynchronous motor 1, this parameter is used to set the proportional coefficient of the output current closed-loop control. Setting range: 0–5000	650
P04.43	Integral coefficient in IF mode for asynchronous motor 1	When IF control is adopted for asynchronous motor 1, this parameter is used to set the integral coefficient of the output current closed-loop control. Setting range: 0–5000	350
P04.44	Starting frequency point for switching off IF mode for asynchronous motor 1	0.00–P04.50	10.00Hz
P04.45	Enable/disable IF mode for asynchronous motor 2	0: Disable 1: Enable	0
P04.46	Current setting in IF mode for asynchronous motor 2	When IF control is adopted for asynchronous motor 2, this parameter is used to set the output current. The value is a percentage in relative to the rated current of the motor. Setting range: 0.0–200.0%	120.0%
P04.47	Proportional coefficient in IF mode for asynchronous motor 2	When IF control is adopted for asynchronous motor 2, this parameter is used to set the proportional coefficient of the output current closed-loop control. Setting range: 0–5000	650

Function code	Name	Description	Default
P04.48	Integral coefficient in IF mode for asynchronous motor 2	When IF control is adopted for asynchronous motor 2, this parameter is used to set the integral coefficient of the output current closed-loop control. Setting range: 0–5000	350
P04.49	Starting frequency point for switching off IF mode for asynchronous motor 2	0.00–P04.51	10.00Hz
P04.50	End frequency point for switching off IF mode for asynchronous motor 1	P04.44–P00.03	25.00Hz
P04.51	End frequency point for switching off IF mode for asynchronous motor 2	P04.49–P00.03	25.00Hz

6.1.5 Torque control

The inverter supports torque control and speed control. Speed control aims to stabilize the speed to keep the set speed consistent with the actual running speed, meanwhile, the max. load-carrying capacity is restricted by the torque limit. Torque control aims to stabilize the torque to keep the set torque consistent with the actual output torque, meanwhile, the output frequency is restricted by the upper and lower limits.



Function code	Name	Description	Default
P00.00	Speed control mode	0: Sensorless vector control (SVC) mode 0 1: SVC 1 2: SVPWM 3: FVC **Note:** To select 0, 1, or 3 as the control mode, enable the inverter to perform motor parameter autotuning first	2
P03.32	Enabling torque control	0: Disable 1: Enable	0
P03.11	Torque setting method	0–1: Keypad (P03.12) 2: AI1 3: AI2 4: AI3 5: Pulse frequency HDIA 6: Multi-step torque 7: Modbus/Modbus TCP communication 8: PROFIBUS/CANopen/DeviceNet communication 9: Ethernet communication 10: Pulse frequency HDIB 11: EtherCAT/PROFINET/EtherNet IP communication 12: Programmable card **Note:** For these settings, 100% corresponds to the motor rated current.	0
P03.12	Torque set through keypad	-300.0%–300.0% (of the motor rated current)	50.0%
P03.13	Torque reference filter time	0.000–10.000s	0.010s
P03.14	Setting source of FWD rotation frequency upper limit in torque control	0: Keypad (P03.16) 1: AI1 2: AI2 3: AI3 4: Pulse frequency HDIA 5: Multi-step setting 6: Modbus/Modbus TCP communication 7: PROFIBUS/CANopen/DeviceNet communication 8: Ethernet communication 9: Pulse frequency HDIB 10: EtherCAT/PROFINET/EtherNet IP communication 11: Programmable card 12: Reserved **Note:** For these settings, 100% corresponds to the max. frequency.	0

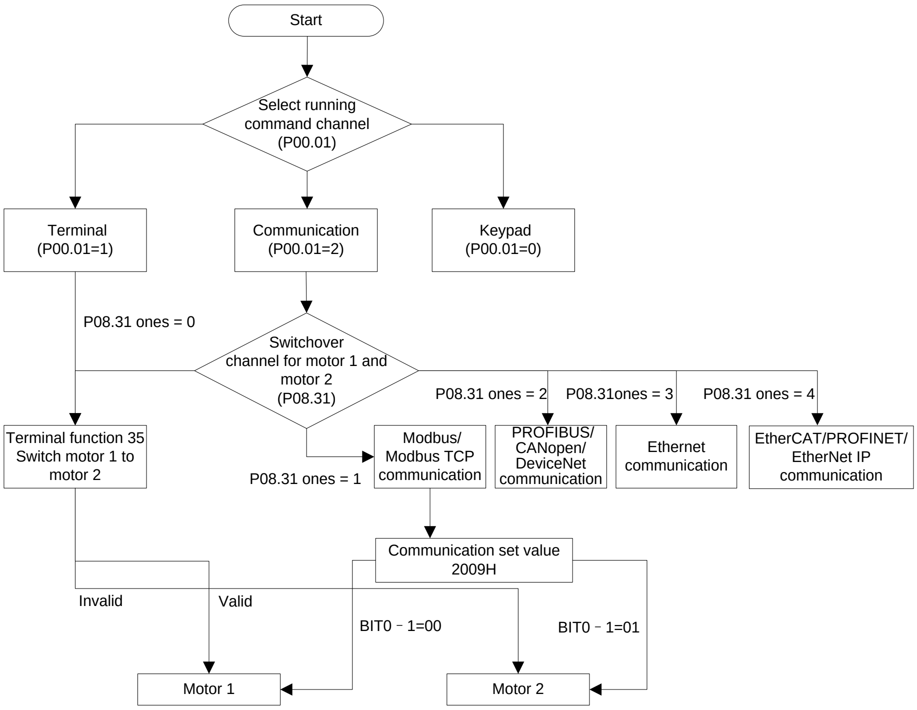
Function code	Name	Description	Default
P03.15	Setting source of REV rotation frequency upper limit in torque control	0: Keypad (P03.17) 1: AI1 2: AI2 3: AI3 4: Pulse frequency HDIA 5: Multi-step setting 6: Modbus/Modbus TCP communication 7: PROFIBUS/CANopen/DeviceNet communication 8: Ethernet communication 9: Pulse frequency HDIB 10: EtherCAT/PROFINET/EtherNet IP communication 11: Programmable card 12: Reserved **Note:** For these settings, 100% corresponds to the max. frequency.	0
P03.16	FWD rotation frequency upper limit set through keypad in torque control	0.00Hz–P00.03 (Max. output frequency)	50.00 Hz
P03.17	REV rotation frequency upper limit set through keypad in torque control	0.00Hz–P00.03 (Max. output frequency)	50.00 Hz
P03.18	Setting source of electromotive torque upper limit	0: Keypad (P03.20) 1: AI1 2: AI2 3: AI3 4: Pulse frequency HDIA 5: Modbus/Modbus TCP communication 6: PROFIBUS/CANopen/DeviceNet communication 7: Ethernet communication 8: Pulse frequency HDIB 9: EtherCAT/PROFINET/EtherNet IP communication 10: Programmable card 11: Reserved **Note:** For these settings, 100% corresponds to the motor rated current.	0
P03.19	Setting source of braking torque upper limit	0: Keypad (P03.21) 1: AI1	0

Function code	Name	Description	Default
		2: AI2 3: AI3 4: Pulse frequency HDIA 5: Modbus/Modbus TCP communication 6: PROFIBUS/CANopen/DeviceNet communication 7: Ethernet communication 8: Pulse frequency HDIB 9: EtherCAT/PROFINET/EtherNet IP communication 10: Programmable card 11: Reserved **Note:** For these settings, 100% corresponds to the motor rated current.	
P03.20	Electromotive torque upper limit set through keypad	0.0–300.0% (of the motor rated current)	180.0%
P03.21	Braking torque upper limit set through keypad	0.0–300.0% (of the motor rated current)	180.0%
P17.09	Motor output torque	-250.0–250.0%	0.0%
P17.15	Torque reference value	-300.0–300.0% (of the motor rated current)	0.0%

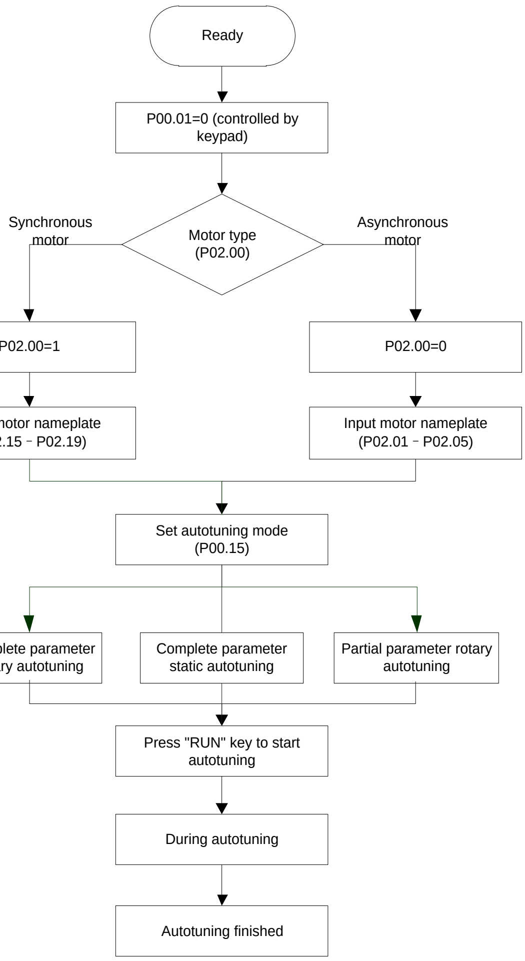
6.1.6 Motor parameters

	✧ Check the safety conditions surrounding the motor and load machineries before autotuning as physical injury may occur due to sudden start of motor during autotuning. ✧ Although the motor does not run during static autotuning, the motor is still supplied with power. Do not touch the motor during autotuning; otherwise, electric shock may occur. Do not touch the motor before autotuning is completed.
	✧ If the motor has been connected to a load, do not carry out rotary autotuning. Otherwise, the inverter may malfunction or may be damaged. If rotary autotuning is carried out on a motor which has been connected to a load, incorrect motor parameter settings and motor action exceptions may occur. Disconnect from the load to carry out autotuning if necessary.

The inverter can drive both asynchronous motors and synchronous motors, and it supports two sets of motor parameters, which can be switched over by multifunction digital input terminals or communication modes.



The control performance of the inverter is based on accurate motor models. Therefore, you need to carry out motor parameter autotuning before running a motor for the first time (taking motor 1 as an example).



Note:

- Motor parameters must be set correctly according to the motor nameplate.

- If rotary autotuning is selected during motor autotuning, disconnect the motor from the load to put the motor in static and no-load state. Otherwise, the motor parameter autotuning results may be incorrect. In addition, autotune P02.06–P02.10 for AMs and autotune P02.20–P02.23 for SMs.
- If static autotuning is selected for motor autotuning, there is no need to disconnect the motor from the load, but the control performance may be impacted as only a part of the motor parameters have been autotuned. In addition, autotune P02.06–P02.10 for AMs and autotune P02.20–P02.22 for SMs. P02.23 can be obtained through calculation.
- Motor autotuning can be carried out on the present motor only. If you need to perform autotuning on the other motor, switch the motor through selecting the switchover channel of motor 1 and motor 2 by setting the ones place of P08.31.

Related parameter list:

Function code	Name	Description	Default
P00.01	Channel of running commands	0: Keypad 1: Terminal 2: Communication	0
P00.15	Motor parameter autotuning	0: No operation 1: Rotary autotuning 1; carry out comprehensive motor parameter autotuning; rotary autotuning is used in cases where high control precision is required; 2: Static autotuning 1 (comprehensive autotuning); static autotuning 1 is used in cases where the motor cannot be disconnected from load; 3: Static autotuning 2 (partial autotuning) ; when current motor is motor 1, only P02.06, P02.07 and P02.08 will be autotuned; when current motor is motor 2, only P12.06, P12.07 and P12.08 will be autotuned. 4: Rotary autotuning 2, which is similar to rotary autotuning 1 but is only applicable to asynchronous motors. 5: Rotary autotuning 3 (partial autotuning), which is only applicable to asynchronous motors.	0
P02.00	Type of motor 1	0: Asynchronous motor 1: Synchronous motor	0
P02.01	Rated power of asynchronous motor 1	0.1–3000.0kW	Model depended
P02.02	Rated frequency of asynchronous motor 1	0.01Hz–P00.03 (Max. output frequency)	50.00Hz
P02.03	Rated speed of asynchronous motor 1	1–60000rpm	Model depended
P02.04	Rated voltage of asynchronous motor 1	0–1200V	Model depended
P02.05	Rated current of asynchronous motor 1	0.8–6000.0A	Model depended

Function code	Name	Description	Default
P02.06	Stator resistance of asynchronous motor 1	0.001–65.535Ω	Model depended
P02.07	Rotor resistance of asynchronous motor 1	0.001–65.535Ω	Model depended
P02.08	Leakage inductance of asynchronous motor 1	0.1–6553.5mH	Model depended
P02.09	Mutual inductance of asynchronous motor 1	0.1–6553.5mH	Model depended
P02.10	No-load current of asynchronous motor 1	0.1–6553.5A	Model depended
P02.15	Rated power of synchronous motor 1	0.1–3000.0kW	Model depended
P02.16	Rated frequency of synchronous motor 1	0.01Hz–P00.03 (Max. output frequency)	50.00Hz
P02.17	Number of pole pairs of synchronous motor 1	1–50	2
P02.18	Rated voltage of synchronous motor 1	0–1200V	Model depended
P02.19	Rated current of synchronous motor 1	0.8–6000.0A	Model depended
P02.20	Stator resistance of synchronous motor 1	0.001–65.535Ω	Model depended
P02.21	Direct-axis inductance of synchronous motor 1	0.01–655.35mH	Model depended
P02.22	Quadrature-axis inductance of synchronous motor 1	0.01–655.35mH	Model depended
P02.23	Counter-emf constant of synchronous motor 1	0–10000	300
P05.01–P05.06	Function of multi-function digital input terminal (S1–S4, HDIA,HDIB)	35: Switch from motor 1 to motor 2	/
P08.31	Switching between motor 1 and motor 2	0x00–0x14 Ones: Switchover channel 0: Switch over by terminal 1: Switch over by Modbus/Modbus TCP communication 2: Switch over by PROFIBUS / CANopen /DeviceNet 3: Switch over by Ethernet communication	0x00

Function code	Name	Description	Default
		4: Switch over by EtherCAT/PROFINET/EtherNet IP communication Tens: Motor switchover during running 0: Disable switchover during running 1: Enable switchover during running	
P12.00	Type of motor 2	0: Asynchronous motor 1: Synchronous motor	0
P12.01	Rated power of asynchronous motor 2	0.1–3000.0kW	Model depended
P12.02	Rated frequency of asynchronous motor 2	0.01Hz–P00.03 (Max. output frequency)	50.00Hz
P12.03	Rated speed of asynchronous motor 2	1–60000rpm	Model depended
P12.04	Rated voltage of asynchronous motor 2	0–1200V	Model depended
P12.05	Rated current of asynchronous motor 2	0.8–6000.0A	Model depended
P12.06	Stator resistance of asynchronous motor 2	0.001–65.535Ω	Model depended
P12.07	Rotor resistance of asynchronous motor 2	0.001–65.535Ω	Model depended
P12.08	Leakage inductance of asynchronous motor 2	0.1–6553.5mH	Model depended
P12.09	Mutual inductance of asynchronous motor 2	0.1–6553.5mH	Model depended
P12.10	No-load current of asynchronous motor 2	0.1–6553.5A	Model depended
P12.15	Rated power of synchronous motor 2	0.1–3000.0kW	Model depended
P12.16	Rated frequency of synchronous motor 2	0.01Hz–P00.03 (Max. output frequency)	50.00Hz
P12.17	Number of pole pairs of synchronous motor 2	1–50	2
P12.18	Rated voltage of synchronous motor 2	0–1200V	Model depended
P12.19	Rated current of synchronous motor 2	0.8–6000.0A	Model depended
P12.20	Stator resistance of synchronous motor 2	0.001–65.535Ω	Model depended

Function code	Name	Description	Default
P12.21	Direct-axis inductance of synchronous motor 2	0.01–655.35mH	Model depended
P12.22	Quadrature-axis inductance of synchronous motor 2	0.01–655.35mH	Model depended
P12.23	Counter-emf constant of synchronous motor 2	0–10000	300

6.1.7 Start/stop control

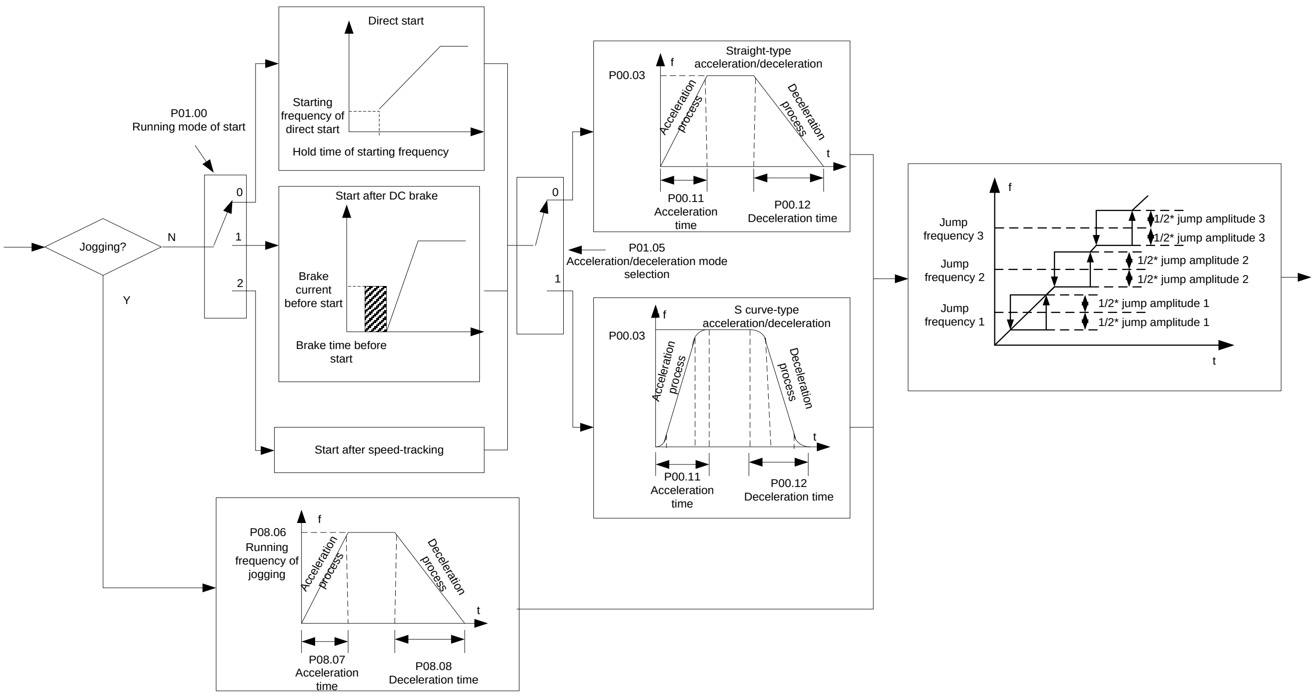
The start/stop control of the inverter involves three states: start after a running command is given at power-on; start after power-off restart is effective; start after automatic fault reset. The three start/stop control states are described in the following.

There are three start modes for the inverter, which are start at starting frequency, start after DC braking, and start after speed tracking. You can select the proper start mode based on actual conditions.

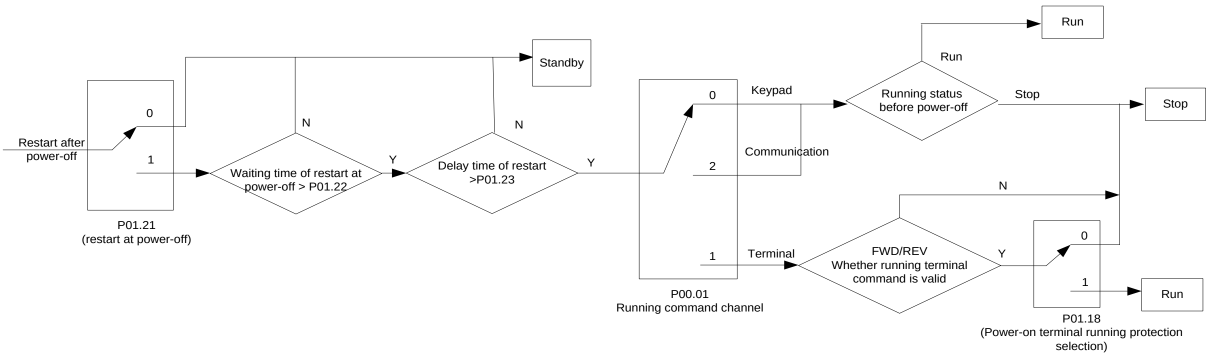
For large-inertia load, especially in cases where reversal may occur, you can choose to start after DC braking or start after speed tracking.

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

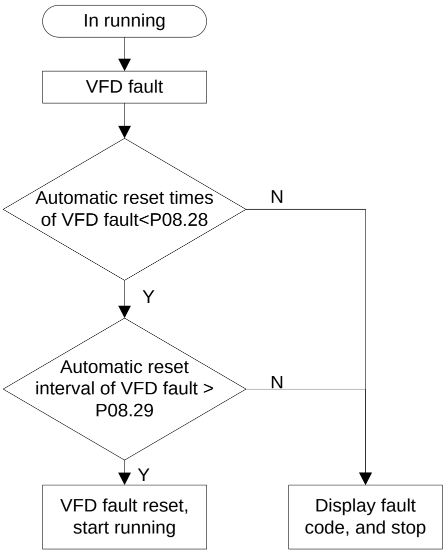
(1) Logic diagram for start after a running command is given at power-on



(2) Logic diagram for start after power-off restart is effective



(3) Logic diagram for start after automatic fault reset



Related parameter list:

Function code	Name	Description	Default
P00.01	Channel of running commands	0: Keypad 1: Terminal 2: Communication	0
P00.11	Acceleration time 1	0.0–3600.0s	Model depended
P00.12	Deceleration time 1	0.0–3600.0s	Model depended
P01.00	Running mode of start	0: Direct start 1: Start after DC brake 2: Start after speed tracking	0
P01.01	Starting frequency of direct start	0.00–50.00Hz	0.50Hz
P01.02	Hold time of starting frequency	0.0–50.0s	0.0s
P01.03	DC braking current before start	0.0–100.0%	0.0%
P01.04	DC braking time before start	0.00–50.00s	0.00s

Function code	Name	Description	Default
P01.05	Acceleration/deceleration mode	0: Straight line 1: S curve **Note:** If mode 1 is selected, it is required to set P01.07, P01.27 and P01.08 accordingly	0
P01.08	Stop mode	0: Decelerate to stop 1: Coast to stop	0
P01.09	Starting frequency of DC braking after stop	0.00Hz–P00.03 (Max. output frequency)	0.00Hz
P01.10	Waiting time of DC braking after stop	0.00–50.00s	0.00s
P01.11	DC braking current of stop	0.0–100.0%	0.0%
P01.12	DC braking time of stop	0.00–50.00s	0.00s
P01.13	Deadzone time of forward/reverse rotation	0.0–3600.0s	0.0s
P01.14	Forward/reverse rotation switchover mode	0: switch over after zero frequency 1: switch over after starting frequency 2: switch over after passing stop speed and delay	1
P01.15	Stop speed	0.00–100.00Hz	0.50 Hz
P01.16	Stop speed detection mode	0: Set value of speed (the only detection mode valid in SVPWM mode) 1: Detection value of speed	1
P01.18	Power-on terminal running protection selection	0: Terminal running command is invalid at power-on 1: Terminal running command is valid at power-on	0
P01.19	Action selected when running frequency less than frequency lower limit (valid when frequency lower limit greater than 0)	Ones place: Action selection 0: Run at the frequency lower limit 1: Stop 2: Sleep Tens place: Stop mode 0: Coast to stop 1: Decelerate to stop	0x00
P01.20	Wake-up-from-sleep delay	0.0–3600.0s (valid when P01.19 is 2)	0.0s
P01.21	Restart after power outage	0: Restart is disabled 1: Restart is enabled	0
P01.22	Waiting time of restart after power outage	0.0–3600.0s (valid when P01.21 is 1)	1.0s
P01.23	Start delay	0.0–60.0s	0.0s

Function code	Name	Description	Default
P01.24	Stop speed delay	0.0–100.0s	0.0s
P01.25	Open-loop 0Hz output selection	0: No voltage output 1: With voltage output 2: Output as per DC braking current of stop	0
P01.26	Deceleration time of emergency-stop	0.0–60.0s	2.0s
P01.27	Time of starting section of deceleration S curve	0.0–50.0s	0.1s
P01.28	Time of ending section of deceleration S curve	0.0–50.0s	0.1s
P01.29	Short-circuit braking current	0.0–150.0% (of rated inverter output current)	0.0%
P01.30	Hold time of short-circuit braking at startup	0.00–50.00s	0.00s
P01.31	Hold time of short-circuit braking at stop	0.00–50.00s	0.00s
P01.32	Pre-exciting time of jogging	0–10.000s	0.000s
P01.33	Starting frequency of braking for jogging to stop	0–P00.03	0.00Hz
P01.34	Delay to enter sleep	0–3600.0s	0.0s
P05.01–P05.06	Digital input function selection	1: Forward running 2: Reverse running 4: Forward jogging 5: Reverse jogging 6: Coast to stop 7: Fault reset 8: Running pause 21: Acceleration/deceleration time selection 1 22: Acceleration/deceleration time selection 2 30: Acceleration/deceleration disabled	/
P08.00	Running frequency of jog	0.00Hz–P00.03 (Max. output frequency)	5.00Hz
P08.01	Acceleration time at jogging	0.0–3600.0s	Model depended
P08.02	Deceleration time at jogging	0.0–3600.0s	Model depended
P08.03	Acceleration time 2	0.0–3600.0s	Model depended
P08.04	Declaration time 2	0.0–3600.0s	Model depended
P08.05	Acceleration time 3	0.0–3600.0s	Model depended

Function code	Name	Description	Default
P08.06	Declaration time 3	0.0–3600.0s	Model depended
P08.07	Acceleration time 4	0.0–3600.0s	Model depended
P08.08	Declaration time 4	0.0–3600.0s	Model depended
P08.19	Switching frequency of acceleration/deceleration time	0.00–P00.03 (Max. output frequency) 0.00Hz: No switch over If the running frequency is larger than P08.19, switch to acceleration /deceleration time 2	0
P08.21	Reference frequency of acceleration/deceleration time	0: Max. output frequency 1: Set frequency 2: 100Hz Note: Valid for straight-line acceleration/deceleration only	0
P08.28	Automatic fault reset times	0–10	0
P08.29	Automatic fault reset time interval	0.1–3600.0s	1.0s

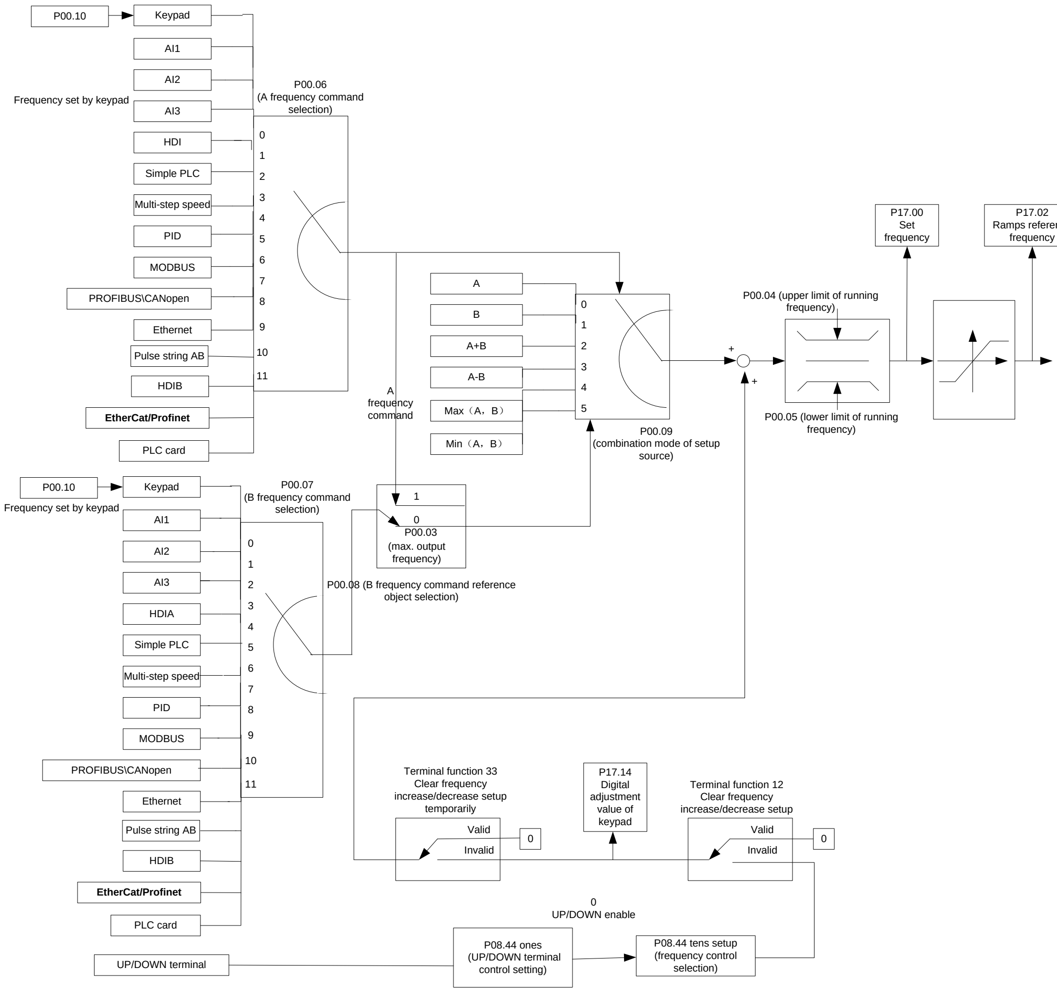
6.1.8 Frequency setting

The inverter supports multiple frequency setting methods, which can be divided into two types: main reference channel and auxiliary reference channel.

There are two main reference channels, namely frequency reference channel A and frequency reference channel B. These two channels support simple arithmetical operation between each other, and they can be switched dynamically by setting multi-function terminals.

There is one input mode for auxiliary reference channel, namely terminal UP/DOWN switch input. By setting function codes, you can enable the corresponding reference mode and the impact made on the inverter frequency reference by this reference mode.

The actual reference of inverter is comprised of the main reference channel and auxiliary reference channel.

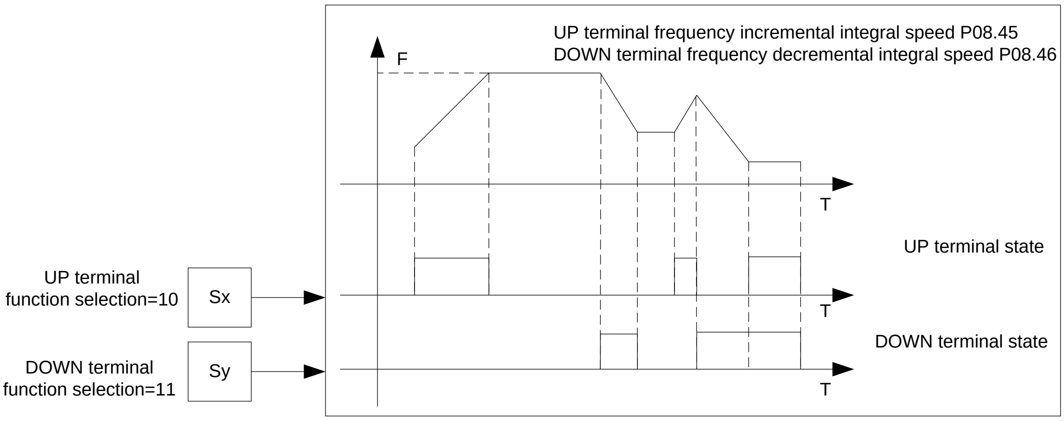


The inverter supports switchover between different reference channels, and the rules for channel switchover are shown in the following.

Present reference channel P00.09	Multifunction terminal function 13 Channel A switched to channel B	Multifunction terminal function 14 Combination setting switched to channel A	Multifunction terminal function 15 Combination setting switched to channel B
A	B	/	/
B	A	/	/
A+B	/	A	B
A-B	/	A	B
Max(A, B)	/	A	B
Min(A, B)	/	A	B

Note: "/" indicates this multifunction terminal is invalid under present reference channel.

When setting the auxiliary frequency inside the inverter via multi-function terminal UP (10) and DOWN (11), you can increase/decrease the frequency quickly by setting P08.45 (UP terminal frequency incremental change rate) and P08.46 (DOWN terminal frequency decrement change rate).



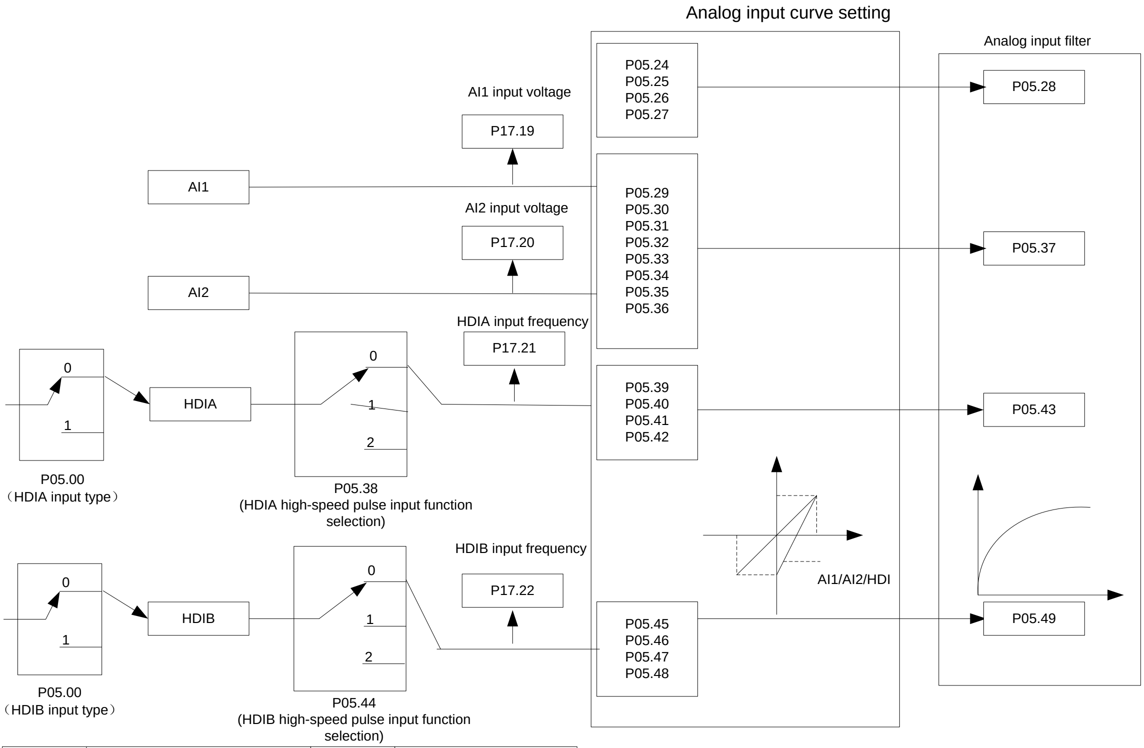
Related parameter list:

Function code	Name	Description	Default
P00.03	Max. output frequency	P00.04–400.00Hz	50.00Hz
P00.04	Upper limit of running frequency	P00.05–P00.03	50.00Hz
P00.05	Lower limit of running frequency	0.00Hz–P00.04	0.00Hz
P00.06	A frequency command selection	0: Keypad	0
P00.07	B frequency command selection	1: AI1 2: AI2 3: AI3 4: High speed pulse HDIA 5: Simple PLC program 6: Multi-step speed running 7: PID control 8: Modbus/Modbus TCP communication 9: PROFIBUS/CANopen/DeviceNet communication 10: Ethernet communication 11: High speed pulse HDIB 12: Pulse train AB 13: EtherCAT/PROFINET/EtherNet IP communication 14: Programmable card 15: Reserved	15
P00.08	Reference object of B frequency command	0: Max. output frequency 1: A frequency command	0
P00.09	Combination mode of setup source	0: A 1: B 2: (A+B) 3: (A-B) 4: Max (A, B) 5: Min (A, B)	0

Function code	Name	Description	Default
P05.01–P05.06	Function of multi-function digital input terminal (S1–S4, HDIA, HDIB)	10: Frequency increase (UP) 11: Frequency decrease (DOWN) 12: Clear frequency increase/decrease setting 13: Switchover between setup A and setup B 14: Switchover between combination setup and setup A 15: Switchover between combination setup and setup B	/
P08.42	Reserved	/	/
P08.43	Reserved	/	/
P08.44	UP/DOWN terminal control	0x000–0x221 Ones: Frequency enabling selection 0: UP/DOWN terminal setting is valid 1: UP/DOWN terminal setting is invalid Tens: Frequency control selection 0: Valid only when P00.06=0 or P00.07=0 1: Valid for all frequency modes 2: Invalid for multi-step speed when multi-step speed takes priority Hundreds: Action selection at stop 0: Valid 1: Valid during running, clear after stop 2: Valid during running, clear after receiving stop command	0x000
P08.45	UP terminal frequency incremental change rate	0.01–50.00 Hz/s	0.50 Hz/s
P08.46	DOWN terminal frequency decremental change rate	0.01–50.00 Hz/s	0.50 Hz/s
P17.00	Set frequency	0.00Hz–P00.03 (Max. output frequency)	0.00Hz
P17.02	Ramp reference frequency	0.00Hz–P00.03 (Max. output frequency)	0.00Hz
P17.14	Digital adjustment value	0.00Hz–P00.03	0.00Hz

6.1.9 Analog input

The inverter provides two analog input terminals, which are AI1 supporting 0–10V/0–20mA, (whether the input is voltage or current can be set by P05.50), and AI2 supporting -10–10V, and two high-speed pulse input terminals. Each input can be filtered separately, and the corresponding reference curve can be set by adjusting the reference corresponds to the max. value and min. value.



P05.00	Ones： 0: HDIA is high-speed pulse input 1: HDIA is digital input	P05.38	0: Set input via frequency 1: Reserved 2: Input via encoder
P05.00	Tens： 0: HDIB is high-speed pulse input 1: HDIB is digital input	P05.44	0: Set input via frequency 1: Reserved 2: Input via encoder

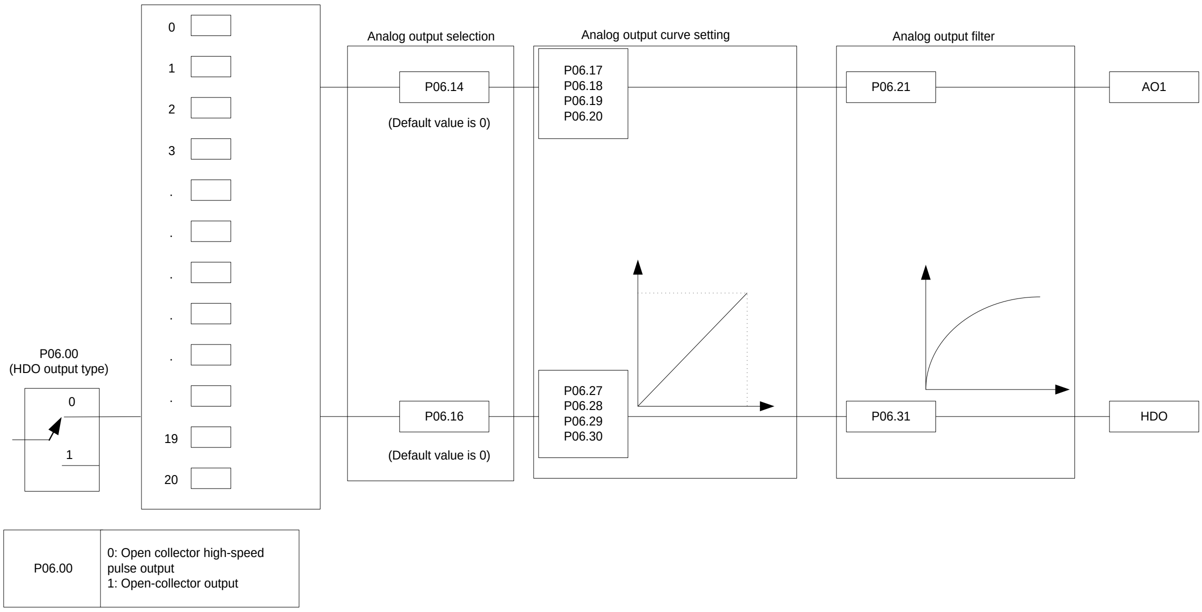
Related parameter list:

Function code	Name	Description	Default
P05.00	HDI input type	0x00–0x11 Ones: HDIA input type 0: HDIA is high-speed pulse input 1: HDIA is digital input Tens: HDIB input type 0: HDIB is high-speed pulse input 1: HDIB is digital input	0x00
P05.24	Lower limit value of AI1	0.00V–P05.26	0.00V
P05.25	Corresponding setting of lower limit of AI1	-300.0%–300.0%	0.0%
P05.26	Upper limit value of AI1	P05.24–10.00V	10.00V
P05.27	Corresponding setting of upper limit of AI1	-300.0%–300.0%	100.0%
P05.28	Input filter time of AI1	0.000s–10.000s	0.100s
P05.29	Lower limit value of AI2	-10.00V–P05.31	-10.00V
P05.30	Corresponding setting of lower limit of AI2	-300.0%–300.0%	-100.0%

Function code	Name	Description	Default
P05.31	Intermediate value 1 of AI2	P05.29–P05.33	0.00V
P05.32	Corresponding setting of intermediate value 1 of AI2	-300.0%–300.0%	0.0%
P05.33	Intermediate value 2 of AI2	P05.31–P05.35	0.00V
P05.34	Corresponding setting of intermediate value 2 of AI2	-300.0%–300.0%	0.0%
P05.35	Upper limit value of AI2	P05.33–10.00V	10.00V
P05.36	Corresponding setting of upper limit of AI2	-300.0%–300.0%	100.0%
P05.37	Input filter time of AI2	0.000s–10.000s	0.100s
P05.38	HDIA high-speed pulse input function	0: Set input via frequency 1: Reserved 2: Input via encoder, used in combination with HDIB	0
P05.39	Lower limit frequency of HDIA	0.000 kHz – P05.41	0.000kHz
P05.40	Corresponding setting of lower limit frequency of HDIA	-300.0%–300.0%	0.0%
P05.41	Upper limit frequency of HDIA	P05.39 –50.000kHz	50.000kHz
P05.42	Corresponding setting of upper limit frequency of HDIA	-300.0%–300.0%	100.0%
P05.43	HDIA frequency input filter time	0.000s–10.000s	0.030s
P05.44	HDIB high-speed pulse input function selection	0: Set input via frequency 1: Reserved 2: Input via encoder, used in combination with HDIA	0
P05.45	Lower limit frequency of HDIB	0.000 kHz – P05.47	0.000kHz
P05.46	Corresponding setting of lower limit frequency of HDIB	-300.0%–300.0%	0.0%
P05.47	Upper limit frequency of HDIB	P05.45 –50.000kHz	50.000kHz
P05.48	Corresponding setting of upper limit frequency of HDIB	-300.0%–300.0%	100.0%
P05.49	HDIB frequency input filter time	0.000s–10.000s	0.030s
P05.50	AI1 input signal type	0–1 0: Voltage type 1: Current type	0

6.1.10 Analog output

The inverter provides one analog output terminal (supporting 0–10V/0–20mA) and one high-speed pulse output terminal. Analog output signals can be filtered separately, and the proportional relation can be adjusted by setting the max. value, min. value, and the percentage of their corresponding output. Analog output signals can output the motor speed, output frequency, output current, motor torque and motor power at a certain proportion.



Terminal output is described as follows:

Setting	Function	Description
0	Running frequency	0–Max. output frequency
1	Set frequency	0–Max. output frequency
2	Ramp reference frequency	0–Max. output frequency
3	Running speed	0–Synchronous speed corresponding to max. output frequency
4	Output current (relative to inverter)	0–Twice the inverter rated current
5	Output current (relative to motor)	0–Twice the motor rated current
6	Output voltage	0–1.5 times the inverter rated voltage
7	Output power	0–Twice the motor rated power
8	Set torque value (bipolar)	0–Twice the motor rated current. A negative value corresponds to 0.0% by default.
9	Output torque (absolute value)	0 – +/-(Twice the motor rated torque)
10	AI1 input value	0–10V/0–20mA
11	AI2 input value	0V–10V. A negative value corresponds to 0.0% by default.
12	AI3 input value	0–10V/0–20mA
13	High-speed pulse HDIA input	0.00–50.00kHz
14	Value 1 set through Modbus/Modbus TCP communication	0–1000
15	Value 2 set through Modbus/Modbus TCP communication	0–1000
16	Value 1 set through PROFIBUS/CANopen/DeviceNet communication	0–1000

Setting	Function	Description
17	Value 2 set through PROFIBUS/CANopen/DeviceNet communication	0–1000
18	Value 1 set through Ethernet communication	0–1000
19	Value 2 set through Ethernet communication	0–1000
20	High-speed pulse HDIB input	0.00–50.00kHz
21	Value 1 set through EtherCAT/PROFINET/ EtherNET IP communication	0–1000. A negative value corresponds to 0.0% by default.
22	Torque current (bipolar)	0–Triple the motor rated current. A negative value corresponds to 0.0% by default.
23	Exciting current	0–Triple the motor rated current. A negative value corresponds to 0.0% by default.
24	Set frequency (bipolar)	0–Max. output frequency. A negative value corresponds to 0.0% by default.
25	Ramp reference frequency (bipolar)	0–Max. output frequency. A negative value corresponds to 0.0% by default.
26	Running speed (bipolar)	0–Synchronous speed corresponding to max. output frequency. A negative value corresponds to 0.0% by default.
27	Value 2 set through EtherCAT/PROFINET/EtherNet IP communication	0–1000
28	AO1 from the Programmable card	0–1000
29	AO2 from the Programmable card	0–1000
30	Running speed	0–Twice the motor rated synchronous speed.
31	Output torque (bipolar)	0–Twice the motor rated torque. A negative value corresponds to 0.0% by default.
32	AI/AO temperature detection output	AO value of AI/AO temperature detection
33–63	Reserved	

Related parameter list:

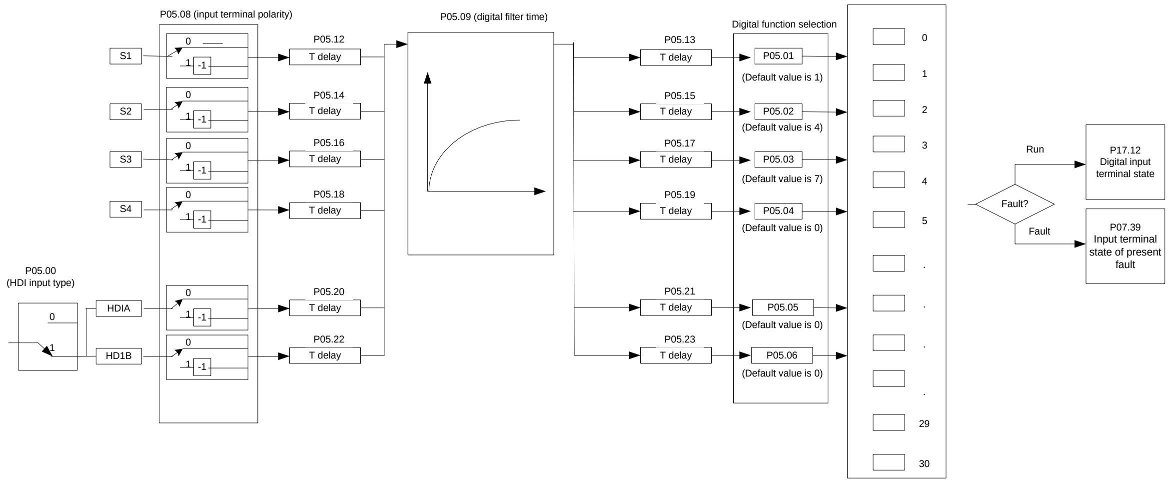
Function code	Name	Description	Default
P06.00	HDO output type	0: Open collector high-speed pulse output 1: Open collector output	0
P06.14	AO1 output selection	0: Running frequency (0–Max. output frequency) 1: Set frequency (0–Max. output frequency) 2: Ramp reference frequency (0–Max. output frequency) 3: Rotational speed (0–Speed corresponding to max. output frequency)	0
P06.15	Reserved		0
P06.16	HDO high-speed pulse output		0

Function code	Name	Description	Default
		4: Output current (0–Twice the inverter rated current) 5: Output current (0–Twice the motor rated current) 6: Output voltage (0–1.5 times the inverter rated voltage) 7: Output power (0–Twice the motor rated power) 8: Set torque (0–Twice the motor rated torque) 9: Output torque (Absolute value, 0–+/- Twice the motor rated torque) 10: AI1 input (0–10V/0–20mA) 11: AI2 input (0–10V) 12: AI3 input (0–10V/0–20mA) 13: HDIA input (0.00–50.00kHz) 14: Value 1 set through Modbus/Modbus TCP communication (0–1000) 15: Value 2 set through Modbus/Modbus TCP communication (0–1000) 16: Value 1 set through PROFIBUS/CANopen/DeviceNet communication (0–1000) 17: Value 2 set through PROFIBUS/CANopen/DeviceNet communication (0–1000) 18: Value 1 set through Ethernet communication (0–1000) 19: Value 2 set through Ethernet communication (0–1000) 20: HDIB input (0.00–50.00kHz) 21: Value 1 set through EtherCAT/PROFINET/EtherNet IP communication (0–1000) 22: Torque current (bipolar, 0–Triple the motor rated current) 23: Exciting current (bipolar, 0–Triple the motor rated current) 24: Set frequency (bipolar, 0–Max. output frequency) 25: Ramp reference frequency (bipolar, 0–Max. output frequency) 26: Rotational speed (bipolar, 0–Speed corresponding to max. output frequency)	

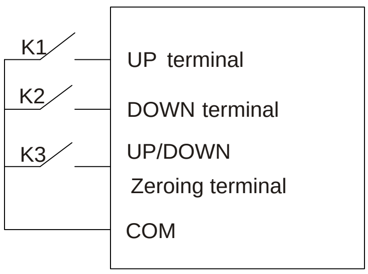
Function code	Name	Description	Default
		27: Value 2 set through EtherCAT/PROFINET/EtherNet IP communication (0–1000) 28: AO1 from the programmable card (0–1000) 29: AO2 from the programmable card (0–1000) 30: Rotational speed (0–Twice the motor rated synchronous speed) 31: Output torque (Actual value, 0–Twice the motor rated torque) 32: AI/AO temperature detection output	
P06.17	Lower limit of AO1 output	-300.0%–P06.19	0.0%
P06.18	Corresponding AO1 output of lower limit	0.00V–10.00V	0.00V
P06.19	Upper limit of AO1 output	P06.17–300.0%	100.0%
P06.20	Corresponding AO1 output of upper limit	0.00V–10.00V	10.00V
P06.21	AO1 output filter time	0.000s–10.000s	0.000s
P06.22–P06.26	Reserved variable	0–65535	0
P06.27	Lower limit of HDO output	-300.0%–P06.29	0.0%
P06.28	Corresponding HDO output of lower limit	0.00–50.00kHz	0.0kHz
P06.29	Upper limit of HDO output	P06.27–300.0%	100.0%
P06.30	Corresponding HDO output of upper limit	0.00–50.00kHz	50.00kHz
P06.31	HDO output filter time	0.000s–10.000s	0.000s

6.1.11 Digital input

The inverter provides four programmable digital input terminals and two HDI input terminals. All the digital input terminal functions can be programmed by function codes. HDI input terminal can be set to act as high-speed pulse input terminal or common digital input terminal; if it is set to act as high-speed pulse input terminal, you can also set HDIA or HDIB high-speed pulse input to serve as the frequency reference and encoder signal input.



