Operation Manual

Goodrive3000 Series
Medium Voltage VFD

SHENZHEN INVT ELECTRIC CO., LTD.

Preface

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

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

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

This manual instructs you how to install, wire, set parameters for, diagnose and remove faults for, and maintain the VFD, and also lists related precautions. Please read this manual carefully before the installation to ensure a proper installation and operation of the VFD.

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

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 indicator is turned 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 as our products has already been tested for voltage withstand at the factory. • 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 1600V 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. • Anyone wearing or implanted with electronic medical devices should stay 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 effectively reduce the VFD electromagnetic radiation, and guarantee personnel safety under any conditions. • Ensure the grounding cable diameters meet safety requirements. • When multiple cabinets are connected, each cabinet must be independently grounded. • To 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 must 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 Run

	• 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 Goodrive3000 series products.

	• The fiber should be handled very carefully. Do not touch the fiber optic conduction section (glass fiber) when inserting or extracting the fiber, because 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 Gooddrive3000 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

GD3000 - 01 - 400G - 12

① ② ③ ④

Figure 2-1 Product model designation

Table 2-1 Product model code description

Symbol	Field	Description
①	Product series	GD3000: Medium voltage three-level product
②	Sub-series	01: Two-quadrant module product of IP00 11: Four-quadrant module product of IP00 00: Standard two-quadrant product of IP20 10: Standard four-quadrant product of IP20 05: Standard two-quadrant product of IP54 15: Standard four-quadrant product of IP54
③	Rated power	075G: 75kW 500G: 500kW
④	Voltage class	06: 660V 12: 1140V 33: 3300V

2.2 Goodrive3000 two-quadrant VFD technical specifications

Table 2-2 Goodrive3000 two-quadrant VFD technical specifications

Description		Specifications
Power input	Rated input voltage (V)	AC 3PH 560V–760V; rated voltage: 660V AC 3PH 970V–1310V; rated voltage: 1140V AC 3PH 2805V–3795V (6-pulse rectifier); rated voltage: 3300V AC 3PH 1750V–1905V (12-pulse rectifier); rated voltage: 3300V
	Rated input current (A)	See 2.4.1.
	Rated frequency	50Hz/60Hz, fluctuation range: ±5%
	Efficiency (%)	More than 98%
Power output	Rated output current (A)	See 2.4.1.
	Rated output voltage (V)	0–Input voltage (V)
	Output power factor	0.85–0.95 (depend on different motors)
Running control feature	Control mode	V/F (V/F separation function), open loop vector, closed loop vector
	Max. output frequency	400Hz
	Motor parameter autotuning	Support for static and rotation autotuning
	Speed range	Closed loop vector: 1:1000 Open loop vector: 1:100

Description		Specifications
	Speed control accuracy	Closed loop vector: ±0.1% of max. speed Open loop vector: ±0.5% of max. speed
	Speed fluctuation	±0.3% (open loop vector) ±0.1% (closed loop vector)
	Current limit	Max. value can be set to 200% of rated current
	Speed tracking restart	Used to implement impact-free smooth startup for rotating motors
	Torque control accuracy	10% (open loop vector) 5% (closed loop vector)
	Starting torque	0.5Hz 150% (open loop vector) Zero frequency 180% (closed loop vector)
	Overload capacity	150% of rated current: 60s, 180% of rated current: 10s
	Important functions	Master-slave control, multi-step speed running, simple PLC, ACC/DEC time switch, S curve ACC/DEC, energy saving running, PID adjustment, MODBUS communication, droop control, torque control, switch between torque and speed control mode, and so on
Peripheral interface	Analog input	Two AIs: 12-bit resolution, error of ±1%, at 25°C One input of 0–10V or 0–20mA, which can be selected through J3 One input of -10–10V, which can be selected through function codes
	Analog output	Two AOs: 12-bit resolution, error of ±1%, at 25°C Output range: -10V–+10V or -20mA–+20mA Whether voltage or current is selected as the output type is set through J1 and J2
	Digital input	6 digital inputs
	Digital output	One open collector output; two relay output
	RS485	Support for MODBUS
	CAN communication	CAN communication can be use for master-slave control.
	Optical-fiber communication	Optical-fiber communication can be use for master-slave control.
Important protection function	Motor overtemperature protection	PT100 can be connected externally.
	Overload protection	150% of rated current: 60s, 180% of rated current: 10