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

Setting	Function	Description
0	No function	The inverter does not act even if there is signal input; you can set the unused terminals to "no function" to avoid misacts.
1	Forward running (FWD)	Control the forward/reverse running of the inverter by external terminals.
2	Reverse running (REV)	
3	3-wire control/Sin	Set the inverter running mode to 3-wire control mode by this terminal. See P05.13 for details.
4	Forward jogging	Frequency when jogging, see P08.06, P08.07 and P08.08 for jogging acceleration/deceleration time.
5	Reverse jogging	
6	Coast to stop	The inverter blocks output, and the stop process of motor is uncontrolled by the inverter. This mode is applied in cases of large-inertia load and free stop time; its definition is the same with P01.08, and it is mainly used in remote control.
7	Fault reset	External fault reset function, its function is the same with the STOP/RST key on the keypad. This function can be used in remote fault reset.
8	Running pause	The inverter decelerates to stop, however, all the running parameters are in memory state, such as PLC parameter, wobbling frequency, and PID parameter. After this signal disappears, the inverter will revert to the state before stop.
9	External fault input	When external fault signal is transmitted to the inverter, the inverter releases fault alarm and stops.
10	Frequency increase (UP)	Used to change the frequency-increase/decrease command when the frequency is given by external terminals. 
11	Frequency decrease (DOWN)	
12	Clear frequency increase/decrease setting	

<table>
<tr><th>Setting</th><th>Function</th><th>Description</th></tr>
<tr><td></td><td></td><td>The terminal used to clear frequency-increase/decrease setting can clear the frequency value of auxiliary channel set by UP/DOWN, thus restoring the reference frequency to the frequency given by main reference frequency command channel.</td></tr>
<tr><td>13</td><td>Switching between A setting and B setting</td><td rowspan="3">This function is used to switch between the frequency setting channels.
A frequency reference channel and B frequency reference channel can be switched by no. 13 function; the combination channel set by P00.09 and the A frequency reference channel can be switched by no. 14 function; the combination channel set by P00.09 and the B frequency reference channel can be switched by no. 15 function.</td></tr>
<tr><td>14</td><td>Switching between combination setting and A setting</td></tr>
<tr><td>15</td><td>Switching between combination setting and B setting</td></tr>
<tr><td>16</td><td>Multi-step speed terminal 1</td><td rowspan="4">16-step speeds can be set by combining digital states of these four terminals.
Note: Multi-step speed 1 is low bit, 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>Pause multi-step speed selection function to keep the set value in present state.</td></tr>
<tr><td>21</td><td>Acceleration/deceleration time selection 1</td><td rowspan="2">Use these two terminals to select four groups of acceleration/decoration time.<table><tr><th>Terminal 1</th><th>Terminal 2</th><th>Acceleration or deceleration time selection</th><th>Corresponding parameter</th></tr><tr><td>OFF</td><td>OFF</td><td>Acceleration/ deceleration time 1</td><td>P00.11/P00.12</td></tr><tr><td>ON</td><td>OFF</td><td>Acceleration/ deceleration time 2</td><td>P08.00/P08.01</td></tr><tr><td>OFF</td><td>ON</td><td>Acceleration/ deceleration time 3</td><td>P08.02/P08.03</td></tr><tr><td>ON</td><td>ON</td><td>Acceleration/ deceleration time 4</td><td>P08.04/P08.05</td></tr></table></td></tr>
<tr><td>22</td><td>Acceleration/deceleration time selection 2</td></tr>
<tr><td>23</td><td>Simple PLC stop reset</td><td>Restart simple PLC process and clear previous PLC state information.</td></tr>
<tr><td>24</td><td>Simple PLC pause</td><td>The program pauses during PLC execution, and keeps running in current speed step. After this function is cancelled, simple PLC keeps running.</td></tr>
<tr><td>25</td><td>PID control pause</td><td>PID is ineffective temporarily, and the inverter maintains current frequency output.</td></tr>
<tr><td>26</td><td>Wobbling frequency pause (stop at current frequency)</td><td>The inverter pauses at current output. After this function is canceled, it continues wobbling-frequency operation at current frequency.</td></tr>
</table>

Setting	Function	Description
27	Wobbling frequency reset (revert to center frequency)	The set frequency of inverter reverts to center frequency.
28	Counter reset	Zero out the counter state.
29	Switching between speed control and torque control	The inverter switches from torque control mode to speed control mode, or vice versa.
30	Acceleration/deceleration disabled	Ensure the inverter will not be impacted by external signals (except for stop command), and maintains current output frequency.
31	Counter trigger	Enable pulse counting of the counter.
33	Clear frequency increase/decrease setting temporarily	When the terminal is closed, the frequency value set by UP/DOWN can be cleared to restore to the frequency given by frequency command channel; when the terminal is disconnected, it will revert to the frequency value after frequency increase/decrease setting.
34	DC brake	The inverter starts DC braking immediately after the command becomes valid.
35	Switching between motor 1 and motor 2	When this terminal is valid, you can realize switchover control of two motors.
36	Command switches to keypad	When this terminal is valid, the running command channel will switch to keypad compulsorily. If this function becomes invalid, the running command channel will revert to the original state.
37	Command switches to terminal	When this terminal is valid, the running command channel will switch to terminal compulsorily. If this function becomes invalid, the running command channel will revert to the original state.
38	Command switches to communication	When this terminal is valid, the running command channel will switch to communication compulsorily. If this function becomes invalid, the running command channel will revert to the original state.
39	Pre-exciting command	When this terminal is valid, motor pre-exciting will be started until this terminal becomes invalid.
40	Zero out power consumption quantity	After this command becomes valid, the power consumption quantity of the inverter will be zeroed out.
41	Maintain power consumption quantity	When this command is valid, current operation of the inverter will not impact the power consumption quantity.
42	Source of upper torque limit switches to keypad	When this command is valid, the upper limit of the torque will be set by keypad.
43	Position reference point input	Valid only for S1, S2, and S3.
44	Disable spindle orientation	Spindle orientation is invalid.
45	Spindle zeroing/local position zeroing	Spindle positioning is triggered.
46	Spindle zero position selection 1	Spindle zero position selection 1.

Setting	Function	Description
47	Spindle zero position selection 2	Spindle zero position selection 2.
48	Spindle scale division selection 1	Spindle scale division selection 1.
49	Spindle scale division selection 2	Spindle scale division selection 2.
50	Spindle scale division selection 3	Spindle scale division selection 3.
51	Position/speed control switchover terminal	Terminal for switching between position control and speed control.
52	Disable pulse input	Pulse input is invalid when the terminal is valid.
53	Clear position deviation	Used to clear the input deviation of position loop.
54	Switch position proportional gains	Used to switch position proportional gains.
55	Enable cyclic digital positioning	Cyclic positioning can be enabled when digital positioning is valid.
56	Emergency stop	When this command is valid, the motor decelerate to emergency stop as per the time set by P01.26.
57	Motor overtemperature fault input	Motor stops at motor over-temperature fault input.
59	Switch from FVC to SVPWM control	When this terminal is valid in stop state, switch to SVPWM control.
60	Switch to FVC control	When this terminal is valid in stop state, switch to FVC (closed-loop vector) control.
61	PID polarity switchover	Switching the output polarity of PID, this terminal should be used in conjunction with P09.03
62	Reserved	
63	Enable servo	When the thousands place of P21.00 is set to enable the servo, the servo enabling terminal is valid, which controls the inverter to enter zero servo control. At this situation, no startup command is needed.
64	FWD max. limit	Max frequency limit on forward rotation
65	REV max limit	Max frequency limit on reverse rotation
66	Zero out the counter	Zero out the position counting value
67	Pulse increase	When the terminal function is valid, the pulse input is increased according to the P21.27 pulse speed.
68	Enable pulse superimposition	When the pulse superimposition is enabled, pulse increase and pulse decrease are effective.
69	Pulse decrease	When the terminal function is valid, the pulse input is decreased according to the P21.27 pulse speed.

Setting	Function	Description
70	Electronic gear selection	If the terminal is valid, the proportional numerator is switched to the P21.30 numerator of the 2nd command ratio.
71	Switch to mater	In stopped state, if the terminal is valid, the master is used.
72	Switch to slave	In stopped state, if the terminal is valid, the slave is used.
73	Reset roll diameter	Used to reset the roll diameter when the tension control function is enabled.
74	Switch winding/unwinding	Used to switch winding/unwinding modes when the tension control function is enabled.
75	Tension control pre-drive	If the terminal is valid when the tension control function is enabled, tension control pre-drive is performed.
76	Disable roll diameter calculation	If the terminal is valid when the tension control function is enabled, roll diameter calculation is disabled.
77	Clear alarm display	Used to clear the alarm display when the tension control function is enabled.
78	Manual braking of tension control	If the terminal is valid when the tension control function is enabled, manual braking is activated.
79	Trigger forced feeding interrupt	If the terminal is valid when the tension control function is enabled, a feeding interrupt signal is triggered forcibly.
80	Initial roll diameter 1	Used to select different initial roll diameters by combining with the initial roll diameter 2 when the tension control function is enabled.
81	Initial roll diameter 2	Used to select different initial roll diameters by combining with the initial roll diameter 1 when the tension control function is enabled.
82	Trigger fire mode control	In fire mode, if the terminal is valid, the fire mode control signal is triggered.
83	Switch tension PID parameters	Used to switch two PID parameter groups when the tension control function is enabled. The first group is used by default. If the terminal is valid, the second group is used.
84–95	Reserved	

Related parameter list:

Function code	Name	Description	Default
P05.00	HDI input type	0x00–0x11 Ones place: HDIA input type 0: HDIA is high-speed pulse input 1: HDIA is digital input Tens place: HDIB input type 0: HDIB is high-speed pulse input 1: HDIB is digital input	0x00

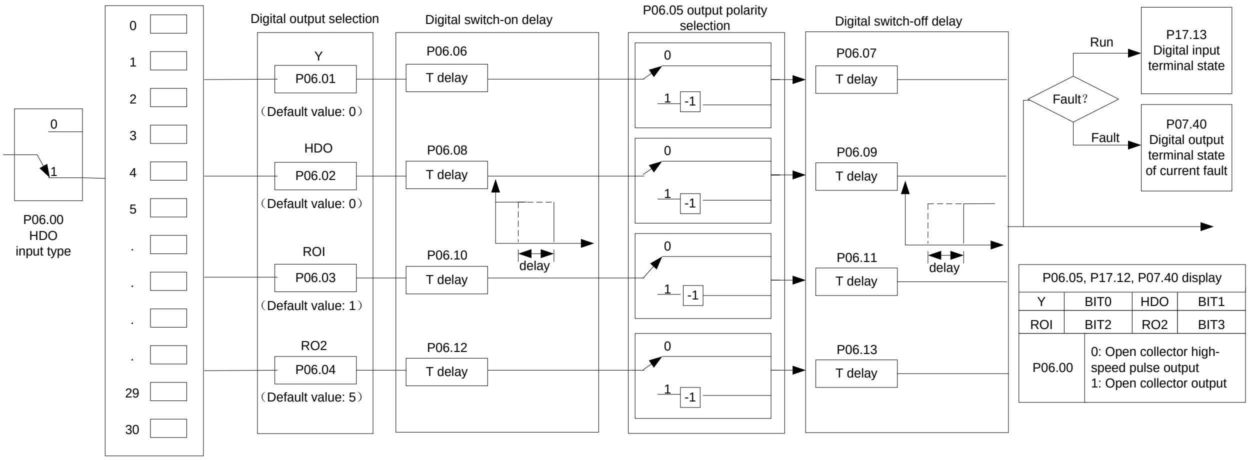
<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th></tr>
<tr><td>P05.01</td><td>Function of S1 terminal</td><td rowspan="6">0: No function
1: Forward running
2: Reverse running
3: 3-wire control/Sin
4: Forward jogging
5: Reverse jogging
6: Coast to stop
7: Fault reset
8: Running pause
9: External fault input
10: Frequency increase (UP)
11: Frequency decrease (DOWN)
12: Clear frequency increase/decrease setting
13: Switchover between setup A and setup B
14: Switchover between combination setting and A setting
15: Switchover between combination setting and setup B
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: Acceleration/deceleration time selection 1
22: Acceleration/deceleration time selection 2
23: Simple PLC stop reset
24: Simple PLC pause
25: PID control pause
26: Wobbling frequency pause
27: Wobbling frequency reset
28: Counter reset
29: Switching between speed control and torque control
30: Acceleration/deceleration disabled
31: Counter trigger
32: Reserved
33: Clear frequency increase/decrease setting temporarily
34: DC brake
35: Switching between motor 1 and motor 2
36: Command switches to keypad
37: Command switches to terminal
38: Command switches to communication
39: Pre-exciting command</td><td>1</td></tr>
<tr><td>P05.02</td><td>Function of S2 terminal</td><td>4</td></tr>
<tr><td>P05.03</td><td>Function of S3 terminal</td><td>7</td></tr>
<tr><td>P05.04</td><td>Function of S4 terminal</td><td>0</td></tr>
<tr><td>P05.05</td><td>Function of HDIA terminal</td><td>0</td></tr>
<tr><td>P05.06</td><td>Function of HDIB terminal</td><td>0</td></tr>
</table>

Function code	Name	Description	Default
		40: Zero out power consumption quantity 41: Maintain power consumption quantity 42: Source of upper torque limit switches to keypad 43: Position reference point input (only valid for S1, S2 and S3) 44: Disable spindle orientation 45: Spindle zeroing/local positioning zeroing 46: Spindle zero position selection 1 47: Spindle zero position selection 2 48: Spindle scale division selection 1 49: Spindle scale division selection 2 50: Spindle scale division selection 3 51: Position/speed control switchover terminal 52: Disable pulse input 53: Clear position deviation 54: Switch position proportional gains 55: Enable cyclic digital positioning 56: Emergency stop 57: Motor overtemperature fault input 59: Switch to V/F control 60: Switch to FVC control 61: PID polarity switchover 62: Reserved 63: Enable servo 64: FWD max. limit 65: REV max limit 66: Zero out the counter 67: Pulse increase 68: Enable pulse superimposition 69: Pulse decrease 70: Electronic gear selection 71: Switch to master 72: Switch to slave 73: Reset the roll diameter 74: Switch winding/unwinding 75: Pre-drive 76: Disable roll diameter calculation 77: Clear alarm display 78: Manual braking 79: Trigger forced feeding interrupt 80: Initial roll diameter 1 81: Initial roll diameter 2 82: Trigger fire mode control	

Function code	Name	Description	Default
		83: Switch tension PID parameters 84–95: Reserved	
P05.08	Polarity of input terminal	0x00–0x3F	0x00
P05.09	Digital filter time	0.000–1.000s	0.010s
P05.10	Virtual terminal setting	0x00–0x3F (0: disable, 1: enable) BIT0: S1 virtual terminal BIT1: S2 virtual terminal BIT2: S3 virtual terminal BIT3: S4 virtual terminal BIT4: HDIA virtual terminal BIT8: HDIB virtual terminal	0x00
P05.11	2/3-wire control mode	0: 2-wire control 1 1: 2-wire control 2 2: 3-wire control 1 3: 3-wire control 2	0
P05.12	S1 terminal switch-on delay	0.000–50.000s	0.000s
P05.13	S1 terminal switch-off delay	0.000–50.000s	0.000s
P05.14	S2 terminal switch-on delay	0.000–50.000s	0.000s
P05.15	S2 terminal switch-off delay	0.000–50.000s	0.000s
P05.16	S3 terminal switch-on delay	0.000–50.000s	0.000s
P05.17	S3 terminal switch-off delay	0.000–50.000s	0.000s
P05.18	S4 terminal switch-on delay	0.000–50.000s	0.000s
P05.19	S4 terminal switch-off delay	0.000–50.000 s	0.000s
P05.20	HDIA terminal switch-on delay	0.000–50.000s	0.000s
P05.21	HDIA terminal switch-off delay	0.000–50.000s	0.000s
P05.22	HDIB terminal switch-on delay	0.000–50.000s	0.000s
P05.23	HDIB terminal switch-off delay	0.000–50.000s	0.000s
P07.39	Input terminal status at present fault	/	0x0000
P17.12	Digital input terminal state	/	0x00

6.1.12 Digital output

The inverter provides two groups of relay output terminals, one open collector Y output terminal and one high-speed pulse output (HDO) terminal. All the digital output terminal functions can be programmed by function codes, of which the high-speed pulse output terminal HDO can also be set to high-speed pulse output or digital output by function code.



The following table lists the function code options. A same output terminal function can be repeatedly selected.

Setting	Function	Description
0	Invalid	Output terminal has no function
1	In running	Output ON signal when there is frequency output during running
2	In forward running	Output ON signal when there is frequency output during forward running
3	In reverse running	Output ON signal when there is frequency output during reverse running
4	In jogging	Output ON signal when there is frequency output during jogging
5	inverter fault	Output ON signal when inverter fault occurred
6	Frequency level detection FDT1	Refer to P08.32 and P08.33
7	Frequency level detection FDT2	Refer to P08.34 and P08.35
8	Frequency reached	Refer to P08.36
9	Running in zero speed	Output ON signal when the inverter output frequency and reference frequency are both zero.
10	Reach upper limit frequency	Output ON signal when the running frequency reaches upper limit frequency
11	Reach lower limit frequency	Output ON signal when the running frequency reached lower limit frequency
12	Ready to run	Main circuit and control circuit powers are established, the protection functions do not act; when the inverter is ready to run, output ON signal.
13	In pre-exciting	Output ON signal during pre-exciting of the inverter
14	Overload pre-alarm	Output ON signal after the pre-alarm time elapsed based on the pre-alarm threshold; see P11.08–P11.10 for details.
15	Underload pre-alarm	Output ON signal after the pre-alarm time elapsed based on the pre-alarm threshold; see P11.11–P11.12 for details.
16	Simple PLC state completed	Output signal when current stage of simple PLC is completed

Setting	Function	Description
17	Simple PLC cycle completed	Output signal when a single cycle of simple PLC operation is completed
23	Virtual terminal output of Modbus/Modbus TCP communication	Output corresponding signal based on the set value of Modbus/Modbus TCP; output ON signal when it is set to 1, output OFF signal when it is set to 0
24	Virtual terminal output of POROFIBUS/CANopen communication	Output corresponding signal based on the set value of PROFIBUS/CANopen; output ON signal when it is set to 1, output OFF signal when it is set to 0
25	Virtual terminal output of Ethernet communication	Output corresponding signal based on the set value of Ethernet; output ON signal when it is set to 1, output OFF signal when it is set to 0.
26	DC bus voltage established	Output is valid when the bus voltage is above the undervoltage threshold of the inverter
27	Z pulse output	Output is valid when the encoder Z pulse is arrived, and is invalid after 10 ms.
28	During pulse superposition	Output is valid when the pulse superposition terminal input function is valid
29	STO action	Output when STO fault occurred
30	Positioning completed	Output is valid when position control positioning is completed
31	Spindle zeroing completed	Output is valid when spindle zeroing is completed
32	Spindle scale-division completed	Output is valid when spindle scale-division is completed
33	In speed limit	Output is valid when the frequency is limited
34	Virtual terminal output of EtherCAT/PROFINET/ EtherNet IP communication	The corresponding signal is output according to the set value of PROFINET communication. When it is set to 1, the ON signal is output, and when it is set to 0, the OFF signal is output.
35	Reserved	
36	Speed/position control switchover completed	Output is valid when the mode switchover is completed
37	Any frequency reached	The frequency reached signal is output when the present ramp reference frequency is greater than the detection value for frequency being reached.
38–40	Reserved	
41	Y1	Y1 from the programmable card
42	Y2	Y2 from the programmable card
43	HDO	HDO from the programmable card
44	RO1	RO1 from the programmable card
45	RO2	RO2 from the programmable card
46	RO3	RO3 from the programmable card
47	RO4	RO4 from the programmable card

Setting	Function	Description
48	EC PT100 detected OH pre-alarm	Pre-alarm of overheating (OH) detected by the expansion card (EC) with PT100.
49	EC PT1000 detected OH pre-alarm	Pre-alarm of OH detected by the EC with PT1000.
50	AI/AO detected OH pre-alarm	Pre-alarm of OH detected by AI/AO.
51	Stopped or running at zero speed	The inverter is in stopped state or running at zero speed.
52	Disconnection detected in tension control	Disconnection is detected when the disconnection detection is enabled in tension control.
53	Roll diameter setting reached	The set roll diameter is reached during running in tension control.
54	Max. roll diameter reached	The max. roll diameter is reached during running in tension control.
55	Min. roll diameter reached	The min. roll diameter is reached during running in tension control.
56	Fire control mode enabled	The fire mode is turned on.
57–63	Reserved	

Related parameter list:

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th></tr>
<tr><td>P06.00</td><td>HDO output type</td><td>0: Open collector high-speed pulse output
1: Open collector output</td><td>0</td></tr>
<tr><td>P06.01</td><td>Y1 output selection</td><td rowspan="4">0: Invalid
1: In running
2: In forward running
3: In reverse running
4: In jogging
5: inverter fault
6: Frequency level detection FDT1
7: Frequency level detection FDT2
8: Frequency reached
9: Running in zero speed
10: Reach upper limit frequency
11: Reach lower limit frequency
12: Ready to run
13: In pre-exciting
14: Overload pre-alarm
15: Underload pre-alarm
16: Simple PLC stage completed
17: Simple PLC cycle completed</td><td>0</td></tr>
<tr><td>P06.02</td><td>HDO output selection</td><td>0</td></tr>
<tr><td>P06.03</td><td>Relay RO1 output selection</td><td>1</td></tr>
<tr><td>P06.04</td><td>Relay RO2 output selection</td><td>5</td></tr>
</table>

Function code	Name	Description	Default
		18: Reach set counting value 19: Reach designated counting value 20: External fault is valid 21: Reserved 22: Reach running time 23: Virtual terminal output of Modbus/Modbus TCP communication 24: Virtual terminal output of POROFIBUS/CANopen communication 25: Virtual terminal output of Ethernet communication 26: DC bus voltage established 27: Z pulse output 28: During pulse superposition 29: STO action 30: Positioning completed 31: Spindle zeroing completed 32: Spindle scale-division completed 33: In speed limit 34: Virtual terminal output of EtherCAT/PROFINET/EtherNet IP communication 35: Reserved 36: Speed/position control switchover completed 37: Any frequency reached 38–40: Reserved 41: Y1 from the programmable card 42: Y2 from the programmable card 43: HDO from the programmable card 44: RO1 from the programmable card 45: RO2 from the programmable card 46: RO3 from the programmable card 47: RO4 from the programmable card 48: EC PT100 detected OH pre-alarm 49: EC PT1000 detected OH pre-alarm 50: AI/AO detected OH pre-alarm 51: Stopped or running at zero speed 52: Disconnection detected in tension control 53: Roll diameter setting reached 54: Max. roll diameter reached 55: Min. roll diameter reached 56: Fire control mode enabled 57–63: Reserved	

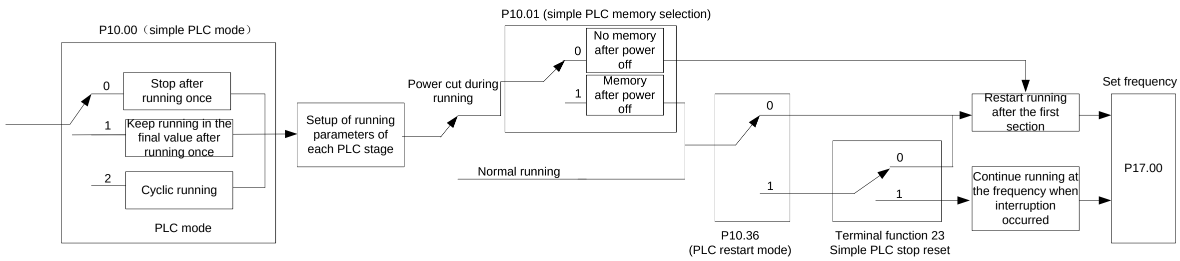
Function code	Name	Description	Default
P06.05	Output terminal polarity selection	0x00–0x0F	0x00
P06.06	Y switch-on delay	0.000–50.000s	0.000s
P06.07	Y switch-off delay	0.000–50.000s	0.000s
P06.08	HDO switch-on delay	0.000–50.000s (valid only when P06.00=1)	0.000s
P06.09	HDO switch-off delay	0.000–50.000s (valid only when P06.00=1)	0.000s
P06.10	Relay RO1 switch-on delay	0.000–50.000s	0.000s
P06.11	Relay RO1 switch-off delay	0.000–50.000s	0.000s
P06.12	Relay RO2 switch-on delay	0.000–50.000s	0.000s
P06.13	Relay RO2 switch-off delay	0.000–50.000s	0.000s
P07.40	Output terminal status at present fault	/	0x0000
P17.13	Digital output terminal state	/	0x00

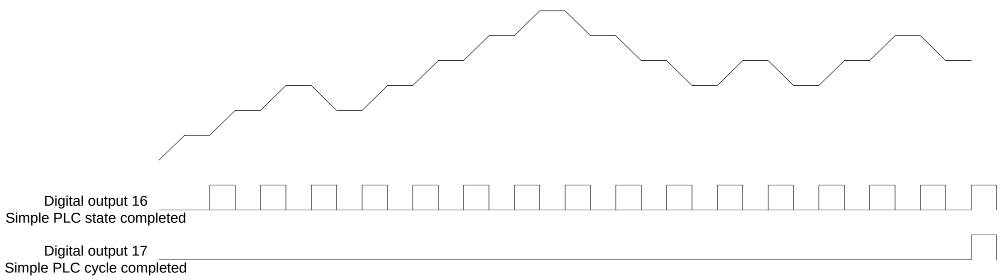
6.1.13 Simple PLC

Simple PLC is a multi-step speed generator, and the inverter can change the running frequency and direction automatically based on the running time to fulfill process requirements. Previously, such function was realized with external PLC, while now, the inverter itself can achieve this function.

The inverter can realize 16-step speeds control, and provide four groups of acceleration/deceleration time for you to choose.

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





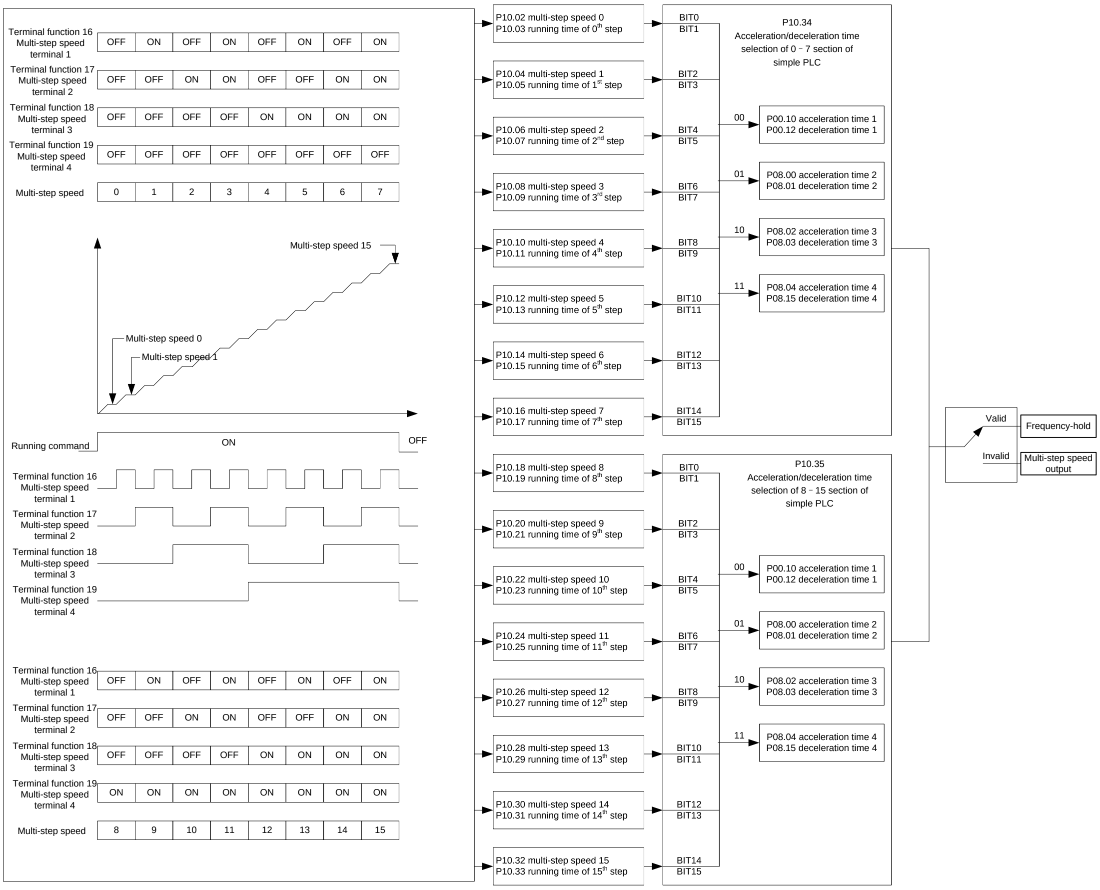
Related parameter list:

Function code	Name	Description	Default
P05.01–P05.06	Digital input function selection	23: Simple PLC stop reset 24: Pause simple PLC 25: Pause PID control	
P06.01–P06.04	Digital output function selection	16: Simple PLC stage reached 17: Simple PLC cycle reached	
P10.00	Simple PLC mode	0: Stop after running once 1: Keep running in the final value after running once 2: Cyclic running	0
P10.01	Simple PLC memory selection	0: No memory after power down 1: Memory after power down	0
P10.02	Multi-step speed 0	-300.0–300.0%	0.0%
P10.03	Running time of step 0	0.0–6553.5s (min)	0.0s
P10.04	Multi-step speed 1	-300.0–300.0%	0.0%
P10.05	Running time of step 1	0.0–6553.5s (min)	0.0s
P10.06	Multi-step speed 2	-300.0–300.0%	0.0%
P10.07	Running time of step 2	0.0–6553.5s (min)	0.0s
P10.08	Multi-step speed 3	-300.0–300.0%	0.0%
P10.09	Running time of step 3	0.0–6553.5s (min)	0.0s
P10.10	Multi-step speed 4	-300.0–300.0%	0.0%
P10.11	Running time of step 4	0.0–6553.5s (min)	0.0s
P10.12	Multi-step speed 5	-300.0–300.0%	0.0%
P10.13	Running time of step 5	0.0–6553.5s (min)	0.0s
P10.14	Multi-step speed 6	-300.0–300.0%	0.0%
P10.15	Running time of step 6	0.0–6553.5s (min)	0.0s
P10.16	Multi-step speed 7	-300.0–300.0%	0.0%
P10.17	Running time of step 7	0.0–6553.5s (min)	0.0s
P10.18	Multi-step speed 8	-300.0–300.0%	0.0%
P10.19	Running time of step 8	0.0–6553.5s (min)	0.0s
P10.20	Multi-step speed 9	-300.0–300.0%	0.0%
P10.21	Running time of step 9	0.0–6553.5s (min)	0.0s
P10.22	Multi-step speed 10	-300.0–300.0%	0.0%
P10.23	Running time of step 10	0.0–6553.5s (min)	0.0s
P10.24	Multi-step speed 11	-300.0–300.0%	0.0%
P10.25	Running time of step 11	0.0–6553.5s (min)	0.0s

Function code	Name	Description	Default
P10.26	Multi-step speed 12	-300.0–300.0%	0.0%
P10.27	Running time of step 12	0.0–6553.5s (min)	0.0s
P10.28	Multi-step speed 13	-300.0–300.0%	0.0%
P10.29	Running time of step 13	0.0–6553.5s (min)	0.0s
P10.30	Multi-step speed 14	-300.0–300.0%	0.0%
P10.31	Running time of step 14	0.0–6553.5s (min)	0.0s
P10.32	Multi-step speed 15	-300.0–300.0%	0.0%
P10.33	Running time of step 15	0.0–6553.5s (min)	0.0s
P10.36	PLC restart mode	0: Restart from the first section 1: Continue running at the frequency when interruption occurred	0
P10.34	Acceleration/deceleration time of steps 0–7 of simple PLC	0x0000–0XFFFF	0000
P10.35	Acceleration/deceleration time of steps 8–15 of simple PLC	0x0000–0XFFFF	0000
P05.01–P05.09	Digital input function	23: Simple PLC stop reset 24: Simple PLC pause 25: PID control pause	
P06.01–P06.04	Digital output function	16: Simple PLC stage reached 17: Simple PLC cycle reached	
P17.00	Set frequency	0.00Hz–P00.03 (Max. output frequency)	0.00Hz
P17.27	Acutal stage of simple PLC	Displays the actual stage of the simple PLC function.	0

6.1.14 Multi-step speed running

The inverter can set 16-step speeds, which are selectable by multi-step speed terminals 1–4, corresponding to multi-step speed 0 to multi-step speed 15.



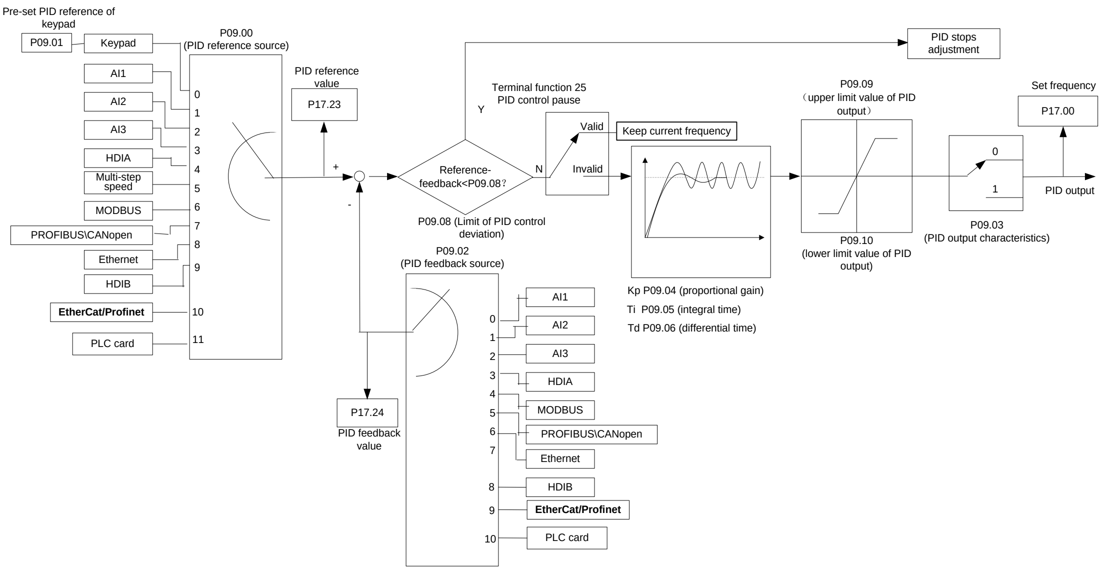
Related parameter list:

Function code	Name	Description	Default
P05.01–P05.06	Digital input function selection	16: Multi-step speed terminal 1 17: Multi-step speed terminal 2 18: Multi-step speed terminal 3 19: Multi-step speed terminal 4 20: Pause multi-step speed running	
P10.02	Multi-step speed 0	-300.0–300.0%	0.0%
P10.03	Running time of step 0	0.0–6553.5s (min)	0.0s
P10.04	Multi-step speed 1	-300.0–300.0%	0.0%
P10.05	Running time of step 1	0.0–6553.5s (min)	0.0s
P10.06	Multi-step speed 2	-300.0–300.0%	0.0%
P10.07	Running time of step 2	0.0–6553.5s (min)	0.0s
P10.08	Multi-step speed 3	-300.0–300.0%	0.0%
P10.09	Running time of step 3	0.0–6553.5s (min)	0.0s
P10.10	Multi-step speed 4	-300.0–300.0%	0.0%
P10.11	Running time of step 4	0.0–6553.5s (min)	0.0s
P10.12	Multi-step speed 5	-300.0–300.0%	0.0%
P10.13	Running time of step 5	0.0–6553.5s (min)	0.0s

Function code	Name	Description	Default
P10.14	Multi-step speed 6	-300.0–300.0%	0.0%
P10.15	Running time of step 6	0.0–6553.5s (min)	0.0s
P10.16	Multi-step speed 7	-300.0–300.0%	0.0%
P10.17	Running time of step 7	0.0–6553.5s (min)	0.0s
P10.18	Multi-step speed 8	-300.0–300.0%	0.0%
P10.19	Running time of step 8	0.0–6553.5s (min)	0.0s
P10.20	Multi-step speed 9	-300.0–300.0%	0.0%
P10.21	Running time of step 9	0.0–6553.5s (min)	0.0s
P10.22	Multi-step speed 10	-300.0–300.0%	0.0%
P10.23	Running time of step 10	0.0–6553.5s (min)	0.0s
P10.24	Multi-step speed 11	-300.0–300.0%	0.0%
P10.25	Running time of step 11	0.0–6553.5s (min)	0.0s
P10.26	Multi-step speed 12	-300.0–300.0%	0.0%
P10.27	Running time of step 12	0.0–6553.5s (min)	0.0s
P10.28	Multi-step speed 13	-300.0–300.0%	0.0%
P10.29	Running time of step 13	0.0–6553.5s (min)	0.0s
P10.30	Multi-step speed 14	-300.0–300.0%	0.0%
P10.31	Running time of step 14	0.0–6553.5s (min)	0.0s
P10.32	Multi-step speed 15	-300.0–300.0%	0.0%
P10.33	Running time of step 15	0.0–6553.5s (min)	0.0s
P10.34	Acceleration/decoration time of steps 0–7 of simple PLC	0x0000–0XFFFF	0000
P10.35	Acceleration/decoration time of steps 8–15 of simple PLC	0x0000–0XFFFF	0000
P17.27	Acutal stage of simple PLC	Displays the present stage of the simple PLC function.	0

6.1.15 PID control

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



Introduction to the working principles and control methods for PID control

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

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

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

When the frequency command selection (P00.06, P00.07) is 7 or the voltage setting channel selection (P04.27) is 6, the inverter is process PID controlled.

6.1.15.1 General procedures for PID parameter settings

a. Determining proportional gain P

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

b. Determine integral time Ti

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

c. Determining derivative time Td

The derivative time Td is generally set to 0.

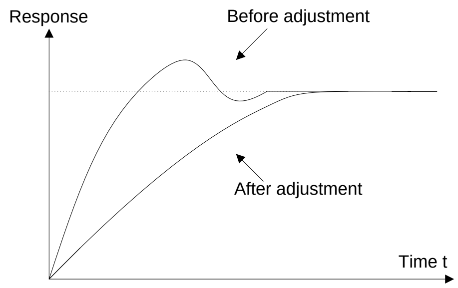
If users need to set Td to another value, set in the same way with P and Ti, namely set Td to 30% of the value when there is no oscillation.

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

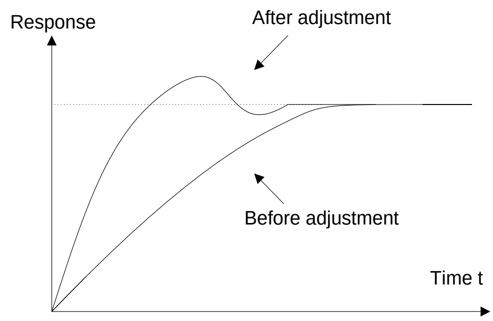
6.1.15.2 PID adjusting methods

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

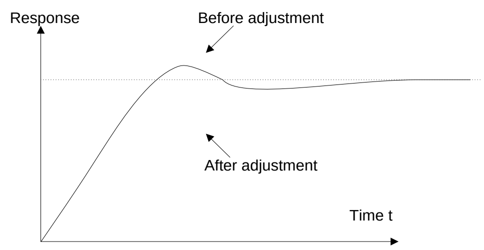
Control overshoot: When oveshoot occurred, shorten the derivative time (Td) and prolong integral time (Ti).



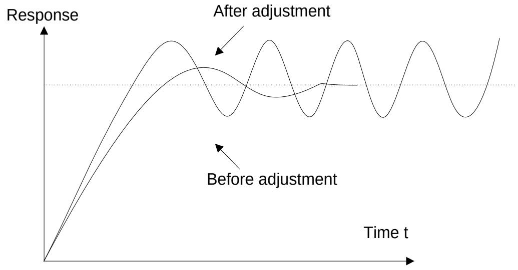
Stabilize the feedback value as fast as possible: when overshoot occurred, shorten integral time (Ti) and prolong derivative time (Td) to stabilize control as fast as possible.



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



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



Related parameter list:

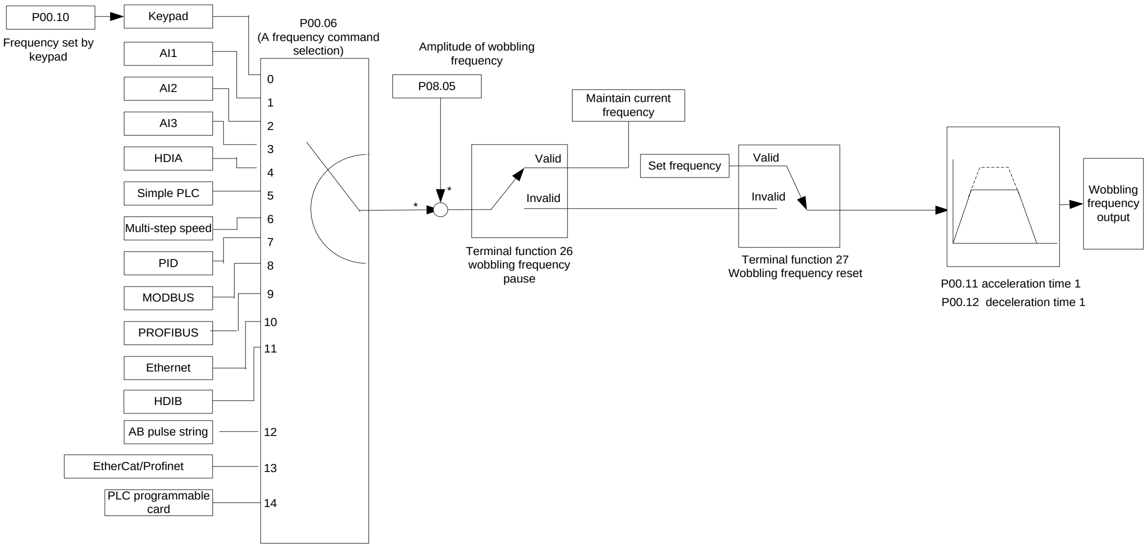
Function code	Name	Description	Default
P09.00	PID reference source	0: Set by P09.01 1: AI1 2: AI2 3: AI3 4: High-speed pulse HDIA 5: Multi-step 6: Modbus/Modbus TCP communication 7: PROFIBUS/CANopen/DeviceNet communication 8: Ethernet communication 9: High-speed pulse HDIB 10: EtherCAT/PROFINET/EtherNet IP communication 11: Programmable expansion card 12: Reserved	0
P09.01	PID digital setting	-100.0%–100.0%	0.0%
P09.02	PID feedback source	0: AI1 1: AI2 2: AI3 3: High-speed pulse HDIA 4: Modbus/Modbus TCP communication 5: PROFIBUS/CANopen/DeviceNet communication 6: Ethernet communication 7: High-speed pulse HDIB 8: EtherCAT/PROFINET/EtherNet IP communication 9: Programmable expansion card 10: Reserved	0
P09.03	PID output characteristics	0: PID output is positive characteristic 1: PID output is negative characteristic	0
P09.04	Proportional gain (Kp)	0.00–100.00	1.80
P09.05	Integral time (Ti)	0.01–10.00s	0.90s
P09.06	Derivative time (Td)	0.00–10.00s	0.00s
P09.07	Sampling cycle (T)	0.000–10.000s	0.100s

Function code	Name	Description	Default
P09.08	Limit of PID control deviation	0.0–100.0%	0.0%
P09.09	Upper limit value of PID output	P09.10–100.0% (max. frequency or voltage)	100.0%
P09.10	Lower limit value of PID output	-100.0%–P09.09 (max. frequency or voltage)	0.0%
P09.11	Feedback offline detection value	0.0–100.0%	0.0%
P09.12	Feedback offline detection time	0.0–3600.0s	1.0s
P09.13	PID control selection	0x0000–0x1111 Ones: 0: Continue integral control after the frequency reaches upper/lower limit 1: Stop integral control after the frequency reaches upper/lower limit Tens: 0: The same with the main reference direction 1: Contrary to the main reference direction Hundreds: 0: Limit as per the max. frequency 1: Limit as per A frequency Thousands: 0: A+B frequency, acceleration /deceleration of main reference A frequency source buffering is invalid 1: A+B frequency, acceleration/ deceleration of main reference A frequency source buffering is valid, acceleration/deceleration is determined by P08.04 (acceleration time 4).	0x0001
P09.14	Low frequency proportional gain (Kp)	0.00–100.00	1.00
P09.15	ACC/DEC time of PID command	0.0–1000.0s	0.0s
P09.16	PID output filter time	0.000–10.000s	0.000s
P09.17	Reserved		
P09.18	Low frequency integral time (Ti)	0.00–10.00s	0.90s
P09.19	Low frequency differential time (Td)	0.00–10.00s	0.00s
P09.20	Low frequency point for PID parameter switching	0.00–P09.21	5.00Hz

Function code	Name	Description	Default
P09.21	High frequency point for PID parameter switching	P09.20–P00.04	10.00Hz
P17.00	Set frequency	0.00Hz–P00.03 (Max. output frequency)	0.00Hz
P17.23	PID reference value	-100.0–100.0%	0.0%
P17.24	PID feedback value	-100.0–100.0%	0.0%

6.1.16 Running at wobbling frequency

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



Function code	Name	Description	Default
P00.03	Max. output frequency	P00.03–400.00Hz	50.00Hz
P00.06	A frequency command selection	0: Keypad 1: AI1 2: AI2 3: AI3 4: High speed pulse HDIA 5: Simple PLC program 6: Multi-step speed running 7: PID control 8: Modbus/Modbus TCP communication 9: PROFIBUS/CANopen/DeviceNet communication 10: Ethernet communication 11: High speed pulse HDIB 12: Pulse train AB 13: EtherCAT/PROFINET/EtherNet IP communication 14: Programmable card	0

Function code	Name	Description	Default
P00.11	Acceleration time 1	0.0–3600.0s	Model depended
P00.12	Deceleration time 1	0.0–3600.0s	Model depended
P05.01–P05.06	Digital input function selection	26: Wobbling frequency pause (stop at current frequency) 27: Wobbling frequency reset (revert to center frequency)	/
P08.15	Amplitude of wobbling frequency	0.0–100.0% (relative to set frequency)	0.0%
P08.16	Amplitude of jump frequency	0.0–50.0% (relative to amplitude of wobbling frequency)	0.0%
P08.17	Wobbling frequency rise time	0.1–3600.0s	5.0s
P08.18	Wobbling frequency fall time	0.1–3600.0s	5.0s

6.1.17 Local encoder input

The inverter supports pulse count function by inputting the count pulse from HDI high-speed pulse port. When the actual count value is no less than the set value, digital output terminal will output count-value-reached pulse signal, and the corresponding count value will be zeroed out.

Function code	Name	Description	Default
P05.00	HDI input type	0x00–0x11 Ones: HDIA input type 0: HDIA is high-speed pulse input 1: HDIA is digital input Tens: HDIB input type 0: HDIB is high-speed pulse input 1: HDIB is digital input	0x00
P05.38	HDIA high-speed pulse input function	0: Set input via frequency 1: Reserved 2: Input via encoder, used in combination with HDIB	0
P05.44	HDIB high-speed pulse input function selection	0: Set input via frequency 1: Reserved 2: Input via encoder, used in combination with HDIA	0
P18.00	Actual frequency of encoder	-999.9–3276.7Hz	0.0Hz
P20.15	Speed measurement mode	0: PG card 1: local; realized by HDIA and HDIB; supports incremental 24V encoder only	0

6.1.18 Commissioning procedures for position control and spindle positioning

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

Step 1: Restore to default value via keypad

Step 2: Set P00.03, P00.04 and P02 group motor nameplate parameters

Step 3: Motor parameter autotuning

Carry out rotary parameter autotuning or static parameter autotuning via keypad, if the motor can be disconnected from load, then it is users can carry out rotary parameter autotuning; otherwise, carry out static parameter autotuning, the parameter obtained from autotuning will be saved in P02 motor parameter group automatically.

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

a) Confirm the encoder direction and parameter setup

Set P20.01 (encoder pulse-per-revolution), set P00.00=2 and P00.10=20Hz, and run the inverter, at this point, the motor rotates at 20Hz, observe whether the speed measurement value of P18.00 is correct, if the value is negative, it indicates the encoder direction is reversed, under such situation, set P20.02 to 1; if the speed measurement value deviates greatly, it indicates P20.01 is set improperly. Observe whether P18.02 (encoder Z pulse count value) fluctuates, if yes, it indicates the encoder suffers interference or P20.01 is set improperly, requiring users to check the wiring and the shielding layer.

b) Determine Z pulse direction

Set P00.10=20Hz, and set P00.13 (running direction) to forward and reverse direction respectively to observe whether the difference value of P18.02 is less than 5, if the difference value remains to be larger than 5 after setting Z pulse reversal function of P20.02, power off and exchange phase A and phase B of the encoder, and then observe the difference between the value of P18.02 during forward and reverse rotation. Z pulse direction only affects the forward/reverse positioning precision of the spindle positioning carried out with Z pulse.

Step 5: Closed-loop vector pilot-run

Set P00.00=3, and carry out closed-loop vector control, adjust P00.10 and speed loop and current loop PI parameter in P03 group to make it run stably in the whole range.

Step 6: Flux-weakening control

Set flux-weakening regulator gain P03.26=0–8000, and observe the flux-weakening control effect. P03.22–P03.24 can be adjusted as needed.

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

Step 1: Set P00.18=1, restore to default value

Step 2: Set P00.00=3 (VC), set P00.03, P00.04, and motor nameplate parameters in P02 group.

Step 3: Set P20.00 and P20.01 encoder parameters

When the encoder is resolver-type encoder, set the encoder pulse count value to (resolver pole pair number × 1024), eg, if pole pair number is 4, set P20.01 to 4096.

Step 4: Ensure the encoder is installed and set correctly

When motor stops, observe whether P18.21 (resolver angle) fluctuates, if it fluctuates sharply, check the wiring and grounding. Rotates the motor slowly, observe whether P18.21 changes accordingly. If yes, it indicates motor is connected correctly; if the value of P18.02 keeps constant at a non-zero value after rotating for multiple circles, it indicates encoder Z signal is correct.

Step 5: Autotuning of initial position of magnetic pole

Set P20.11=2 or 3 (3: rotary autotuning; 2: static autotuning), press RUN key to run the inverter.

a) Rotary autotuning (P20.11 = 3)

Detect the position of current magnetic pole when autotuning starts, and then accelerates to 10Hz, autotuning corresponding magnetic pole position of encoder Z pulse, and decelerate to stop.

During running, if ENC1O or ENC1D fault occurred, set P20.02=1 and carry out autotuning again.

After autotuning is done, the angle obtained from autotuning will be saved in P20.09 and P20.10 automatically.

b) Static autotuning

In cases where the load can be disconnected, it is recommended to adopt rotary autotuning (P20.11=3) as it has high angle precision. If the load cannot be disconnected, users can adopt static autotuning (P20.11=2). The magnetic pole position obtained from autotuning will be saved in P20.09 and P20.10.

Step 6: Closed-loop vector pilot-run

Adjust P00.10 and speed loop and current loop PI parameter in P03 group to make it run stably in the whole range. If oscillation occurred, reduce the value of P03.00, P03.03, P03.09 and P03.10. If current oscillation noise occurred during low speed, adjust P20.05.

Note: It is necessary to re-determine P20.02 (encoder direction) and carry out magnetic pole position autotuning again if the wiring of motor or encoder is changed.

3. Commissioning procedures for pulse string control

Pulse input is operated based on closed-loop vector control; speed detection is needed in the subsequent spindle positioning, zeroing operation and division operation.

Step 1: Restore to default value by keypad

Step 2: Set P00.03, P00.04 and motor nameplate parameters in P02 group

Step 3: Motor parameter autotuning: rotary parameter autotuning or static parameter autotuning

Step 4: Verity the installation and settings of encoder. Set P00.00=3 and P00.10=20Hz to run the system, and check the control effect and performance of the system.

Step 5: Set P21.00=0001 to set positioning mode to position control, namely pulse-string control. There are four kinds of pulse command modes, which can be set by P21.01 (pulse command mode).

Under position control mode, you can check high-order bit and low-order bit of position reference and feedback, P18.02 (count value of Z pulse), P18.00 (actual frequency of encoder), P18.17 (pulse command frequency) and P18.19 (position regulator output) via P18, through which users can figure out the relation between P18.8 (position of position reference point) and P18.02, pulse command frequency P18.17, feedforward P18.18 and position regulator output P18.19.

Step 6: The position regulator has two gains, namely P21.02 and P21.03, and they can be switched by speed command, torque command and terminals.

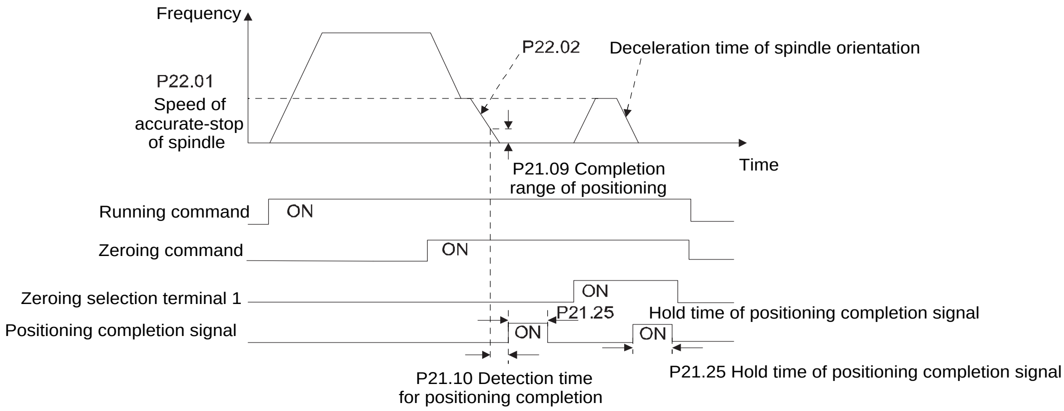
Step 7: When P21.08 (output limit of position controller) is set to 0, the position control will be invalid, and at this point, the pulse string acts as frequency source, P21.13 (position feedforward gain) should be set to 100%, and the speed acceleration/deceleration time is determined by the acceleration /deceleration time of pulse string, the pulse string acceleration/deceleration time of the system can be adjusted. If the pulse string acts as the frequency source in speed control, users can also set P21.00 to 0000, and set the frequency source reference P00.06 or P00.07 to 12 (set by pulse string AB), at this point, the acceleration/deceleration time is determined by the acceleration/deceleration time of the inverter, meanwhile, the parameters of pulse string AB is still set by P21 group. In speed mode, the filter time of pulse string AB is determined by P21.29.

Step 8: The input frequency of pulse string is the same with the feedback frequency of encoder pulse, the relation between them can be changed by altering P21.11 (numerator of position command ratio) and P21.12 (denominator of position command ratio)

Step 9: When running command or servo enabling is valid (by setting P21.00 or terminal function 63), it will enter pulse string servo running mode.

4. Commissioning procedures for spindle positioning

Spindle orientation is to realize orientation functions like zeroing and division based on closed-loop vector control



Step 1–4: These four steps are the same with the first four steps of the commissioning procedures for closed-loop vector control, which aim to fulfill the control requirements of closed-loop vector control, thus realizing spindle positioning function in either position control or speed control mode.

Step 5: Set P22.00.bit0=1 to enable spindle positioning, set P22.00.bit1 to select spindle zero input. If the system adopts encoder for speed measurement, set P22.00.bit1 to 0 to select Z pulse input; if the system adopts photoelectric switch for speed measurement, set P22.00.bit1 to 1 to select photoelectric switch as zero input; set P22.00.bit2 to select zero search mode, set P22.00.bit3 to enable or disable zero calibration, and select zero calibration mode by setting P22.00.bit7.

Step 6: Spindle zeroing operation

a) Select the positioning direction by setting P22.00.bit4;

b) There are four zero positions in P22 group, users can choose one out of four zeroing positions by setting zeroing input terminal selection (46, 47) in P05 group. When executing zeroing function, the motor will stop accurately at corresponding zeroing position according to the set positioning direction, which can be viewed via P18.10;

c) The positioning length of spindle zeroing is determined by the deceleration time of accurate-stop and the speed of accurate-stop;

Step 7: Spindle division operation

There are seven scale-division positions in P22 group, users can choose one out of seven scale-division positions by setting scale-division input terminal selection (48, 49, 50) in P05 group. Enable corresponding scale-division terminal after the motor stops accurately, and the motor will check the scale-division position state and switch to corresponding position incrementally, at this point, users can check P18.09.

Step 8: Priority level of speed control, position control and zeroing

The priority level of speed running is higher than that of the scale division, when the system runs in scale-division mode, if spindle orientation is prohibited, the motor will turn to speed mode or position mode.

The priority level of zeroing is higher than that of the scale division.

Scale-division command is valid when the scale-division terminal is from 000 state to non-000 state, eg, in 000–011, the spindle executes scale division 3. The transition time during terminal switchover needs to be less than 10ms; otherwise, wrong scale division command may be executed.

Step 9: Hold positioning

The position loop gain during positioning is P21.03; while the position loop gain in positioning-completion-hold state is P21.02. In order to keep sufficient position-hold force and ensure no system oscillation occurred, adjust P03.00, P03.01, P20.05 and P21.02.

Step 10: Positioning command selection (bit6 of P22.00)

Electric level signal: Positioning command (zeroing and scale division) can be executed only when there is running command or the servo is enabled.

Step 11: Spindle reference point selection (bit0 of P22.00)

Encoder Z pulse positioning supports the following spindle positioning modes:

a) The encoder is installed on the motor shaft, the motor shaft and spindle is 1:1 rigid connection;

b) The encoder is installed on the motor shaft, the motor shaft and spindle is 1:1 belt connection;

At this point, the belt may slip during high-speed running and cause inaccurate positioning, it is recommended to install proximity switch on the spindle.

c) The encoder is installed on the spindle, and the motor shaft is connected to the spindle with belt, the drive ratio is not necessarily 1:1;

At this point, set P20.06 (speed ratio of the mounting shaft between motor and encoder), and set P22.14 (spindle drive ratio) to 1. As the encoder is not installed on the motor, the control performance of closed-loop vector will be affected.

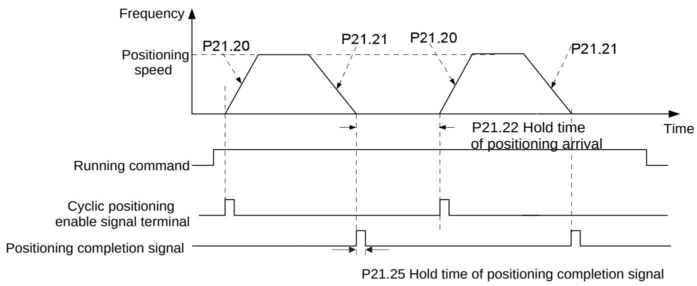
Proximity switch positioning supports the following spindle positioning modes:

a) The encoder is installed on the motor shaft, the drive ratio between motor shaft and spindle is not necessarily 1:1;

At this point, it is required to set P22.14 (spindle drive ratio).

5. Commissioning procedures for digital positioning

The diagram for digital positioning is shown below.



Step 1–4: These four steps are the same with the first four steps of the commissioning procedures for closed-loop vector control, which aim to fulfill the control requirements of closed-loop vector control.

Step 5: Set P21.00=0011 to enable digital positioning. Set P21.17, P21.11 and P21.12 (set positioning displacement) according to actual needs; set P21.18 and P21.19 (set positioning speed); set P21.20 and P21.21 (set acceleration/deceleration time of positioning).

Step 6: Single positioning operation

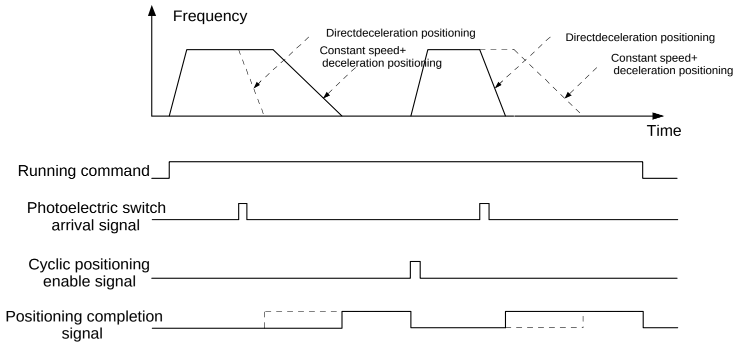
Set P21.16.bit1=0, and the motor will carry out single positioning action and stay in the positioning position according to the setup in step 5.

Step 7: Cyclic positioning operation

Set P21.16.bit1=1 to enable cyclic positioning. The cyclic positioning is divided into continuous mode and repetitive mode; users can also carry out cyclic positioning through terminal function (no. 55, enable digital positioning cycle)

6. Commissioning procedures for positioning of photoelectric switch

Photoelectric switch positioning is to realize positioning function based on closed-loop vector control.



Step 1–4: These four steps are the same with the first four steps of the commissioning procedures for closed-loop vector control, which aim to fulfill the control requirements of closed-loop vector control.

Step 5: Set P21.00=0021 to enable photoelectric switch positioning, the photoelectric switch signal can be connected to S8 terminal only, and set P05.08=43, meanwhile, set P21.17, P21.11 and P21.12 (set positioning displacement) based on actual needs; set P21.21 (deceleration time of positioning), however, when present running speed is too fast or the set positioning displacement is too small, the deceleration time of positioning will be invalid, and it will enter direct deceleration positioning mode.

Step 6: Cyclic positioning

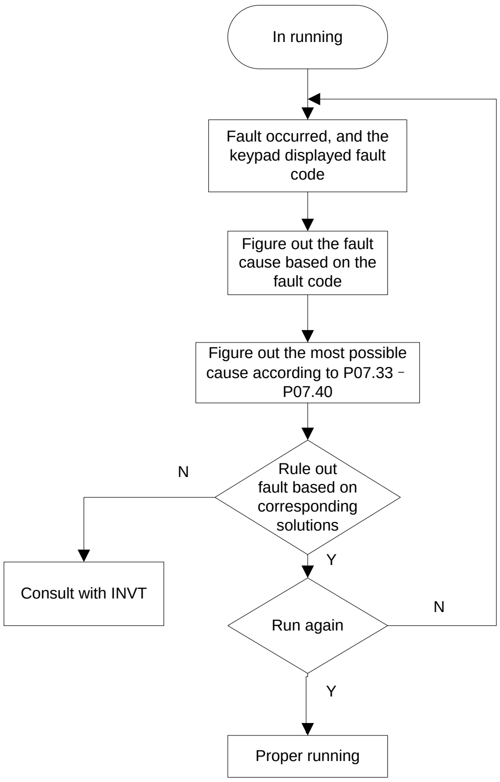
After positioning is done, the motor will stay in current position. Users can set cyclic positioning through input terminal function selection (55: enable cyclic digital positioning) in P05 group; when the terminal receives cyclic positioning enable signal (pulse signal), the motor will continue running in the set speed as per the speed mode and re-enter positioning state after encountering photoelectric switch.

(7) Hold positioning

The position loop gain during positioning is P21.03; while the position loop gain in positioning-completion-hold state is P21.02. In order to keep sufficient position-hold force and ensure no system oscillation occurred, adjust P03.00, P03.01, P20.05 and P21.02.

6.1.19 Fault handling

The following provides fault handling information.



Related parameter list:

Function code	Name	Description	Default
P07.27	Present fault type	0: No fault 1: Inverter unit U phase protection (OUt1)	0
P07.28	Last fault type		0

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th></tr>
<tr><td>P07.29</td><td>2nd-last fault type</td><td rowspan="4">2: Inverter unit V phase protection (OUt2)
3: Inverter unit W phase protection (OUt3)
4: Overcurrent during acceleration (OC1)
5: Overcurrent during deceleration (OC2)
6: Overcurrent during constant speed (OC3)
7: Overvoltage during acceleration (OV1)
8: Overvoltage during deceleration (OV2)
9: Overvoltage during constant speed (OV3)
10: Bus undervoltage fault (UV)
11: Motor overload (OL1)
12: inverter overload (OL2)
13: Phase loss on input side (SPI)
14: Phase loss on output side (SPO)
15: Rectifier module overheat (OH1)
16: Inverter module overheat (OH2)
17: External fault (EF)
18: Modbus/Modbus TCP communication fault (CE)
19: Current detection fault (ItE)
20: Motor autotuning fault (tE)
21: EEPROM operation fault (EEP)
22: PID feedback offline fault (PIDE)
23: Braking unit fault (bCE)
24: Running time reached (END)
25: Electronic overload (OL3)
26: Keypad communication error (PCE)
27: Parameter upload error (UPE)
28: Parameter download error (DNE)
29: PROFIBUS DP communication fault (E-DP)
30: Ethernet communication fault (E-NET)
31: CANopen communication fault (E-CAN)
32: To-ground short-circuit fault 1 (ETH1)
33: To-ground short-circuit fault 2 (ETH2)
34: Speed deviation fault (dEu)
35: Mal-adjustment fault (STo)
36: Underload fault (LL)
37: Encoder offline fault (ENC1O)
38: Encoder reversal fault (ENC1D)
39: Encoder Z pulse offline fault (ENC1Z)
40: Safe torque off (STO)
41: Channel H1 safety circuit exception (STL1)</td><td>0</td></tr>
<tr><td>P07.30</td><td>3rd-last fault type</td><td>0</td></tr>
<tr><td>P07.31</td><td>4th-last fault type</td><td>0</td></tr>
<tr><td>P07.32</td><td>5th-last fault type</td><td>0</td></tr>
</table>

Function code	Name	Description	Default
		42: Channel H2 safety circuit exception (STL2) 43: Channel H1 and H2 exception (STL3) 44: Safety code FLASH CRC check fault (CrCE) 55: Duplicate expansion card type (E-Err) 56: Encoder UVW loss fault (ENCUV) 57: PROFINET communication timeout fault (E-PN) 58: CAN communication fault (SECAN) 59: Motor over-temperature fault (OT) 60: Failure to identify the card at slot 1 (F1-Er) 61: Failure to identify the card at slot 2 (F2-Er) 62: Failure to identify the card at slot 3 (F3-Er) 63: Communication timeout of the card at slot 1 (C1-Er) 64: Communication timeout of the card at slot 2 (C2-Er) 65: Communication timeout of the card at slot 3 (C3-Er) 66: EtherCAT communication fault (E-CAT) 67: Bacnet communication fault (E-BAC) 68: DeviceNet communication fault (E-DEV) 69: CAN slave fault in master/slave synchronization (S-Err) 70: EC PT100 detected overheating (OtE1) 71: EC PT1000 detected overheating (OtE2) 72: EtherNet/IP communication timeout (E-EIP) 73: No upgrade bootload (E-PAO) 74: AI1 disconnected (E-AI1) 75: AI2 disconnected (E-AI2) 76: AI3 disconnected (E-AI3)	
P07.33	Running frequency at present fault	0.00Hz–P00.03	0.00Hz
P07.34	Ramp reference frequency at present fault	0.00Hz–P00.03	0.00Hz
P07.35	Output voltage at present fault	0–1200V	0V
P07.36	Output current at present fault	0.0–6300.0A	0.0A
P07.37	Bus voltage at present fault	0.0–2000.0V	0.0V
P07.38	Max. temperature at present fault	-20.0–120.0°C	0.0°C

Function code	Name	Description	Default
P07.39	Input terminal status at present fault	0x0000–0xFFFF	0x0000
P07.40	Output terminal status at present fault	0x0000–0xFFFF	0x0000
P07.41	Running frequency at last fault	0.00Hz–P00.03	0.00Hz
P07.42	Ramp reference frequency at last fault	0.00Hz–P00.03	0.00Hz
P07.43	Output voltage at last fault	0–1200V	0V
P07.44	Output current at last fault	0.0–6300.0A	0.0A
P07.45	Bus voltage at last fault	0.0–2000.0V	0.0V
P07.46	Max. temperature at last fault	-20.0–120.0°C	0.0°C
P07.47	Input terminal status at last fault	0x0000–0xFFFF	0x0000
P07.48	Output terminal state at last fault	0x0000–0xFFFF	0x0000
P07.49	Running frequency at 2nd-last fault	0.00Hz–P00.03	0.00Hz
P07.50	Ramp reference frequency at 2nd-last fault	0.00Hz–P00.03	0.00Hz
P07.51	Output voltage at 2nd-last fault	0–1200V	0V
P07.52	Output current at 2nd-last fault	0.0–6300.0A	0.0A
P07.53	Bus voltage at 2nd-last fault	0.0–2000.0V	0.0V
P07.54	Max. temperature at 2nd-last fault	-20.0–120.0°C	0.0°C
P07.55	Input terminal status at 2nd-last fault	0x0000–0xFFFF	0x0000
P07.56	Output terminal status at 2nd-last fault	0x0000–0xFFFF	0x0000

6.2 Fault information and fault handling

6.2.1 inverter faults and solutions

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

Fault code	Fault type	Possible cause	Corrective measures
OUt1	[1] Inverter unit phase-U protection	Acceleration is too fast; IGBT module is damaged; Misacts caused by interference; drive wires are poorly connected;	Increase acceleration time; Replace the power unit; Check drive wires; Check whether there is strong
OUt2	[2] Inverter unit phase-V protection		

Fault code	Fault type	Possible cause	Corrective measures
OUt3	[3] Inverter unit phase-W protection	Shorted to ground.	interference surrounds the peripheral equipment
OV1	[7] Over-voltage during acceleration	Deceleration time is too short; Exception occurred to input voltage; Large energy feedback; Lack of braking units; Dynamic braking is not enabled	Check input power; Check whether load deceleration time is too short; or the motor starts during rotating; Install dynamic braking units; Check the setup of related function codes
OV2	[8] Over-voltage during deceleration		
OV3	[9] Over-voltage during constant speed running		
OC1	[4] Over-current during acceleration	Acceleration is too fast; Grid voltage is too low; inverter power is too small; Load transient or exception occurred; To-ground short circuit or output phase loss occur; Strong external interference sources; Overcurrent stall protection is not enabled	Increase acceleration /deceleration time; Check input power; Select the inverter with larger power; Check if the load is short circuited (to-ground short circuit or line-to-line short circuit) or the rotation is not smooth; Check the output wiring; Check if there is strong interference; Check the setup of related function codes.
OC2	[5] Over-current during deceleration		
OC3	[6] Over-current during constant speed running		
UV	[10] Bus undervoltage fault	Grid voltage is too low; Overvoltage stall protection is not enabled	Check grid input power; Check the setup of related function codes
OL1	[11] Motor overload	Grid voltage is too low; Rated motor current is set improperly; Motor stall or load jumps violently	Check grid voltage; Reset rated motor current; Check the load and adjust torque boost
OL2	[12] inverter overload	Acceleration is too fast; The motor in rotating is restarted; Grid voltage is too low; Load is too large; Power is too small;	Increase acceleration time; Avoid restart after stop; Check grid voltage; Select the inverter with larger power; Select proper motor
SPI	[13] Phase loss on input side	Phase loss or violent fluctuation occurred to R, S and T input	Check the input power; Check installation wiring
SPO	[14] Phase loss on output side	Phase loss occurred to U, V, W output (or the three phases of motor is asymmetrical)	Check the output wiring; Check the motor and cable

Fault code	Fault type	Possible cause	Corrective measures
OH1	[15] Overheat of rectifier module	Air duct is blocked or fan is damaged; Ambient temperature is too high; Long-time overload running	Ventilate the air duct or replace the fan; Lower the ambient temperature
OH2	[16] Overheat of inverter module		
EF	[17] External fault	SI external fault input terminal acts	Check external device input
CE	[18] Modbus/Modbus TCP communication fault	Baud rate is set improperly; Communication line fault; Communication address error; Communication suffers from strong interference	Set proper baud rate; Check the wiring of communication interfaces; Set proper communication address; Replace or change the wiring to enhance anti-interference capacity
ItE	[19] Current detection fault	Poor contact of the connector of control board; Hall component is damaged; Exception occurred to amplification circuit	Check the connector and re-plug; Replace the hall component; Replace the main control board
tE	[20] Motor autotuning fault	Motor capacity does not match with the inverter capacity, this fault may occur easily if the difference between them is exceeds five power classes; Motor parameter is set improperly; The parameters gained from autotuning deviate sharply from the standard parameters; Autotuning timeout	Change the inverter model, or adopt V/F mode for control; Set proper motor type and nameplate parameters; Empty the motor load and carry out autotuning again; Check motor wiring and parameter setup; Check whether upper limit frequency is larger than 2/3 of the rated frequency
EEP	[21] EEPROM fault	R/W error occurred to the control parameters; EEPROM is damaged	Press STOP/RST to reset; Replace the main control board
PIDE	[22] PID feedback offline fault	PID feedback offline; PID feedback source disappears;	Check PID feedback signal wires; Check PID feedback source
bCE	[23] Braking unit fault	Braking circuit fault or braking tube is damaged; The resistance of external braking resistor is too small	Check the braking unit, replace with new braking tubes; Increase braking resistance
END	[24] Running time is up	The actual running time of the inverter is larger than the set running time	Ask help from the supplier, adjust the set running time

Fault code	Fault type	Possible cause	Corrective measures
OL3	[25] Electronic overload fault	The inverter releases overload pre-alarm based on the set value	Check the load and overload pre-alarm threshold
PCE	[26] Keypad communication fault	The keypad wire is poorly contacted or disconnected; The keypad wire is too long and suffers strong interference; Circuit fault occurred to the keypad or communication part of the main board	Check the keypad wires to confirm whether fault exists; Check the surroundings to rule out interference source; Replace the hardware and ask for maintenance service
UPE	[27] Parameter upload error	The keypad wire is poorly contacted or disconnected; The keypad wire is too long and suffers strong interference; Circuit fault occurred to the keypad or communication part of the main board	Check the surroundings to rule out interference source; Replace the hardware and ask for maintenance service; Replace the hardware and ask for maintenance service
DNE	[28] Parameter download error	The keypad wire is poorly contacted or disconnected; The keypad wire is too long and suffers strong interference; Data storage error occurred to the keypad	Check the surroundings to rule out interference source; Replace the hardware and ask for maintenance service; Re-backup keypad data
ETH1	[32] To-ground short circuit fault 1	inverter output is short connected to the ground; Current detection circuit is faulty; Actual motor power setup deviates sharply from the inverter power	Check whether motor wiring is proper; Replace the hall component; Replace the main control board; Reset the motor parameters properly
ETH2	[33] To-ground short circuit fault 1	inverter output is short connected to ground; Current detection circuit is faulty; Actual motor power setup deviates sharply from the inverter power	Check whether motor wiring is proper; Replace the hall component; Replace the main control board; Reset the motor parameters properly
dEu	[34] Speed deviation fault	Load is too heavy, or stall occurred	Check the load to ensure it is proper, increase the detection time; Check whether control parameters are set properly
STo	[35] Maladjustment fault	Control parameters of synchronous motor is set improperly;	Check the load to ensure it is proper, Check whether load is proper;

Fault code	Fault type	Possible cause	Corrective measures
		The parameter gained from autotuning is inaccurate; The inverter is not connected to motor	Check whether control parameters are set correctly; Increase maladjustment detection time
LL	[36] Electronic underload fault	The inverter performs underload pre-alarm based on the set value	Check the load and overload pre-alarm threshold
ENC1O	[37] Encoder offline fault	Encoder line sequence is wrong, or signal wires are poorly connected	Check the encoder wiring
ENC1D	[38] Encoder reversal fault	The encoder speed signal is contrary to the motor running direction	Reset encoder direction
ENC1Z	[39] Encoder Z pulse offline fault	Z signal wires are disconnected	Check the wiring of Z signal
OT	[59] Motor over-temperature fault	Motor over-temperature input terminal is valid; Exception occurred to t temperature detection Exception occurred to resistor; Long-time overload running or exception occurred	Check the wiring of motor over-temperature input terminal (terminal function 57); Check whether temperature sensor is proper; Check the motor and perform maintenance on the motor
STO	[40] Safe torque off	Safe torque off function is enabled by external forces	/
STL1	[41] Exception occurred to safe circuit of channel H1	The wiring of STO is improper; Fault occurred to external switch of STO; Hardware fault occurred to safety circuit of channel H1	Check whether terminal wiring of STO is proper and firm enough; Check whether external switch of STO can work properly; Replace the control board
STL2	[42] Exception occurred to channel H2 safe circuit	The wiring of STO is improper; Fault occurred to external switch of STO; Hardware fault occurred to safety circuit of channel H2	Check whether terminal wiring of STO is proper and firm enough; Check whether external switch of STO can work properly; Replace the control board
STL3	[43] Exception occurred to channel H1 and channel H2	Hardware fault occurred to STO circuit	Replace the control board
CrCE	[44] Safety code FLASH CRC check fault	Control board is faulty	Replace the control board
E-Err	[55] Repetitive expansion card type	The two inserted expansion cards are of the same type	You should not insert two cards with the same type; check the type of expansion card, and remove one card after power down

Fault code	Fault type	Possible cause	Corrective measures
ENCUV	[56] Encoder UVW loss fault	No electric level variation occurred to UVW signal	Check the wiring of UVW; Encoder is damaged
F1-Er	[60] Failed to identify the expansion card in card slot 1	There is data transmission in interfaces of card slot 1, however, it cannot read the card type	Confirm whether the expansion card inserted can be supported; Stabilize the expansion card interfaces after power down, and confirm whether fault still occurs at next power-on; Check whether the insertion port is damaged, if yes, replace the insertion port after power down
F2-Er	[61] Failed to identify the expansion card in card slot 2	There is data transmission in interfaces of card slot 2, however, it cannot read the card type	Confirm whether the expansion card inserted can be supported; Stabilize the expansion card interfaces after power down, and confirm whether fault still occurs at next power-on; Check whether the insertion port is damaged, if yes, replace the insertion port after power down
F3-Er	[62] Failed to identify the expansion card in card slot 3	There is data transmission in interfaces of card slot 3, however, it cannot read the card type	Confirm whether the expansion card inserted can be supported; Stabilize the expansion card interfaces after power down, and confirm whether fault still occurs at next power-on; Check whether the insertion port is damaged, if yes, replace the insertion port after power down
C1-Er	[63] Communication timeout occurred to the expansion card in card slot 1	There is no data transmission in interfaces of card slot 1	Confirm whether the expansion card inserted can be supported; Stabilize the expansion card interfaces after power down, and confirm whether fault still occurs at next power-on; Check whether the insertion port is damaged, if yes, replace the insertion port after power down

Fault code	Fault type	Possible cause	Corrective measures
C2-Er	[64] Communication timeout occurred to the expansion card in card slot 2	There is no data transmission in interfaces of card slot 2	Confirm whether the expansion card inserted can be supported; Stabilize the expansion card interfaces after power down, and confirm whether fault still occurs at next power-on; Check whether the insertion port is damaged, if yes, replace the insertion port after power down
C3-Er	[65] Communication timeout occurred to the expansion card in card slot 3	There is no data transmission in interfaces of card slot 3	Confirm whether the expansion card inserted can be supported; Stabilize the expansion card interfaces after power down, and confirm whether fault still occurs at next power-on; Check whether the insertion port is damaged, if yes, replace the insertion port after power down
E-DP	[29] PROFIBUS card communication timeout fault	There is no data transmission between the communication card and the host controller (or PLC).	Check whether the communication card wiring is loose or dropped.
E-NET	[30] Ethernet card communication timeout fault	There is no data transmission between the communication card and the host controller.	Check whether the communication card wiring is loose or dropped.
E-CAN	[31] CANopen card communication timeout fault	There is no data transmission between the communication card and the host controller (or PLC)	Check whether the communication card wiring is loose or dropped.
E-PN	[57] PROFINET card communication timeout fault	There is no data transmission between the communication card and the host controller (or PLC)	Check whether the communication card wiring is loose or dropped.
E-CAT	[66] EtherCAT card communication timeout fault	There is no data transmission between the communication card and the host controller (or PLC)	Check whether the communication card wiring is loose or dropped
E-BAC	[67] BACNet card communication timeout fault	There is no data transmission between the communication card and the host controller (or PLC).	Check whether the communication card wiring is loose or dropped
E-DEV	[68] DeviceNet card communication timeout fault	There is no data transmission between the communication card and the host controller (or PLC).	Check whether the communication card wiring is loose or dropped

Fault code	Fault type	Possible cause	Corrective measures
ESCAN	[58] CAN master/slave communication card communication timeout fault	There is no data transmission between the CAN master and slave communication cards	Check whether the communication card wiring is loose or dropped
S-Err	[69] CAN slave fault in master/slave synchronization	Fault occurred to one of the CAN slave inverters	Detect the CAN slave inverter and analyze the corresponding fault cause of the inverter
P-E1–P-E10	[45]–[54] Programmable card customized faults 1–10	User program logic error in the programmable card. A fault occurred on the customized position.	Check the user program logic. Perform troubleshooting based on actual customized faults.
OtE1	[70] EC PT100 detected OH	The PT100 temperature sensor is inaccurate or not calibrated. Device or ambient temperature is too high.	Calibrate the sensor through parameter settings. Lower the device or ambient temperature.
OtE2	[71] EC PT1000 detected OH	The PT1000 temperature sensor is inaccurate or not calibrated. Device or ambient temperature is too high.	Calibrate the sensor through parameter settings. Lower the device or ambient temperature.
E-EIP	[72] EtherNet IP communication timeout	There is no data transmission between the communication card and the host controller (or PLC).	Check whether the communication card wiring is loose or dropped.
E-PAO	[73] No upgrade bootloader	The upgrade bootloader is missing.	Contact us.
E-AI1	[74] AI1 disconnection	Input voltage of AI1 is too low; AI1 wiring is disconnected.	Connect a 5V or 10mA power source to check whether the input is normal; Check the wiring or replace the cables.
E-AI2	[75] AI2 disconnection	Input voltage of AI2 is too low; AI2 wiring is disconnected.	Connect a 5V or 10mA power source to check whether the input is normal; Check the wiring or replace the cables.
E-AI3	[76] AI3 disconnection	Input voltage of AI3 is too low; AI4 wiring is disconnected.	Connect a 5V or 10mA power source to check whether the input is normal; Check the wiring or replace the cables.

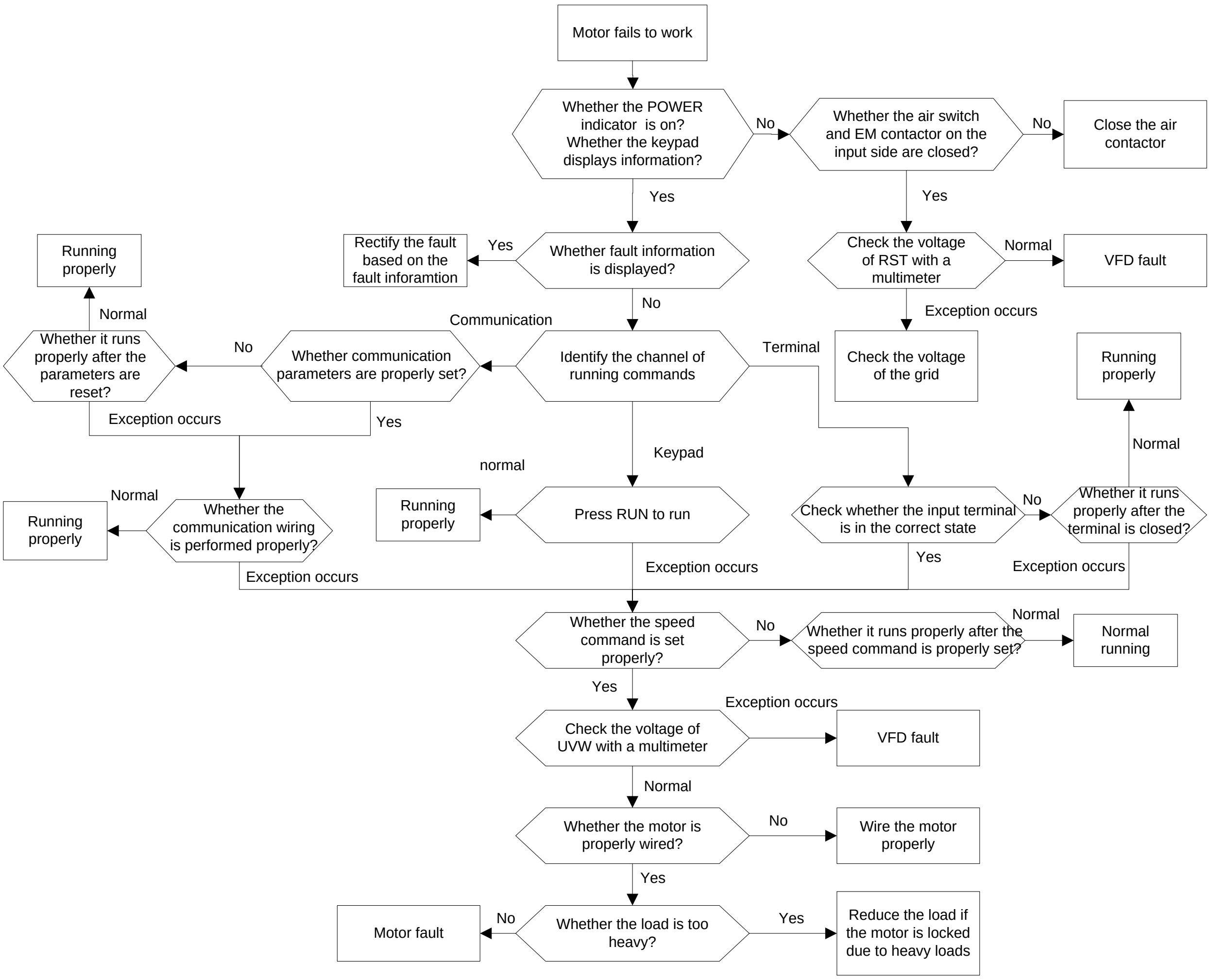
6.2.2 Other status

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

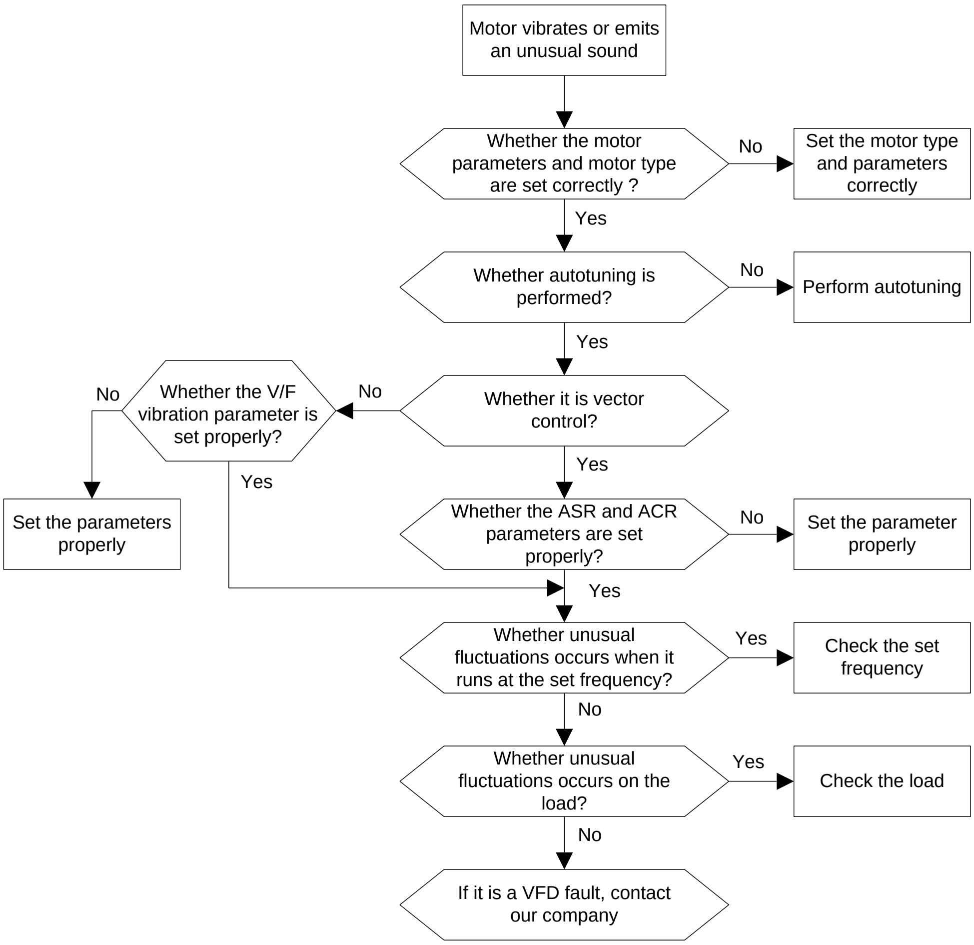
6.3 Analysis on common faults

The inverter may encounter the following faults, which are analyzed in the following.

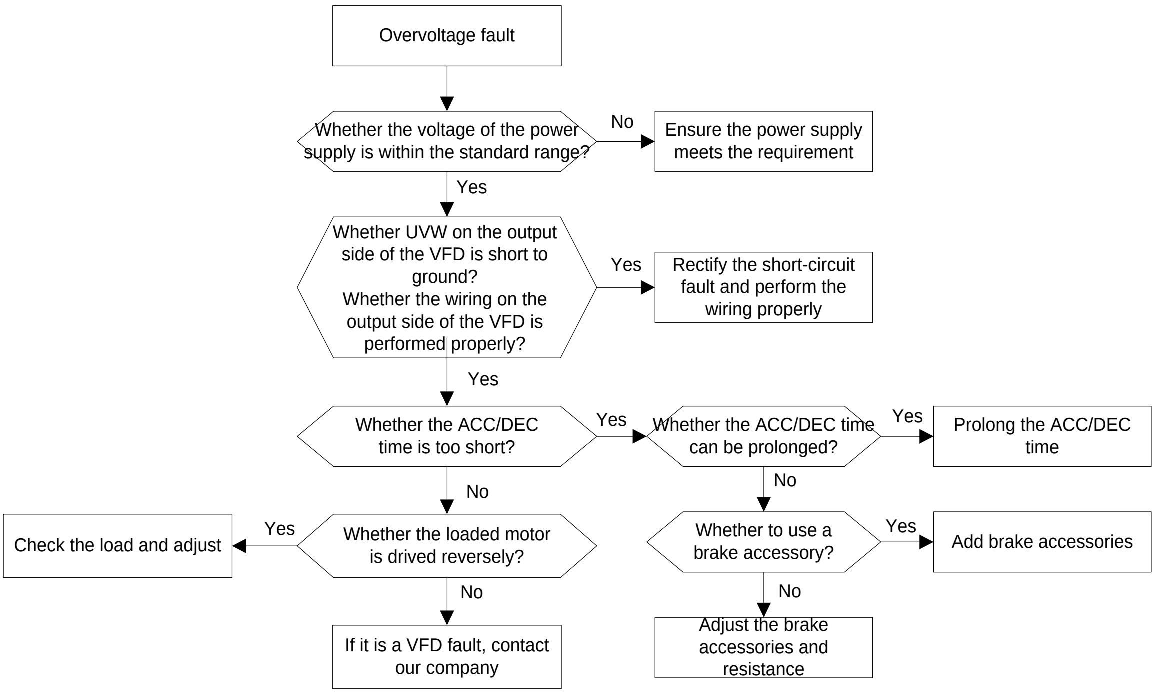
6.3.1 Motor fails to work



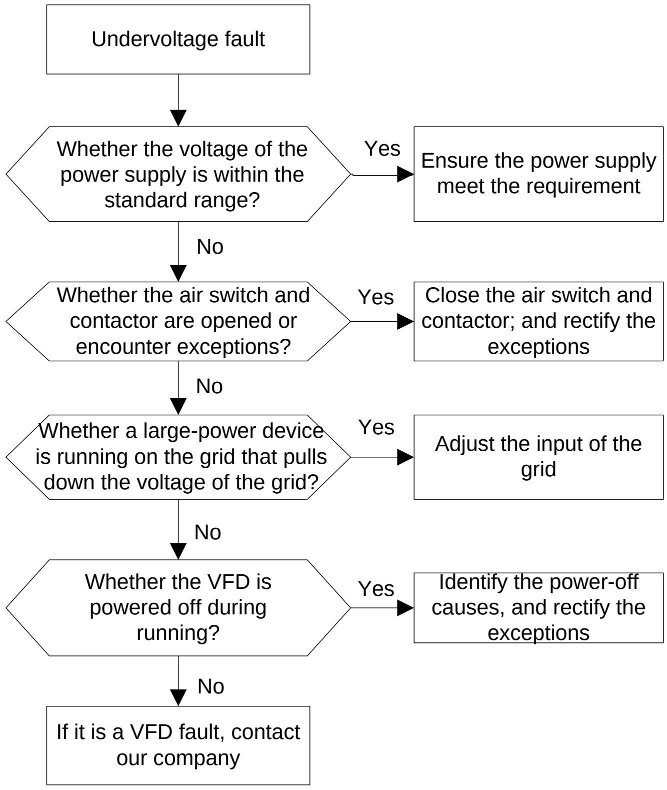
6.3.2 Motor vibrates



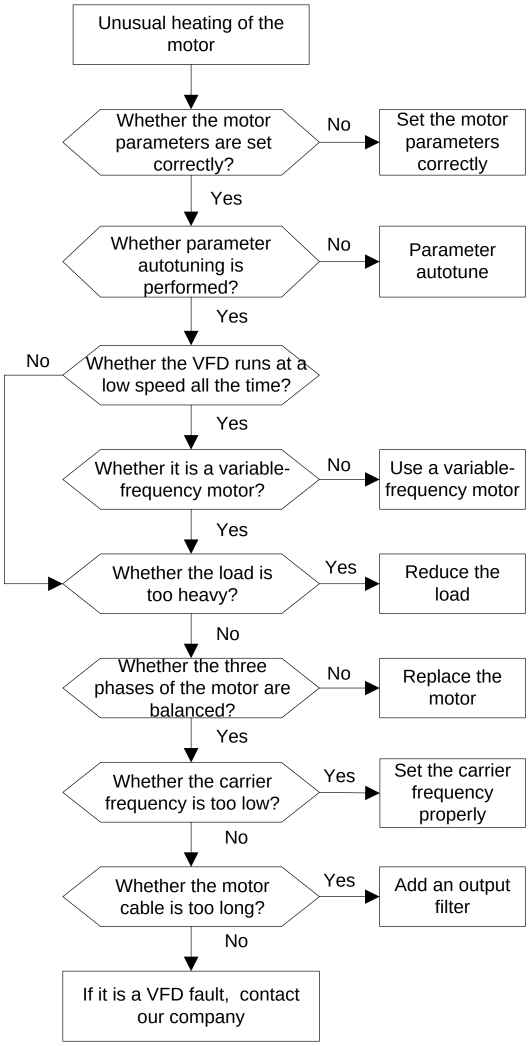
6.3.3 Overvoltage



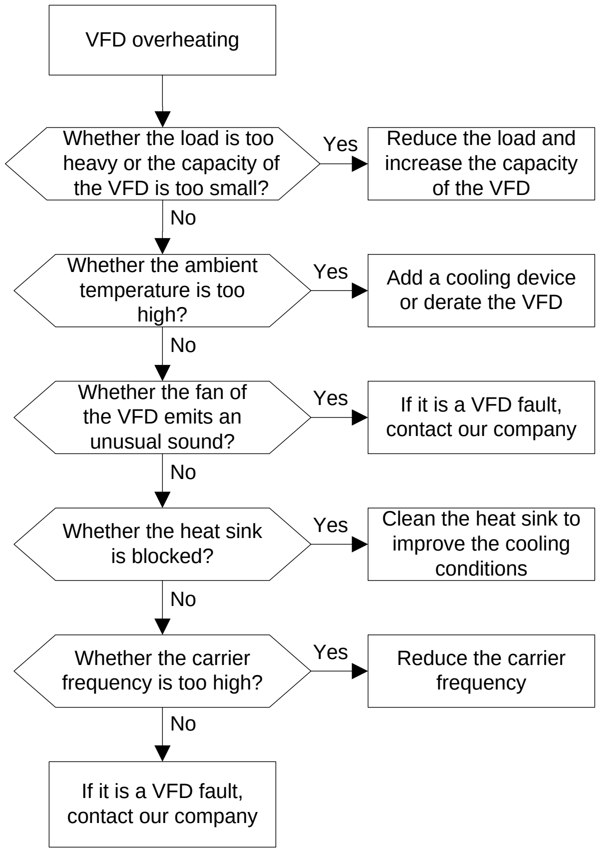
6.3.4 Undervoltage



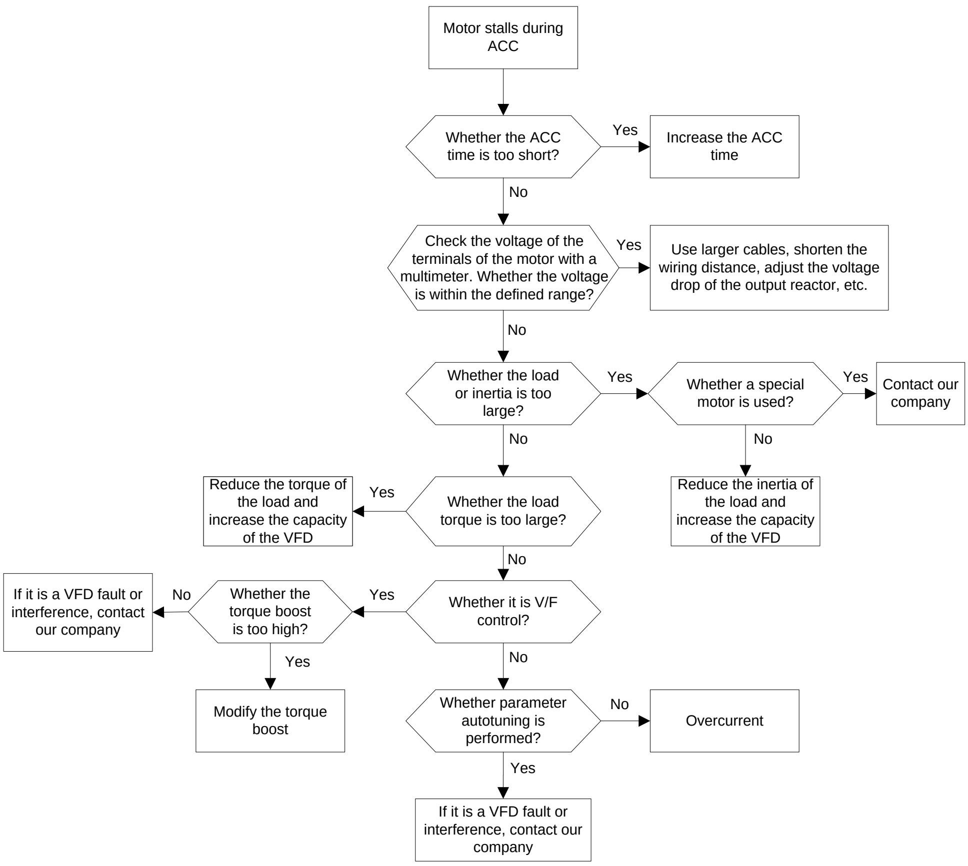
6.3.5 Unusual heating of motor



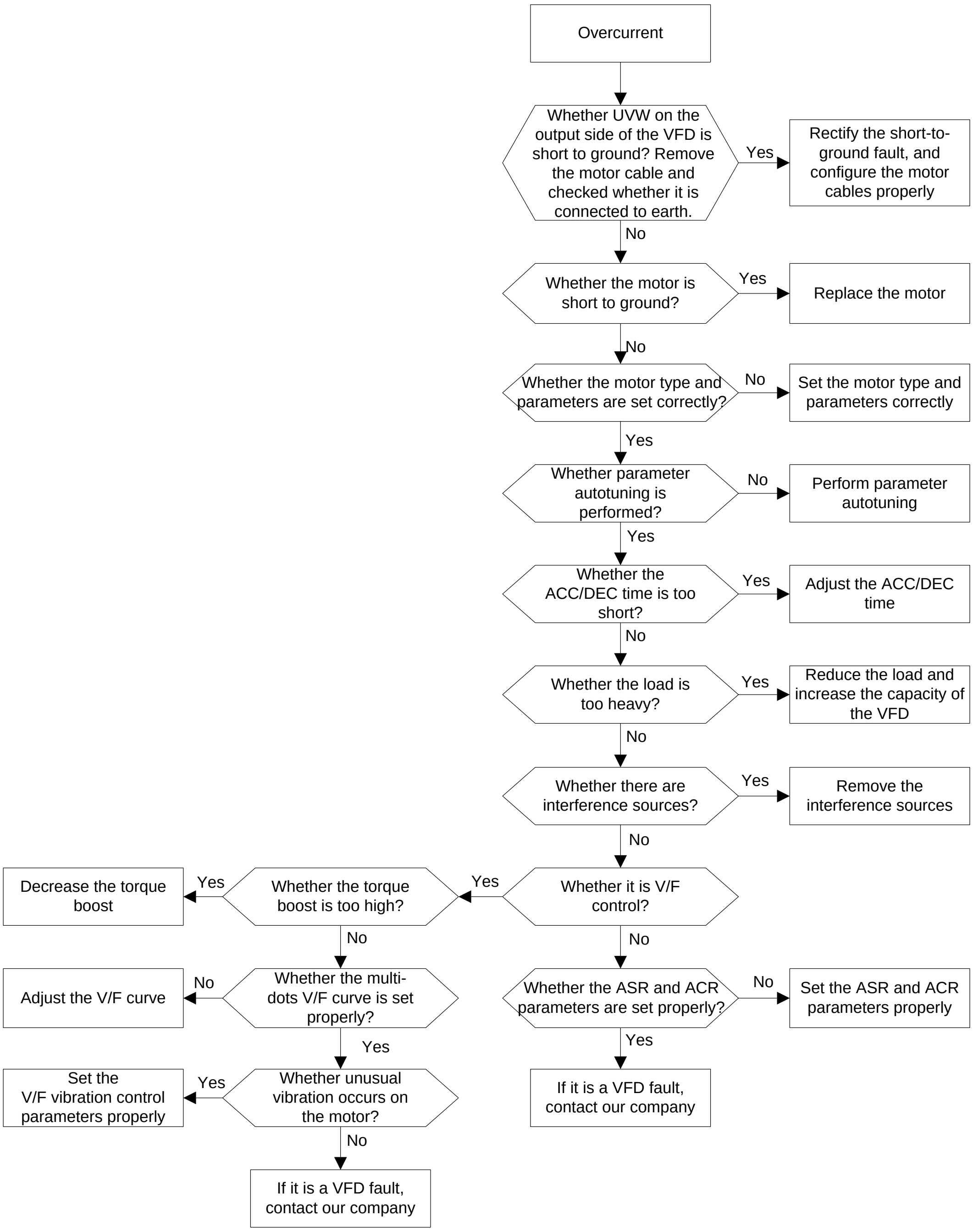
6.3.6 inverter overheating



6.3.7 Motor stalls during ACC



6.3.8 Overcurrent



6.4 Function parameter list

The function parameters of the inverter are divided into groups by function. Among the function parameter groups, the P98 group is the analog input and output calibration group, while the P99 group contains the factory function parameters, which are user inaccessible. Each group includes several function codes (each function code identifies a function parameter). A three-level menu style is applied to the function codes. For example, "P08.08" indicates the 8th function code in the P08 group.

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

The content of the function code table is as follows:

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

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

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

Column 4 "Default": Initial value set in factory

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

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

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

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

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

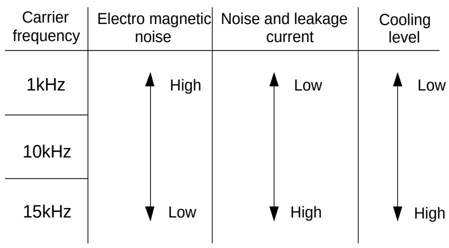
The parameters adopt the decimal system (DEC). If the hexadecimal system is adopted, all bits are mutually independent on data during parameter editing. The setting ranges at some bits can be hexadecimal (0–F).

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

To better protect parameters, the inverter provides the password protection function. After a password is set (that is, P07.00 is set to a non-zero value), "0.0.0.0.0" is displayed when you press the PRG/ESC key to enter the function code editing interface. You need to enter the correct user password to enter the interface. For the factory parameters, you need to enter the correct factory password to enter the interface. (You are not advised to modify the factory parameters. Incorrect parameter setting may cause operation exceptions or even damage to the inverter.) If password protection is not in locked state, you can change the password any time. You can set P07.00 to 0 to cancel the user password. When P07.00 is set to a non-zero value during power-on, parameters are prevented from being modified by using the user password function. When you modify function parameters through serial communication, the user password protection function is also applicable and compliant with the same rule.

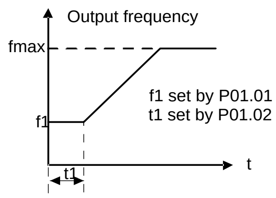
Function code	Name	Description	Default	Modify
P00 group—Basic functions				
P00.00	Speed control mode	0: Sensorless vector control (SVC) mode 0 1: SVC 1 2: SVPWM 3: FVC **Note:** To select 0, 1, or 3 as the control mode, enable the inverter to perform motor parameter autotuning first	2	◎
P00.01	Channel of running commands	0: Keypad 1: Terminal 2: Communication	0	○
P00.02	Communication mode of running commands	0: Modbus/Modbus TCP 1: PROFIBUS/CANopen/DeviceNet 2: Ethernet 3: EtherCAT/PROFINET/EtherNet IP 4: Programmable card 5: Wireless communication card 6: Reserved **Note:** 1, 2, 3, 4 and 5 are extended functions which are applicable with corresponding cards.	0	○

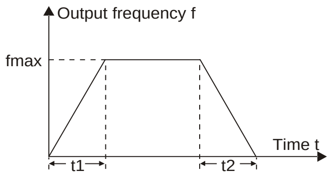
Function code	Name	Description	Default	Modify
P00.03	Max. output frequency	Used to set the maximum output frequency of the inverter. It is the basis of frequency setting and the acceleration/deceleration. Setting range: Max. (P00.04, 10.00)–630.00Hz	50.00Hz	◎
P00.04	Upper limit of running frequency	Used to set the upper limit of inverter output frequency. This value cannot be more than the maximum output frequency. When the set frequency is higher than the upper limit, the inverter runs at the upper limit frequency. Setting range: P00.05–P00.03 (Max. output frequency)	50.00Hz	◎
P00.05	Lower limit of running frequency	The lower limit of running frequency is the lower limit value of inverter output frequency. When the set frequency is lower than the lower limit, the inverter runs at the lower limit frequency. **Note: Max. output frequency ≥ upper limit frequency ≥ lower limit frequency.** Setting range: 0.00Hz–P00.04 (upper limit of running frequency)	0.00Hz	◎
P00.06	A frequency command selection	0: Keypad 1: AI1 2: AI2 3: AI3 4: High speed pulse HDIA 5: Simple PLC program 6: Multi-step speed running 7: PID control 8: Modbus/Modbus TCP communication 9: PROFIBUS/CANopen/DeviceNet communication 10: Ethernet communication 11: High speed pulse HDIB 12: Pulse train AB 13: EtherCAT/PROFINET/EtherNet IP communication 14: Programmable card 15: Reserved	0	○
P00.07	B frequency command selection		15	○
P00.08	Reference object of B frequency command	0: Max. output frequency 1: A frequency command	0	○
P00.09	Combination mode of setting source	0: A 1: B 2: (A+B)	0	○

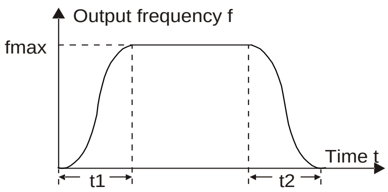
<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th><th>Modify</th></tr>
<tr><td></td><td></td><td>3: (A-B)
4: Max. (A, B)
5: Min. (A, B)</td><td></td><td></td></tr>
<tr><td>P00.10</td><td>Set frequency via keypad</td><td>When A and B frequency commands are set by keypad, the value is the initial digital set value of the inverter frequency.
Setting range: 0.00 Hz–P00.03 (Max. output frequency)</td><td>50.00Hz</td><td>○</td></tr>
<tr><td>P00.11</td><td>Acceleration time 1</td><td rowspan="2">Acceleration time is the time needed for accelerating from 0Hz to Max. output frequency (P00.03).
Deceleration time is the time needed from decelerating from Max. output frequency (P00.03) to 0Hz.
The inverter defines four groups of acceleration and deceleration time, which can be selected via multi-function digital input terminals (P05 group). The acceleration/deceleration time of the inverter is the first group by default.
Setting range of P00.11 and P00.12: 0.0–3600.0s</td><td>Model depended</td><td>○</td></tr>
<tr><td>P00.12</td><td>Deceleration time 1</td><td>Model depended</td><td>○</td></tr>
<tr><td>P00.13</td><td>Running direction</td><td>0: Run in default direction
1: Run in reverse direction
2: Reverse running is prohibited</td><td>0</td><td>○</td></tr>
<tr><td>P00.14</td><td>Carrier frequency setting</td><td>

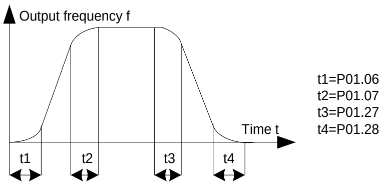
The relation between the model and carrier frequency is shown below.
<table>
<tr><th colspan="2">Model</th><th>Default carrier frequency</th></tr>
<tr><td rowspan="3">380V</td><td>1.5–11kW</td><td>8kHz</td></tr>
<tr><td>15–55kW</td><td>4kHz</td></tr>
<tr><td>Above 75kW</td><td>2kHz</td></tr>
<tr><td rowspan="2">660V</td><td>22–55kW</td><td>4kHz</td></tr>
<tr><td>Above 75kW</td><td>2kHz</td></tr>
</table>
Advantages of high carrier frequency are as follows: ideal current waveform, few current harmonics and small motor noise.</td><td>Model depended</td><td>○</td></tr>
</table>

Function code	Name	Description	Default	Modify
		Disadvantages of high carrier frequency are as follows: growing switch consumption, enlarged temperature rise, impacted output capacity; under high carrier frequency, the inverter needs to be derated for use, meanwhile, the leakage current will increase, which increases electromagnetic interference to the surroundings. While low carrier frequency is the contrary. Low carrier frequency will cause unstable operation at low frequency, decrease the torque, or even lead to oscillation. The carrier frequency of inverter is set properly by default, and it should not be changed at will. If the default carrier frequency is exceeded during use, derating is required, derate by 10% for every additional 1k carrier frequency. Setting range: 1.0–15.0kHz		
P00.15	Motor parameter autotuning	0: No operation 1: Rotary autotuning 1; carry out comprehensive motor parameter autotuning; rotary autotuning is used in cases where high control precision is required; 2: Static autotuning 1 (comprehensive autotuning); static autotuning 1 is used in cases where the motor cannot be disconnected from load; 3: Static autotuning 2 (partial autotuning) ; when current motor is motor 1, only P02.06, P02.07 and P02.08 will be autotuned; when current motor is motor 2, only P12.06, P12.07 and P12.08 will be autotuned. 4: Rotary autotuning 2, which is similar to rotary autotuning 1 but is only applicable to asynchronous motors. 5: Rotary autotuning 3 (partial autotuning), which is only applicable to asynchronous motors.	0	◎
P00.16	AVR function	0: Invalid 1: Valid during the whole process Automatic voltage regulation function is used to eliminate the impact on the output voltage of inverter when bus voltage fluctuates.	1	○
P00.17	Reserved			
P00.18	Function parameter restoration	0: No operation 1: Restore default values (excluding motor parameters)	0	◎

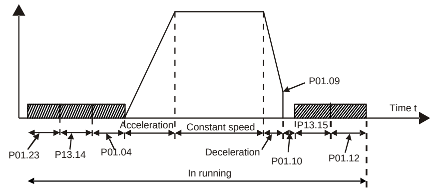
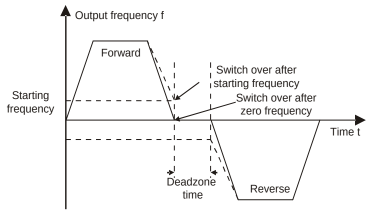
Function code	Name	Description	Default	Modify
		2: Clear fault records 3: Reserved 4: Reserved 5: Restore default values (for factory test mode) 6: Restore default values (including motor parameters) **Note:** After the selected operation is performed, this parameter is automatically restored to 0. Restoring the default values may delete the user password. Exercise caution when using this function. The option 5 can be used only for factory testing.		
P01 group—Start and stop control				
P01.00	Running mode of start	0: Direct start 1: Start after DC brake 2: Start after speed tracking	0	◎
P01.01	Starting frequency of direct start	Starting frequency of direct startup is the initial frequency when the inverter starts. See P01.02 (hold time of starting frequency) for details. Setting range: 0.00–50.00Hz	0.50Hz	◎
P01.02	Hold time of starting frequency	 A proper starting frequency can increase the torque during startup. Within the hold time of starting frequency, the output frequency of inverter is the starting frequency, and then it runs from the starting frequency to the target frequency, if the target frequency (frequency command) is below the starting frequency, the inverter will be standby rather than running. The starting frequency value is unlimited by the lower limit frequency. Setting range: 0.0–50.0s	0.0s	◎
P01.03	DC braking current before start	During starting, the inverter will first perform DC braking based on the set DC braking current before startup, and then it will accelerate after the set DC braking time before startup elapses. If the set DC braking time is 0, DC braking will be invalid. The larger the DC braking current, the stronger the braking force. The DC braking current before startup refers to the percentage relative to rated inverter output current.	0.0%	◎
P01.04	DC braking time before start		0.00s	◎

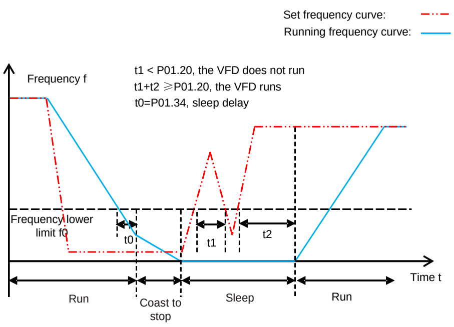
<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th><th>Modify</th></tr>
<tr><td></td><td></td><td>Setting range of P01.03: 0.0–100.0%
Setting range of P01.04: 0.00–50.00s</td><td></td><td></td></tr>
<tr><td>P01.05</td><td>Acceleration/deceleration mode</td><td>This function code is used to select the frequency variation mode during starting and running.
0: Straight line; the output frequency increases or decreases in straight line;


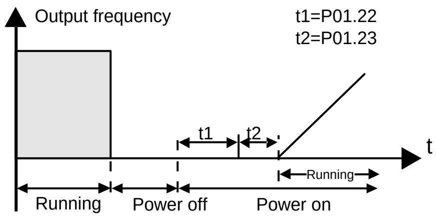
1: S curve; the output frequency increases or decreases in S curve;
S curve is generally used in cases where smooth start/stop is required, such as elevator, conveyer belt, and so on.


Note: When set to 1, it is required to set P01.06, P01.07, P01.27 and P01.28 accordingly.</td><td>0</td><td>◎</td></tr>
<tr><td>P01.06</td><td>Time of starting section of acceleration S curve</td><td rowspan="2">The curvature of S curve is determined by acceleration range and acceleration and deceleration time.


Setting range: 0.0–50.0s</td><td>0.1s</td><td>◎</td></tr>
<tr><td>P01.07</td><td>Time of ending section of acceleration S curve</td><td>0.1s</td><td>◎</td></tr>
<tr><td>P01.08</td><td>Stop mode</td><td>0: Decelerate to stop; after stop command is valid, the inverter lowers output frequency based on the deceleration mode and the defined deceleration time, after the frequency drops to the stop speed (P01.15), the inverter stops.
1: Coast to stop; after stop command is valid, the inverter stops output immediately, and the load coasts to stop as per mechanical inertia.</td><td>0</td><td>○</td></tr>
<tr><td>P01.09</td><td>Starting frequency of DC braking after stop</td><td rowspan="2">Starting frequency of DC braking after stop; during decelerating to stop, when this frequency is reached, DC braking will be performed after stop.
Demagnetization time (waiting time of DC braking</td><td>0.00Hz</td><td>○</td></tr>
<tr><td>P01.10</td><td>Waiting time of DC braking after stop</td><td>0.00s</td><td>○</td></tr>
</table>

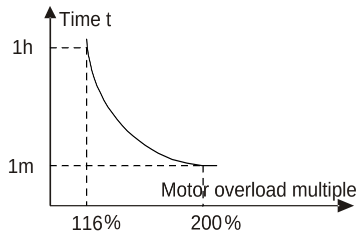
Function code	Name	Description	Default	Modify
P01.11	DC braking current of stop	after stop): Before the DC brake, the inverter will block output, and after the demagnetization time elapses, DC braking will start. This function is used to prevent overcurrent fault caused by DC braking during high speed. DC braking current after stop: it means the DC braking force applied, the larger the current, the stronger the DC braking effect.  Setting range of P01.09: 0.00Hz–P00.03 (Max. output frequency) Setting range of P01.10: 0.00–30.00s Setting range of P01.11: 0.0–100.0% (of the rated inverter output current) Setting range of P01.12: 0.0–50.0s	0.0%	○
P01.12	DC braking time of stop		0.00s	○
P01.13	Deadzone time of forward/reverse rotation	This function code refers to the transition time of the threshold set by P01.14 during setting forward/reverse rotation of the inverter, as shown below.  Setting range: 0.0–3600.0s	0.0s	○
P01.14	Forward/reverse rotation switchover mode	0: Switch over after zero frequency 1: Switch over after starting frequency 2: Switch over after passing stop speed and delay	1	◎
P01.15	Stop speed	0.00–100.00Hz	0.50Hz	◎
P01.16	Stop speed detection mode	0: Set value of speed (the only detection mode valid in SVPWM mode) 1: Detection value of speed	0	◎
P01.17	Stop speed detection time	0.00–100.00s	0.50s	◎
P01.18	Terminal running protection at power-on	When the running command channel is controlled by terminals, the system will detect running terminal state automatically during power-on. 0: Terminal running command is invalid during power-on. The inverter will not run during power-on	0	○

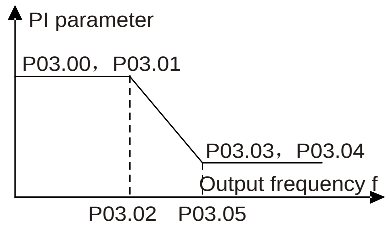
Function code	Name	Description	Default	Modify
		even if the running command terminal is detected to be valid, and the system is in running protection state. The inverter will run only after this terminal is cancelled and enabled again. 1: Terminal running command is valid during power-on. The system will start the inverter automatically after initialization is done if the running command terminal is detected to be valid during power-on. **Note:** This function must be set with caution. Otherwise, serious consequences may occur.		
P01.19	Action selected when running frequency less than frequency lower limit (valid when frequency lower limit greater than 0)	This parameter specifies the running status of inverter when the set frequency is below the lower limit. Ones place: Action selection 0: Run in lower limit of the frequency 1: Stop 2: Sleep Tens place: Stop mode 0: Coast to stop 1: Decelerate to stop The inverter stops as set in the tens place if the action selection is stop or sleep when the set frequency is below the lower limit. The inverter resumes the running state automatically when the set frequency is above the lower limit again and this situation lasts for the time set by P01.20.	0	◎
P01.20	Wake-up-from-sleep delay	This parameter specifies the sleep delay. When the running frequency of inverter is below the lower limit frequency, the inverter enters sleep state; when the set frequency is above the lower limit again and continues to be so after the time set by P01.20 elapses, the inverter will run automatically.  Setting range: 0.0–3600.0s (valid when P.01.19 is 2)	0.0s	○

Function code	Name	Description	Default	Modify
P01.21	Restart after power down	This parameter specifies the automatic running of the inverter at next power-on after power down. 0: Disabled restart 1: Enable restart, namely the inverter will run automatically after the time set by P01.22 elapses if the starting conditions are met.	0	○
P01.22	Waiting time of restart after power down	This parameter specifies the waiting time before automatically running at next power-on after power down.  Setting range: 0.0–3600.0s (valid when P01.21=1)	1.0s	○
P01.23	Start delay	This parameter specifies the delay of the inverter's wake-up-from-sleep after running command is given, the inverter will start to run and output after the time set by P01.23 elapses to realize brake release. Setting range: 0.0–600.0s	0.0s	○
P01.24	Stop speed delay	0.0–600.0s	0.0s	○
P01.25	Open-loop 0Hz output selection	0: No voltage output 1: With voltage output 2: Output as per DC braking current of stop	0	○
P01.26	Deceleration time of emergency-stop	0.0–60.0s	2.0s	○
P01.27	Time of starting section of deceleration S curve	0.0–50.0s	0.1s	◎
P01.28	Time of ending section of deceleration S curve	0.0–50.0s	0.1s	◎
P01.29	Short-circuit braking current	When the inverter starts in direct start mode (P01.00=0), set P01.30 to a non-zero value to enter short-circuit brake. During stop, if the running frequency of inverter is below the starting frequency of braking after stop, set P01.31 to a non-zero value to enter short-circuit braking after stop, and then carry out DC braking in the time set by P01.12 (refer to P01.09–P01.12).	0.0%	○
P01.30	Hold time of short-circuit braking at startup		0.00s	○
P01.31	Hold time of short-circuit braking at stop		0.00s	○

Function code	Name	Description	Default	Modify
		Setting range of P01.29: 0.0–150.0% (of the rated inverter output current) Setting range of P01.30: 0.0–50.0s Setting range of P01.31: 0.0–50.0s		
P01.32	Pre-exciting time of jogging	0–10.000s	0.000s	○
P01.33	Starting frequency of braking for jogging to stop	0–P00.03	0.00Hz	○
P01.34	Delay to enter sleep	0–3600.0s	0.0s	○
P02 group—Parameters of motor 1				
P02.00	Type of motor 1	0: Asynchronous motor 1: Synchronous motor	0	◎
P02.01	Rated power of asynchronous motor 1	0.1–3000.0kW	Model depended	◎
P02.02	Rated frequency of asynchronous motor 1	0.01Hz–P00.03 (Max. output frequency)	50.00Hz	◎
P02.03	Rated speed of asynchronous motor 1	1–60000rpm	Model depended	◎
P02.04	Rated voltage of asynchronous motor 1	0–1200V	Model depended	◎
P02.05	Rated current of asynchronous motor 1	0.8–6000.0A	Model depended	◎
P02.06	Stator resistance of asynchronous motor 1	0.001–65.535Ω	Model depended	○
P02.07	Rotor resistance of asynchronous motor 1	0.001–65.535Ω	Model depended	○
P02.08	Leakage inductance of asynchronous motor 1	0.1–6553.5mH	Model depended	○
P02.09	Mutual inductance of asynchronous motor 1	0.1–6553.5mH	Model depended	○
P02.10	No-load current of asynchronous motor 1	0.1–6553.5A	Model depended	○

Function code	Name	Description	Default	Modify
P02.11	Magnetic saturation coefficient 1 of iron core of asynchronous motor 1	0.0–100.0%	80.0%	○
P02.12	Magnetic saturation coefficient 2 of iron core of asynchronous motor 1	0.0–100.0%	68.0%	○
P02.13	Magnetic saturation coefficient 3 of iron core of asynchronous motor 1	0.0–100.0%	57.0%	○
P02.14	Magnetic saturation coefficient 4 of iron core of asynchronous motor 1	0.0–100.0%	40.0%	○
P02.15	Rated power of synchronous motor 1	0.1–3000.0kW	Model depended	◎
P02.16	Rated frequency of synchronous motor 1	0.01Hz–P00.03 (Max. output frequency)	50.00Hz	◎
P02.17	Number of pole pairs of synchronous motor 1	1–128	2	◎
P02.18	Rated voltage of synchronous motor 1	0–1200V	Model depended	◎
P02.19	Rated current of synchronous motor 1	0.8–6000.0A	Model depended	◎
P02.20	Stator resistance of synchronous motor 1	0.001–65.535Ω	Model depended	○
P02.21	Direct-axis inductance of synchronous motor 1	0.01–655.35mH	Model depended	○
P02.22	Quadrature-axis inductance of synchronous motor 1	0.01–655.35mH	Model depended	○
P02.23	Counter-emf constant of synchronous motor 1	0–10000	300	○
P02.24	Reserved	0x0000–0xFFFF	0	●
P02.25	Reserved	0%–50% (of the motor rated current)	10%	●
P02.26	Overload protection of motor 1	0: No protection 1: Common motor (with low-speed compensation).	2	◎

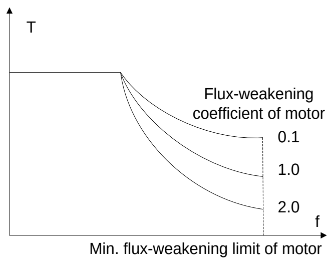
Function code	Name	Description	Default	Modify
		As the cooling effect of common motor will be degraded in low speed, the corresponding electronic thermal protection value should also be adjusted properly, the low compensation here means to lower the overload protection threshold of the motor whose running frequency is below 30Hz. 2: Frequency-variable motor (without low speed compensation). As the cooling effect of frequency-variable motor is not affected by the rotating speed, there is no need to adjust the protection value during low speed running.		
P02.27	Overload protection coefficient of motor 1	Motor overload multiples M=Iout/(In×K) In is rated motor current, Iout is inverter output current, K is motor overload protection coefficient. The smaller the K, the larger the value of M, and the easier the protection. When M=116%, protection is performed after motor overload last for 1 hour; when M=150%, protection is performed after motor overload lasts for 12 minutes; when M=180%, protection is performed after motor overload lasts for 5 minutes; when M=200%, protection is performed after motor overload lasts for 60 seconds; and when M≥ 400%, protection is performed immediately.  Setting range: 20.0%–120.0%	100.0%	○
P02.28	Power display calibration coefficient of motor 1	This function adjusts the power display value of motor 1 only, and it does not affect the control performance of the inverter. Setting range: 0.00–3.00	1.00	○
P02.29	Parameter display of motor 1	0: Display as per motor type; under this mode, only parameters related to current motor type will be displayed. 1: Display all; under this mode, all the motor parameters will be displayed.	0	○
P02.30	System inertia of motor 1	0–30.000kgm^2	0	○
P02.31–P02.32	Reserved	0–65535	0	○

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th><th>Modify</th></tr>
<tr><td colspan="5">P03 group—Vector control of motor 1</td></tr>
<tr><td>P03.00</td><td>Speed loop proportional gain 1</td><td rowspan="6">Parameters of P03.00–P03.05 fit for vector control mode only. Below P03.02, speed loop PI parameter is P03.00 and P03.01; above P03.06, speed loop PI parameter is P03.03 and P03.04; in between, PI parameter is obtained by linear variation between two groups of parameters, as shown below.


The speed loop dynamic response characteristics of vector control can be adjusted by setting the proportional coefficient and integral time of speed regulator. Increase proportional gain or decrease integral time can accelerate dynamic response of speed loop, however, if the proportional gain is too large or integral time is too small, system oscillation and overshoot may occur; if proportional gain is too small, stable oscillation or speed offset may occur.
Speed loop PI parameter is closely related to the system inertial, you should make adjustment based on default PI parameter according to different load characteristics to fulfill different needs.
Setting range of P03.00:0.0–200.0;
Setting range of P03.01: 0.000–10.000s
Setting range of P03.02: 0.00Hz–P03.05
Setting range of P03.03: 0.0–200.0
Setting range of P03.04: 0.000–10.000s
Setting range of P03.05: P03.02–P00.03 (Max. output frequency)</td><td>20.0</td><td>○</td></tr>
<tr><td>P03.01</td><td>Speed loop integral time 1</td><td>0.200s</td><td>○</td></tr>
<tr><td>P03.02</td><td>Switch low point frequency</td><td>5.00Hz</td><td>○</td></tr>
<tr><td>P03.03</td><td>Speed loop proportional gain 2</td><td>20.0</td><td>○</td></tr>
<tr><td>P03.04</td><td>Speed loop integral time 2</td><td>0.200s</td><td>○</td></tr>
<tr><td>P03.05</td><td>Switch over high point frequency</td><td>10.00Hz</td><td>○</td></tr>
<tr><td>P03.06</td><td>Speed loop output filter</td><td>0–8 (corresponds to 0–2^8/10ms)</td><td>0</td><td>○</td></tr>
<tr><td>P03.07</td><td>Vector control slip compensation coefficient (motoring)</td><td rowspan="2">Slip compensation coefficient is used to adjust the slip frequency of vector control to improve speed control precision. This parameter can be used to control speed offset.
Setting range: 50–200%</td><td>100%</td><td>○</td></tr>
<tr><td>P03.08</td><td>Vector control slip compensation coefficient (generating)</td><td>100%</td><td>○</td></tr>
</table>

Function code	Name	Description	Default	Modify
P03.09	Current loop proportional coefficient P	**Note:** ● These two parameters are used to adjust PI parameters of current loop; it affects dynamic response speed and control precision of the system directly. The default value needs no adjustment under common conditions; ● Applicable to SVC mode 0 (P00.00=0), SVC mode 1 (P00.00=1), and FVC (P00.00=3) Setting range: 0–65535	1000	○
P03.10	Current loop integral coefficient I		1000	○
P03.11	Torque setting method	0–1: Keypad (P03.12) 2: AI1 3: AI2 4: AI3 5: Pulse frequency HDIA 6: Multi-step torque 7: Modbus/Modbus TCP communication 8: PROFIBUS/CANopen/DeviceNet communication 9: Ethernet communication 10: Pulse frequency HDIB 11: EtherCAT/PROFINET/EtherNet IP communication 12: Programmable card **Note:** For these settings, 100% corresponds to the motor rated current.	0	○
P03.12	Torque set through keypad	-300.0%–300.0% (of the motor rated current)	20.0%	○
P03.13	Torque reference filter time	0.000–10.000s	0.010s	○
P03.14	Setting source of FWD rotation frequency upper limit in torque control	0: Keypad (P03.16) 1: AI1 2: AI2 3: AI3 4: Pulse frequency HDIA 5: Multi-step setting 6: Modbus/Modbus TCP communication 7: PROFIBUS/CANopen/DeviceNet communication 8: Ethernet communication 9: Pulse frequency HDIB 10: EtherCAT/PROFINET/EtherNet IP communication	0	○

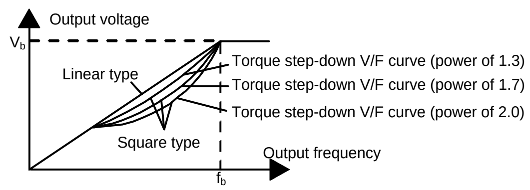
Function code	Name	Description	Default	Modify
		11: Programmable card 12: Reserved **Note:** For these settings, 100% corresponds to the max. frequency.		
P03.15	Setting source of REV rotation frequency upper limit in torque control	0: Keypad (P03.17) 1: AI1 2: AI2 3: AI3 4: Pulse frequency HDIA 5: Multi-step setting 6: Modbus/Modbus TCP communication 7: PROFIBUS/CANopen/DeviceNet communication 8: Ethernet communication 9: Pulse frequency HDIB 10: EtherCAT/PROFINET/EtherNet IP communication 11: Programmable card 12: Reserved **Note:** For these settings, 100% corresponds to the max. frequency.	0	○
P03.16	FWD rotation frequency upper limit set through keypad in torque control	Used to specify frequency limits. 100% corresponds to the max. frequency. P03.16 specifies the upper-limit frequency when P03.14=1; P03.17 specifies the upper-limit frequency when P03.15=1. Setting range: 0.00Hz–P00.03 (Max. output frequency)	50.00Hz	○
P03.17	REV rotation frequency upper limit set through keypad in torque control		50.00Hz	○
P03.18	Setting source of electromotive torque upper limit	0: Keypad (P03.20) 1: AI1 2: AI2 3: AI3 4: Pulse frequency HDIA 5: Modbus/Modbus TCP communication 6: PROFIBUS/CANopen/DeviceNet communication 7: Ethernet communication 8: Pulse frequency HDIB 9: EtherCAT/PROFINET/EtherNet IP communication 10: Programmable card	0	○

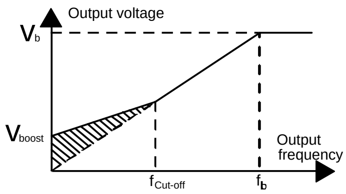
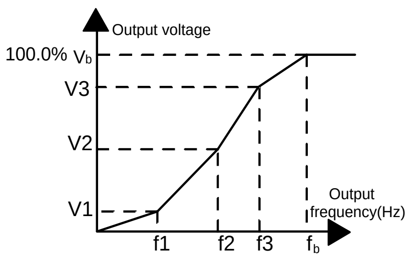
<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th><th>Modify</th></tr>
<tr><td></td><td></td><td>11: Reserved
Note: For these settings, 100% corresponds to the motor rated current.</td><td></td><td></td></tr>
<tr><td>P03.19</td><td>Setting source of braking torque upper limit</td><td>0: Keypad (P03.21)
1: AI1
2: AI2
3: AI3
4: Pulse frequency HDIA
5: Modbus/Modbus TCP communication
6: PROFIBUS/CANopen/DeviceNet communication
7: Ethernet communication
8: Pulse frequency HDIB
9: EtherCAT/PROFINET/EtherNet IP communication
10: Programmable card
11: Reserved
Note: For these settings, 100% corresponds to the motor rated current.</td><td>0</td><td>○</td></tr>
<tr><td>P03.20</td><td>Electromotive torque upper limit set through keypad</td><td rowspan="2">Used to set torque limits.
Setting range: 0.0–300.0% (of the motor rated current)</td><td>180.0%</td><td>○</td></tr>
<tr><td>P03.21</td><td>Braking torque upper limit set through keypad</td><td>180.0%</td><td>○</td></tr>
<tr><td>P03.22</td><td>Flux-weakening coefficient of constant-power zone</td><td rowspan="2">Used when asynchronous motor is in flux-weakening control.


P03.22 and P03.23 are valid during constant power. When motor speed is above rated speed, motor enters flux-weakening running state. The flux-weakening control coefficient can change the flux-weakening curvature, the larger the coefficient, the steeper the curve, the smaller the coefficient, the smoother the curve.
Setting range of P03.22: 0.1–2.0
Setting range of P03.23: 10%–100%</td><td>0.3</td><td>○</td></tr>
<tr><td>P03.23</td><td>Min. flux-weakening point of constant-power zone</td><td>20%</td><td>○</td></tr>
</table>

Function code	Name	Description	Default	Modify
P03.24	Max. voltage limit	P03.24 sets the maximum output voltage of the inverter, which is the percentage of rated motor voltage. Set the value according to onsite conditions. Setting range:0.0–120.0%	100.0%	○
P03.25	Pre-exciting time	Carry out motor pre-exciting during starting to build a magnetic field inside the motor to improve the torque characteristics of motor during starting. Setting range: 0.000–10.000s	0.300s	○
P03.26	Flux-weakening proportional gain	0–8000	1000	○
P03.27	Vector control speed display	0: Display as per the actual value 1: Display as per the set value	0	○
P03.28	Static friction compensation coefficient	0.0–100.0%	0.0%	○
P03.29	Corresponding frequency point of static friction	0.50–P03.31	1.00Hz	○
P03.30	High speed friction compensation coefficient	0.0–100.0%	0.0%	○
P03.31	Corresponding frequency of high speed friction torque	P03.29–400.00Hz	50.00Hz	○
P03.32	Enabling torque control	0: Disable 1: Enable	0	◎
P03.33	Flux weakening integral gain	0–8000	1200	○
P03.34	Flux-weakening control mode	0x000–0x112 Ones place: Control mode 0: Mode 0 1: Mode 1 2: Mode 2 Tens place: Compensation of inductance saturation coefficient 0: Enable 1: Disable Hundreds place: Reserved 0: Reserved 1: Reserved	0x000	○

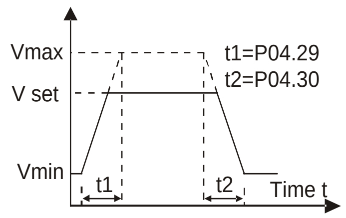
Function code	Name	Description	Default	Modify
P03.35	Control optimization setting	0x0000–0x1111 Ones place: Torque command selection 0: Torque reference 1: Torque current reference Tens place: Reserved 0: Reserved 1: Reserved Hundreds place: Whether to enable ASR integral separation 0: Disable 1: Enable Thousands place: Reserved 0: Reserved 1: Reserved	0x0000	○
P03.36	Speed loop differential gain	0.00–10.00s	0.00s	○
P03.37	High-frequency current loop proportional coefficient	Under FVC (P00.00=3) and P03.39, the current loop PI parameters are P03.09 and P03.10; above P03.39, the PI parameters are P03.37 and P03.38. Setting range of P03.37: 0–65535 Setting range of P03.38: 0–65535 Setting range of P03.39: 0.0–100.0% (relative to max. frequency)	1000	○
P03.38	High-frequency current loop integral coefficient		1000	○
P03.39	Current loop high-frequency switchover point		100.0%	○
P03.40	Enabling inertia compensation	0: Disable 1: Enable	0	○
P03.41	Upper limit of inertia compensation torque	Limit the max. inertia compensation torque to prevent inertia compensation torque from being too large. Setting range: 0.0–150.0% (rated motor torque)	10.0%	○
P03.42	Inertia compensation filter times	Filter times of inertia compensation torque, used to smooth inertia compensation torque. Setting range: 0–10	7	○
P03.43	Inertia identification torque value	Due to friction force, it is required to set certain identification torque for the inertia identification to be performed properly. 0.0–100.0% (rated motor torque)	10.0%	○
P03.44	Enable inertia identification	0: No operation 1: Start identification	0	◎

Function code	Name	Description	Default	Modify
P03.45	Current loop proportional coefficient after autotuning	Automatic update will be performed after motor parameter autotuning. In the closed-loop vector control mode for synchronous motors, you can set the value of this function code to P03.09. Range: 0–65535 **Note: Set the value to 0 if motor parameter autotuning is not performed.**	0	●
P03.46	Current integral proportional coefficient after autotuning	Automatic update will be performed after motor parameter autotuning. In the closed-loop vector control mode for synchronous motors, you can set the value of this function code to P03.10. Range: 0–65535 **Note: Set the value to 0 if motor parameter autotuning is not performed.**	0	●
P04 group—V/F control				
P04.00	V/F curve setting of motor 1	This group of function code defines the V/F curve of motor 1 to satisfy different load characteristics needs. 0: Straight V/F curve; fit for constant-torque load 1: Multi-point V/F curve 2: Torque down V/F curve (power of 1.3) 3: Torque down V/F curve (power of 1.7) 4: Torque down V/F curve (power of 2.0) Curves 2–4 are suitable for torque-variable load of fan pump and similar equipment. You can make adjustment based on load characteristics to achieve optimal energy-saving effect. 5: Customized V/F (V/F separation); under this mode, V is separated from f. You can adjust f through the frequency reference channel set by P00.06 to change the curve characteristic, or adjust V through the voltage reference channel set by P04.27 to change the curve characteristics. **Note:** The V_b in the figure below corresponds to rated motor voltage, and f_b corresponds to rated motor frequency. 	0	◎

Function code	Name	Description	Default	Modify
P04.01	Torque boost of motor 1	In order to compensate for low-frequency torque characteristics, you can make some boost compensation to the output voltage. P04.01 is relative to the maximum output voltage V_b. P04.02 defines the percentage of cut-off frequency of manual torque boost to the rated motor frequency f_b. Torque boost can improve the low-frequency torque characteristics of V/F. You should select torque boost based on the load, for example, larger load requires larger torque boost, however, if the torque boost is too large, the motor will run at over-excitation, which will cause increased output current and motor heat-up, thus degrading the efficiency. When torque boost is set to 0.0%, the inverter is automatic torque boost. Torque boost cut-off threshold: Below this frequency threshold, the torque boost is valid, exceeding this threshold will nullify torque boost.  Setting range of P04.01: 0.0%: (automatic) 0.1%–10.0% Setting range of P04.02: 0.0%–50.0%	0.0%	○
P04.02	Motor 1 torque boost cut-off		20.0%	○
P04.03	V/F frequency point 1 of motor 1	When P04.00 =1 (multi-point V/F curve), you can set V/F curve via P04.03–P04.08. V/F curve is usually set according to the characteristics of motor load. **Note:** V1<V2<V3, f1<f2<f3. If low-frequency voltage is set too high, motor overheat or burnt-down may occur, and overcurrent stall or overcurrent protection may occur to the inverter.  Setting range of P04.03: 0.00Hz–P04.05 Setting range of P04.04: 0.0%–110.0% (rated	0.00Hz	○
P04.04	V/F voltage point 1 of motor 1		00.0%	○
P04.05	V/F frequency point 2 of motor 1		0.00Hz	○
P04.06	V/F voltage point 2 of motor 1		0.0%	○
P04.07	V/F frequency point 3 of motor 1		0.00Hz	○
P04.08	V/F voltage point 3 of motor 1		00.0%	○

Function code	Name	Description	Default	Modify
		voltage of motor 1) Setting range of P04.05: P04.03–P04.07 Setting range of P04.06: 0.0%–110.0% (rated voltage of motor 1) Setting range of P04.07: P04.05–P02.02 (rated frequency of asynchronous motor 1) or P04.05–P02.16 (rated frequency of synchronous motor 1) Setting range of P04.08: 0.0%–110.0% (rated voltage of motor 1)		
P04.09	V/F slip compensation gain of motor 1	This parameter is used to compensate for the motor rotating speed change caused by load change in the SVPWM mode, and thus improve the rigidity of the mechanical characteristics of the motor. You need to calculate the rated slip frequency of the motor as follows: $\triangle f=fb-n\times p/60$ where fb is the rated frequency of motor 1, corresponding to P02.02; n is the rated speed of motor 1, corresponding to P02.03; p is the number of pole pairs of motor 1. 100% corresponds to the rated slip frequency $\triangle f$ of motor 1. Setting range: 0.0–200.0%	100.0%	○
P04.10	Low-frequency oscillation control factor of motor 1	In SVPWM mode, the motor, especially the large-power motor may experience current oscillation during certain frequencies, which may lead to unstable motor operation, or even inverter overcurrent, you can adjust these two parameters properly to eliminate such phenomenon. Setting range of P04.10: 0–100 Setting range of P04.11: 0–100 Setting range of P04.12: 0.00Hz–P00.03 (Max. output frequency)	10	○
P04.11	High-frequency oscillation control factor of motor 1		10	○
P04.12	Oscillation control threshold of motor 1		30.00Hz	○
P04.13	V/F curve setting of motor 2	This parameter defines the V/F curve of motor 2 of the inverter to meet various load characteristic requirements. 0: Straight V/F curve 1: Multi-point V/F curve 2: Torque-down V/F curve (power of 1.3) 3: Torque-down V/F curve (power of 1.7) 4: Torque-down V/F curve (power of 2.0) 5: Customize V/F (V/F separation)	0	◎

Function code	Name	Description	Default	Modify
P04.14	Torque boost of motor 2	**Note:** Refer to the parameter description of P04.01 and P04.02. Setting range of P04.14: 0.0%: (automatic) 0.1%–10.0% Setting range of 0.0%–50.0% (relative to rated frequency of motor 2)	0.0%	○
P04.15	Torque boost cut-off of motor 2		20.0%	○
P04.16	V/F frequency point 1 of motor 2	**Note:** Refer to the parameter description of P04.03–P04.08 Setting range of P04.16: 0.00Hz–P04.18 Setting range of P04.17:0.0%–110.0% (rated voltage of motor 2) Setting range of P04.18: P04.16–P04.20 Setting range of P04.19: 0.0%–110.0% (rated voltage of motor 2) Setting range of P04.20: P04.18–P12.02 (rated frequency of asynchronous motor 2) or P04.18–P12.16 (rated frequency of synchronous motor 2) Setting range of P04.21: 0.0%–110.0% (of the rated voltage of motor 2)	0.00Hz	○
P04.17	V/F voltage point 1 of motor 2		00.0%	○
P04.18	V/F frequency point 2 of motor 2		0.00Hz	○
P04.19	V/F voltage point 2 of motor 2		00.0%	○
P04.20	V/F frequency point 3 of motor 2		0.00Hz	○
P04.21	V/F voltage point 3 of motor 2		00.0%	○
P04.22	V/F slip compensation gain of motor 2	This parameter is used to compensate for the motor rotating speed change caused by load change in the SVPWM mode, and thus improve the rigidity of the mechanical characteristics of the motor. You need to calculate the rated slip frequency of the motor as follows: $\triangle f=fb-n*p/60$ where fb is the rated frequency of motor 2, corresponding to P12.02; n is the rated speed of motor 2, corresponding to P12.03; p is the number of pole pairs of motor 2. 100% corresponds to the rated slip frequency $\triangle f$ of motor 2. Setting range: 0.0–200.0%	0.0%	○
P04.23	Low-frequency oscillation control factor of motor 2	In the SVPWM mode, current oscillation may easily occur on motors, especially large-power motors, at some frequency, which may cause unstable running of motors or even overcurrent of inverters. You can modify this parameter to prevent current oscillation. Setting range of P04.23: 0–100 Setting range of P04.24: 0–100 Setting range of P04.25: 0.00 Hz–P00.03 (Max. output frequency)	10	○
P04.24	High-frequency oscillation control factor of motor 2		10	○
P04.25	Oscillation control threshold of motor 2		30.00Hz	○

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th><th>Modify</th></tr>
<tr><td>P04.26</td><td>Energy-saving run</td><td>0: No action
1: Automatic energy-saving operation
Under light-load state, the motor can adjust the output voltage automatically to achieve energy-saving purpose</td><td>0</td><td>◎</td></tr>
<tr><td>P04.27</td><td>Voltage setting channel</td><td>0: Keypad; output voltage is determined by P04.28
1: AI1
2: AI2
3: AI3
4: HDIA
5: Multi-step (the set value is determined by P10 group)
6: PID
7: Modbus/Modbus TCP communication
8: PROFIBUS/CANopen/DeviceNet communication
9: Ethernet communication
10: HDIB
11: EtherCAT/PROFINET/EtherNet IP communication
12: Programmable card
13: Reserved</td><td>0</td><td>○</td></tr>
<tr><td>P04.28</td><td>Voltage value set through keypad</td><td>When the keypad is set as the voltage setting channel, the value of this parameter is used as the voltage value.
Setting range: 0.0%–100.0%</td><td>100.0%</td><td>○</td></tr>
<tr><td>P04.29</td><td>Voltage increase time</td><td rowspan="2">Voltage increase time means the time needed from outputting the min. voltage to accelerating to output the max. voltage.
Voltage decrease time means the time needed from outputting max. voltage to outputting the min. voltage
Setting range: 0.0–3600.0s</td><td>5.0s</td><td>○</td></tr>
<tr><td>P04.30</td><td>Voltage decrease time</td><td>5.0s</td><td>○</td></tr>
<tr><td>P04.31</td><td>Output max. voltage</td><td rowspan="2">Set the upper/lower limit value of output voltage.


Setting range of P04.31: P04.32–100.0% (rated motor voltage)
Setting range of P04.32: 0.0%–P04.31</td><td>100.0%</td><td>◎</td></tr>
<tr><td>P04.32</td><td>Output min. voltage</td><td>0.0%</td><td>◎</td></tr>
</table>

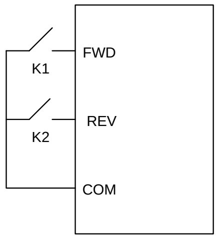
Function code	Name	Description	Default	Modify
P04.33	Flux-weakening coefficient in the constant power zone	1.00–1.30	1.00	○
P04.34	Pull-in current 1 in synchronous motor VF control	When the synchronous motor VF control mode is enabled, this parameter is used to set the reactive current of the motor when the output frequency is lower than the frequency set in P04.36. Setting range: -100.0%–+100.0% (of the motor rated current)	20.0%	○
P04.35	Pull-in current 2 in synchronous motor VF control	When the synchronous motor VF control mode is enabled, this parameter is used to set the reactive current of the motor when the output frequency is higher than the frequency set in P04.36. Setting range: -100.0%–+100.0% (of the motor rated current)	10.0%	○
P04.36	Frequency threshold for pull-in current switching in synchronous motor VF control	When the synchronous motor VF control mode is enabled, this parameter is used to set the frequency threshold for the switching between pull-in current 1 and pull-in current 2. Setting range: 0.0%–200.0% (of the motor rated frequency)	20.0%	○
P04.37	Reactive current closed-loop proportional coefficient in synchronous motor VF	When the synchronous motor VF control mode is enabled, this parameter is used to set the proportional coefficient of the reactive current closed-loop control. Setting range: 0–3000	50	○
P04.38	Reactive current closed-loop integral time in synchronous motor VF control	When the synchronous motor VF control mode is enabled, this parameter is used to set the integral coefficient of the reactive current closed-loop control. Setting range: 0–3000	30	○
P04.39	Reactive current closed-loop output limit in synchronous motor VF control	When the synchronous motor VF control mode is enabled, this parameter is used to set the output limit of the reactive current in the closed-loop control. A greater value indicates a higher reactive closed-loop compensation voltage and higher output power of the motor. In general, you do not need to modify this parameter. Setting range: 0–16000	8000	○
P04.40	Enable/disable IF mode for asynchronous motor 1	0: Disabled 1: Enabled	0	◎

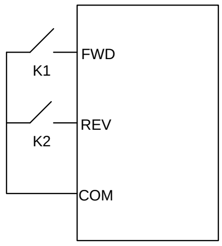
Function code	Name	Description	Default	Modify
P04.41	Current setting in IF mode for asynchronous motor 1	When IF control is adopted for asynchronous motor 1, this parameter is used to set the output current. The value is a percentage in relative to the rated current of the motor. Setting range: 0.0–200.0%	120.0%	○
P04.42	Proportional coefficient in IF mode for asynchronous motor 1	When IF control is adopted for asynchronous motor 1, this parameter is used to set the proportional coefficient of the output current closed-loop control. Setting range: 0–5000	650	○
P04.43	Integral coefficient in IF mode for asynchronous motor 1	When IF control is adopted for asynchronous motor 1, this parameter is used to set the integral coefficient of the output current closed-loop control. Setting range: 0–5000	350	○
P04.44	Starting frequency point for switching off IF mode for asynchronous motor 1	0.00–P04.50	10.00Hz	○
P04.45	Enable/disable IF mode for asynchronous motor 2	0: Disable 1: Enable	0	◎
P04.46	Current setting in IF mode for asynchronous motor 2	When IF control is adopted for asynchronous motor 2, this parameter is used to set the output current. The value is a percentage in relative to the rated current of the motor. Setting range: 0.0–200.0%	120.0%	○
P04.47	Proportional coefficient in IF mode for asynchronous motor 2	When IF control is adopted for asynchronous motor 2, this parameter is used to set the proportional coefficient of the output current closed-loop control. Setting range: 0–5000	650	○
P04.48	Integral coefficient in IF mode for asynchronous motor 2	When IF control is adopted for asynchronous motor 2, this parameter is used to set the integral coefficient of the output current closed-loop control. Setting range: 0–5000	350	○
P04.49	Starting frequency point for switching off IF mode for asynchronous motor 2	0.00–P04.51	10.00Hz	○

Function code	Name	Description	Default	Modify
P04.50	End frequency point for switching off IF mode for asynchronous motor 1	P04.44–P00.03	25.00Hz	○
P04.51	End frequency point for switching off IF mode for asynchronous motor 2	P04.49–P00.03	25.00Hz	○
P05 group—Input terminals				
P05.00	HDI input type	0x00–0x11 Ones: HDIA input type 0: HDIA is high-speed pulse input 1: HDIA is digital input Tens: HDIB input type 0: HDIB is high-speed pulse input 1: HDIB is digital input	0	◎
P05.01	Function of S1 terminal	0: No function 1: Forward running 2: Reverse running 3: 3-wire control/Sin 4: Forward jogging 5: Reverse jogging 6: Coast to stop 7: Fault reset 8: Running pause 9: External fault input 10: Frequency increase (UP) 11: Frequency decrease (DOWN) 12: Clear frequency increase/decrease setting 13: Switchover between setup A and setup B 14: Switchover between combination setup and setup A 15: Switchover between combination setup and setup B 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	1	◎
P05.02	Function of S2 terminal		4	◎
P05.03	Function of S3 terminal		7	◎
P05.04	Function of S4 terminal		0	◎
P05.05	Function of HDIA terminal		0	◎
P05.06	Function of HDIB terminal		0	◎

Function code	Name	Description	Default	Modify
		21: Acceleration/deceleration time selection 1 22: Acceleration/deceleration time selection 2 23: Simple PLC stop reset 24: Simple PLC pause 25: PID control pause 26: Wobbling frequency pause 27: Wobbling frequency reset 28: Counter reset 29: Switchover between speed control and torque control 30: Acceleration/deceleration disabled 31: Counter trigger 32: Reserved 33: Clear frequency increase/decrease setting temporarily 34: DC brake 35: Switchover between motor 1 and motor 2 36: Command switches to keypad 37: Command switches to terminal 38: Command switches to communication 39: Pre-exciting command 40: Zero out power consumption quantity 41: Maintain power consumption quantity 42: Switching the upper torque limit setting mode to keypad 43: Position reference point input (valid only for S1, S2 and S3 are valid) 44: Spindle orientation disabled 45: Spindle zeroing/local positioning zeroing 46: Spindle zero position selection 1 47: Spindle zero position selection 2 48: Spindle scale division selection 1 49: Spindle scale division selection 2 50: Spindle scale division selection 3 51: Terminal for switching between position control and speed control 52: Pulse input disabled 53: Clear position deviation cleared 54: Switch over position proportional gain 55: Enable cyclic positioning of digital position positioning 56: Emergency stop		

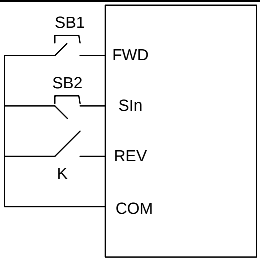
Function code	Name	Description	Default	Modify
		57: Motor over-temperature fault input 58: Enable rigid tapping 59: Switch to V/F control 60: Switch to FVC control 61: PID polarity switchover 62: Reserved 63: Enable servo 64: Limit of forward run 65: Limit of reverse run 66: Zero out encoder counting 67: Pulse increase 68: Enable pulse superimposition 69: Pulse decrease 70: Electronic gear selection 71: Switch to master 72: Switch to slave 73: Reset the roll diameter 74: Switch winding/unwinding 75: Pre-drive 76: Disable roll diameter calculation 77: Clear alarm display 78: Manual braking 79: Trigger forced feeding interrupt 80: Initial roll diameter 1 81: Initial roll diameter 2 82: Trigger fire mode control 83: Switch tension PID parameters 84–95: Reserved		
P05.07	Reserved	0–65535	0	●
P05.08	Polarity of input terminal	This parameter specifies the polarity of input terminals. When the bit is set to 0, the input terminal polarity is positive. When the bit is set to 1, the input terminal polarity is negative. 0x000–0x3F	0x00	○
P05.09	Digital filter time	Set the sampling filtering time of the S1–S4, HDIA, and HDIB terminals. In cases where interference is strong, increase the value of this parameter to avoid mal-operation. 0.000–1.000s	0.010s	○

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th><th>Modify</th></tr>
<tr><td>P05.10</td><td>Virtual terminal setting</td><td>0x00–0x3F (0: disable, 1: enable)
BIT0: S1 virtual terminal
BIT1: S2 virtual terminal
BIT2: S3 virtual terminal
BIT3: S4 virtual terminal
BIT4: HDIA virtual terminal
BIT5: HDIB virtual terminal</td><td>0x00</td><td>◎</td></tr>
<tr><td>P05.11</td><td>2/3 Wire control mode</td><td>This parameter specifies the 2/3 Wire control mode.
0: 2-Wire control 1; integrate enabling function with direction. This mode is the most popular dual-line mode. Direction of motor rotation is determined by the defined FWD/REV terminal command.


<table>
<tr><th>FWD</th><th>REV</th><th>Running command</th></tr>
<tr><td>OFF</td><td>OFF</td><td>Stop</td></tr>
<tr><td>ON</td><td>OFF</td><td>Forward running</td></tr>
<tr><td>OFF</td><td>ON</td><td>Reverse running</td></tr>
<tr><td>ON</td><td>ON</td><td>Hold</td></tr>
</table>
1: 2-wire control 2; separate enabling function with direction. In this mode, the defined FWD is enabling terminal, and the direction is determined by the state of REV.


<table>
<tr><th>FWD</th><th>REV</th><th>Running command</th></tr>
<tr><td>OFF</td><td>OFF</td><td>Stop</td></tr>
<tr><td>ON</td><td>OFF</td><td>Forward running</td></tr>
<tr><td>OFF</td><td>ON</td><td>Stop</td></tr>
<tr><td>ON</td><td>ON</td><td>Reverse running</td></tr>
</table>
2: 3-wire control 1; This mode defines Sin as enabling terminal, and the running command is generated by FWD, the direction is controlled by REV. During running, the Sin terminal should be closed, and terminal FWD generates a rising edge signal, then the inverter starts to run in the direction set by the state of terminal REV; the inverter should be stopped by disconnecting terminal Sin.</td><td>0</td><td>◎</td></tr>
</table>

Function code	Name	Description	Default	Modify

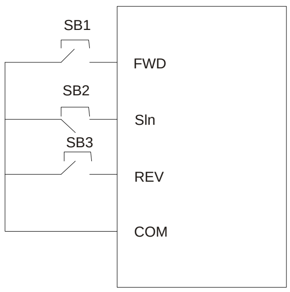


The direction control during running is shown below.

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

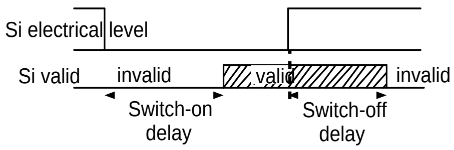
SIn: 3-wire control/Sin, FWD: Forward running, REV: Reverse running

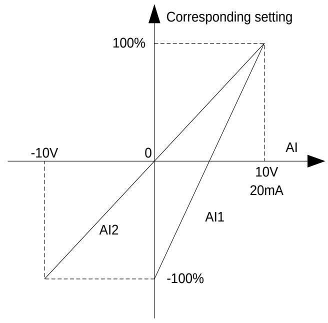
3: 3-wire control 2; This mode defines Sin as enabling terminal. The running command is generated by FWD or REV, and they control the running direction. During running, the terminal Sin should be closed, and terminal FWD or REV generates a rising edge signal to control the running and direction of inverter; the inverter should be stopped by disconnecting terminal Sin.



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

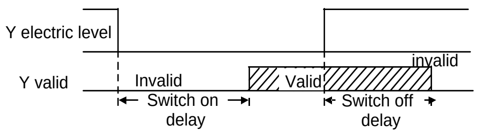
SIn: 3-wire control/Sin, FWD: Forward running, REV: Reverse running

Function code	Name	Description	Default	Modify
		Note: For dual-line running mode, when FWD/REV terminal is valid, if the inverter stops due to stop command given by other sources, it will not run again after the stop command disappears even if the control terminals FWD/REV are still valid. To make the inverter run again, you need to trigger FWD/REV again, such as PLC single-cycle stop, fixed-length stop, and valid STOP/RST stop during terminal control. (See P07.04)		
P05.12	S1 terminal switch-on delay	These function codes define corresponding delay of the programmable input terminals during level variation from switch-on to switch-off .  Setting range: 0.000–50.000s **Note:** After a virtual terminal is enabled, the state of the terminal can be changed only in communication mode. The communication address is 0x200A.	0.000s	○
P05.13	S1 terminal switch-off delay		0.000s	○
P05.14	S2 terminal switch-on delay		0.000s	○
P05.15	S2 terminal switch-off delay		0.000s	○
P05.16	S3 terminal switch-on delay		0.000s	○
P05.17	S3 terminal switch-off delay		0.000s	○
P05.18	S4 terminal switch-on delay		0.000s	○
P05.19	S4 terminal switch-off delay		0.000s	○
P05.20	HDIA terminal switch-on delay		0.000s	○
P05.21	HDIA terminal switch-off delay		0.000s	○
P05.22	HDIB terminal switch-on delay		0.000s	○
P05.23	HDIB terminal switch-off delay		0.000s	○
P05.24	Lower limit value of AI1	These function codes define the relation between analog input voltage and corresponding set value of analog input. When the analog input voltage exceeds the range of max./min. input, the max. input or min. input will be adopted during calculation. When analog input is current input, 0–20mA current corresponds to 0–10V voltage. In different applications, 100% of analog setting	0.00V	○
P05.25	Corresponding setting of lower limit of AI1		0.0%	○
P05.26	Upper limit value of AI1		10.00V	○
P05.27	Corresponding setting of upper limit of AI1		100.0%	○
P05.28	Input filter time of AI1		0.030s	○

Function code	Name	Description	Default	Modify
P05.29	Lower limit value of AI2	corresponds to different nominal values. The figure below illustrates several settings.  Input filter time: Adjust the sensitivity of analog input, increase this value properly can enhance the anti-interference capacity of analog variables; however, it will also degrade the sensitivity of analog input. **Note:** AI1 can support 0–10V/0–20mA input, when AI1 selects 0–20mA input; the corresponding voltage of 20mA is 10V; AI2 supports -10V–+10V input. Setting range of P05.24: 0.00V–P05.26 Setting range of P05.25: -300.0%–300.0% Setting range of P05.26: P05.24–10.00V Setting range of P05.27: -300.0%–300.0% Setting range of P05.28: 0.000s–10.000s Setting range of P05.29: -10.00V–P05.31 Setting range of P05.30: -300.0%–300.0% Setting range of P05.31: P05.29–P05.33 Setting range of P05.32: -300.0%–300.0% Setting range of P05.33: P05.31–P05.35 Setting range of P05.34: -300.0%–300.0% Setting range of P05.35: P05.33–10.00V Setting range of P05.36: -300.0%–300.0% Setting range of P05.37: 0.000s–10.000s	-10.00V	○
P05.30	Corresponding setting of lower limit of AI2		-100.0%	○
P05.31	Intermediate value 1 of AI2		0.00V	○
P05.32	Corresponding setting of intermediate value 1 of AI2		0.0%	○
P05.33	Intermediate value 2 of AI2		0.00V	○
P05.34	Corresponding setting of intermediate value 2 of AI2		0.0%	○
P05.35	Upper limit value of AI2		10.00V	○
P05.36	Corresponding setting of upper limit of AI2		100.0%	○
P05.37	Input filter time of AI2		0.030s	○
P05.38	HDIA high-speed pulse input function	0: Set input via frequency 1: Reserved 2: Input via encoder, used in combination with HDIB	0	◎
P05.39	Lower limit frequency of HDIA	0.000 kHz – P05.41	0.000 kHz	○
P05.40	Corresponding setting of lower limit frequency of HDIA	-300.0%–300.0%	0.0%	○

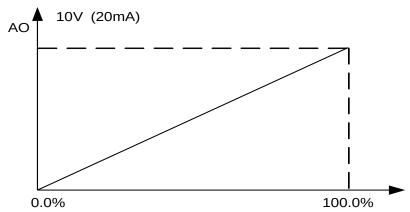
Function code	Name	Description	Default	Modify
P05.41	Upper limit frequency of HDIA	P05.39 –50.000kHz	50.000 kHz	○
P05.42	Corresponding setting of upper limit frequency of HDIA	-300.0%–300.0%	100.0%	○
P05.43	HDIA frequency input filter time	0.000s–10.000s	0.030s	○
P05.44	HDIB high-speed pulse input function selection	0: Set input via frequency 1: Reserved 2: Encoder input, used in combination with HDIA	0	◎
P05.45	Lower limit frequency of HDIB	0.000 kHz – P05.47	0.000 kHz	○
P05.46	Corresponding setting of lower limit frequency of HDIB	-300.0%–300.0%	0.0%	○
P05.47	Upper limit frequency of HDIB	P05.45–50.000kHz	50.000 kHz	○
P05.48	Corresponding setting of upper limit frequency of HDIB	-300.0%–300.0%	100.0%	○
P05.49	HDIB frequency input filter time	0.000s–10.000s	0.030s	○
P05.50	AI1 input signal type	0: Voltage type 1: Current type **Note:** You can set the AI1 input signal type through the corresponding function code.	0	◎
P05.51–P05.52	Reserved	0–65535	0	●
P06 group—Output terminals				
P06.00	HDO output type	0: Open collector high-speed pulse output: Max. frequency of the pulse is 50.00kHz. For details about the related functions, see P06.27–P06.31. 1: Open collector output: For details about the related functions, see P06.02.	0	◎
P06.01	Y1 output selection	0: Invalid 1: In running 2: In forward running 3: In reverse running 4: In jogging 5: inverter fault	0	○
P06.02	HDO output selection		0	○
P06.03	Relay RO1 output selection		1	○
P06.04	Relay RO2 output selection		5	○

Function code	Name	Description	Default	Modify
		6: Frequency level detection FDT1 7: Frequency level detection FDT2 8: Frequency reached 9: Running in zero speed 10: Reach upper limit frequency 11: Reach lower limit frequency 12: Ready to run 13: In pre-exciting 14: Overload pre-alarm 15: Underload pre-alarm 16: Simple PLC stage completed 17: Simple PLC cycle completed 18: Reach set counting value 19: Reach designated counting value 20: External fault is valid 21: Reserved 22: Reach running time 23: Virtual terminal output of Modbus/Modbus TCP communication 24: Virtual terminal output of POROFIBUS/CANopen communication 25: Virtual terminal output of Ethernet communication 26: DC bus voltage established 27: Z pulse output 28: During pulse superposition 29: STO action 30: Positioning completed 31: Spindle zeroing completed 32: Spindle scale-division completed 33: In speed limit 34: Virtual terminal output of EtherCAT/PROFINET/EtherNet IP communication 35: Reserved 36: Speed/position control switchover completed 37: Any frequency reached 38–40: Reserved 41: Y1 from the programmable card 42: Y2 from the programmable card 43: HDO from the programmable card 44: RO1 from the programmable card		

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th><th>Modify</th></tr>
<tr><td></td><td></td><td>45: RO2 from the programmable card
46: RO3 from the programmable card
47: RO4 from the programmable card
48: EC PT100 detected OH pre-alarm
49: EC PT1000 detected OH pre-alarm
50: AI/AO detected OH pre-alarm
51: Stopped or running at zero speed
52: Disconnection detected in tension control
53: Roll diameter setting reached
54: Max. roll diameter reached
55: Min. roll diameter reached
56: Fire control mode enabled
57–63: Reserved</td><td></td><td></td></tr>
<tr><td>P06.05</td><td>Output terminal polarity selection</td><td>This parameter specifies the polarity of output terminals.
When the bit is set to 0, input terminal polarity is positive;
When the bit is set to 1 input terminal polarity is negative.<table><tr><td>BIT3</td><td>BIT2</td><td>BIT1</td><td>BIT0</td></tr><tr><td>RO2</td><td>RO1</td><td>HDO</td><td>Y</td></tr></table>Setting range: 0x00–0xF</td><td>0x00</td><td>○</td></tr>
<tr><td>P06.06</td><td>Y switch-on delay</td><td rowspan="8">This function code defines the corresponding delay of the level variation from switch-on to switch-off.


Setting range: 0.000–50.000s
Note: P06.08 and P06.09 are valid only when P06.00=1.</td><td>0.000s</td><td>○</td></tr>
<tr><td>P06.07</td><td>Y switch-off delay</td><td>0.000s</td><td>○</td></tr>
<tr><td>P06.08</td><td>HDO switch-on delay</td><td>0.000s</td><td>○</td></tr>
<tr><td>P06.09</td><td>HDO switch-off delay</td><td>0.000s</td><td>○</td></tr>
<tr><td>P06.10</td><td>Relay RO1 switch-on delay</td><td>0.000s</td><td>○</td></tr>
<tr><td>P06.11</td><td>Relay RO1 switch-off delay</td><td>0.000s</td><td>○</td></tr>
<tr><td>P06.12</td><td>Relay RO2 switch-on delay</td><td>0.000s</td><td>○</td></tr>
<tr><td>P06.13</td><td>Relay RO2 switch-off delay</td><td>0.000s</td><td>○</td></tr>
<tr><td>P06.14</td><td>AO1 output selection</td><td rowspan="3">0: Running frequency (0–Max. output frequency)
1: Set frequency (0–Max. output frequency)
2: Ramp reference frequency (0–Max. output frequency)
3: Rotational speed (100% corresponds to the speed at max. output frequency.)</td><td>0</td><td>○</td></tr>
<tr><td>P06.15</td><td>Reserved</td><td>0</td><td>○</td></tr>
<tr><td>P06.16</td><td>HDO high-speed pulse output</td><td>0</td><td>○</td></tr>
</table>

Function code	Name	Description	Default	Modify
		4: Output current (100% corresponds to twice the inverter rated current.) 5: Output current (100% corresponds to twice the motor rated current.) 6: Output voltage (100% corresponds to 1.5 times the inverter rated voltage.) 7: Output power (100% corresponds to twice the motor rated power.) 8: Set torque (100% corresponds to twice the motor rated current.) 9: Output torque (Absolute value; 100% corresponds to twice the motor rated torque.) 10: AI1 input (0–10V/0–20mA) 11: AI2 input (0–10V) 12: AI3 input (0–10V/0–20mA) 13: HDIA input (0.00–50.00kHz) 14: Value 1 set through Modbus/Modbus TCP communication (0–1000) 15: Value 2 set through Modbus/Modbus TCP communication (0–1000) 16: Value 1 set through PROFIBUS/CANopen/DeviceNet communication (0–1000) 17: Value 2 set through PROFIBUS/CANopen/DeviceNet communication (0–1000) 18: Value 1 set through Ethernet communication (0–1000) 19: Value 2 set through Ethernet communication (0–1000) 20: HDIB input (0.00–50.00kHz) 21: Value 1 set through EtherCAT/PROFINET/EtherNet IP communication (0–1000) 22: Torque current (bipolar; 100% corresponds to triple the motor rated current.) 23: Exciting current (bipolar; 100% corresponds to triple the motor rated current.) 24: Set frequency (bipolar, 0–Max. output frequency) 25: Ramp reference frequency (bipolar, 0–Max. output frequency) 26: Rotational speed (bipolar, 0–Speed corresponding to max. output frequency)		

Function code	Name	Description	Default	Modify
		27: Value 2 set through EtherCAT/PROFINET/EtherNet IP communication (0–1000) 28: AO1 from the programmable card (0–1000) 29: AO2 from the programmable card (0–1000) 30: Rotational speed (100% corresponds to twice the motor rated synchronous speed.) 31: Output torque (Actual value; 100% corresponds to twice the motor rated torque.) 32: AI/AO temperature detection output 33–63: Reserved **Note:** When the output comes from the programmable card (28–29), if the card is a Codesys programmable card, P27.00 must be set to 1. When AO1 is of the current output type, 100% corresponds to 20mA; when AO1 is of the voltage output type, 100% corresponds to 10V; 100% of HDO corresponds to the output of P06.30.		
P06.17	Lower limit of AO1 output	Above function codes define the relation between output value and analog output. When the output value exceeds the set max./min. output range, the upper/low limit of output will be adopted during calculation. When analog output is current output, 1mA corresponds to 0.5V voltage. In different applications, 100% of output value corresponds to different analog outputs.  Setting range of P06.17: -300.0%–P06.19 Setting range of P06.18: 0.00V–10.00V Setting range of P06.19: P06.17–300.0% Setting range of P06.20: 0.00V–10.00V Setting range of P06.21: 0.000s–10.000s	0.0%	○
P06.18	Corresponding AO1 output of lower limit		0.00V	○
P06.19	Upper limit of AO1 output		100.0%	○
P06.20	Corresponding AO1 output of upper limit		10.00V	○
P06.21	AO1 output filter time		0.000s	○
P06.22–P06.26	Reserved	0–65535	0	●
P06.27	Lower limit of HDO output	-300.0%–P06.29	0.00%	○

Function code	Name	Description	Default	Modify
P06.28	Corresponding HDO output of lower limit	0.00–50.00kHz	0.00kHz	○
P06.29	Upper limit of HDO output	P06.27–300.0%	100.0%	○
P06.30	Corresponding HDO output of upper limit	0.00–50.00kHz	50.00 kHz	○
P06.31	HDO output filter time	0.000s–10.000s	0.000s	○
P06.32	Reserved	0–65535	0	●
P06.33	Frequency reach detection value	0–P00.03	1.00Hz	○
P06.34	Frequency reach detection time	0–3600.0s	0.5s	○
P07 group—Human-machine interface				
P07.00	User password	0–65535 Set it to any non-zero value to enable password protection. 00000: Clear the previous user password and disable password protection. After the user password is set and takes effect, you cannot enter the parameter menu if you enter an incorrect password. Please remember your password and save it in a secure place. After you exit the function code editing interface, the password protection function is enabled within 1 minute. If password protection is enabled, "0.0.0.0.0" is displayed when you press the PRG/ESC key again to enter the function code editing interface. You need to enter the correct user password to enter the interface. **Note:** Restoring the default values may delete the user password. Exercise caution when using this function.	0	○
P07.01	Reserved			
P07.02	Function of keys	Range: 0x00–0x27 Ones: Function selection of QUICK/JOG key 0: No function 1: Jogging 2: Reserved 3: Forward/reverse rotation switchover 4: Clear UP/DOWN setting 5: Coast to stop 6: Switch over the running command reference mode in sequence	0x01	◎

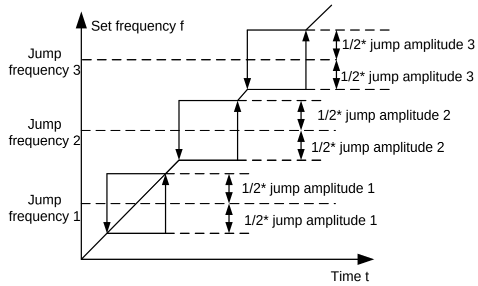
Function code	Name	Description	Default	Modify
		7: Reserved Tens: Reserved		
P07.03	Running command channel switchover sequence of QUICK key	When P07.02=6, set the switchover sequence of running command channel. 0: keypad control→terminal control→ communication control 1: keypad control←→terminal control 2: keypad control←→communication control 3: terminal control←→communication control	0	○
P07.04	Stop function selection of STOP/RST key	Validness selection of stop function of STOP/RST. For fault reset, STOP/RST is valid under any situation. 0: valid only for panel control only 1: valid for both panel and terminal control 2: valid for both panel and communication control 3: valid for all control modes	0	○
P07.05–P07.07	Reserved	/	/	
P07.08	Frequency display coefficient	0.01–10.00 Display frequency=running frequency× P07.08	1.00	○
P07.09	Speed display coefficient	0.1–999.9% Mechanical speed=120×display running frequency×P07.09/number of motor pole pairs	100.0%	○
P07.10	Linear speed display coefficient	0.1–999.9% Linear speed=mechanical speed×P07.10	1.0%	○
P07.11	Temperature of rectifier bridge module	-20.0–120.0°C	0.0°C	●
P07.12	Temperature of inverter module	-20.0–120.0°C	0.0°C	●
P07.13	Software version of control board	1.00–655.35	Depends on version	●
P07.14	Accumulated running time	0–65535h	0h	●
P07.15	High bit of VFD power consumption	Display the power consumption of the inverter. inverter power consumption=P07.15×1000+P07.16 Setting range of P07.15: 0–65535 kWh (×1000) Setting range of P07.16: 0.0–999.9 kWh	0kWh	●
P07.16	Low bit of VFD power consumption		0.0kWh	●
P07.17	Reserved			

Function code	Name	Description	Default	Modify
P07.18	Rated power of VFD	0.4–3000.0kW	Model depended	●
P07.19	Rated voltage of VFD	50–1200V	Model depended	●
P07.20	Rated current of VFD	0.1–6000.0A	Model depended	●
P07.21	Factory barcode 1	0x0000–0xFFFF	Model depended	●
P07.22	Factory barcode 2	0x0000–0xFFFF	Model depended	●
P07.23	Factory barcode 3	0x0000–0xFFFF	Model depended	●
P07.24	Factory barcode 4	0x0000–0xFFFF	Model depended	●
P07.25	Factory barcode 5	0x0000–0xFFFF	Model depended	●
P07.26	Factory barcode 6	0x0000–0xFFFF	Model depended	●
P07.27	Present fault type	0: No fault 1: Inverter unit U phase protection (OUt1) 2: Inverter unit V phase protection (OUt2) 3: Inverter unit W phase protection (OUt3) 4: Overcurrent during acceleration (OC1) 5: Overcurrent during deceleration (OC2) 6: Overcurrent during constant speed (OC3) 7: Overvoltage during acceleration (OV1) 8: Overvoltage during deceleration (OV2) 9: Overvoltage during constant speed (OV3) 10: Bus undervoltage fault (UV) 11: Motor overload (OL1) 12: inverter overload (OL2) 13: Phase loss on input side (SPI) 14: Phase loss on output side (SPO) 15: Rectifier module overheat (OH1) 16: Inverter module overheat (OH2) 17: External fault (EF) 18: Modbus/Modbus TCP communication fault (CE) 19: Current detection fault (ItE) 20: Motor autotuning fault (tE) 21: EEPROM operation fault (EEP)	0	●
P07.28	Last fault type		0	●
P07.29	2nd-last fault type		0	●
P07.30	3rd-last fault type		0	●
P07.31	4th-last fault type		0	●
P07.32	5th-last fault type		0	●

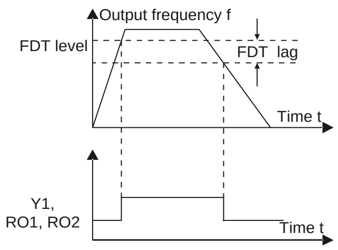
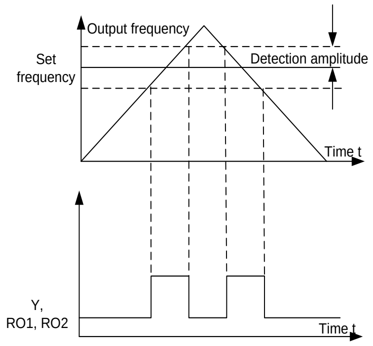
Function code	Name	Description	Default	Modify
		22: PID feedback offline fault (PIDE) 23: Braking unit fault (bCE) 24: Running time reached (END) 25: Electronic overload (OL3) 26: Keypad communication error (PCE) 27: Parameter upload error (UPE) 28: Parameter download error (DNE) 29: PROFIBUS communication fault (E-DP) 30: Ethernet communication fault (E-NET) 31: CANopen communication fault (E-CAN) 32: To-ground short-circuit fault 1 (ETH1) 33: To-ground short-circuit fault 2 (ETH2) 34: Speed deviation fault (dEu) 35: Maladjustment fault (STo) 36: Underload fault (LL) 37: Encoder offline fault (ENC1O) 38: Encoder reversal fault (ENC1D) 39: Encoder Z pulse offline fault (ENC1Z) 40: Safe torque off (STO) 41: Channel H1 safety circuit exception (STL1) 42: Channel H2 safety circuit exception (STL2) 43: Channel H1 and H2 exception (STL3) 44: Safety code FLASH CRC fault (CrCE) 45: Programmable card customized fault 1 (P-E1) 46: Programmable card customized fault 2 (P-E2) 47: Programmable card customized fault 3 (P-E3) 48: Programmable card customized fault 4 (P-E4) 49: Programmable card customized fault 5 (P-E5) 50: Programmable card customized fault 6 (P-E6) 51: Programmable card customized fault 7 (P-E7) 52: Programmable card customized fault 8 (P-E8) 53: Programmable card customized fault 9 (P-E9) 54: Programmable card customized fault 10 (P-E10) 55: Duplicate card type(E-Err) 56: Encoder UVW loss fault (ENCUV) 57: PROFIBUS communication fault (E-PN) 58: CANopen communication fault (ESCAN) 59: Motor over-temperature fault (OT) 60: Failure to identify the card at slot 1 (F1-Er) 61: Failure to identify the card at slot 2 (F2-Er)		

Function code	Name	Description	Default	Modify
		62: Failure to identify the card at slot 3 (F3-Er) 63: Communication timeout of the card at slot 1 (C1-Er) 64: Communication timeout of the card at slot 2 (C2-Er) 65: Communication timeout of the card at slot 3 (C3-Er) 66: EtherCAT communication fault (E-CAT) 67: Bacnet communication fault (E-BAC) 68: DeviceNet communication fault (E-DEV) 69: CAN slave fault in master/slave synchronization (S-Err) 70: EC PT100 detected overheating (OtE1) 71: EC PT1000 detected overheating (OtE2) 72: EtherNet/IP communication timeout (E-EIP) 73: No upgrade bootload (E-PAO) 74: AI1 disconnected (E-AI1) 75: AI2 disconnected (E-AI2) 76: AI3 disconnected (E-AI3)		
P07.33	Running frequency at present fault	0.00Hz–P00.03	0.00Hz	●
P07.34	Ramp reference frequency at present fault	0.00Hz–P00.03	0.00Hz	●
P07.35	Output voltage at present fault	0–1200V	0V	●
P07.36	Output current at present fault	0.0–6300.0A	0.0A	●
P07.37	Bus voltage at present fault	0.0–2000.0V	0.0V	●
P07.38	Max. temperature at present fault	-20.0–120.0°C	0.0°C	●
P07.39	Input terminal status at present fault	0x0000–0xFFFF	0x0000	●
P07.40	Output terminal status at present fault	0x0000–0xFFFF	0x0000	●
P07.41	Running frequency at last fault	0.00Hz–P00.03	0.00Hz	●
P07.42	Ramp reference frequency at last fault	0.00Hz–P00.03	0.00Hz	●

Function code	Name	Description	Default	Modify
P07.43	Output voltage at last fault	0–1200V	0V	●
P07.44	Output current at last fault	0.0–6300.0A	0.0A	●
P07.45	Bus voltage at last fault	0.0–2000.0V	0.0V	●
P07.46	Max. temperature at last fault	-20.0–120.0°C	0.0°C	●
P07.47	Input terminal status at last fault	0x0000–0xFFFF	0x0000	●
P07.48	Output terminal state at last fault	0x0000–0xFFFF	0x0000	●
P07.49	Running frequency at 2nd-last fault	0.00Hz–P00.03	0.00Hz	●
P07.50	Ramp reference frequency at 2nd-last fault	0.00Hz–P00.03	0.00Hz	●
P07.51	Output voltage at 2nd-last fault	0–1200V	0V	●
P07.52	Output current at 2nd-last fault	0.0–6300.0A	0.0A	●
P07.53	Bus voltage at 2nd-last fault	0.0–2000.0V	0.0V	●
P07.54	Max. temperature at 2nd-last fault	-20.0–120.0°C	0.0°C	●
P07.55	Input terminal status at 2nd-last fault	0x0000–0xFFFF	0x0000	●
P07.56	Output terminal status at 2nd-last fault	0x0000–0xFFFF	0x0000	●
P08 group—Enhanced functions				
P08.00	Acceleration time 2	See P00.11 and P00.12 for detailed definitions. The inverter defines four groups of acceleration/deceleration time, which can be selected by multi-function digital input terminal (P05 group). The acceleration/deceleration time of the inverter is the first group by default. Setting range: 0.0–3600.0s	Model depended	○
P08.01	Deceleration time 2		Model depended	○
P08.02	Acceleration time 3		Model depended	○
P08.03	Deceleration time 3		Model depended	○
P08.04	Acceleration time 4		Model depended	○

Function code	Name	Description	Default	Modify
P08.05	Deceleration time 4		Model depended	○
P08.06	Running frequency of jogging	This function code is used to define the reference frequency of the inverter during jogging. Setting range: 0.00Hz–P00.03 (Max. output frequency)	5.00Hz	○
P08.07	Acceleration time of jogging	Jogging acceleration time is the time needed for the inverter to accelerate from 0Hz to Max. output frequency (P00.03). Jogging deceleration time is the time needed from decelerating from Max. output frequency (P00.03) to 0Hz. Setting range: 0.0–3600.0s	Model depended	○
P08.08	Deceleration time of jogging		Model depended	○
P08.09	Jump frequency 1	When the set frequency is within the range of jump frequency, the inverter will run at the boundary of jump frequency. The inverter can avoid mechanical resonance point by setting the jump frequency, and three jump frequency points can be set. If the jump frequency points are set to 0, this function will be invalid.  Setting range: 0.00Hz–P00.03 (Max. output frequency)	0.00Hz	○
P08.10	Jump frequency amplitude 1		0.00Hz	○
P08.11	Jump frequency 2		0.00Hz	○
P08.12	Jump frequency amplitude 2		0.00Hz	○
P08.13	Jump frequency 3		0.00Hz	○
P08.14	Jump frequency amplitude 3		0.00Hz	○
P08.15	Amplitude of wobbling frequency	0.0–100.0% (relative to set frequency)	0.0%	○
P08.16	Amplitude of jump frequency	0.0–50.0% (relative to amplitude of wobbling frequency)	0.0%	○
P08.17	Rise time of wobbling frequency	0.1–3600.0s	5.0s	○
P08.18	Descend time of wobbling frequency	0.1–3600.0s	5.0s	○
P08.19	Switching frequency of acceleration/deceleration time	0.00–P00.03 (Max. output frequency) 0.00Hz: no switchover Switch to acceleration/deceleration time 2 if the running frequency is larger than P08.19	0.00Hz	○

Function code	Name	Description	Default	Modify
P08.20	Frequency threshold of the start of droop control	0.00–50.00Hz	2.00Hz	○
P08.21	Reference frequency of acceleration/ deceleration time	0: Max. output frequency 1: Set frequency 2: 100Hz **Note: Valid for straight acceleration/deceleration only**	0	◎
P08.22	Output torque calculation mode	0: Calculated based on torque current 1: Calculated based on output power	0	○
P08.23	Number of decimal points of frequency	0: Two decimal points 1: One decimal point	0	○
P08.24	Number of decimal points of linear speed	0: No decimal point 1: One 2: Two 3: Three	0	○
P08.25	Set count value	P08.26–65535	0	○
P08.26	Designated count value	0–P08.25	0	○
P08.27	Set running time	0–65535min	0min	○
P08.28	Automatic fault reset times	Automatic fault reset times: When the inverter selects automatic fault reset, it is used to set the times of automatic reset, if the continuous reset times exceeds the value set by P08.29, the inverter will report fault and stop to wait for repair. Interval of automatic fault reset: select the interval time from when fault occurred to automatic fault reset actions. After the inverter starts, if no fault occurred during 60s, the fault reset times will be zeroed out. Setting range of P08.28: 0–10 Setting range of P08.29: 0.1–3600.0s	0	○
P08.29	Automatic fault reset time interval		1.0s	○
P08.30	Reduction ratio of droop control	This parameter specifies the variation rate of the inverter output frequency based on the load; it is mainly used in balancing the power when multiple motors drive the same load. Setting range: 0.00–50.00Hz	0.00Hz	○
P08.31	Switchover selection for motor 1 and motor 2	0x00–0x14 Ones: Switchover channel 0: Terminal 1: Modbus/Modbus TCP communication	0x00	◎

Function code	Name	Description	Default	Modify
		2: PROFIBUS/CANopen/DeviceNet communication 3: Ethernet communication 4: EtherCAT/PROFINET/EtherNet IP communication Tens: indicates whether to enable switchover during running 0: Disable 1: Enable		
P08.32	FDT1 level detection value	When the output frequency exceeds the corresponding frequency of FDT level, multi-function digital output terminal outputs "frequency level detection FDT" signal, this signal will be valid until the output frequency lowers to below the corresponding frequency (FDT level-FDT lag detection value), the waveform is shown in the figure below.  Setting range of P08.32: 0.00Hz–P00.03 (Max. output frequency) Setting range of P08.33: 0.0–100.0% (FDT1 level) Setting range of P08.34: 0.00Hz–P00.03 (Max. output frequency) Setting range of P08.35: 0.0–100.0% (FDT2 level)	50.00Hz	○
P08.33	FDT1 lag detection value		5.0%	○
P08.34	FDT2 level detection value		50.00Hz	○
P08.35	FDT2 lag detection value		5.0%	○
P08.36	Detection value for frequency arrival	When the output frequency is within the positive /negative detection range of the set frequency, the multi-function digital output terminal outputs "frequency arrival" signal as shown below.  Setting range: 0.00Hz–P00.03 (Max. output frequency)	0.00Hz	○

Function code	Name	Description	Default	Modify
P08.37	Enable/disable energy-consumption brake	0: Disable energy-consumption 1: Enable energy-consumption	1	○
P08.38	Energy-consumption braking threshold voltage	Set the starting bus voltage of energy-consumption brake, adjust this value properly can brake the load effectively. The default value will change with the change of voltage class. Setting range: 200.0–2000.0V	220V voltage: 380.0V; 380V voltage: 700.0V; 660V voltage: 1120.0V	○
P08.39	Running mode of cooling fan	0: Common running mode 1: The fan keeps running after power-on 2: Running mode 2	0	○
P08.40	PWM selection	0x0000–0x1121 Ones place: PWM mode selection 0: PWM mode 1, 3PH modulation and 2PH modulation 1: PWM mode 2, 3PH modulation Tens place: PWM low-speed carrier limit 0: Low-speed carrier limit mode 1 1: Low-speed carrier limit mode 2 2: No limit Hundreds place: Deadzone compensation method 0: Compensation method 1 1: Compensation method 2 Thousands place: PWM loading mode selection 0: Interruptive loading 1: Normal loading	0x1101	◎
P08.41	Overmodulation selection	0x00–0x1111 Ones place: Whether to enable overmodulation 0: Disable overmodulation 1: Enable overmodulation Tens place: Overmodulation mode 0: Mild overmodulation 1: Deepened overmodulation Hundreds: Carrier frequency limit 0: Yes 1: No Thousands: Output voltage compensation 0: No 1: Yes	0x1001	◎

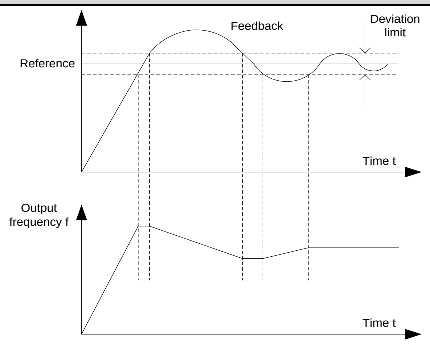
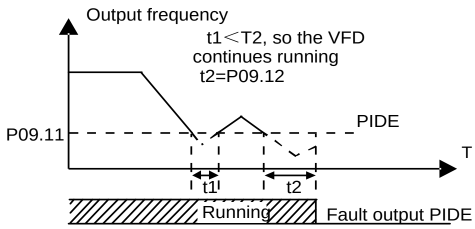
Function code	Name	Description	Default	Modify
P08.42	Reserved			
P08.43	Reserved			
P08.44	UP/DOWN terminal control setup	0x000–0x221 Ones: Frequency control selection 0: UP/DOWN terminal setup is valid 1: UP/DOWN terminal setup is invalid Tens: Frequency control selection 0: Valid only when P00.06=0 or P00.07=0 1: All frequency modes are valid 2: Invalid for multi-step speed when multi-step speed takes priority Hundreds: Action selection during stop 0: Valid 1: Valid during running, clear after stop 2: Valid during running, clear after receiving stop command	0x000	○
P08.45	UP terminal frequency incremental integral rate	0.01–50.00Hz/s	0.50Hz/s	○
P08.46	DOWN terminal frequency decremental change rate	0.01–50.00Hz/s	0.50Hz/s	○
P08.47	Action selection for frequency setup during power down	0x000–0x111 Ones place: Action selection at power-off during frequency adjusting through digitals. 0: Save the setting at power-off. 1: Clear the setting at power-off. Action selection at power-off during frequency adjusting through Modbus/Modbus TCP communication 0: Save the setting at power-off. 1: Clear the setting at power-off. Hundreds place: Action selection at power-off during frequency adjusting through DP communication 0: Save the setting at power-off. 1: Clear the setting at power-off.	0x000	○
P08.48	High bit of initial value of power consumption	Set the initial value of power consumption. Initial value of power consumption=P08.48×1000+ P08.49 Setting range of P08.48: 0–59999 kWh (k) Setting range of P08.49: 0.0–999.9 kWh	0kWh	○
P08.49	Low bit of initial value of power consumption		0.0kWh	○

Function code	Name	Description	Default	Modify
P08.50	Flux braking	This function code is used to enable flux braking function. 0: Invalid 100–150: The larger the coefficient, the stronger the braking intensity The inverter enables motor to decelerate quickly by increasing the motor flux which converts energy generated during braking into thermal energy. The inverter monitors motor state continuously even during flux braking, thus flux braking can be applied in motor stop or used to change motor speed. The flux braking also carries the following advantages. 1) Brake immediately after sending stop command, removing the need to wait for flux to attenuate. 2) Better cooling effect. During flux braking, the stator current of the motor increases, while the rotor current does not change, while the cooling effect of stator is much more effective than that of the rotor.	0	○
P08.51	Current regulation coefficient on input side	This function code is used to adjust the current display value on the AC input side. 0.00–1.00	0.56	○
P08.52	STO lock	0: STO alarm lock Alarm-lock means STO alarm must be reset after state restoration when STO occurs. 1: STO alarm unlock Alarm-unlock means when STO occurs, after state restoration, STO alarm will disappear automatically.	0	○
P08.53	Bias value of upper limit frequency of torque control	0.00 Hz–P00.03 (Max. output frequency) **Note:** This parameter is valid only for the torque control mode.	0.00Hz	○
P08.54	Acceleration/ deceleration selection of upper limit frequency of torque control	0: No limit on acceleration or deceleration 1: Acceleration/deceleration time 1 2: Acceleration/deceleration time 2 3: Acceleration/deceleration time 3 4: Acceleration/deceleration time 4	0	○
P08.55	Enabling auto carrier frequency reduction	0: Disable 1: Enable **Note:** Automatic carrier frequency reduction indicates that the inverter automatically reduces the carrier frequency when detecting the heat sink	0	○

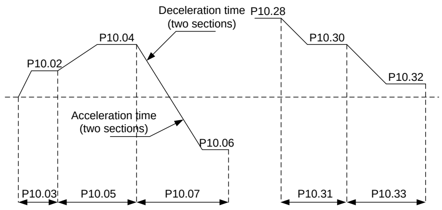
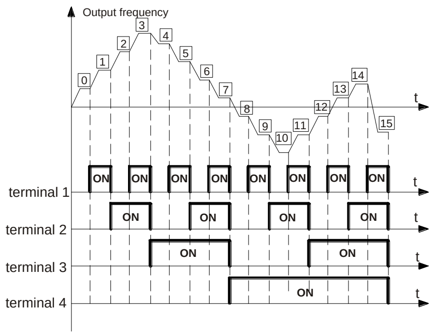
Function code	Name	Description	Default	Modify
		temperature exceeds the rated temperature. When the temperature decreases to a certain degree, the carrier frequency recovers. This function reduces the chance of inverter overheat alarm.		
P08.56	Min. carrier frequency	0.0–15.0kHz	Model depended	●
P08.57	Temperature point of auto carrier frequency reduction	40.0–85.0°C	70.0°C	○
P08.58	Interval of carrier frequency reduction	0–30min	10min	○
P08.59	AI1 disconnection detection threshold	0–100%	0	○
P08.60	AI2 disconnection detection threshold	0–100%	0	○
P08.61	AI3 disconnection detection threshold	0–100%	0	○
P08.62	Output current filter time	0.000–10.000s	0.000	○
P08.63	Output torque filter times	0–8	8	○
P09 group— PID control				
P09.00	PID reference source	When frequency command (P00.06, P00. 07) is set to 7, or voltage setting channel (P04.27) is set to 6, the inverter running mode is process PID control. This parameter determines the target reference channel of process PID. 0: Set by P09.01 1: AI1 2: AI2 3: AI3 4: High-speed pulse HDIA 5: Multi-step 6: Modbus/Modbus TCP communication 7: PROFIBUS/CANopen/DeviceNet communication 8: Ethernet communication 9: High-speed pulse HDIB 10: EtherCAT/PROFINET/EtherNet IP communication 11: Programmable card	0	○

Function code	Name	Description	Default	Modify
		12: Reserved The set target of process PID is a relative value, for which 100% equals 100% of the feedback signal of the controlled system. The system always calculates a relative value (0–100.0%).		
P09.01	PID digital setting	This parameter is mandatory when P09.00 is set to 0. The reference value of this parameter is the feedback of the system. Setting range: -100.0%–100.0%	0.0%	○
P09.02	PID feedback source	This parameter is used to select PID feedback channel. 0: AI1 1: AI2 2: AI3 3: High-speed pulse HDIA 4: Modbus/Modbus TCP communication 5: PROFIBUS/CANopen/DeviceNet communication 6: Ethernet communication 7: High-speed pulse HDIB 8: EtherCAT/PROFINET/EtherNet IP communication 9: Programmable expansion card 10: Reserved **Note:** The reference channel and feedback channel cannot overlap. Otherwise, effective PID control cannot be achieved.	0	○
P09.03	PID output characteristics	0: PID output is positive characteristic: namely, the feedback signal is larger than the PID reference, which requires the inverter output frequency to decrease for PID to reach balance, eg, tension PID control of winding 1: PID output is negative characteristics: namely the feedback signal is less than PID reference, which requires inverter output frequency to increase for PID to reach balance, eg, tension PID control of unwinding.	0	○
P09.04	Proportional gain (Kp)	This function code is suitable for proportional gain P of PID input. It determines the regulation intensity of the whole PID regulator, the larger the value of P, the stronger the regulation intensity. If this parameter	1.80	○

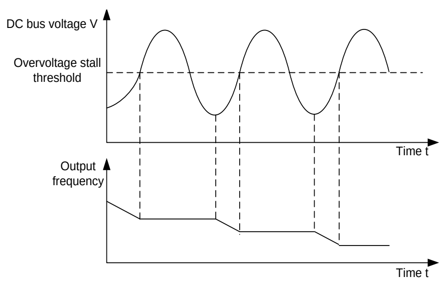
Function code	Name	Description	Default	Modify
		is 100, it means when the deviation between PID feedback and reference is 100%, the regulation amplitude of PID regulator (ignoring integral and differential effect) on output frequency command is the max. frequency (ignoring integral and differential actions). Setting range: 0.00–100.00		
P09.05	Integral time (Ti)	It determines the speed of integral regulation made on the deviation between PID feedback and reference by PID regulator. When the deviation between PID feedback and reference is 100%, the regulation of integral regulator (ignoring integral and differential actions), after undergoing continuous regulation during this time period, can reach Max. output frequency (P00.03) The shorter the integral time, the stronger the regulation intensity. Setting range: 0.00–10.00s	0.90s	○
P09.06	Derivative time (Td)	It determines the intensity of the regulation made on the change rate of deviation between PID feedback and reference by PID regulator. If feedback changes by 100% during this period, the regulation of differential regulator (ignoring integral and differential actions) is Max. output frequency (P00.03) The longer the derivative time, the stronger the regulation intensity. Setting range: 0.00–10.00s	0.00s	○
P09.07	Sampling cycle (T)	It means the sampling cycle of feedback. The regulator operates once during each sampling cycle. The larger the sampling cycle, the slower the response. Setting range: 0.001–10.000s	0.001s	○
P09.08	Limit of PID control deviation	It is the max. allowable deviation of PID system output value relative to closed-loop reference value. Within this limit, PID regulator stops regulation. Set this function code properly to regulate the precision and stability of PID system. Setting range: 0.0–100.0%	0.0%	○

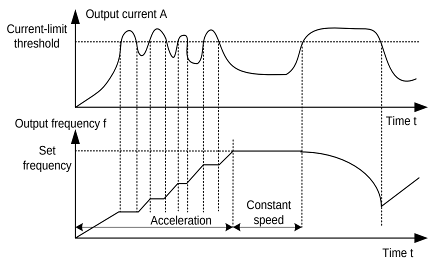
Function code	Name	Description	Default	Modify
				
P09.09	Upper limit value of PID output	These two function codes are used to set the upper/lower limit value of PID regulator.	100.0%	○
P09.10	Lower limit value of PID output	100.0% corresponds to Max. output frequency (P00.03) or max. voltage (P04.31) Setting range of P09.09: P09.10–100.0% Setting range of P09.10: -100.0%–P09.09	0.0%	○
P09.11	Feedback offline detection value	Set PID feedback offline detection value, when the detection value is no more than the feedback offline detection value, and the duration exceeds the value set in P09.12, the inverter will report "PID feedback offline fault", and keypad displays PIDE.	0.0%	○
P09.12	Feedback offline detection time	 Setting range of P09.11: 0.0–100.0% Setting range of P09.12: 0.0–3600.0s	1.0s	○
P09.13	PID control selection	0x0000–0x1111 Ones: 0: Continue integral control after the frequency reaches upper/lower limit 1: Stop integral control after the frequency reaches upper/lower limit Tens: 0: The same with the main reference direction 1: Contrary to the main reference direction Hundreds: 0: Limit based on the max. frequency 1: Limit based on A frequency Thousands: 0: A+B frequency, acceleration /deceleration of main reference A frequency source buffering is invalid	0x0001	○

Function code	Name	Description	Default	Modify
		1: A+B frequency, acceleration/ deceleration of main reference A frequency source buffering is valid, acceleration and deceleration are determined by P08.04 (acceleration time 4).		
P09.14	Low-frequency proportional gain (Kp)	0.00–100.00 Low-frequency switching point: 5.00Hz, high-frequency switching point: 10.00Hz (P09.04 corresponds to high-frequency parameter), and the middle is the linear interpolation between these two points	1.00	○
P09.15	Acceleration/ deceleration time of PID command	0.0–1000.0s	0.0s	○
P09.16	Filter time of PID output	0.000–10.000s	0.000s	○
P09.17	Reserved			
P09.18	Low-frequency integral time (Ti)	0.00–10.00s	0.90s	○
P09.19	Low-frequency differential time (Td)	0.00–10.00s	0.00s	○
P09.20	Low-frequency point of PID parameter switching	0.00–P09.21 P09.20–P00.04	5.00Hz	○
P09.21	High-frequency point of PID parameter switching		10.00Hz	○
P09.22–P09.28	Reserved			
P10 group––Simple PLC and multi-step speed control				
P10.00	Simple PLC mode	0: Stop after running once; the inverter stops automatically after running for one cycle, and it can be started only after receiving running command. 1: Keep running in the final value after running once; The inverter keeps the running frequency and direction of the last section after a single cycle. 2: Cyclic running; the inverter enters the next cycle after completing one cycle until receiving stop command and stops.	0	○
P10.01	Simple PLC memory selection	0: No memory after power down 1: Memory after power down; PLC memories its running stage and running frequency before power down.	0	○

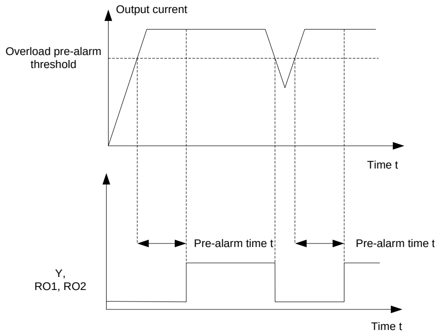
Function code	Name	Description	Default	Modify
P10.02	Multi-step speed 0	Frequency setting range for steps from step 0 to step 15: -300.0–300.0%, 100% corresponds to Max. output frequency (P00.03). Running time setting range for steps from step 0 to step 15: 0.0–6553.5s (min). The time unit is specified by P10.37. When simple PLC operation is selected, you must set P10.02–P10.33 to determine the running frequency and running time of each step. **Note:** The symbol of multi-step speed determines the running direction of simple PLC, and the negative value means reverse running.  When selecting multi-step speed running, the multi-step speed is within the range of -fmax–fmax, and it can be set continuously. The start/stop of multi-step running is also determined by P00.01. The inverter supports the setting of speeds of 16 steps, which are set by combined codes of multi-step terminals 1–4 (set by S terminals, corresponding to function codes P05.01–P05.06) and correspond to multi-step speeds 0–15.  When terminals 1–4 are OFF, the frequency input mode is set by P00.06 or P00.07. When terminals 1–4 are not all OFF, the frequency set by multi-step speed will prevail, and the priority of multi-step setting is higher than that of the keypad, analog, high-speed pulse, PID, and communication settings. The relationship between terminals 1–4 are shown in the table below.	0.0%	○
P10.03	Running time of step 0		0.0s(min)	○
P10.04	Multi-step speed 1		0.0%	○
P10.05	Running time of step 1		0.0s(min)	○
P10.06	Multi-step speed 2		0.0%	○
P10.07	Running time of step 2		0.0s(min)	○
P10.08	Multi-step speed 3		0.0%	○
P10.09	Running time of step 3		0.0s(min)	○
P10.10	Multi-step speed 4		0.0%	○
P10.11	Running time of step 4		0.0s(min)	○
P10.12	Multi-step speed 5		0.0%	○
P10.13	Running time of step 5		0.0s(min)	○
P10.14	Multi-step speed 6		0.0%	○
P10.15	Running time of step 6		0.0s(min)	○
P10.16	Multi-step speed 7		0.0%	○
P10.17	Running time of step 7		0.0s(min)	○
P10.18	Multi-step speed 8		0.0%	○
P10.19	Running time of step 8		0.0s(min)	○
P10.20	Multi-step speed 9		0.0%	○
P10.21	Running time of step 9		0.0s(min)	○
P10.22	Multi-step speed 10		0.0%	○
P10.23	Running time of step 10		0.0s(min)	○
P10.24	Multi-step speed 11		0.0%	○
P10.25	Running time of step 11		0.0s(min)	○
P10.26	Multi-step speed 12		0.0%	○
P10.27	Running time of step 12		0.0s(min)	○
P10.28	Multi-step speed 13		0.0%	○

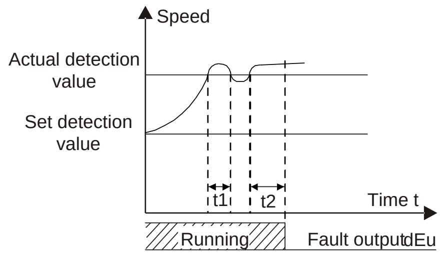
<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th><th>Modify</th></tr>
<tr><td>P10.29</td><td>Running time of step 13</td><td rowspan="5">
<table>
<tr><td>Terminal 1</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td></tr>
<tr><td>Terminal 2</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td></tr>
<tr><td>Terminal 3</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td></tr>
<tr><td>Terminal 4</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td></tr>
<tr><td>Step</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr>
<tr><td>Terminal 1</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td></tr>
<tr><td>Terminal 2</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td></tr>
<tr><td>Terminal 3</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td></tr>
<tr><td>Terminal 4</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td></tr>
<tr><td>Step</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td></tr>
</table>
</td><td>0.0s(min)</td><td>○</td></tr>
<tr><td>P10.30</td><td>Multi-step speed 14</td><td>0.0%</td><td>○</td></tr>
<tr><td>P10.31</td><td>Running time of step 14</td><td>0.0s(min)</td><td>○</td></tr>
<tr><td>P10.32</td><td>Multi-step speed 15</td><td>0.0%</td><td>○</td></tr>
<tr><td>P10.33</td><td>Running time of step 15</td><td>0.0s(min)</td><td>○</td></tr>
<tr><td>P10.34</td><td>Acceleration/ deceleration time of steps 0–7 of simple PLC</td><td rowspan="2">Detailed illustration is shown in the table below.
<table>
<tr><th>Function code</th><th colspan="2">Binary</th><th>Step no.</th><th>ACC/ DEC time 1</th><th>ACC/ DEC time 2</th><th>ACC/ DEC time 3</th><th>ACC/ DEC time 4</th></tr>
<tr><td rowspan="8">P10.34</td><td>BIT1</td><td>BIT0</td><td>0</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT3</td><td>BIT2</td><td>1</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT5</td><td>BIT4</td><td>2</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT7</td><td>BIT6</td><td>3</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT9</td><td>BIT8</td><td>4</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT11</td><td>BIT10</td><td>5</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT13</td><td>BIT12</td><td>6</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT15</td><td>BIT14</td><td>7</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td rowspan="8">P10.35</td><td>BIT1</td><td>BIT0</td><td>8</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT3</td><td>BIT2</td><td>9</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT5</td><td>BIT4</td><td>10</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT7</td><td>BIT6</td><td>11</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT9</td><td>BIT8</td><td>12</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT11</td><td>BIT10</td><td>13</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT13</td><td>BIT12</td><td>14</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT15</td><td>BIT14</td><td>15</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
</table>
Select corresponding acceleration/deceleration time, and then convert 16-bit binary number into hexadecimal number, finally, set corresponding function code.
Acceleration/deceleration time 1 is set by P00.11 and P00.12; Acceleration/deceleration time 2 is set by P08.00 and P08.01; Acceleration/deceleration time 3 is set by P08.02 and P08.03; Acceleration /deceleration time 4 is set by P08.04 and P08.05.
Setting range: 0x0000–0xFFFF</td><td>0x0000</td><td>○</td></tr>
<tr><td>P10.35</td><td>Acceleration/ deceleration time of steps 8–15 of simple PLC</td><td>0x0000</td><td>○</td></tr>
<tr><td>P10.36</td><td>PLC restart mode</td><td>0: Restart from the first step, namely if the inverter stops during running (caused by stop command, fault or power down), it will run from the first step after restart.
1: Continue running from the step frequency when</td><td>0</td><td>◎</td></tr>
</table>

Function code	Name	Description	Default	Modify
		interruption occurred, namely if the inverter stops during running (caused by stop command or fault), it will record the running time of current step, and enters this step automatically after restart, then continue running at the frequency defined by this step in the remaining time.		
P10.37	Multi-step time unit	0: second (s). The running time of each step is counted in seconds. 1: minute (min). The running time of each step is counted in minutes.	0	◎
P11 group—Protection parameters				
P11.00	Phase-loss protection	0x000–0x111 Ones: 0: Disable software input phase loss protection 1: Enable software input phase loss protection Tens: 0: Disable output phase loss protection 1: Enable output phase loss protection Hundreds: 0: Disable hardware input phase loss protection 1: Enable hardware input phase loss protection	0x110	○
P11.01	Frequency-drop at transient power down	0: Disable 1: Enable	0	○
P11.02	Energy braking in standby state	0: Enable 1: Disable	0	◎
P11.03	Overvoltage stall protection	0: Disable 1: Enable 	1	○
P11.04	Overvoltage stall protection voltage	120–150% (standard bus voltage) (380V)	136%	○
		120–150% (standard bus voltage) (220V)	120%	
P11.05	Current-limit selection	During accelerated running, as the load is too large, the actual acceleration rate of motor is lower than that of output frequency, if no measures are taken, the inverter may trip due to overcurrent during acceleration.	01	◎

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th><th>Modify</th></tr>
<tr><td></td><td></td><td>0x00–0x11
Ones: Current-limit action selection
0: Invalid
1: Always valid
Tens: Hardware current-limit overload alarm selection
0: Valid
1: Invalid</td><td></td><td></td></tr>
<tr><td>P11.06</td><td>Automatic current-limit level</td><td rowspan="2">Current-limit protection function detects output current during running, and compares it with the current-limit level defined by P11.06, if it exceeds the current-limit level, the inverter will run at stable frequency during accelerated running, or run in decreased frequency during constant-speed running; if it exceeds the current-limit level continuously, the inverter output frequency will drop continuously until reaching lower limit frequency. When the output current is detected to be lower than the current-limit level again, it will continue accelerated running.


Setting range of P11.06: 50.0–200.0% (of the rated inverter output current)
Setting range of P11.07: 0.00–50.00Hz/s</td><td>G type: 160.0%
P type: 120.0%</td><td>◎</td></tr>
<tr><td>P11.07</td><td>Frequency-drop rate during current limit</td><td>10.00 Hz/s</td><td>◎</td></tr>
<tr><td>P11.08</td><td>VFD or motor overload/underload pre-alarm</td><td rowspan="3">0x000–0x1132
Ones place:
0: Motor overload/underload pre-alarm, relative to rated motor current
1: inverter overload/underload pre-alarm, relative to rated inverter output current
2: inverter output torque overload/underload pre-alarm, relative to rated motor torque
Tens place:
0: The inverter continues running after overload/underload alarm.
1: The inverter continues running after underload alarm, and stops running after overload fault.
2: The inverter continues running after overload</td><td>0x000</td><td>○</td></tr>
<tr><td>P11.09</td><td>Overload pre-alarm detection level</td><td>G type: 150%
P type: 120%</td><td>○</td></tr>
<tr><td>P11.10</td><td>Overload pre-alarm detection time</td><td>1.0s</td><td>○</td></tr>
</table>

Function code	Name	Description	Default	Modify
		alarm, and stops running after underload fault. 3: The inverter stops running after overload/underload fault. Hundreds place: 0: Always detect 1: Detect during constant-speed running Thousands place: inverter overload current reference selection 0: Related to current calibration coefficient 1: Irrelated to current calibration coefficient If the inverter or motor output current is larger than the overload pre-alarm detection level (P11.09), and the duration exceeds the overload pre-alarm detection time (P11.10), overload pre-alarm signal will be outputted.  Setting range of P11.09: P11.11–200% (relative value determined by the ones place of P11.08) Setting range of P11.10: 0.1–3600.0s		
P11.11	Underload pre-alarm detection level	Underload pre-alarm signal will be outputted if the output current of the inverter or motor is lower than underload pre-alarm detection level (P11.11), and the duration exceeds underload pre-alarm detection time (P11.12). Setting range of P11.11: 0–P11.09 (relative value determined by the ones place of P11.08) Setting range of P11.12: 0.1–3600.0s	50%	○
P11.12	Underload pre-alarm detection time		1.0s	○
P11.13	Fault output terminal action during fault	Used to set the action of fault output terminals during undervoltage and fault reset. 0x00–0x11 Ones: 0: Act during undervoltage fault 1: Do not act during undervoltage fault Tens: 0: Act during fault reset 1: Do not act during fault reset	0x00	○

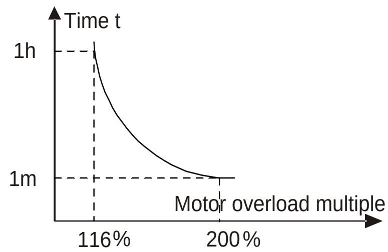
Function code	Name	Description	Default	Modify
P11.14	Speed deviation detection value	0.0–50.0% This parameter is used to set the speed deviation detection value.	10.0%	○
P11.15	Speed deviation detection time	Used to set the speed deviation detection time. **Note: Speed deviation protection is invalid when P11.15 is set to 0.0.**  Setting range: 0.0–10.0s	2.0s	○
P11.16	Automatic frequency-reduction during voltage drop	0–1 0: Invalid 1: Valid	0	○
P11.17	Proportional coefficient of voltage regulator during undervoltage stall	This parameter is used to set the proportional coefficient of the bus voltage regulator during undervoltage stall. Setting range: 0–1000	100	○
P11.18	Integral coefficient of voltage regulator during undervoltage stall	This parameter is used to set the integral coefficient of the bus voltage regulator during undervoltage stall. Setting range: 0–1000	40	○
P11.19	Proportional coefficient of current regulator during undervoltage stall	This parameter is used to set the proportional coefficient of the active current regulator during undervoltage stall. Setting range: 0–1000	25	○
P11.20	Integral coefficient of current regulator during undervoltage stall	This parameter is used to set the integral coefficient of the active current regulator during undervoltage stall. Setting range: 0–2000	150	○
P11.21	Proportional coefficient of voltage regulator during overvoltage stall	This parameter is used to set the proportional coefficient of the bus voltage regulator during overvoltage stall. Setting range: 0–1000	60	○
P11.22	Integral coefficient of voltage regulator during overvoltage stall	This parameter is used to set the integral coefficient of the bus voltage regulator during overvoltage stall. Setting range: 0–1000	10	○

Function code	Name	Description	Default	Modify
P11.23	Proportional coefficient of current regulator during overvoltage stall	This parameter is used to set the proportional coefficient of the active current regulator during overvoltage stall. Setting range: 0–1000	60	○
P11.24	Integral coefficient of current regulator during overvoltage stall	This parameter is used to set the integral coefficient of the active current regulator during overvoltage stall. Setting range: 0–2000	250	○
P11.25	Enable VFD overload integral	0: Disabled 1: Enabled When this parameter is set to 0, the overload timing value is reset to zero after the inverter is stopped. In this case, the determination of inverter overload takes more time, and therefore the effective protection over the inverter is weakened. When this parameter is set to 1, the overload timing value is not reset, and the overload timing value is accumulative. In this case, the determination of inverter overload takes less time, and therefore the protection over the inverter can be performed more quickly.	0	◎
P11.26	Reserved			
P11.27	VF vibration control method	0x00–0x11 Ones place: 0: Method 1 1: Method 2 Tens place: 0–1: Reserved	0x00	◎
P11.28	SPO switch-on detection delay time	0.0–60.0s **Note:** The SPO detection is started only after the inverter runs for the delay time P11.28 to advoid false alarms caused by the unstable frequency.	5.0s	○
P11.29	SPO unbalance factor	0–10	6	○
P11.30	Reserved			
P11.31	Fault severity group 1	0x0000–0x3333 Thousands place/Hundreds place/Tens place/Ones place: 0: Report the fault 1: Report the fault after deceleration to stop 2: Pre-alarm, with the action executed according to P11.51	0x0000	○
P11.32	Fault severity group 2		0x0000	○
P11.33	Fault severity group 3		0x0000	○
P11.34	Fault severity group 4		0x0000	○
P11.35	Fault severity group 5		0x0000	○
P11.36	Fault severity group 6		0x0000	○

Function code	Name	Description	Default	Modify
P11.37	Fault severity group 7	3: Screen out the fault **Note**: Different fault actions are taken for different fault severities. The first 10 faults are not grouped by severity, but each four of the subsequent faults are grouped by severity in ascending order from right to left in hexadecimal format, that is, from the ones place to the thousands place (for example, the ones place of fault severity group 1 corresponds to fault 11). Group 1: Faults 11–14 (OL1, OL2, SPI, SPO) Group 2: Faults 15–18 (OH1, OH2, EF, CE) Group 3: Faults 19–22 (ItE, tE, EEP, PIDE) Group 4: Faults 23–26 (bCE, END, OL3, PCE) Group 5: Faults 27–30 (UPE, DNE, E-DP, E-NET) Group 6: Faults 31–34 (E-CAN, ETH1, ETH2, dEu) Group 7: Faults 35–38 (STo, LL, ENC1O, ENC1D) Group 8: Faults 39–42 (ENC1Z, STO, STL1, STL2) Group 9: Faults 43–46 (STL3, CrCE, P-E1, P-E2) Group 10: Faults 47–50 (P-E3, P-E4, P-E5, P-E6) Group 11: Faults 51–54 (P-E7, P-E8, P-E9, P-E10) Group 12: Faults 55–58 (E-Err, ENCU, E-PN, SECAN) Group 13: Faults 59–62 (OT, F1-Er, F2-Er, F3-Er) Group 14: Faults 63–66 (C1-Er, C2-Er, C3-Er, E-CAT) Group 15: Faults 67–70 (E-BAC, E-DEV, S-Err, OtE1) Group 16: Faults 71–75 (OtE2, E-EIP, E-PAO, E-AI1) Group 17: Faults 75–78 (E-AI2, E-AI3, Reserved, Reserved) Group 18: Faults 79–82 (Reserved, Reserved, Reserved, Reserved) Group 19: Faults 83–86 (Reserved, Reserved, Reserved, Reserved) Group 20: Faults 87–90 (Reserved, Reserved, Reserved, Reserved)	0x0000	○
P11.38	Fault severity group 8		0x0000	○
P11.39	Fault severity group 9		0x0000	○
P11.40	Fault severity group 10		0x0000	○
P11.41	Fault severity group 11		0x0000	○
P11.42	Fault severity group 12		0x0000	○
P11.43	Fault severity group 13		0x0000	○
P11.44	Fault severity group 14		0x0000	○
P11.45	Fault severity group 15		0x0000	○
P11.46	Fault severity group 16		0x0000	○
P11.47	Fault severity group 17		0x0000	○
P11.48	Fault severity group 18		0x0000	○
P11.49	Fault severity group 19		0x0000	○
P11.50	Fault severity group 20		0x0000	○
P11.51	Action for fault pre-alarm	0–4 0: Run at the set frequency 1: Run at the output frequency at the time of fault 2: Run at the frequency upper limit 3: Run at the frequency lower limit 4: Run at the frequency reserved for exception	0	○

Function code	Name	Description	Default	Modify
P11.52	Frequency reserved for exception	0.00–630.00Hz	0.00Hz	○
P11.53	Fire mode function	0–2 0: Invalid 1: Fire mode 1 2: Fire mode 2 When P11.53=0, the fire mode is invalid, and the normal running mode is used. In this case, the inverter stops when encountering a fault. When the fire mode function is valid, the inverter runs at the speed specified by P11.54. When fire mode 1 is selected, the inverter always runs except when the inverter has been damaged. When fire mode 2 is selected, the inverter always runs, but the inverter stops when encountering OUT1, OUT2, OUT3, OC1, OC2, OC3, OV1, OV2, OV3, or SPO. **Note:** Terminal control must be used for a fire mode. When the fire mode has lasted 5 minutes, it is reset, and no warranty of repair is processed.	0	◎
P11.54	Running frequency in fire mode	0.00Hz–P00.03 (Max. output frequency)	50.00Hz	○
P11.55	Fire mode flag	0–1 **Note:** When the fire mode has lasted 5 minutes, it is reset, and no warranty of repair is processed.	0	●
P11.56–P11.69	Reserved	/	/	/
P12 group—Parameters of motor 2				
P12.00	Type of motor 2	0: Asynchronous motor 1: Synchronous motor	0	◎
P12.01	Rated power of asynchronous motor 2	0.1–3000.0kW	Model depended	◎
P12.02	Rated frequency of asynchronous motor 2	0.01Hz–P00.03 (Max. output frequency)	50.00Hz	◎
P12.03	Rated speed of asynchronous motor 2	1–60000rpm	Model depended	◎
P12.04	Rated voltage of asynchronous motor 2	0–1200V	Model depended	◎

Function code	Name	Description	Default	Modify
P12.05	Rated current of asynchronous motor 2	0.8–6000.0A	Model depended	◎
P12.06	Stator resistance of asynchronous motor 2	0.001–65.535Ω	Model depended	○
P12.07	Rotor resistance of asynchronous motor 2	0.001–65.535Ω	Model depended	○
P12.08	Leakage inductance of asynchronous motor 2	0.1–6553.5mH	Model depended	○
P12.09	Mutual inductance of asynchronous motor 2	0.1–6553.5mH	Model depended	○
P12.10	No-load current of asynchronous motor 2	0.1–6553.5A	Model depended	○
P12.11	Magnetic saturation coefficient 1 of iron core of asynchronous motor 2	0.0–100.0%	80%	○
P12.12	Magnetic saturation coefficient 2 of iron core of asynchronous motor 2	0.0–100.0%	68%	○
P12.13	Magnetic saturation coefficient 3 of iron core of asynchronous motor 2	0.0–100.0%	57%	○
P12.14	Magnetic saturation coefficient 4 of iron core of asynchronous motor 2	0.0–100.0%	40%	○
P12.15	Rated power of synchronous motor 2	0.1–3000.0kW	Model depended	◎
P12.16	Rated frequency of synchronous motor 2	0.01Hz–P00.03 (Max. output frequency)	50.00Hz	◎
P12.17	Number of pole pairs of synchronous motor 2	1–128	2	◎
P12.18	Rated voltage of synchronous motor 2	0–1200V	Model depended	◎

Function code	Name	Description	Default	Modify
P12.19	Rated voltage of synchronous motor 2	0.8–6000.0A	Model depended	◎
P12.20	Stator resistance of synchronous motor 2	0.001–65.535Ω	Model depended	○
P12.21	Direct-axis inductance of synchronous motor 2	0.01–655.35mH	Model depended	○
P12.22	Quadrature-axis inductance of synchronous motor 2	0.01–655.35mH	Model depended	○
P12.23	Counter-emf constant of synchronous motor 2	0–10000V	300	○
P12.24	Reserved			
P12.25	Reserved			
P12.26	Overload protection of motor 2	0: No protection 1: Common motor (with low-speed compensation) 2: Frequency-variable motor (without low-speed compensation)	2	◎
P12.27	Overload protection coefficient of motor 2	Motor overload multiples M = Iout/(In×K) In is rated motor current, Iout is inverter output current, K is motor overload protection coefficient. The smaller the K, the larger the value of M, the easier the protection. When M=116%, protection is performed after motor overload last for 1 hour; when M=150%, protection is performed after motor overload lasts for 12 minutes; when M=180%, protection is performed after motor overload lasts for 5 minutes; when M=200%, protection is performed after motor overload lasts for 60 seconds; and when M≥ 400%, protection is performed immediately.  Setting range: 20.0%–120.0%	100.0%	○
P12.28	Power display calibration coefficient of motor 2	0.00–3.00	1.00	○

Function code	Name	Description	Default	Modify
P12.29	Parameter display of motor 2	0: Display based on the motor type; under this mode, only parameters related to current motor type will be displayed. 1: Display all; under this mode, all the parameters will be displayed.	0	○
P12.30	System inertia of motor 2	0–30.000kgm^2	0.000	○
P12.31–P12.32	Reserved	0–65535	0	○
P13 group—Control parameters of SM				
P13.00	Reduction rate of the pull-in current of synchronous motor	This parameter is used to set the reduction rate of the input reactive current. When the active current of the synchronous motor increases to some extent, the input reactive current can be reduced to improve the power factor of the motor. Setting range: 0.0%–100.0% (of the motor rated current)	80.0%	○
P13.01	Initial pole detection mode	0: No detection 1: High-frequency current injection 2: Pulse superimposition	0	◎
P13.02	Pull-in current 1	Pull-in current is the pole position orientation current; pull-in current 1 is valid within the lower limit of pull-in current switchover frequency threshold. If you need to increase the starting torque, increase the value of this function code properly. Setting range: 0.0%–100.0% (of the motor rated current)	20.0%	○
P13.03	Pull-in current 2	Pull-in current is the pole position orientation current; pull-in current 2 is valid within the upper limit of pull-in current switchover frequency threshold, and you do not need to change pull-in current 2 under common situations. Setting range: 0.0%–100.0% (of the motor rated current)	10.0%	○
P13.04	Pull-in current switchover frequency	0.00Hz–200.0% (of the motor rated current)	20.0%	○
P13.05	High-frequency superposition frequency (reserved)	200Hz–1000Hz	500Hz	◎
P13.06	Pulse current setting	This parameter is used to set the pulse current threshold when the initial magnetic pole position is detected in the pulse mode. The value is a	100.0%	◎

Function code	Name	Description	Default	Modify
		percentage in relative to the rated current of the motor. Setting range: 0.0–300.0% (of the motor rated voltage)		
P13.07	Reserved	0.0–400.0	0.0	○
P13.08	Control parameter 1	0–0xFFFF	0	○
P13.09	Frequency threshold of phase-lock loop switch-in	This parameter is used to set the frequency threshold for enabling the counter-electromotive force phase-locked loop in SVC 0. When the running frequency is lower than the value of this parameter, the phase-locked loop is disabled; and when the running frequency is higher than that, the phase-locked loop is enabled. Setting range: 0.00–655.35	50.00	○
P13.10	Reserved	0.0–359.9	0.0	○
P13.11	Maladjustment detection time	This parameter is used to adjust the responsiveness of anti-maladjustment function. If the load inertia is large, increase the value of this parameter properly, however, the responsiveness may slow down accordingly. Setting range: 0.0–10.0s	0.5s	○
P13.12	High-frequency compensation coefficient of synchronous motor	This parameter is valid when the motor speed exceeds the rated speed. If motor oscillation occurred, adjust this parameter properly. Setting range: 0.0–100.0%	0.0	○
P13.13	High-frequency pull-in current	0–300.0% (of the rated inverter output current)	20.0%	◎
P13.19	Reserved	0–65535	0	○
P14 group—Serial communication				
P14.00	Local communication address	Setting range: 1–247 When the master is writing frames, and the slave communication address is set to 0, it is the broadcast communication address, and all the slaves on the Modbus bus will accept this frame, but the slave never responds. Local communication address is unique in the communication network, which is the basis for point-to-point communication between the upper computer and the inverter. **Note: The slave address cannot be set to 0.**	1	○
P14.01	Communication baud rate setup	This parameter is used to set the data transmission speed between upper computer and the inverter.	4	○

Function code	Name	Description	Default	Modify
		0: 1200BPS 1: 2400BPS 2: 4800BPS 3: 9600BPS 4: 19200BPS 5: 38400BPS 6: 57600BPS 7: 115200BPS **Note: Baud rate of the upper computer must be the same with the inverter; otherwise, communication cannot be performed. The larger the baud rate, the faster the communication speed.**		
P14.02	Data bit check setup	The data format of upper computer must be the same with the inverter; otherwise, communication cannot be performed. 0: No parity check (N, 8, 1) for RTU 1: Even parity (E, 8, 1) for RTU 2: Odd parity (O, 8, 1) for RTU 3: No parity check (N, 8, 2) for RTU 4: Even parity (E, 8, 2) for RTU 5: Odd parity (O, 8, 2) for RTU	1	○
P14.03	Communication response delay	0–200ms It refers to the time interval from when the data is received by the inverter to the moment when the data is sent to the upper computer. If the response delay is less than the system processing time, the response delay will be subject to system processing time; if the response delay is longer than the system processing time, data will be sent to the upper computer at a delay after data process is done by system.	5	○
P14.04	RS485 communication timeout period	0.0 (invalid)–60.0s When this parameter is set to 0.0, the communication timeout time is invalid. When it is set a non-zero value, the inverter reports the "Modbus/Modbus TCP communication fault" (CE) if the communication interval exceeds the value. In general, this parameter is set to 0.0. When continuous communication is required, you can set the function code to monitor communication status.	0.0s	○

Function code	Name	Description	Default	Modify
P14.05	Transmission error processing	0: Alarm and coast to stop 1: Do not alarm and continue running 2: Do not alarm and stop as per the stop mode (under communication control mode only) 3: Do not alarm and stop as per the stop mode (under all control modes)	0	○
P14.06	Modbus communication processing action	0x000–0x111 Ones: 0: Write operation has response 1: Write operation has no response Tens: 0: Communication password protection is invalid 1: Communication password protection is valid Hundreds place: Valid only for RS485 communication 0: User-defined addresses specified by P14.07 and P14.08 are invalid 1: User-defined addresses specified by P14.07 and P14.08 are valid	0x000	○
P14.07	User-defined running command address	0x0000–0xFFFF	0x2000	○
P14.08	User-defined frequency setting address	0x0000–0xFFFF	0x2001	○
P14.09	Modbus TCP communication timeout time	0.0–60.0s	5.0	○
P14.10	Enabling program upgrade through RS485	0–1 0: Disable 1: Enable	0	◎
P14.11	Bootloader software version	0.00–655.35	0.00	●
P14.12	Displaying no upgrade bootloader fault	0–1 0: Display 1: Do not display	0	○
P14.13–P14.47	Reserved			
P14.48	Channel selection for mapping between PZDs and function codes	0x00–0x12 Ones place: Channel for mapping function codes to PZDs 0: Reserved	0x12	○

Function code	Name	Description	Default	Modify
		1: Group P15 2: Group P16 Tens place: Save function at power failure 0: Disable 1: Enable		
P14.49	Mapped function code of received PZD2	0x0000–0xFFFF	0x0000	○
P14.50	Mapped function code of received PZD3	0x0000–0xFFFF	0x0000	○
P14.51	Mapped function code of received PZD4	0x0000–0xFFFF	0x0000	○
P14.52	Mapped function code of received PZD5	0x0000–0xFFFF	0x0000	○
P14.53	Mapped function code of received PZD6	0x0000–0xFFFF	0x0000	○
P14.54	Mapped function code of received PZD7	0x0000–0xFFFF	0x0000	○
P14.55	Mapped function code of received PZD8	0x0000–0xFFFF	0x0000	○
P14.56	Mapped function code of received PZD9	0x0000–0xFFFF	0x0000	○
P14.57	Mapped function code of received PZD10	0x0000–0xFFFF	0x0000	○
P14.58	Mapped function code of received PZD11	0x0000–0xFFFF	0x0000	○
P14.59	Mapped function code of received PZD12	0x0000–0xFFFF	0x0000	○
P14.60	Mapped function code of sent PZD2	0x0000–0xFFFF	0x0000	○
P14.61	Mapped function code of sent PZD3	0x0000–0xFFFF	0x0000	○
P14.62	Mapped function code of sent PZD4	0x0000–0xFFFF	0x0000	○
P14.63	Mapped function code of sent PZD5	0x0000–0xFFFF	0x0000	○
P14.64	Mapped function code of sent PZD6	0x0000–0xFFFF	0x0000	○
P14.65	Mapped function code of sent PZD7	0x0000–0xFFFF	0x0000	○
P14.66	Mapped function code of sent PZD8	0x0000–0xFFFF	0x0000	○

Function code	Name	Description	Default	Modify
P14.67	Mapped function code of sent PZD9	0x0000–0xFFFF	0x0000	○
P14.68	Mapped function code of sent PZD10	0x0000–0xFFFF	0x0000	○
P14.69	Mapped function code of sent PZD11	0x0000–0xFFFF	0x0000	○
P14.70	Mapped function code of sent PZD12	0x0000–0xFFFF	0x0000	○
P15 group—Functions of communication expansion card 1				
P15.00	Reserved			
P15.01	Module address	0–127	2	◎
P15.02	Received PZD2	0–31 0: Invalid 1: Set frequency (0–Fmax. Unit: 0.01Hz) 2: PID reference (-1000–1000, in which 1000 corresponds to 100.0%) 3: PID feedback (-1000–1000, in which 1000 corresponds to 100.0%) 4: Torque setting (-3000–+3000, in which 1000 corresponds to 100.0% of the motor rated current) 5: Setting of the upper limit of forward running frequency (0–Fmax. Unit: 0.01 Hz) 6: Setting of the upper limit of reverse running frequency (0–Fmax. Unit: 0.01 Hz) 7: Upper limit of electromotive torque (0–3000, in which 1000 corresponds to 100.0% of the motor rated current) 8: Upper limit of braking torque (0–3000, in which 1000 corresponds to 100% of the motor rated current) 9: Virtual input terminal command (Range: 0x000–0x3FF, corresponding to S8/S7/S6/S5/HDIB/HDIA/S4/S3/S2/S1) 10: Virtual output terminal command (Range: 0x00–0x0F, corresponding to RO2/RO1/HDO/Y1) 11: Voltage setting (special for V/F separation) (0–1000, in which 1000 corresponds to 100% of the motor rated voltage) 12: AO1 output setting 1 (-1000–+1000, in which 1000 corresponds to 100.0%) 13: AO2 output setting 2 (-1000–1000, in which 1000 corresponds to 100.0%)	0	○
P15.03	Received PZD3		0	○
P15.04	Received PZD4		0	○
P15.05	Received PZD5		0	○
P15.06	Received PZD6		0	○
P15.07	Received PZD7		0	○
P15.08	Received PZD8		0	○
P15.09	Received PZD9		0	○
P15.10	Received PZD10		0	○
P15.11	Received PZD11		0	○
P15.12	Received PZD12		0	○

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th><th>Modify</th></tr>
<tr><td></td><td></td><td>14: High-order bit of position reference (signed)
15: Low-order bit of position reference (unsigned)
16: High-order bit of position feedback (signed)
17: Low-order bit of position feedback (unsigned)
18: Position feedback setting flag (position feedback can be set only after this flag is set to 1 and then to 0)
19: Function parameter mapping (PZD2–PZD12 correspond to P14.49–P14.59)
20–31: Reserved</td><td></td><td></td></tr>
<tr><td>P15.13</td><td>Sent PZD2</td><td rowspan="11">0–31
0: Invalid
1: Running frequency (x100, Hz)
2: Set frequency (x100, Hz)
3: Bus voltage (x10, V)
4: Output voltage (x1, V)
5: Output current (x10, A)
6: Actual output torque (x10, %)
7: Actual output power (x10, %)
8: Rotation speed of running (x1, RPM)
9: Linear speed of running (x1, m/s)
10: Ramp reference frequency
11: Fault code
12: AI1 input (x100, V)
13: AI2 input (x100, V)
14: AI3 input (x100, V)
15: HDIA frequency value (x100, kHz)
16: Terminal input status
17: Terminal output status
18: PID reference (x100, %)
19: PID feedback (x100, %)
20: Motor rated torque
21: High-order bit of position reference (signed)
22: Low-order bit of position reference (unsigned)
23: High-order bit of position feedback (signed)
24: Low-order bit of position feedback (unsigned)
25: Status word
26: HDIB frequency value (x100, kHz)
27: High-order bit of PG card pulse feedback
28: Low-order bit of PG card pulse feedback
29: High-order bit of PG card pulse reference</td><td>0</td><td>○</td></tr>
<tr><td>P15.14</td><td>Sent PZD3</td><td>0</td><td>○</td></tr>
<tr><td>P15.15</td><td>Sent PZD4</td><td>0</td><td>○</td></tr>
<tr><td>P15.16</td><td>Sent PZD5</td><td>0</td><td>○</td></tr>
<tr><td>P15.17</td><td>Sent PZD6</td><td>0</td><td>○</td></tr>
<tr><td>P15.18</td><td>Sent PZD7</td><td>0</td><td>○</td></tr>
<tr><td>P15.19</td><td>Sent PZD8</td><td>0</td><td>○</td></tr>
<tr><td>P15.20</td><td>Sent PZD9</td><td>0</td><td>○</td></tr>
<tr><td>P15.21</td><td>Sent PZD10</td><td>0</td><td>○</td></tr>
<tr><td>P15.22</td><td>Sent PZD11</td><td>0</td><td>○</td></tr>
<tr><td>P15.23</td><td>Sent PZD12</td><td>0</td><td>○</td></tr>
</table>

Function code	Name	Description	Default	Modify
		30: Low-order bit of PG card pulse reference 31: Function parameter mapping (PZD2–PZD12 correspond to P14.60–P14.70)		
P15.24	Reserved			
P15.25	DP communication timeout time	0.0 (invalid)–60.0s	5.0	○
P15.26	CANopen communication timeout time	0.0 (invalid)–60.0s	5.0	○
P15.27	CANopen communication baud rate	0–7 0: 1000kbps 1: 800kbps 2: 500kbps 3: 250kbps 4: 125kbps 5: 100kbps 6: 50kbps 7: 20kbps	3	◎
P15.28	Master/slave CAN communication address	0–127	1	◎
P15.29	Master/slave CAN communication baud rate selection	0: 50Kbps 1: 100 Kbps 2: 125Kbps 3: 250Kbps 4: 500Kbps 5: 1M bps	2	◎
P15.30	Master/slave CAN communication timeout time	0.0 (invalid)–300.0s	0.0s	○
P15.31–P15.42	Reserved			
P15.43	Communication control word expression format	0–1 0: Decimal format 1: Binary format	0	◎
P16 group––Functions of communication expansion card 2				
P16.00–P16.01	Reserved			
P16.02	Ethernet monitoring card IP address 1	0–255	192	◎

Function code	Name	Description	Default	Modify
P16.03	Ethernet monitoring card IP address 2	0–255	168	◎
P16.04	Ethernet monitoring card IP address 3	0–255	0	◎
P16.05	Ethernet monitoring card IP address 4	0–255	1	◎
P16.06	Ethernet monitoring card subnet mask 1	0–255	255	◎
P16.07	Ethernet monitoring card subnet mask 2	0–255	255	◎
P16.08	Ethernet monitoring card subnet mask 3	0–255	255	◎
P16.09	Ethernet monitoring card subnet mask 4	0–255	0	◎
P16.10	Ethernet monitoring card gateway 1	0–255	192	◎
P16.11	Ethernet monitoring card gateway 2	0–255	168	◎
P16.12	Ethernet monitoring card gateway 3	0–255	0	◎
P16.13	Ethernet monitoring card gateway 4	0–255	1	◎
P16.14	Ethernet monitoring variable address 1	0x0000–0xFFFF	0x0000	○
P16.15	Ethernet monitoring variable address 2	0x0000–0xFFFF	0x0000	○
P16.16	Ethernet monitoring variable address 3	0x0000–0xFFFF	0x0000	○
P16.17	Ethernet monitoring variable address 4	0x0000–0xFFFF	0x0000	○
P16.18–P16.23	Reserved			
P16.24	Identification time for the expansion card in card slot 1	0.0–600.0s If it is set to 0.0, identification fault will not be detected.	0.0s	○
P16.25	Identification time for the expansion card in card slot 2	0.0–600.0s If it is set to 0.0, offline fault will not be detected.	0.0s	○
P16.26	Identification time for the expansion card in card slot 3	0.0–600.0s If it is set to 0.0, offline fault will not be detected.	0.0s	○

Function code	Name	Description	Default	Modify
P16.27	Communication timeout period of expansion card in card slot 1	0.0–600.0s If it is set to 0.0, offline fault will not be detected.	0.0s	○
P16.28	Communication timeout period of expansion card in card slot 2	0.0–600.0s If it is set to 0.0, offline fault will not be detected.	0.0s	○
P16.29	Communication timeout period of expansion card in card slot 3	0.0–600.0s If it is set to 0.0, offline fault will not be detected.	0.0s	○
P16.30	EtherCAT communication timeout time (Reserved)	0.0–60.0s	5.0	○
P16.31	PROFINET communication timeout time	0.0–60.0s	5.0	○
P16.32	Received PZD2	0–31 0: Invalid 1: Set frequency (0–Fmax. Unit: 0.01Hz) 2: PID reference (-1000–1000, in which 1000 corresponds to 100.0%) 3: PID feedback (-1000–1000, in which 1000 corresponds to 100.0%) 4: Torque setting (-3000–+3000, in which 1000 corresponds to 100.0% of the motor rated current) 5: Setting of the upper limit of forward running frequency (0–Fmax. Unit: 0.01 Hz) 6: Setting of the upper limit of reverse running frequency (0–Fmax. Unit: 0.01 Hz) 7: Upper limit of electromotive torque (0–3000, in which 1000 corresponds to 100.0% of the motor rated current) 8: Upper limit of braking torque (0–3000, in which 1000 corresponds to 100% of the motor rated current) 9: Virtual input terminal command (Range: 0x000–0x3FF, corresponding to S8/S7/S6/S5/HDIB/HDIA/S4/S3/S2/S1) 10: Virtual output terminal command (Range: 0x00–0x0F, corresponding to RO2/RO1/HDO/Y1) 11: Voltage setting (special for V/F separation)	0	○
P16.33	Received PZD3		0	○
P16.34	Received PZD4		0	○
P16.35	Received PZD5		0	○
P16.36	Received PZD6		0	○
P16.37	Received PZD7		0	○
P16.38	Received PZD8		0	○
P16.39	Received PZD9		0	○
P16.40	Received PZD10		0	○
P16.41	Received PZD11		0	○
P16.42	Received PZD12		0	○

Function code	Name	Description	Default	Modify
		(0–1000, in which 1000 corresponds to 100% of the motor rated voltage) 12: AO1 output setting 1 (-1000–+1000, in which 1000 corresponds to 100.0%) 13: AO2 output setting 2 (-1000–1000, in which 1000 corresponds to 100.0%) 14: High-order bit of position reference (signed) 15: Low-order bit of position reference (unsigned) 16: High-order bit of position feedback (signed) 17: Low-order bit of position feedback (unsigned) 18: Position feedback setting flag (position feedback can be set only after this flag is set to 1 and then to 0) 19: Function parameter mapping (PZD2–PZD12 correspond to P14.49–P14.59) 20–31: Reserved		
P16.43	Sent PZD2	0–31 0: Invalid 1: Running frequency (x100, Hz) 2: Set frequency (x100, Hz) 3: Bus voltage (x10, V) 4: Output voltage (x1, V) 5: Output current (x10, A) 6: Actual output torque (x10, %) 7: Actual output power (x10, %) 8: Rotation speed of running (x1, RPM) 9: Linear speed of running (x1, m/s) 10: Ramp reference frequency 11: Fault code 12: AI1 input (x100, V) 13: AI2 input (x100, V) 14: AI3 input (x100, V) 15: HDIA frequency value (x100, kHz) 16: Terminal input status 17: Terminal output status 18: PID reference (x100, %) 19: PID feedback (x100, %) 20: Motor rated torque 21: High-order bit of position reference (signed) 22: Low-order bit of position reference (unsigned) 23: High-order bit of position feedback (signed) 24: Low-order bit of position feedback (unsigned)	0	○
P16.44	Sent PZD3		0	○
P16.45	Sent PZD4		0	○
P16.46	Sent PZD5		0	○
P16.47	Sent PZD6		0	○
P16.48	Sent PZD7		0	○
P16.49	Sent PZD8		0	○
P16.50	Sent PZD9		0	○
P16.51	Sent PZD10		0	○
P16.52	Sent PZD11		0	○
P16.53	Sent PZD12		0	○

Function code	Name	Description	Default	Modify
		25: Status word 26: HDIB frequency value (x100, kHz) 27: High-order bit of PG card pulse feedback 28: Low-order bit of PG card pulse feedback 29: High-order bit of PG card pulse reference 30: Low-order bit of PG card pulse reference 31: Function parameter mapping (PZD2–PZD12 correspond to P14.60–P14.70)		
P16.54	Ethernet IPcommunication timeout time	0.0–60.0s	5.0	○
P16.55	Ethernet IP communication rate	0–4 0: Self-adaptive 1: 100M full-duplex 2: 100M half-duplex 3: 10M full-duplex 4: 10M half-duplex	0	◎
P16.56	Bluetooth pairing code	0–65535	0	●
P16.57	Bluetooth host type	0–65535 0: No host connection 1: Mobile APP 2: Bluetooth box 3–65535: Reserved	0	●
P16.58	Industrial Ethernet communication card IP address 1	0–255	192	◎
P16.59	Industrial Ethernet communication card IP address 2	0–255	168	◎
P16.60	Industrial Ethernet communication card IP address 3	0–255	0	◎
P16.61	Industrial Ethernet communication card IP address 4	0–255	20	◎
P16.62	Industrial Ethernet communication card subnet mask 1	0–255	255	◎
P16.63	Industrial Ethernet communication card subnet mask 2	0–255	255	◎

Function code	Name	Description	Default	Modify
P16.64	Industrial Ethernet communication card subnet mask 3	0–255	255	◎
P16.65	Industrial Ethernet communication card subnet mask 4	0–255	0	◎
P16.66	Industrial Ethernet communication card gateway 1	0–255	192	◎
P16.67	Industrial Ethernet communication card gateway 2	0–255	168	◎
P16.68	Industrial Ethernet communication card gateway 3	0–255	0	◎
P16.69	Industrial Ethernet communication card gateway 4	0–255	1	◎
P17 group—Status viewing				
P17.00	Set frequency	Display current set frequency of the inverter. Range: 0.00Hz–P00.03	50.00Hz	●
P17.01	Output frequency	Display current output frequency of the inverter. Range: 0.00Hz–P00.03	0.00Hz	●
P17.02	Ramp reference frequency	Display current ramp reference frequency of the inverter. Range: 0.00Hz–P00.03	0.00Hz	●
P17.03	Output voltage	Display current output voltage of the inverter. Range: 0–1200V	0V	●
P17.04	Output current	Display the valid value of current output current of the inverter. Range: 0.0–5000.0A	0.0A	●
P17.05	Motor speed	Display current motor speed. Range: 0–65535RPM	0 RPM	●
P17.06	Torque current	Display current torque current of the inverter. Range: -3000.0–3000.0A	0.0A	●
P17.07	Exciting current	Display current exciting current of the inverter. Range: -3000.0–3000.0A	0.0A	●
P17.08	Motor power	Display current motor power; 100% relative to rated motor power, positive value is motoring state, negative value is generating state. Range: -300.0–300.0% (relative to rated motor power)	0.0%	●

Function code	Name	Description	Default	Modify
P17.09	Motor output torque	Display current output torque of the inverter; 100% relative to rated motor torque, during forward running, positive value is motoring state, negative value is generating state, during reverse running, positive value is generating state, negative value is motoring state. Range: -250.0–250.0%	0.0%	●
P17.10	Estimated motor frequency	The estimated motor rotor frequency under open-loop vector condition. Range: 0.00– P00.03	0.00Hz	●
P17.11	DC bus voltage	Display current DC bus voltage of the inverter. Range: 0.0–2000.0V	0V	●
P17.12	Digital input terminal state	Display current digital input terminal state of the inverter. 0x00–0x3F Bit0: S1 Bit1: S2 Bit2: S3 Bit3: S4 Bit4: HDIA Bit5: HDIB	0x00	●
P17.13	Digital output terminal state	Display current digital output terminal state of the inverter. 0x00–0x0F Bit0: Y1 Bit1: HDO Bit2: RO1 Bit3: RO2	0x00	●
P17.14	Digital adjustment variable	Display the regulating variable by UP/DOWN terminals of the inverter. Range: 0.00Hz–P00.03	0.00Hz	●
P17.15	Torque reference value	Relative to percentage of the rated torque of current motor, display torque reference. Range: -300.0%–300.0% (of the motor rated current)	0.0%	●
P17.16	Linear speed	0–65535	0	●
P17.17	Reserved			
P17.18	Count value	0–65535	0	●
P17.19	AI1 input voltage	Display input signal of AI 1 Range: 0.00–10.00V	0.00V	●

Function code	Name	Description	Default	Modify
P17.20	AI2 input voltage	Display input signal of AI2 Range: -10.00V–10.00V	0.00V	●
P17.21	HDIA input frequency	Display input frequency of HDIA Range: 0.000–50.000kHz	0.000 kHz	●
P17.22	HDIB input frequency	Display input frequency of HDIB Range: 0.000–50.000kHz	0.000 kHz	●
P17.23	PID reference value	Display PID reference value Range: -100.0–100.0%	0.0%	●
P17.24	PID feedback value	Display PID feedback value Range: -100.0–100.0%	0.0%	●
P17.25	Motor power factor	Display the power factor of current motor. Range: -1.00–1.00	1.00	●
P17.26	Current running time	Display current running time of the inverter. Range: 0–65535min	0min	●
P17.27	Acutal stage of simple PLC	Displays the present stage of the simple PLC function. Range: 0–15	0	●
P17.28	Motor ASR controller output	Display the speed loop ASR controller output value under vector control mode, relative to the percentage of rated torque of the motor. Range: -300.0%–300.0% (of the motor rated current)	0.0%	●
P17.29	Pole angle of open-loop synchronous motor	Display initial identification angle of synchronous motor Range: 0.0–360.0	0.0	●
P17.30	Phase compensation of synchronous motor	Display phase compensation of synchronous motor Range: -180.0–180.0	0.0	●
P17.31	High-frequency superposition current of synchronous motor	0.0%–200.0% (of the motor rated current)	0.0	●
P17.32	Motor flux linkage	0.0%–200.0%	0.0%	●
P17.33	Exciting current reference	Display the exciting current reference value under vector control mode Range: -3000.0–3000.0A	0.0A	●
P17.34	Torque current reference	Display torque current reference value under vector control mode Range: -3000.0–3000.0A	0.0A	●
P17.35	AC incoming current	Display the valid value of incoming current on AC side Range: 0.0–5000.0A	0.0A	●

Function code	Name	Description	Default	Modify
P17.36	Output torque	Display output torque value, during forward running, positive value is motoring state, negative value is generating state; during reverse running, positive value is generating state, negative value is motoring state. Range: -3000.0Nm–3000.0Nm	0.0Nm	●
P17.37	Motor overload count value	0–65535	0	●
P17.38	Process PID output	-100.0%–100.0%	0.00%	●
P17.39	Parameter download wrong function code	0.00–99.00	0.00	●
P17.40	Motor control mode	Ones: Control mode 0: Vector 0 1: Vector 1 2: VF control 3: Closed-loop vector control Tens: Control state 0: Speed control 1: Torque control 2: Position control Hundreds: Motor number 0: Motor 1 1: Motor 2	0x2	●
P17.41	Upper limit of the torque when motoring	0.0%–300.0% (of the motor rated current)	180.0%	●
P17.42	Upper limit of braking torque	0.0%–300.0% (of the motor rated current)	180.0%	●
P17.43	Upper limit frequency of forward running of torque control	0.00–P00.03	50.00Hz	●
P17.44	Upper limit frequency of reverse running of torque control	0.00–P00.03	50.00Hz	●
P17.45	Inertia compensation torque	-100.0%–100.0%	0.0%	●
P17.46	Friction compensation torque	-100.0%–100.0%	0.0%	●
P17.47	Motor pole pairs	0–65535	0	●
P17.48	VFD overload count value	0–65535	0	●
P17.49	Frequency set by A source	0.00–P00.03	0.00Hz	●

Function code	Name	Description	Default	Modify
P17.50	Frequency set by B source	0.00–P00.03	0.00Hz	●
P17.51	PID proportional output	-100.0%–100.0%	0.00%	●
P17.52	PID integral output	-100.0%–100.0%	0.00%	●
P17.53	PID differential output	-100.0%–100.0%	0.00%	●
P17.54	Actual PID proportional gain	0.00–100.00	0.00%	●
P17.55	Actual PID integral time	0.00–10.00s	0.00%	●
P17.56	Actual PID differential time	0.00–10.00s	0.00%	●
P17.57	Peak value at 100Hz frequency component (square-wave orthogonal function detected)	0.0–300.0V Peak value of bus voltage fluctuation at 100Hz frequency component, which is detected by using a square-wave orthogonal function	0.0V	●
P17.58	Peak value at 100Hz frequency component (sine-wave orthogonal function detected)	0.0–300.0V Peak value of bus voltage fluctuation at 100Hz frequency component, which is detected by using a sine-wave orthogonal function	0.0V	●
P17.59–P17.63	Reserved			
P18 group—Status viewing in closed-loop control				
P18.00	Actual frequency of encoder	The actual-measured encoder frequency; the value of forward running is positive; the value of reverse running is negative. Range: -999.9–3276.7Hz	0.0Hz	●
P18.01	Encoder position count value	Encoder count value, quadruple frequency, Range: 0–65535	0	●
P18.02	Encoder Z pulse count value	Corresponding count value of encoder Z pulse. Range: 0–65535	0	●
P18.03	High bit of position reference value	High bit of position reference value, zero out after stop. Range: 0–30000	0	●
P18.04	Low bit of position reference value	Low bit of position reference value, zero out after stop. Range: 0–65535	0	●
P18.05	High bit of position feedback value	High bit of position feedback value, zero out after stop. Range: 0–30000	0	●

Function code	Name	Description	Default	Modify
P18.06	Low bit of position feedback value	Low bit of position feedback value, zero out after stop. Range: 0–65535	0	●
P18.07	Position deviation	Deviation between current reference position and actual running position. Range: -32768–32767	0	●
P18.08	Position of position reference point	Position of reference point of Z pulse when the spindle stops accurately. Range: 0–65535	0	●
P18.09	Current position setup of spindle	Current position setup when the spindle stops accurately. Range: 0–359.99	0.00	●
P18.10	Current position when spindle stops accurately	Current position when spindle stops accurately. Range: 0–65535	0	●
P18.11	Encoder Z pulse direction	Z pulse direction display. When the spindle stops accurately, there may be a couple of pulses' error between the position of forward and reverse orientation, which can be eliminated by adjusting Z pulse direction of P20.02 or exchanging phase AB of encoder. 0: Forward 1: Reverse	0	●
P18.12	Encoder Z pulse angle	Reserved. Range: 0.00–359.99	0.00	●
P18.13	Encoder Z pulse error times	Reserved. Range: 0–65535	0	●
P18.14	High bit of encoder pulse count value	0–65535	0	●
P18.15	Low bit of encoder pulse count value	0–65535	0	●
P18.16	Main control board measured speed value	-3276.8–3276.7Hz	0.0Hz	●
P18.17	Pulse command frequency	Pulse command (A2, B2 terminal) is converted to the set frequency, and it is valid under pulse position mode and pulse speed mode. Range: -3276.8–3276.7Hz	0.00Hz	●
P18.18	Pulse command feedforward	Pulse command (A2, B2 terminal) is converted to the set frequency, and it is valid under pulse position mode and pulse speed mode. Range: -3276.8–3276.7Hz	0.00Hz	●

Function code	Name	Description	Default	Modify
P18.19	Position regulator output	-327.68–327.67Hz	0.00Hz	●
P18.20	Count value of resolver	Count value of resolver. Range: 0–65535	0	●
P18.21	Resolver angle	The pole position angle read according to the resolver-type encoder. Range: 0.00–359.99	0.00	●
P18.22	Pole angle of closed-loop synchronous motor	Current pole position. Range: 0.00–359.99	0.00	●
P18.23	State control word 3	0–65535	0	●
P18.24	High bit of count value of pulse reference	0–65535	0	●
P18.25	Low bit of count value of pulse reference	0–65535	0	●
P18.26	PG card measured speed value	-3276.8–3276.7Hz	0.0Hz	●
P18.27	Encoder UVW sector	0–7	0	●
P18.28	Encoder PPR (pulse-per-revolution) display	0–65535	0	●
P18.29	Angle compensation value of synchronous motor	-180.0–180.0	0.00	●
P18.30	Reserved	0–65535	0	●
P18.31	Pulse reference Z pulse value	0–65535	0	●
P18.32	Pulse-given main control board measured speed value	-3276.8–3276.7Hz	0.0Hz	●
P18.33	Pulse-given PG card measured speed value	-3276.8–3276.7Hz	0.0Hz	●
P18.34	Present encoder filter width	0–63	0	●
P18.35	8k test duration	0–65535	0	●
P19 group—Expansion card status viewing				
P19.00	Type of card at slot 1	0–65535 0: No card	0	●
P19.01	Type of card at slot 2		0	●

Function code	Name	Description	Default	Modify
P19.02	Type of card at slot 3	1: Programmable card 2: I/O card 3: Incremental PG card 4: Incremental PG card with UVW 5: Ethernet communication card 6: DP communication card 7: Bluetooth card 8: Resolver PG card 9: CANopen communication card 10: WIFI card 11: PROFINET communication card 12: Sine/Cosine PG card without CD signal 13: Sine/Cosine PG card with CD signal 14: Absolute encoder PG card 15: CAN master/slave communication card 16: Modbus/Modbus TCP communication card 17: EtherCAT communication card 18: BacNet communication card 19: DeviceNet communication card 20: PT100/PT1000 temperature detection card 21: EtherNet IP communication card 22: MECHATROLINK communication card 23–65535: Reserved	0	●
P19.03	Software version of expansion card at slot 1	0.00–655.35	0.00	●
P19.04	Software version of expansion card at slot 2	0.00–655.35	0.00	●
P19.05	Software version of expansion card at slot 3	0.00–655.35	0.00	●
P19.06	Input state of expansion I/O card terminals	0–0xFFFF	0	●
P19.07	Output state of expansion I/O card terminals	0–0xFFFF	0	●
P19.08	Reserved	/	/	/
P19.09	AI3 input voltage of expansion I/O card	0.00–10.00V	0.00V	●

Function code	Name	Description	Default	Modify
P19.10	EC PT100 detected temperature	-50.0–150.0°C	0.0°C	●
P19.11	EC PT100 detected digital	0–4096	0	●
P19.12	EC PT1000 detected temperature	-50.0–150.0°C	0.0°C	●
P19.13	EC PT1000 detected digital	0–4096	0	●
P19.14	Alarm display	0–4 0: No alarm 1: PT100 detected OH alarm (A-Ot1) 2: PT1000 detected OH alarm (A-Ot2) 3: PT100 disconnection alarm (A-Pt1) 4: PT1000 disconnection alarm (A-Pt2)	0	●
P19.15	VFD control word	0–65535	0	●
P19.16	VFD status word	0–65535	0	●
P19.17	Ethernet monitoring variable 1	0–65535	0	●
P19.18	Ethernet monitoring variable 2	0–65535	0	●
P19.19	Ethernet monitoring variable 3	0–65535	0	●
P19.20	Ethernet monitoring variable 4	0–65535	0	●
P19.21	AI/AO detected temperature	-20.0–200.0°C	0.0	●
P19.22–P19.39	Reserved			
P20 group—Encoder of motor 1				
P20.00	Encoder type display	0: Incremental encoder 1: Resolver-type encoder 2: Sin/Cos encoder 3: Endat absolute encoder	0	●
P20.01	Encoder pulse number	Number of pulses generated when the encoder revolves for one circle. Setting range: 0–60000	1024	◎
P20.02	Encoder direction	Ones: AB direction 0: Forward 1: Reverse	0x000	◎

Function code	Name	Description	Default	Modify
		Tens: Z pulse direction (reserved) 0: Forward 1: Reverse Hundreds: CD/UVW pole signal direction 0: Forward 1: Reverse		
P20.03	Detection time of encoder offline fault	The detection time of encoder offline fault. Setting range: 0.0–10.0s **Note:** When the value is 0.0s, the fault will not be detected.	2.0s	○
P20.04	Detection time of encoder reversal fault	Detection time of encoder reversal fault. Setting range: 0.0–100.0s	0.8s	○
P20.05	Filter times of encoder detection	Setting range: 0x00–0x99 Ones: Low-speed filter time, corresponds to 2^(0–9)×125μs. Tens: High-speed filter times, corresponds to2^(0–9)×125μs.	0x33	○
P20.06	Speed ratio between encoder mounting shaft and motor	You need to set this parameter when the encoder is not installed on the motor shaft and the drive ratio is not 1. Setting range: 0.001–65.535	1.000	○
P20.07	Control parameters of synchronous motor	Bit0: Enable Z pulse calibration Bit1: Enable encoder angle calibration Bit2: Enable SVC speed measurement Bit3: Reserved Bit4: Reserved Bit5: Reserved Bit6: Enable CD signal calibration Bit7: Reserved Bit8: Do not detect encoder fault during autotuning Bit9: Enable Z pulse detection optimization Bit10: Enable initial Z pulse calibration optimization Bit11: Reserved Bit12: Clear Z pulse arrival signal after stop Bit13: Reserved Bit14: Detect Z pulse after one rotation Bit15: Reserved	0x0003	○
P20.08	Enable Z pulse offline detection	0x00–0x11 Ones: Z pulse 0: Do not detect	0x10	○

Function code	Name	Description	Default	Modify
		1: Enable Tens: UVW pulse (for synchronous motor) 0: Do not detect 1: Enable		
P20.09	Initial angle of Z pulse	Relative electric angle of encoder Z pulse and motor pole position. Setting range: 0.00–359.99	0.00	○
P20.10	Initial angle of the pole	Relative electric angle of encoder position and motor pole position. Setting range: 0.00–359.99	0.00	○
P20.11	Autotuning of initial angle of pole	0–3 0: No operation 1: Rotary autotuning (DC braking) 2: Static autotuning (suitable for resolver-type encoder, sin/cos with CD signal feedback) 3: Rotary autotuning (initial angle identification)	0	◎
P20.12	Speed measurement optimization selection	0–2 0: No optimization 1: Optimization mode 1 2: Optimization mode 2	1	◎
P20.13	CD signal zero offset gain	0–65535	0	○
P20.14	Encoder type selection	Ones: Incremental encoder 0: without UVW 1: with UVW Tens: Sin/Cos encoder 0: without CD signal 1: with CD signal	0x00	◎
P20.15	Speed measurement mode	0: PG card 1: local; realized by HDIA and HDIB; supports incremental 24V encoder only	0	◎
P20.16	Frequency-division coefficient	0–255 When this parameter is set to 0 or 1, frequency division of 1:1 is implemented.	0	○
P20.17	Pulse filer processing	0x0000–0xFFFF Bit0: Enable/disable encoder input filter 0: No filter 1: Filter Bit1: Encoder signal filter mode (set Bit0 or Bit2 to 1)	0x0033	○

Function code	Name	Description	Default	Modify
		0: Self-adaptive filter 1: Use P20.18 filter parameters Bit2: Enable/disable encoder frequency-division output filter 0: No filter 1: Filter Bit3: Enable/disable filter for frequency-division output of pulse reference 0: No filter 1: Filter Bit4: Enable/disable pulse reference filter 0: No filter 1: Filter Bit5: Pulse reference filter mode (valid when Bit4 is set to 1) 0: Self-adaptive filter 1: Use P20.19 filter parameters Bit6: Frequency-divided output source setting (valid only for incremental encoders) 0: Encoder signals 1: Pulse reference signals Bits7–15: Reserved		
P20.18	Encoder pulse filter width	0–63 The filtering time is P20.18×0.25 μs. The value 0 or 1 indicates 0.25 μs.	2	○
P20.19	Pulse reference filter width	0–63 The filtering time is P20.19×0.25 μs. The value 0 or 1 indicates 0.25 μs.	2	○
P20.20	Pulse number of pulse reference	0–16000	1024	◎
P20.21	Enable angle compensation of synchronous motor	0–1	0	○
P20.22	Switchover frequency threshold of speed measurement mode	0–630.00Hz **Note:** This parameter is valid only when P20.12 is set to 0.	1.00Hz	○
P20.23	Synchronous motor angle compensation coefficient	-200.0–200.0%	100.0%	○
P20.24	Number of pole pairs in inital magnetic pole angle autotuning	1–128	2	◎

Function code	Name	Description	Default	Modify
P21 group—Position control				
P21.00	Positioning mode	0x0000–0x7121 Ones: Control mode selection 0: Speed control 1: Position control Tens: Position command source 0: Pulse train 1: Digital position 2: Positioning of photoelectric switch during stop Hundreds: Reserved Thousands: Reserved	0x0000	○
P21.01	Pulse command mode	0x0000–0x3133 Ones: Pulse mode 0: A/B quadrature pulse; A precedes B 1: A: PULSE; B: SIGN If channel B is of low electric level, the edge counts up; if channel B is of high electric level, the edge counts down. 2: A: Positive pulse Channel A is positive pulse; channel B needs no wiring 3: A/B dual-channel pulse; channel A pulse edge counts up, channel B pulse edge counts down Tens: Pulse direction Bit0: Set pulse direction 0: Forward 1: Reverse Bit1: Set pulse direction by running direction 0: Disable, and BIT0 is valid; 1: Enable Hundreds: Reserved Thousands: Pulse control selection Bit0: Pulse filter selection 0: Inertia filter 1: Average moving filter Bit1: Overspeed control 0: No control 1: Control	0x0000	◎
P21.02	APR gain 1	The two automatic position regulator (APR) gains are switched based on the switching mode set in P21.04. When the spindle orientation function is	20.0	○
P21.03	APR gain 2		30.0	○

Function code	Name	Description	Default	Modify
		used, the gains are switched automatically, regardless of the setting of P21.04. P21.03 is used for dynamic running, and P21.02 is used for maintaining the locked state. Setting range: 0.0–400.0		
P21.04	Switching mode of position loop gain	This parameter is used to set the APR gain switching mode. To use torque command-based switching, you need to set P21.05; and to use speed command-based switching, you need to set P21.06. 0: No switching 1: Torque command 2: Speed command 3–5: Reserved	0	○
P21.05	Torque command level during position gain switchover	0.0–100.0% (rated motor torque)	10.0%	○
P21.06	Speed command level during position gain switchover	0.0–100.0% (rated motor speed)	10.0%	○
P21.07	Smooth filter coefficient during gain switchover	The smooth filter coefficient during position gain switchover. Setting range: 0–15	5	○
P21.08	Output limit of position controller	The output limit of position regulator, if the limit value is 0, position regulator will be invalid, and no position control can be performed, however, speed control is available. Setting range: 0.0–100.0% (Max. output frequency P00.03)	20.0%	○
P21.09	Completion range of positioning	When the position deviation is less than P21.09, and the duration is larger than P21.10, positioning completion signal will be outputted. Setting range: 0–1000	10	○
P21.10	Detection time for positioning completion	0.0–1000.0ms	10.0ms	○
P21.11	Numerator of position command ratio	Electronic gear ratio, used to adjust the corresponding relation between position command and actual running displacement. Setting range: 1–65535	1000	○
P21.12	Denominator of position command ratio	Setting range: 1–65535	1000	○

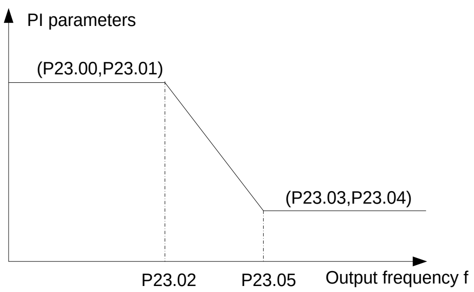
Function code	Name	Description	Default	Modify
P21.13	Position feedforward gain	0.00–120.00% For pulse train reference only (position control)	100.00	○
P21.14	Position feedforward filter time constant	0.0–3200.0ms For pulse train reference only (position control)	3.0ms	○
P21.15	Position command filter time constant	The position feedforward filter time constant during pulse train positioning. 0.0–3200.0ms	0.0ms	◎
P21.16	Digital positioning mode	0x0000–0xFFFF Bit0: Positioning mode selection 0: Relative position 1: Absolute position (home) (reserved) Bit1: Positioning cycle selection 0: Cyclic positioning by terminals 1: Automatic cyclic positioning Bit2: Cycle mode 0: Continuous 1: Repetitive (supported by automatic cyclic positioning only) Bit3: P21.17 digital setting mode 0: Incremental 1: Position type (do not support continuous mode) Bit4: Home searching mode 0: Search for the home just once 1: Search for the home during each run Bit5: Home calibration mode 0: Calibrate in real time 1: Single calibration Bit6: Positioning completion signal selection 0: Valid during the time set by P21.25 (Hold time of positioning completion signal) 1: Always valid Bit7: Initial positioning selection (for cyclic positioning by terminals) 0: Invalid (do not rotate) 1: Valid Bit8: Positioning enable signal selection (for cyclic positioning by terminals only; positioning function is always enabled for automatic cyclic positioning) 0: Pulse signal 1: Level signal Bit9: Position source	0x0000	○

Function code	Name	Description	Default	Modify
		0: P21.17 setting 1: PROFIBUS/CANopen setting Bit10: Whether to save the encoder pulse counting value at power failure 0: Do not save 1: Save Bit 11: Reserved Bit12: Positioning curve selection (reserved) 0: Straight line 1: S curve		
P21.17	Position digital reference	Set digital positioning position; Actual position=P21.17×P21.11/P21.12 0–65535	0	○
P21.18	Positioning speed setup selection	0: Set by P21.19 1: Set by AI1 2: Set by AI2 3: Set by AI3 4: Set by high speed pulse HDIA 5: Set by high speed pulse HDIB	0	○
P21.19	Positioning speed digits	0–100.0% max. frequency	20.0%	○
P21.20	Acceleration time of positioning	Set the acceleration/deceleration time of positioning process. Acceleration time of positioning means the time needed for the inverter to accelerate from 0Hz to Max. output frequency (P00.03). Deceleration time of positioning means the time needed for the inverter to decelerate from Max. output frequency (P00.03) to 0hz. Setting range of P21.20: 0.01–300.00s Setting range of P21.21: 0.01–300.00s	3.00s	○
P21.21	Deceleration time of positioning		3.00s	○
P21.22	Hold time of positioning arrival	Set the hold time of waiting when target positioning position is reached. Setting range: 0.000–60.000s	0.100s	○
P21.23	Home search speed	0.00–50.00Hz	2.00Hz	○
P21.24	Home position offset	0–65535	0	○
P21.25	Hold time of positioning completion signal	The hold time of positioning completion signal, this parameter is also valid for positioning completion signal of spindle orientation. Setting range: 0.000–60.000s	0.200s	○

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th><th>Modify</th></tr>
<tr><td>P21.26</td><td>Pulse superposition value</td><td rowspan="3">P21.26: -9999–32767
P21.27: 0–3000.0/ms
This function is enabled in the pulse speed reference (P00.06=12) or pulse position mode (P21.00=1):
1. Input terminal function #68 (enable pulse superposition)
When the rising edge of the terminal is detected, the pulse setting is increased to the value of P21.26, and the pulse reference channel is compensated by the pulse superposition rate set in P21.27.
2. Input terminal function #67 (progressive increase of pulses)
When this terminal is enabled, the pulse reference channel is compensated by the pulse superposition rate set in P21.27.
Note: Terminal filtering set in P05.09 may slightly affect the actual superposition.
Example: P21.27 = 1.0/ms; P05.05 = 67
If the input signal of terminal S5 is 0.5s, the actual number of superposed pulses is 500.
3. Input terminal function #69 (progressive decrease of pulses)
The sequence of this function is the same as those described above. The difference lies in that this terminal indicates that negative pulses are superposed.
Note: All the pulses described here are superposed on the pulse reference channel (A2, B2). Pulse filtering, electronic gear, and other functions are valid for superposed pulses.
4. Output terminal function #28 (pulse superposing)
When pulses are superposed, the output terminal operates. After pulses are superposed, the terminal does not operate.</td><td>0</td><td>○</td></tr>
<tr><td>P21.27</td><td>Pulse superposition speed</td><td>8.0/ms</td><td>○</td></tr>
<tr><td>P21.28</td><td>Acceleration/ deceleration time after disabling pulse</td><td>5.0s</td><td>○</td></tr>
<tr><td>P21.29</td><td>Speed feedforward filter time constant (Pulse train speed mode)</td><td>It is the filter time constant detected by pulse train when the speed reference source is set to pulse train (P0.06=12 or P0.07=12).
Setting range: 0–3200.0ms</td><td>10.0ms</td><td>○</td></tr>
</table>

Function code	Name	Description	Default	Modify
P21.30	Numerator of the 2nd command ratio	1–65535	1000	○
P21.31	Pulse reference speed measuring method	0–2 0: Main control board 1: PG card 2: Hybrid	0	○
P21.32	Pulse reference feedforward source	0x0–0x1	0x0	◎
P21.33	Set value of clearing encoder count	0–65535	0	◎
P22 group—Spindle positioning				
P22.00	Spindle positioning mode selection	Bit0: Enable spindle positioning 0: Disable 1: Enable Bit1: Select spindle positioning reference point 0: Z pulse input 1: S2/S3/S4 terminal input Bit2: Search for reference point 0: Search the reference point only once 1: Search the reference point every time Bit3: Enable reference point calibration 0: Disable 1: Enable Bit4: Positioning mode selection 1 0: Set direction positioning 1: Near-by direction positioning Bit5: Positioning mode selection 2 0: Forward positioning 1: Reverse positioning Bit6: Zeroing command selection 0: Electric level mode 1: Pulse mode Bit7: Reference point calibration mode 0: Calibrate at the first time 1: Calibrate in real time Bit8: Action selection after zeroing signal cancellation (electric level type) 0: Switch to speed mode 1: Position lock mode Bit9: Positioning completion signal selection 0: Electric level signal	0	○

Function code	Name	Description	Default	Modify
		1: Pulse signal Bit10: Z pulse signal source 0: Motor 1: Spindle Bits 11–15: Reserved		
P22.01	Speed of spindle orientation	During spindle orientation, the speed of the position point of orientation will be searched, and then it will switch over to position control orientation. Setting range: 0.00–100.00Hz	10.00Hz	○
P22.02	Deceleration time of spindle orientation	Deceleration time of spindle orientation. Spindle orientation deceleration time means the time needed for the inverter to decelerate from Max. output frequency (P00.03) to 0Hz. Setting range: 0.0–100.0s	3.0s	○
P22.03	Spindle zeroing position 0	You can select the zeroing positions of four spindles by terminals (functions 46 and 47). Setting range: 0–65535	0	○
P22.04	Spindle zeroing position 1	Setting range: 0–65535	0	○
P22.05	Spindle zeroing position 2	Setting range: 0–65535	0	○
P22.06	Spindle zeroing position 3	Setting range: 0–65535	0	○
P22.07	Spindle scale-division angle 1	You can select seven spindle scale-division values by terminals (functions 48, 49 and 50). Setting range: 0.00–359.99	15.00	○
P22.08	Spindle scale-division angle 2	Setting range: 0.00–359.99	30.00	○
P22.09	Spindle scale-division angle 3	Setting range: 0.00–359.99	45.00	○
P22.10	Spindle scale-division angle 4	Setting range: 0.00–359.99	60.00	○
P22.11	Spindle scale-division angle 5	Setting range: 0.00–359.99	90.00	○
P22.12	Spindle scale-division angle 6	Setting range: 0.00–359.99	120.00	○
P22.13	Spindle scale-division angle 7	Setting range: 0.00–359.99	180.00	○
P22.14	Spindle drive ratio	This parameter specifies the reduction ratio of the spindle and the mounting shaft of the encoder. Setting range: 0.000–30.000	1.000	○

Function code	Name	Description	Default	Modify
P22.15	Zero-point communication setup of spindle	P22.15 sets spindle zero-point offset, if the selected spindle zero point is P22.03, the final spindle zero point will be the sum of P22.03 and P22.15. Setting range: 0–39999	0	○
P22.16	Reserved	0–65535	0	○
P22.17	Reserved	0–65535	0	○
P22.18	Rigid tapping selection	Ones: Enable/disable 0: Disable 1: Enable Tens: Analog input port selection 0: Invalid 1: AI1 2: AI2 3: AI3	0x00	◎
P22.19	Analog filter time of rigid tapping	0.0ms–1000.0ms	1.0ms	○
P22.20	Max. frequency of rigid tapping	0.00–400.00Hz	50.00Hz	○
P22.21	Corresponding frequency of analog zero drift of rigid tapping	0.00–10.00Hz	0.00Hz	○
P22.22–P22.24	Reserved			
P23 group—Vector control of motor 2				
P23.00	Speed loop proportional gain 1	P23.00–P23.05 fit for vector control mode only. Below switchover frequency 1 (P23.02), the speed loop PI parameters are P23.00 and P23.01. Above switchover frequency 2 (P23.05), the speed loop PI parameters are P23.03 and P23.04; in between them, the PI parameters are obtained by linear variation between two groups of parameters, as shown in the figure below.  	20.0	○
P23.01	Speed loop integral time 1		0.200s	○
P23.02	Switch over low point frequency		5.00Hz	○
P23.03	Speed loop proportional gain 2		20.0	○
P23.04	Speed loop integral time 2		0.200s	○
P23.05	Switch over high point frequency		10.00Hz	○

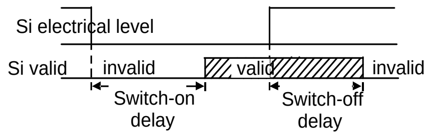
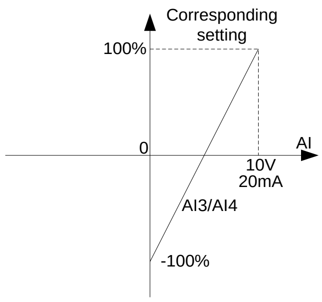
Function code	Name	Description	Default	Modify
		The speed loop dynamic response characteristics of vector control can be adjusted by setting the proportional coefficient and integral time of speed regulator. Increase proportional gain or decrease integral time can accelerate dynamic response of speed loop, however, if the proportional gain is too large or integral time is too small, system oscillation and large overshoot may occur; if proportional gain is too small, stable oscillation or speed offset may occur. Speed loop PI parameter is closely related to the system inertia, you should make adjustment according to different load characteristics based on the default PI parameter to fulfill different needs. Setting range of P23.00: 0.0–200.0 Setting range of P23.01: 0.000–10.000s Setting range of P23.02: 0.00Hz–P23.05 Setting range of P23.03: 0.0–200.0 Setting range of P23.04: 0.000–10.000s Setting range of P23.05: P23.02–P00.03 (Max. output frequency)		
P23.06	Speed loop output filter	0–8 (corresponds to 0–2^8/10ms)	0	○
P23.07	Slip compensation coefficient of vector control (motoring)	Slip compensation coefficient is used to adjust the slip frequency of vector control to improve system speed control precision. You can effectively control the static error of speed by adjusting this parameter properly. Setting range: 50–200%	100%	○
P23.08	Slip compensation coefficient of vector control (generating)		100%	○
P23.09	Current loop proportional coefficient P	**Note:** 1. These two parameters are used to adjust PI parameters of current loop; it affects dynamic response speed and control precision of the system directly. The default value needs no adjustment under common conditions; 2. Applicable to SVC mode 0 (P00.00=0), SVC mode 1 (P00.00=1), and FVC (P00.00=3) Setting range: 0–65535	1000	○
P23.10	Current loop integral coefficient I		1000	○
P23.11	Speed loop differential gain	0.00–10.00s	0.00s	○
P23.12	Proportional coefficient of high-frequency current loop	In the FVC (P00.00=3), when the frequency is lower than the current-loop high-frequency switching threshold (P23.14), the current-loop PI parameters are P23.09 and P23.10; and when the	1000	○

Function code	Name	Description	Default	Modify
P23.13	Integral coefficient of high-frequency current loop	frequency is higher than the current-loop high-frequency switching threshold, the current-loop PI parameters are P23.12 and P23.13. Setting range of P23.12: 0–65535 Setting range of P23.13: 0–65535 Setting range of P23.14: 0.0–100.0% (relative to max. frequency)	1000	○
P23.14	High-frequency switchover threshold of current loop		100.0%	○
P23.15–P23.19	Reserved			
P24 group—Encoder of motor 2				
P24.00	Encoder type display	0: Incremental encoder 1: Resolver-type encoder 2: Sin/Cos encoder 3: Endat absolute encoder	0	●
P24.01	Encoder pulse number	Number of pulses generated when the encoder revolves for one circle. Setting range: 0–60000	1024	◎
P24.02	Encoder direction	Ones: AB direction 0: Forward 1: Reverse Tens: Z pulse direction (reserved) 0: Forward 1: Reverse Hundreds: CD/UVW pole signal direction 0: Forward 1: Reverse	0x000	◎
P24.03	Detection time of encoder offline fault	0.0–10.0s	2.0s	○
P24.04	Detection time of encoder reversal fault	0.0–100.0s	0.8s	○
P24.05	Filter times of encoder detection	Setting range: 0x00–0x99 Ones: Low-speed filter times, corresponds to 2^(0–9)×125μs. Tens: High-speed filter times; corresponds to 2^(0–9)×125μs.	0x33	○
P24.06	Speed ratio between encoder mounting shaft and motor	You need to set this parameter when the encoder is not installed on the motor shaft and the drive ratio is not 1. Setting range: 0.001–65.535	1.000	○

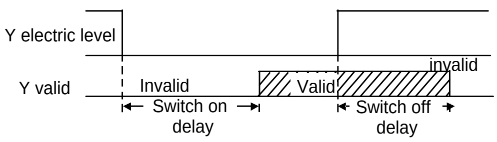
Function code	Name	Description	Default	Modify
P24.07	Control parameters of synchronous motor	0x0000–0xFFFF Bit0: Enable Z pulse calibration Bit1: Enable encoder angle calibration Bit2: Enable SVC speed measurement Bit3: Reserved Bit4: Reserved Bit5: Reserved Bit6: Enable CD signal calibration Bit7: Reserved Bit8: Do not detect encoder fault during autotuning Bit9: Enable Z pulse detection optimization Bit10: Enable initial Z pulse calibration optimization Bit11: Reserved Bit12: Clear Z pulse arrival signal after stop Bit13: Reserved Bit14: Detect Z pulse after one rotation Bit15: Reserved	0x3	○
P24.08	Enable Z pulse offline detection	0x00–0x11 Ones: Z pulse Reserved Tens: UVW pulse 0: Do not detect 1: Enable	0x10	○
P24.09	Initial angle of Z pulse	Relative electric angle of encoder Z pulse and motor pole position. Setting range: 0.00–359.99	0.00	○
P24.10	Initial angle of the pole	Relative electric angle of encoder position and motor pole position. Setting range: 0.00–359.99	0.00	○
P24.11	Autotuning of initial angle of pole	0–3 0: No operation 1: Rotary autotuning (DC braking) 2: Static autotuning (suitable for resolver-type encoder, sin/cos with CD signal feedback) 3: Rotary autotuning (initial angle identification)	0	◎
P24.12	Speed measurement optimization selection	0: No optimization 1: Optimization mode 1 2: Optimization mode 2	1	◎
P24.13	CD signal zero offset gain	0–65535	0	○

Function code	Name	Description	Default	Modify
P24.14	Encoder type selection	Ones: Incremental encoder 0: without UVW 1: with UVW Tens: Sin/Cos encoder 0: without CD signal 1: with CD signal	0x00	◎
P24.15	Speed measurement mode	0: PG card 1: local; realized by HDIA and HDIB; supports incremental 24V encoder only	0	◎
P24.16	Frequency-division coefficient	0–255 When this parameter is set to 0 or 1, frequency division of 1:1 is implemented.	0	○
P24.17	Pulse filer processing	0x0000–0xFFFF Bit0: Enable/disable encoder input filter 0: No filter 1: Filter Bit1: Encoder signal filter mode 0: Self-adaptive filter 1: Use P24.18 filter parameters Bit2: Enable/disable encoder frequency-division output filter 0: No filter 1: Filter Bit3: Enable/disable pulse reference frequency-division output filter 0: No filter 1: Filter Bit4: Enable/disable pulse reference filter 0: No filter 1: Filter Bit5: Pulse reference filter mode 0: Self-adaptive filter 1: Use P24.19 filter parameters Bit6: Frequency- division output source setting (valid only for incremental encoders) 0: Encoder signals 1: Pulse reference signals Bits 7–15: Reserved	0x0033	○
P24.18	Encoder pulse filter width	0–63 The filtering time is P24.18×0.25 μs. The value 0 or 1 indicates 0.25 μs.	2	○

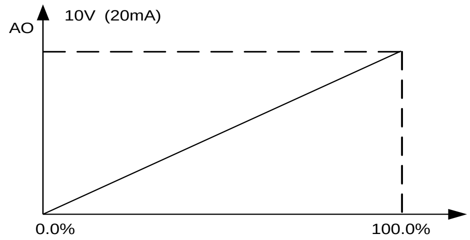
Function code	Name	Description	Default	Modify
P24.19	Pulse reference filter width	0–63 The filtering time is P24.19×0.25 μs. The value 0 or 1 indicates 0.25 μs.	2	○
P24.20	Pulse number of pulse reference	0–16000	1024	◎
P24.21	Enable angle compensation of synchronous motor	0–1	0	○
P24.22	Switchover frequency threshold of speed measurement mode	0–630.00Hz	1.00Hz	○
P24.23	Synchronous motor angle compensation coefficient	-200.0–200.0%	100.0%	○
P24.24	Number of pole pairs in inital magnetic pole angle autotuning	1–128	2	◎
P25 group—Expansion I/O card input functions				
P25.00	HDI3 input type selection	0: HDI3 is high-speed pulse input 1: HDI3 is digital input	0	◎
P25.01	S5 terminal function	The same with P05 group	0	◎
P25.02	S6 terminal function		0	◎
P25.03	S7 terminal function		0	◎
P25.04	S8 terminal function		0	◎
P25.05	S9 terminal function		0	◎
P25.06	S10 terminal function		0	◎
P25.07	HDI3 terminal function		0	◎
P25.08	Input terminal polarity of expansion card	0x00–0x7F	0x00	○
P25.09	Virtual terminal setup of expansion card	0x000–0x7F (0: disable, 1: enable) BIT0: S5 virtual terminal BIT1: S6 virtual terminal BIT2: S7 virtual terminal BIT3: S8 virtual terminal BIT4: S9 virtual terminal BIT5: S10 virtual terminal BIT6: HDI3 virtual terminal	0x00	◎
P25.10	HDI3 terminal switch-on delay	These function codes define corresponding delay of the programmable input terminals during level	0.000s	○

Function code	Name	Description	Default	Modify
P25.11	HDI3 terminal switch-off delay	variation from switch-on to switch-off .  Setting range: 0.000–50.000s	0.000s	○
P25.12	S5 terminal switch-on delay		0.000s	○
P25.13	S5 switch-off delay		0.000s	○
P25.14	S6 terminal switch-on delay		0.000s	○
P25.15	S6 switch-off delay		0.000s	○
P25.16	S7 terminal switch-on delay		0.000s	○
P25.17	S7 switch-off delay		0.000s	○
P25.18	S8 terminal switch-on delay		0.000s	○
P25.19	S8 switch-off delay		0.000s	○
P25.20	S9 terminal switch-on delay		0.000s	○
P25.21	S9 switch-off delay		0.000s	○
P25.22	S10 terminal switch-on delay		0.000s	○
P25.23	S10 switch-off delay		0.000s	○
P25.24	Lower limit value of AI3	These function codes define the relation between analog input voltage and corresponding set value of analog input. When the analog input voltage exceeds the range of max./min. input, the max. input or min. input will be adopted during calculation. When analog input is current input, 0–20mA current corresponds to 0–10V voltage. In different application cases, 100% of the analog setting corresponds to different nominal values. The figure below illustrates several settings.  Input filter time: Adjust the sensitivity of analog input, increase this value properly can enhance the anti-interference capacity of analog variables;	0.00V	○
P25.25	Corresponding setting of lower limit of AI3		0.0%	○
P25.26	Upper limit value of AI3		10.00V	○
P25.27	Corresponding setting of upper limit of AI3		100.0%	○
P25.28	Input filter time of AI3		0.030s	○
P25.29	Lower limit value of AI4		0.00V	○
P25.30	Corresponding setting of lower limit of AI4		0.0%	○
P25.31	Upper limit value of AI4		10.00V	○
P25.32	Corresponding setting of upper limit of AI4		100.0%	○
P25.33	Input filter time of AI4		0.030s	○

Function code	Name	Description	Default	Modify
		however, it will also degrade the sensitivity of analog input. **Note:** AI3 and AI4 can support 0–10V/0–20mA input, when AI3 and AI4 select 0–20mA input, the corresponding voltage of 20mA is 10V. Setting range of P25.24: 0.00V–P25.26 Setting range of P25.25: -300.0%–300.0% Setting range of P25.26: P25.24–10.00V Setting range of P25.27: -300.0%–300.0% Setting range of P25.28: 0.000s–10.000s Setting range of P25.29: 0.00V–P25.31 Setting range of P25.30: -300.0%–300.0% Setting range of P25.31: P25.29–10.00V Setting range of P25.32: -300.0%–300.0% Setting range of P25.33: 0.000s–10.000s		
P25.34	HDI3 high-speed pulse input function	0: Set input via frequency 1: Count	0	◎
P25.35	Lower limit frequency of HDI3	0.000 kHz – P25.37	0.000 kHz	○
P25.36	Corresponding setting of lower limit frequency of HDI3	-300.0%–300.0%	0.0%	○
P25.37	Upper limit frequency of HDI3	P25.35 –50.000kHz	50.000 kHz	○
P25.38	Corresponding setting of upper limit frequency of HDI3	-300.0%–300.0%	100.0%	○
P25.39	HDI3 frequency input filter time	0.000s–10.000s	0.030s	○
P25.40	AI3 input signal type	Range: 0–1 0: Voltage type 1: Current type	0	○
P25.41	AI4 input signal type	Range: 0–1 0: Voltage type 1: Current type	0	○
P25.42–P25.45	Reserved			
P26 group—Expansion I/O card output functions				
P26.00	HDO2 output type	0: Open collector high-speed pulse output 1: Open collector output	0	◎

Function code	Name	Description	Default	Modify
P26.01	HDO2 output selection	The same with P06.01	0	○
P26.02	Y2 output selection		0	○
P26.03	Y3 output selection		0	○
P26.04	Relay RO3 output selection		0	○
P26.05	Relay RO4 output selection		0	○
P26.06	Relay RO5 output selection		0	○
P26.07	Relay RO6 output selection		0	○
P26.08	Relay RO7 output selection		0	○
P26.09	Relay RO8 output selection		0	○
P26.10	Relay RO9 output selection		0	○
P26.11	Relay RO10 output selection		0	○
P26.12	Output terminal polarity of expansion card	0x0000–0x1FFF Bit0: Y2 Bit1: Y3 Bit2: HDO2 Bit3: RO3 Bit4: RO4 Bit5: RO5 Bit6: RO6 Bit7: RO7 Bit8: RO8 Bit9: RO9 Bit10: RO10 Bit11: RO11 Bit12: RO12	0x0000	○
P26.13	HDO2 switch-on delay	Used to define the corresponding delay of the level variation from switch-on to switch-off. 	0.000s	○
P26.14	HDO2 switch-off delay		0.000s	○
P26.15	Y2 switch-on delay		0.000s	○
P26.16	Y2 switch-off delay		0.000s	○

Function code	Name	Description	Default	Modify
P26.17	Y3 switch-on delay	Setting range: 0.000–50.000s **Note: P26.13 and P26.14 are valid only when P26.00 is set to 1.**	0.000s	○
P26.18	Y3 switch-off delay		0.000s	○
P26.19	Relay RO3 switch-on delay		0.000s	○
P26.20	Relay RO3 switch-off delay		0.000s	○
P26.21	Relay RO4 switch-on delay		0.000s	○
P26.22	Relay RO4 switch-off delay		0.000s	○
P26.23	Relay RO5 switch-on delay		0.000s	○
P26.24	Relay RO5 switch-off delay		0.000s	○
P26.25	Relay RO6 switch-on delay		0.000s	○
P26.26	Relay RO6 switch-off delay		0.000s	○
P26.27	Relay RO7 switch-on delay		0.000s	○
P26.28	Relay RO7 switch-off delay		0.000s	○
P26.29	Relay RO8 switch-on delay		0.000s	○
P26.30	Relay RO8 switch-off delay		0.000s	○
P26.31	Relay RO9 switch-on delay		0.000s	○
P26.32	Relay RO9 switch-off delay		0.000s	○
P26.33	Relay RO10 switch-on delay		0.000s	○
P26.34	Relay RO10 switch-off delay		0.000s	○
P26.35	AO2 output selection	The same with P06.14	0	○
P26.36	AO3 output selection		0	○
P26.38	Lower limit of AO2 output	Above function codes define the relation between output value and analog output. When the output value exceeds the set max./min. output range, the upper/low limit of output will be adopted during	0.0%	○
P26.39	Corresponding AO2 output of lower limit		0.00V	○

Function code	Name	Description	Default	Modify
P26.40	Upper limit of AO2 output	calculation. When analog output is current output, 1mA	100.0%	○
P26.41	Corresponding AO2 output of upper limit	corresponds to 0.5V voltage. In different applications, 100% of output value corresponds to different analog outputs.	10.00V	○
P26.42	AO2 output filter time		0.000s	○
P26.43	Lower limit of AO3 output		0.0%	○
P26.44	Corresponding AO3 output of lower limit		0.00V	○
P26.45	Upper limit of AO3 output	Setting range of P26.38: -300.0%–P26.40	100.0%	○
P26.46	Corresponding AO3 output of upper limit	Setting range of P26.39: 0.00V–10.00V Setting range of P26.40: P26.38–100.0%	10.00V	○
P26.47	AO3 output filter time	Setting range of P26.41: 0.00V–10.00V Setting range of P26.42: 0.000s–10.000s Setting range of P26.43: -300.0%–P26.45 Setting range of P26.44: 0.00V–10.00V Setting range of P26.45: P26.43–300.0% Setting range of P26.46: 0.00V–10.00V Setting range of P26.47: 0.000s–10.000s	0.000s	○
P26.48–P26.52	Reserved			
P27 group—Programmable expansion card functions				
P27.00	Enabling programmable card	0–1 This function is reserved.	0	◎
P27.01	I_WrP1	0–65535 Used to write a value to WrP1 of the programmable card.	0	○
P27.02	I_WrP2	0–65535 Used to write a value to WrP2 of the programmable card.	0	○
P27.03	I_WrP3	0–65535 Used to write a value to WrP3 of the programmable card.	0	○
P27.04	I_WrP4	0–65535 Used to write a value to WrP4 of the programmable card.	0	○
P27.05	I_WrP5	0–65535 Used to write a value to WrP5 of the programmable card.	0	○

Function code	Name	Description	Default	Modify
P27.06	I_WrP6	0–65535 Used to write a value to WrP6 of the programmable card.	0	○
P27.07	I_WrP7	0–65535 Used to write a value to WrP7 of the programmable card.	0	○
P27.08	I_WrP8	0–65535 Used to write a value to WrP8 of the programmable card.	0	○
P27.09	I_WrP9	0–65535 Used to write a value to WrP9 of the programmable card.	0	○
P27.10	I_WrP10	0–65535 Used to write a value to WrP10 of the programmable card.	0	○
P27.11	Programmable card status	0–1 Used to display the status of the programmable card. 0: Stopped 1: Running	0	●
P27.12	C_MoP1	0–65535 Used to monitor/view the MoP1 value of the programmable card.	0	●
P27.13	C_MoP2	0–65535 Used to monitor/view the MoP2 value of the programmable card.	0	●
P27.14	C_MoP3	0–65535 Used to monitor/view the MoP3 value of the programmable card.	0	●
P27.15	C_MoP4	0–65535 Used to monitor/view the MoP4 value of the programmable card.	0	●
P27.16	C_MoP5	0–65535 Used to monitor/view the MoP5 value of the programmable card.	0	●
P27.17	C_MoP6	0–65535 Used to monitor/view the MoP6 value of the programmable card.	0	●
P27.18	C_MoP7	0–65535 Used to monitor/view the MoP7 value of the programmable card.	0	●

Function code	Name	Description	Default	Modify
P27.19	C_MoP8	0–65535 Used to monitor/view the MoP8 value of the programmable card.	0	●
P27.20	C_MoP9	0–65535 Used to monitor/view the MoP9 value of the programmable card.	0	●
P27.21	C_MoP10	0–65535 Used to monitor/view the MoP10 value of the programmable card.	0	●
P27.22	Digital input terminal status of programmable card	0x00–0x3F Bit5–Bit0 indicate PS6–PS1 respectively.	0x00	●
P27.23	Digital output terminal status of programmable card	0x0–0x3 Bit0 indicates PRO1, and Bit1 indicates PRO2.	0x0	●
P27.24	AI1 of the programmable card	0–10.00V/0.00–20.00mA AI1 value from the programmable card.	0	●
P27.25	AO1 of programmable card	0–10.00V/0.00–20.00mA AO1 value from the programmable card.	0	●
P27.26	Length of data sent by programmable card and PZD communication object	0x00–0x28 Ones place: Number of the programmable card sent. The number of sent data is 12*digit on the ones place. 3: The inverter sends 24+60 variables and the programmable card sends 36 variables. This is the default delivery method for generic variables. 5: The inverter sends 48+60 variables and the programmable card sends 60 variables. This is how the programmable card on the inverter communicates with the DP/CANopen/PN card through (24+24) PZDs. 8: The inverter sends 96+96 variables and the programmable card sends 96 variables. You can use other values (not 3/5/8), but only if you know which variables correspond to the selected values. Using other values only changes data volumn sent by the programmable card, but not the number of variables sent by the inverter. The inverter still sends 24+60 by default. Tens place: Card that communicates with the programmable card via PZD (Only valid when the ones of P27.26 is 5) 0: DP 1: CANopen	0x03	○

Function code	Name	Description	Default	Modify
		2: PN **Note:** P27.26 can be changed at any time, but the change will only take effect after the re-power on.		
P27.27	Programmable card save function at power failure	0–1 0: Disable 1: Enable	1	◎
P28 group—Master/slave control				
P28.00	Master/slave mode	0: Master/slave control is invalid 1: The local machine is a master 2: The local machine is a slave	0	◎
P28.01	Master/slave communication data selection	0: CAN 1: Reserved	0	◎
P28.02	Master/slave control mode	Ones place: Master/slave running mode selection 0: Master/slave mode 0 (The master and slave adopt speed control and maintain the power balance by droop control) 1: Master/slave mode 1 (The master and slave must be in the same type of vector control mode. The master is speed control, and the slave will be forced to be in the torque control mode. 2: Master/slave mode 2 Start in the slave first speed mode (master/slave mode 0) and then switch to torque mode at a certain frequency point (master/slave mode 1) Tens place: Slave start command source selection 0: Follow the master to start 1: Determined by P00.01 Hundreds place: Slave transmitting/master receiving data enable 0: Enable 1: Disable	0x001	◎
P28.03	Slave speed gain	0.0–500.0%	100.0%	○
P28.04	Slave torque gain	0.0–500.0%	100.0%	○
P28.05	Speed/torque mode switching frequency point in master/slave mode 2	0.00–10.00Hz	5.00Hz	○
P28.06	Slave count	0–15	1	◎
P28.07–P28.08	Reserved			

Function code	Name	Description	Default	Modify
P28.09	CAN slave torque offset	-100.0–100.0%	0.0%	○
P28.10	Enabling EC PT100/PT1000 to detect temperature	0x00–0x11 Ones place: PT100 temperature detection 0: Disable 1: Enable Tens place: PT1000 temperature detection 0: Disable 1: Enable	0x00	◎
P28.11	EC PT100 detected OH protection threshold	Protection threshold of overheating (OH) detected by the expansion card (EC) with PT100. 0.0–150.0°C	120.0°C	○
P28.12	EC PT100 detected OH pre-alarm threshold	Pre-alarm threshold of OH detected by the EC with PT100. 0.0–150.0°C	100.0°C	○
P28.13	EC PT100 detected temperature calibration upper limit	Calibration upper limit of temperature detected by the EC with PT100. 50.0–150.0°C	120.0°C	○
P28.14	EC PT100 detected temperature calibration lower limit	Calibration lower limit of temperature detected by the EC with PT100. -20.0–50.0°C	10.0°C	○
P28.15	EC PT100 calibration upper limit digital	0–4096	2950	○
P28.16	EC PT100 calibration lower limit digital	0–4096	1270	○
P28.17	EC PT1000 detected OH protection threshold	0.0–150.0°C	120.0°C	○
P28.18	EC PT1000 detected OH pre-alarm threshold	0.0–150.0°C	100.0°C	○
P28.19	PT1000 detected temperature calibration upper limit	50.0–150.0°C	120.0°C	○
P28.20	EC PT1000 detected temperature calibration lower limit	-20.0–50.0°C	10.0°C	○
P28.21	EC PT1000 calibration upper limit digital	0–4096	3100	○
P28.22	EC PT1000 calibration lower limit digital	0–4096	1100	○

Function code	Name	Description	Default	Modify
P28.23	Detecting for PT100/PT1000 disconnection from EC	0x00–0x11 Ones place: PT100 disconnection detection 0: Disable 1: Enable Tens place: PT1000 disconnection detection 0: Disable 1: Enable	0x00	◎
P28.24	Enabling digital calibration in EC PT100/PT1000 temperature detection	0–4 0: Disable 1: Enable PT100 lower limit digital calibration. 2: Enable PT100 upper limit digital calibration. 3: Enable PT1000 lower limit digital calibration. 4: Enable PT1000 upper limit digital calibration.	0	○
P28.25	Type of sensor for AI/AO card to detect motor temperature	0–3 0: No temperature sensor 1: PT100 2: PT1000 3: KTY84 **Note:** Temperature is displayed through P19.11. To measure temperature, switch the output of AO1 to current, and connect one end of the temperature resistor to AI1 and AO1, and the other end to GND.	0	◎
P28.26	AI/AO detected motor OH protection threshold	0.0–200.0°C **Note:** When the motor temperature exceeds the threshold, the inverter releases the OT alarm.	110.0°C	○
P28.27	AI/AO detected motor OH pre-alarm threshold	0.0–200.0°C **Note:** When the motor temperature exceeds the value, the DO terminal with function 48 (AI detected motor OH pre-alarm) outputs a valid signal.	90.0°C	○
P90 group—Customized function group 1				
P90.00–P90.39	Reserved	0–65535	0	○
P91 group—Customized function group 2				
P91.00–P91.39	Reserved	0–65535	0	○
P92 group—Customized function group 3				
P92.00–P92.39	Reserved	0–65535	0	○
P93 group—Customized function group 4				
P93.00–P93.39	Reserved	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 VFD 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 examination	1. Conform to the standards 2. There are no tools or dangerous objects
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

Check item		Check content	Check method	Criterion
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.
Main circuit	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
Main circuit	Terminal block	The terminal block is not broken	Visual examination	NA
Main circuit	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 value*0.85.
Main circuit	Transformer and reactor	No abnormal vibration, noise and odor	Hearing, visual examination, smelling	NA
Main circuit	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

Check item		Check content	Check method	Criterion
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 communication

8.1 Modbus protocol overview

This chapter describes the communication protocols supported by the VFD.

The VFD provides RS485 communication interfaces and adopts the master/slave communication based on the international standard Modbus communication protocol. You can implement centralized control (setting commands for controlling the VFD, modifying the running frequency and related function parameters, and monitoring the running status and fault information of the VFD) through PC/PLC, upper control computers, or other devices to meet specific application requirements.

8.2 Modbus protocol introduction

Modbus is a software protocol, a common language used in electronic controllers. By using this protocol, a controller can communicate with other devices through transmission lines. It is a general industrial standard. With this standard, control devices produced by different manufacturers can be connected to form an industrial network and be monitored in a centralized way.

The Modbus protocol provides two transmission modes, namely American Standard Code for Information Interchange (ASCII) and Remote Terminal Unit (RTU). On one Modbus network, all the devices must be consistent in transmission modes, baud rates, data bits, check bits, stop bits, and other basic parameters.

A Modbus network is a control network with one master and multiple slaves, that is, on one Modbus network, there is only one device serving as the master, and other devices are the slaves. The master can communicate with one slave or all the slaves by sending broadcast messages. For separate access commands, a slave needs to return a response. For broadcast messages, slaves do not need to return responses.

8.3 Application of Modbus

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

8.3.1 RS485

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

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

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

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

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

8.3.1.1 When one VFD is used

Figure 8-1 is the Modbus wiring diagram for the network with one VFD and PC. Generally, PCs do not provide RS485 interfaces, and therefore you need to convert an RS232 or USB interface of a PC to an RS485 interface through a converter. Then, connect end A of the RS485 interface to the 485+ port on the terminal block of the VFD, and connect end B to the 485- port. It is recommended that you use shielded twisted pairs. When an RS232-RS485 converter is used, the cable used to connect the RS232 interface of the PC and the converter cannot be longer than 15 m. Use a short cable when possible. It is recommended that you insert the converter directly into the PC. Similarly, when a USB-RS485 converter is used, use a short cable when possible.

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

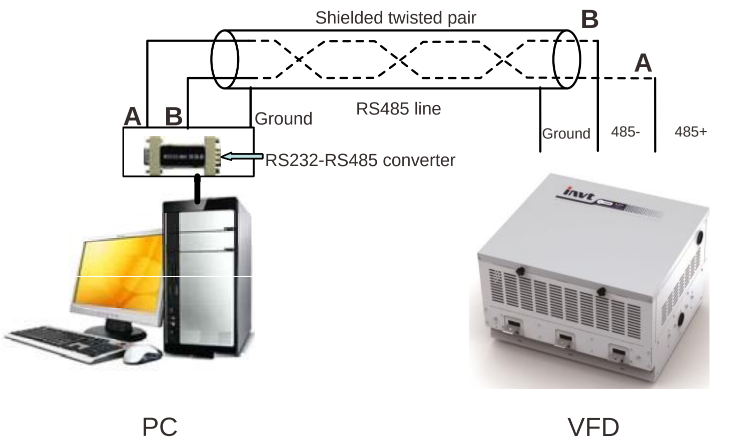


Figure 8-1 RS485 wiring diagram for the network with one VFD

8.3.1.2 When multiple VFDs are used

In the network with multiple VFDs, chrysanthemum connection and star connection are commonly used.

According to the requirements of the RS485 industrial bus standards, all the devices need to be connected in chrysanthemum mode with one 120 Ω terminal resistor on each end, as shown in Figure 8-2. Figure 8-3 is the simplified wiring diagram, and Figure 8-4 is the practical application diagram.

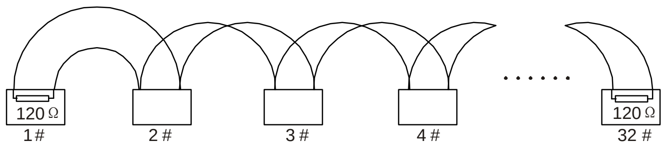


Figure 8-2 Onsite chrysanthemum connection diagram

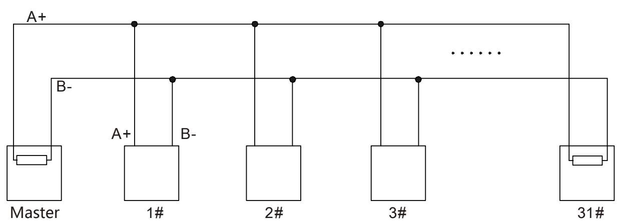


Figure 8-3 Simplified chrysanthemum connection diagram

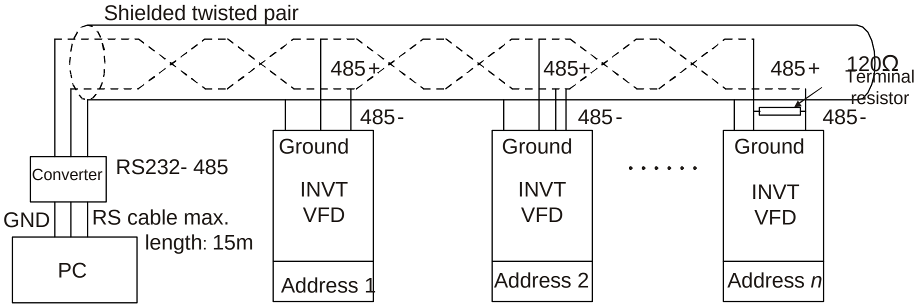


Figure 8-4 Practical application diagram of chrysanthemum connection

Figure 8-5 shows the start connection diagram. When this connection mode is adopted, the two devices that are farthest away from each other on the line must be connected with a terminal resistor (in this figure, the two devices are devices 1# and 15#).

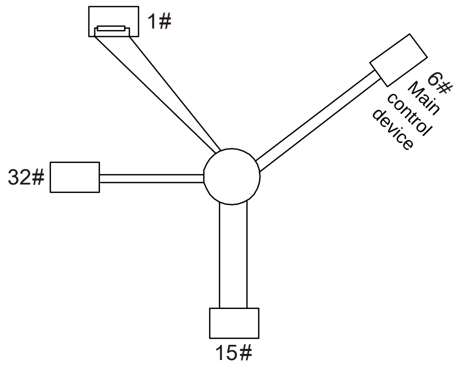


Figure 8-5 Star connection

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

8.3.2 RTU

8.3.2.1 RTU communication frame structure

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

Code system

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

Error detection domain

- Cyclic redundancy check (CRC)

The following table describes the data format.

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

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

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

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

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

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

RTU data frame format

Modbus packet

Start with a time gap (with a min. length of 3.5 bytes)	Slave address	Function code	Data	Check	End with a time gap (with a min. length of 3.5 bytes)

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

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

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

8.3.2.2 RTU communication frame error check modes

During the transmission of data, errors may occur due to various factors. Without check, the data receiving device cannot identify data errors and may make a wrong response. The wrong response may cause severe problems. Therefore, the data must be checked.

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

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

Bit check on individual bytes (odd/even check)

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

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

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

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

Cyclical Redundancy Check (CRC) method

A frame in the RTU format includes an error detection domain based on the CRC calculation. The CRC domain checks all the content of the frame. The CRC domain consists of two bytes, including 16 binary bits. It is calculated by the transmitter and added to the frame. The receiver calculates the CRC of the received frame, and compares the result with the value in the received CRC domain. If the two CRC values are not equal to each other, errors occur in the transmission.

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

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

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

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

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

```
    }
    return(crc_value);
}
```

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

8.4 RTU command code and communication data

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

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

The 03H command is used to read information including the parameters and running status of the VFD.

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

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

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

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

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

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

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

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

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

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

START	T1-T2-T3-T4 (time gap with a min. length of 3.5 bytes)
ADDR	01H
CMD	03H
Number of bytes	04H
High-order bit of data in 0004H	13H
Low-order bit of data in 0004H	88H
High-order bit of data in 0005H	00H
Low-order bit of data in 0005H	00H
CRC low-order bits	7EH
CRC high-order bits	9DH
END	T1-T2-T3-T4 (time gap with a min. length of 3.5 bytes)

The definition of the response information is described as follows:

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

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

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

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

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

8.4.2 Command word 06H, writing a word

This command is used by the master to write data to the VFD. One command can be used to write only one piece of data. It is used to modify the parameters and running mode of the VFD. For example, to write 5000 (1388H) to 0004H of the VFD whose address is 02H, the frame structures are described in the following.

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

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

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

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

Note: Sections 8.4.1 and 8.4.2 mainly describe the command formats. For the detailed application, see section 8.4.8.

8.4.3 Command code 08H, diagnosis

Sub-function code description:

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

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

RTU master command:

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

RTU slave response:

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

Data content low-order bit	ABH
CRC CHK low-order bit	ADH
CRC CHK high-order bit	14H
END	T1-T2-T3-T4 (time gap with a min. length of 3.5 bytes)

8.4.4 Command code 10H, continuous writing (valid only for the inverter)

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

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

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

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

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

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

8.4.5 Data address definition

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

8.4.5.1 Function code address format rules

The address of a function code consists of two bytes, with the high-order bit on the left and low-order bit on the right. The high-order bit ranges from 00 to ffH, and the low-order bit also ranges from 00 to ffH. The high-order bit is the hexadecimal form of the group number before the dot mark, and low-order bit is that of the number behind the dot mark. Take P05.06 as an example: The group number is 05, that is, the high-order bit of the parameter address is the hexadecimal form of 05; and the number behind the dot mark is 06, that is, the low-order bit is the hexadecimal form of 06. Therefore, the function code address is 0506H in the hexadecimal form. For example, the parameter address of P10.01 is 0A01H.

Function code	Name	Description	Setting range	Default	Modify
P10.00	Simple PLC mode	0: Stop after running once 1: Keep running with the final value after running once 2: Cyclic running	0–2	0	○
P10.01	Simple PLC memory selection	0: Without memory after power-off 1: With memory after power-off	0–1	0	○

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

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

8.4.5.2 Description of other function addresses

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

Table 8-1 Modbus function address list for the VFD rectifier

Function	Address	Data description	R/W
Communication-based control command	2000H	0001H: Forward running	W
		0002H:	
		0003H:	
		0004H:	
		0005H: Normal stop	
		0006H:	
		0007H: Fault reset	
		0008H:	
		0009H: Power-on buffering	

Function	Address	Data description	R/W
Communication-based value setting	2001H		W
	2002H	Active current setting (range: -1500–1500, 1000 corresponding to 100.0%)	
	2003H	Reactive current setting (range: -1500–1500, 1000 corresponding to 100.0%)	W
	2004H	DC bus voltage setting (unit: 0.1V)	W
	2005H		W
	2006H		W
	2007H		W
	2008H		W
	2009H	Special control command word: Bit0–1: Bit3–4: =00 Single-machine running mode =01: Master/slave running mode 1 =10: Master/slave running mode 2	W
	200AH	Virtual input terminal command. Range: 0x000–0xFF	W
	200BH	Virtual output terminal command. Range: 0x00–0x3F	W
	200CH		W
	200DH	AO setting 1 (-1000–1000, 1000 corresponding to 100.0%)	W
	200EH	AO setting 2 (-1000–1000, 1000 corresponding to 100.0%)	W
Rectifier status word 1	2100H	0001H: In running	R
		0002H:	
		0003H: Stopped	
		0004H: Faulty	
		0005H: In POFF state	
Rectifier status word 2	2101H	Bit0: =0: Bus voltage not established =1: Bus voltage established Bit4: =0: No overload alarm =1: Overload alarm Bit5–6: =00: Single-machine running mode =01: Master/slave running mode 1 =10: Master/slave running mode 2	R
Rectifier fault code	2102H	See the descriptions of fault types.	R
Rectifier identification code	2103H	GD2000-----0x0115	R

Table 8-2 Modbus function address list for the VFD inverter

Function	Address	Data description	R/W
Communication-based control command	2000H	0001H: Forward running 0002H: Reverse running 0003H: Forward jogging 0004H: Reverse jogging 0005H: Stop 0006H: Coast to stop (emergency stop) 0007H: Fault reset 0008H: Jogging to stop	R/W
Communication-based value setting	2001H	Communication-based frequency setting (0–Fmax, unit: 0.01 Hz)	R/W
	2002H	PID setting, range (0–1000, 1000 corresponding to 100.0%)	
	2003H	PID feedback, range (0–1000, 1000 corresponding to 100.0%)	R/W
	2004H	Torque setting (-3000 – +3000, 1000 corresponding to 100.0% of the motor rated current)	R/W
	2005H	Setting of the upper limit of the forward running frequency (0–Fmax, unit: 0.01 Hz)	R/W
	2006H	Setting of the upper limit of the reverse running frequency (0–Fmax, unit: 0.01 Hz)	R/W
	2007H	Upper limit of the electromotive torque (0–3000, 1000 corresponding to 100.0% of the motor rated current)	R/W
	2008H	Upper limit of the brake torque (0–3000, 1000 corresponding to 100.0% of the motor rated current)	R/W
	2009H	Special control command word: Bit0–1: =00: Motor 1 =01: Motor 2 =10: Motor 3 =11: Motor 4 Bit2: =1: Torque control =0: Speed control Bit3: =1: Clear electricity consumption =0: Keep electricity consumption Bit4:=1: Pre-excitation =0: Disable pre-excitation Bit5:=1: DC braking =0: Disable DC braking	R/W
	200AH	Virtual input terminal command; range:0x000–0x1FF	R/W
	200BH	Virtual output terminal command; range: 0x00–0x0F	R/W
	200CH	Voltage setting (used for V/F separation) (0–1000, 1000 corresponding to 100.0% of the motor rated voltage)	R/W

Function	Address	Data description		R/W
	200DH	AO output setting 1 (-1000–+1000, 1000 corresponding to 100.0%)		R/W
	200EH	AO output setting 2 (-1000–+1000, 1000 corresponding to 100.0%)		R/W
VFD status word 1	2100H	0001H: Forward running		R
		0002H: Reverse running		
		0003H: Stopped		
		0004H: Faulty		
		0005H: POFF		
		0006H: Pre-excited		
VFD status word 2	2101H	Bit0: =0: Not ready to run =1: Ready to run Bi1–2: =00: Motor 1 =01: Motor 2 =10: Motor 3 =11: Motor 4 Bit3 : =0: Asynchronous motor =1: Synchronous motor Bit4: =0: No overload alarm =1: Overload alarm Bit5–Bit6: =00: Keypad-based control =01: Terminal-based control =10: Communication control		R
VFD fault code	2102H	See the description of fault types.		R
VFD identification code	2103H	GD2000-----0x010a		R
Running frequency	3000H	0–Fmax (Unit: 0.01Hz)	Compatible with CHF100A and CHV100 communication addresses	R
Set frequency	3001H	0–Fmax (Unit: 0.01Hz)		R
Bus voltage	3002H	0.0–2000.0V (Unit: 0.1V)		R
Output voltage	3003H	0–1200V (Unit: 1V)		R
Output current	3004H	0.0–3000.0A (Unit: 0.1A)		R
Rotational speed	3005H	0–65535 (Unit: 1RPM)		R
Output power	3006H	-300.0–300.0% (Unit: 0.1%)		R
Output torque	3007H	-250.0–250.0% (Unit: 0.1%)		R
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 status	300AH	000–1FF		R
Output status	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

Function	Address	Data description		R/W
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 present step of multi-step speed	3012H	0–15		R
External length	3013H	0–65535		R
External counting value	3014H	0–65535		R
Torque setting	3015H	-300.0–300.0% (Unit: 0.1%)		R
VFD identification code	3016H			R
Fault code	5000H			R

The Read/Write (R/W) characteristics indicate whether a function can be read and written. For example, "Communication-based control command" can be written, and therefore the command code 06H is used to control the VFD. The R characteristic indicates that a function can only be read, and W indicates that a function can only be written.

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

Equipment code description:

Eight high-order bits of code	Meaning	Eight low-order bits of code	Meaning
0x01	GD	0x0115	GD2000 VFD rectifier
		0x010a	GD2000 VFD inverter

8.4.6 Fieldbus scale

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

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

The fieldbus scale depends on the number of decimals in the value specified in "Detailed parameter description" or "Default value". If there are *n* decimals in the value, the fieldbus scale m is the n^{th}-power of 10. Take the following table as an example, m is 10.

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

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

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

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

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

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

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

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

8.4.7 Error message response

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

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

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

Code	Name	Description
08H	Parameter cannot be modified in running	The parameter to be modified in the write operation of the upper computer cannot be modified during the running of the VFD.
09H	Password protection	A user password is set, and the upper computer does not provide the password to unlock the system when performing a read or write operation. The error of "system locked" is reported.

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

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

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

For an exception response, the following code is returned:

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

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

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

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

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

01	86	04	43 A3
VFD address	Exception response code	Error code	CRC

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

8.4.8 Read/Write operation example

For details about the formats of the read and write commands, see sections 8.4.1 and 8.4.2.

8.4.8.1 Examples of read command 03H

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

The read command transmitted to the VFD is as follows:

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

Assume that the following response is returned:

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

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

Example 2: View information about the VFD whose address is 03H, including "Present fault type" (P07.27) to "5th-last fault type" (P07.32) of which the parameter addresses are 071BH to 0720H (contiguous 6 parameter addresses starting from 071BH).

The command transmitted to the VFD is as follows:

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

Assume that the following response is returned:

03	03	0C	00 23	00 23	00 23	00 23	00 23	00 23	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

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

8.4.8.2 Examples of write command 06H

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

Function	Address	Data description	R/W
Communication-based control command	2000H	0001H: Forward running	W
		0002H: Reverse running	
		0003H: Forward jogging	
		0004H: Reverse jogging	
		0005H: Stop	
		0006H: Coast to stop (emergency stop)	
		0007H: Fault reset	
		0008H: Jogging to stop	
		0009H: Pre-exciting	

The command transmitted by the master is as follows:

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

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

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

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

Function code	Name	Description	Setting range	Default	Modify
P00.03	Max. output frequency	P00.04–600.00H (400.00Hz)	100.00–600.00	50.00Hz	◎

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

The command transmitted by the master is as follows:

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

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

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

8.4.8.3 Examples of continuously write command 10H (valid only to the VFD inverter)

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

Function	Address	Data description	R/W
Communication-based control command	2000H	0001H: Forward running	R/W
		0002H: Reverse running	
		0003H: Forward jogging	
		0004H: Reverse jogging	
		0005H: Stop	
		0006H: Coast to stop (emergency stop)	
		0007H: Fault reset	
		0008H: Jogging to stop	
Communication-based value setting	2001H	Communication-based frequency setting (0–Fmax, unit: 0.01 Hz)	R/W
	2002H	PID setting, range (0–1000, 1000 corresponding to 100.0%)	

In the actual operation, set P00.01 to 2 and P00.06 to 8.

The command transmitted by the master is as follows:

01	10	20 00	00 02	04	00 01	03 E8	3B 10
VFD address	Continuous write command	Parameter address	Parameter quantity	Number of bytes	Froward running	10 Hz	CRC

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

01	10	20 00	00 02	4A 08
VFD address	Continuous write command	Parameter address	Parameter quantity	CRC

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

Function code	Name	Description	Default	Mofdify
P00.11	ACC time 1	Setting range of P00.11 and P00.12: 0.0–3600.0s	Model depended	○
P00.12	DEC time 1		Model depended	○

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

The command transmitted by the master is as follows:

01	10	00 0B	00 02	04	00 64	00 C8	F2 55
VFD address	Continuous write command	Parameter address	Parameter quantity	Number of bytes	10s	20s	CRC

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

01	10	00 0B	00 02	30 0A
VFD address	Continuous write command	Parameter address	Parameter quantity	CRC

Note: In the preceding command description, spaces are added to a command just for explanatory purposes. In practical applications, no space is required in the commands.

8.4.8.4 Modbus communication commissioning example

A PC is used as the host, an RS232-RS485 converter is used for signal conversion, and the PC serial port used by the converter is COM1 (an RS232 port). The upper computer commissioning software is the serial port commissioning assistant Commix, which can be downloaded from the Internet. Download a version that can automatically execute the CRC check function. The following figure shows the interface of Commix.

First, set the serial port to **COM1**. Then, set the baud rate consistently with P14.01. The data bits, check bits, and end bits must be set consistently with P14.02. If the RTU mode is selected, you need to select the hexadecimal form **Input HEX**. To set the software to automatically execute the CRC function, you need to select **ModbusRTU**, select **CRC16 (MODBU SRTU)**, and set the start byte to **1**. After the auto CRC check function is enabled, do not enter CRC information in commands. Otherwise, command errors may occur due to repeated CRC check.

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

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

Note:

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 faults

Common communication faults include the following:

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

Possible causes of no response include the following:

- The serial port is set incorrectly. For example, the converter uses the serial port COM1, but COM2 is selected for the communication.
- The settings of the baud rates, data bits, end bits, and check bits are inconsistent with those set on the VFD.
- The positive pole (+) and negative pole (-) of the RS485 bus are connected reversely.
- The RS485 wire cap on the VFD terminal block is not connected.

8.6 Related function codes

8.6.1 Related to the VFD PWM rectifier

Function code	Name	Description	Setting range	Default
P20.00	Local communication address	1–247; 0 indicates a broadcast address	1–247	1
P20.01	Communication baud rate	0: 1200BPS 1: 2400BPS 2: 4800BPS 3: 9600BPS 4: 19200BPS 5: 38400BPS	0–5	4
P20.02	Data bit check	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

Function code	Name	Description	Setting range	Default
P20.03	Communication response delay	0–200ms	0–200	5
P20.04	Communication timeout time	0.0 (invalid); 0.1–60.0s	0.0–60.0s	0.0s
P20.05	Transmission error processing	0: Report an alarm and coast to stop 1: Keep running without reporting an alarm 2: Stop in enabled stop mode without reporting an alarm (applicable only to communication mode) 3: Stop in enabled stop mode without reporting an alarm (applicable to any mode)	0–3	0
P20.06	Communication processing action	0x00–0x11 LED ones place: 0: Respond to write operations 1: Not respond to write operations LED tens place: 0: Reserved 1: Reserved	0x00–0x11	0x00

8.6.2 Related to the VFD inverter

Function code	Name	Description	Setting range	Default
P14.00	Local communication address	1–247; 0 indicates a broadcast address	1–247	1
P14.01	Communication baud rate	0: 1200BPS 1: 2400BPS 2: 4800BPS 3: 9600BPS 4: 19200BPS 5: 38400BPS 6: 57600BPS 7: 11200BPS	0–7	4
P14.02	Data bit check	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	Communication timeout time	0.0 (invalid); 0.1–60.0s	0.0–60.0	0.0s

Function code	Name	Description	Setting range	Default
P14.05	Transmission error processing	0: Report an alarm and coast to stop 1: Keep running without reporting an alarm 2: Stop in enabled stop mode without reporting an alarm (applicable only to communication mode) 3: Stop in enabled stop mode without reporting an alarm (applicable to any mode)	0–3	0
P14.06	Communication processing action	Ones place: 0: Write operation has response 1: Write operation has no response Tens place: 0: Communication password protection is invalid 1: Communication password protection is valid Hundreds place: Valid only for RS485 communication 0: User-defined addresses specified by P14.07 and P14.08 are invalid 1: User-defined addresses specified by P14.07 and P14.08 are valid	0x00–0x11	0x00

9 Optional peripheral accessories

9.1 Optional cards

The following table lists the supported cards of the VFD.

Name	Model	Specifications
I/O expansion card	EC-IO501-00	● 4 digital inputs ● 1 digital output ● 1 analog input ● 1 analog output ● 2 relay outputs: 1 double-contact output, and 1 single-contact output
IO expansion card 2	EC-IO502-00	● 4 digital inputs ● 1 PT100 ● 1 PT1000 ● 2 relay outputs: single-contact output
Programmable expansion card	EC-PC502-00	● Adopting the global mainstream development environment PLC, supporting multiple types of programming languages, such as the instruction language, structural text, function block diagram, ladder diagram, continuous function chart, and sequential function chart ● Supporting breakpoint commissioning and periodic task run mode selection ● Providing user program storage space of 16K steps, and data storage space of 8K words ● 6 digital inputs ● 2 relay outputs ● 1 AI and 1 AO ● 1 RS485 communication channel, supporting the host controller to switch the master/slave ● Saving data of 1K words at power down
Bluetooth communication card	EC-TX501-1 EC-TX501-2	● Supporting Bluetooth 4.0 ● With INVT's mobile phone APP, you can set the parameters and monitor the states of the VFD through Bluetooth ● The maximum communication distance in open environments is 30 m. ● EC-TX501-1 is equipped with a built-in antenna and applicable to molded case machines. ● EC-TX501-2 is configured with an external sucker antenna and applicable to sheet metal machines.
WIFI communication card	EC-TX502-1 EC-TX502-2	● Meeting IEEE802.11b/g/n； ● With INVT's mobile phone APP, you can monitor the VFD

Name	Model	Specifications
		locally or remotely through WIFI communication ● The maximum communication distance in open environments is 30 m. ● EC-TX502-1 is equipped with a built-in antenna and applicable to molded case machines. ● EC-TX502-2 is configured with an external sucker antenna and applicable to sheetmetal machines.
PROFIBUS-DP communication card	EC-TX503	Supporting the PROFIBUS-DP protocol
Ethernet communication card	EC-TX504	● Supporting Ethernet communication with INVT's internal protocol ● Can be used in combination with INVT's upper computer monitoring software INVT Studio
CANopen communication card	EC-TX505	● Based on the CAN2.0A physical layer ● Supporting the CANopen protocol
PROFINET communication card	EC-TX509	Supporting the PROFINET protocol
Ethernet/IP communication card	EC-TX510	● Supporting the Ethernet IP protocol and ODVA protocol ● With two Ethernet IP ports, supporting 10/100M half/full duplex operating ● Supporting star, line, and ring network topologies (but not supporting ring network monitoring)
CAN master/slave control communication card	EC-TX511	● Based on the CAN2.0B physical layer ● Adopting INVT's master-slave control proprietary protocol
Modbus TCP communication card	EC-TX515	● With two Modbus TCP IO ports, supporting 100M full duplex operating, and supporting line and star network topologies, with the nodes up to 32 ● Able to function as a Modbus TCP slave
Sin/Cos PG card	EC-PG502	● Applicable to Sin/Cos encoders with or without CD signals ● Supporting A, B, Z frequency-divided output ● Supporting pulse string reference input
UVW incremental PG card	EC-PG503-05	● Applicable to differential encoders of 5V ● Supporting the orthogonal input of A, B, and Z ● Supporting pulse input of phase U, V, and W ● Supporting the frequency-divided output of A, B, and Z ● Supporting the input of pulse string reference
Resolver PG card	EC-PG504-00	● Applicable to resolver encoders ● Supporting frequency-divided output of resolver-simulated A, B, Z ● Supporting the input of pulse string reference

Name	Model	Specifications
Multifunction incremental PG card	EC-PG505-12	● Applicable to OC encoders of 5V or 12V ● Applicable to push-pull encoders of 5V or 12V ● Applicable to differential encoders of 5V ● Supporting the orthogonal input of A, B, and Z ● Supporting the frequency-divided output of A, B, and Z ● Supporting the input of pulse string reference
24V incremental PG card	EC-PG505-24	● Applicable to 24V OC encoders ● Applicable to 24V push-pull encoders ● Applicable to 5V differential encoders ● Supporting A, B, Z orthogonal input ● Supporting A, B, Z frequency-divided output ● Supporting the input of pulse string reference
Simplified incremental PG card	EC-PG507-12	● Applicable to 5V or 24V OC encoders ● Applicable to 5V or 12V push-pull encoders ● Applicable to 5V differential encoders
24V simplified incremental PG card	EC-PG507-24	● Applicable to 24V OC encoders ● Applicable to 24V push-pull encoders ● Applicable to 24V differential encoders
GPRS card	EC–IC501-2	● Supporting IoT monitoring ● Supporting remote VFD upgrade

9.2 Reactors

We provide reactors for your selection. Reactors are standard configuration for four-quadrant VFD models.

Reactor models for two-quadrant VFD models

VFD model	Input reactor	Output reactor
GD2000-01-075G-06	ACL120A02006-1	OCL120A01006-1
GD2000-01-090G-06		
GD2000-01-110G-06		
GD2000-01-132G-06	ACL190A01306-1	OCL218A00756-1
GD2000-01-160G-06		
GD2000-01-185G-06		
GD2000-01-200G-06	ACL290A00846-1	OCL270A00546-1
GD2000-01-250G-06		
GD2000-01-315G-06	ACL368A00736-1	OCL380A00386-1
GD2000-01-400G-06	ACL411A00596-1	OCL430A00356-1
GD2000-01-500G-06	ACL600A00406-1	OCL600A00246-1

Reactor models for four-quadrant VFD models

VFD model	Input reactor	PWM reactor	Output reactor
GD2000-11-075G-06	/	PWM70A17606-1	OCL120A01006-1
GD2000-11-090G-06	/	PWM100A13006-1	
GD2000-11-110G-06	/		
GD2000-11-132G-06	/	PWM120A09946-1	OCL218A00756-1
GD2000-11-160G-06	/	PWM175A08526-1	
GD2000-11-185G-06	/		
GD2000-11-200G-06	/	PWM184A06606-1	
GD2000-11-250G-06	ACL290A00846-1	PWM230A05206-1	OCL270A00546-1
GD2000-11-315G-06		PWM290A04206-1	OCL380A00386-1
GD2000-11-400G-06	ACL368A00736-1	PWM368A03306-1	OCL430A00356-1
GD2000-11-500G-06	ACL600A00406-1	PWM460A02606-1	OCL600A00246-1

9.3 Filters

We provide high-performance filters for your selection.

Filter models

VFD model	Input filter model	Output filter model
GD2000-01/11-075G-06 GD2000-01/11-090G-06	FLT-P06100H-B	FLT-L06100H-B
GD2000-01/11-110G-06 GD2000-01/11-185G-06	FLT-P06200H-B	FLT-L06200H-B
GD2000-01/11-200G-06 GD2000-01/11-280G-06	FLT-P06300H-B	FLT-L06300H-B
GD2000-01/11-315G-06 GD2000-01/11-350G-06	FLT-P06400H-B	FLT-L06400H-B
GD2000-01/11-400G-06 GD2000-01/11-500G-06	FLT-P061000H-B	FLT-L061000H-B

Note:

1. If the model you need is not found in the table, use a model of a larger current degree.

2. The filters are selected according to the models or rated currents in the table. For the VFDs of other manufacturers, you may make adjustment according to the rated currents.

3. Two-quadrant and four-quadrant VFD models at the same power use the same filter models.

Appendix A EMC installation guidelines

A.1 Installation guidelines compliable with EMC regulations

A.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.

A.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.

A.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, onsite wiring, grounding, leakage, and power filter use for reference.

A.1.3.1 Noise control

All the connections to the control terminals must use shielded cable. And the shield layer of the cable must ground near the cable 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.

The cable (motor cable) for connecting the VFD and the motor adopts a shielded cable or an independent wiring slot. The shield layer of the motor cable or the metal casing of the wiring slot is connected to the ground of the VFD and the other end is connected to the motor casing. If the noise filter is installed at the same time, the electromagnetic noise can be greatly suppressed.

A.1.3.2 Onsite wiring

Power supply wiring: In different control systems, the power incoming cable is supplied independently from the power transformer. Generally, it uses 5-core wires, of which 3 are live wires, 1 neutral wire, and 1 ground wire. The neutral wire and the ground wire cannot share the same wire.

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 (such as VFD, filter, PLC, and meter) 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: There are generally signal cables (weak current) and power cables (strong current) in the control cabinet. For the VFD, the power cables are divided into incoming and outgoing cables. During wiring, signal cables and power cables need to be arranged in different areas. It is not allowed 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. The incoming and outgoing cables of the power cannot be interlaced or bundled together, especially when installing a noise filter, which will cause electromagnetic noise to form a coupling through the distributed capacitance of the incoming and outgoing cables, thus making the noise filter useless.

A.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.

A.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, can not 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.

A.1.3.5 Noise filter

The noise filter can play a very good role in electromagnetic decoupling. Even if working conditions are met, it is recommended to install the noise filter.

There are actually two types of noise filters:

Noise filter installed at the input end of the VFD for isolation from other equipment

Noise filter or isolation transformer installed at the input of other equipment for isolation from the VFD

A.1.3.6 Other requirements

If you comply with the installation and wiring requirements described in the manual when installing the VFD and EMI filter, the following standards can be met:

✧ 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).

A.2 Interference handling

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:

A.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.

A.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.)

Service line:86-755-23535967 E-mail:overseas@invt.com.cn Website:www.invt.com

The products are owned by **Shenzhen INVT Electric Co.,Ltd.**

Two companies are commissioned to manufacture: (For product code, refer to the 2nd/3rd place of S/N on the name plate.)

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

INVT Power Electronics (Suzhou) Co.,Ltd. (origin code: 06)
Address: No. 1 Kunlun Mountain Road, Science & Technology Town, Gaoxin District, Suzhou, Jiangsu, China

Industrial Automation:
- HMI
- PLC
- VFD
- Servo System
- Elevator Intelligent Control System
- Rail Transit Traction System

Energy & Power:
- UPS
- DCIM
- Solar Inverter
- SVG
- New Energy Vehicle Powertrain System
- New Energy Vehicle Charging System
- New Energy Vehicle Motor

66001-00697

202202 (V1.2)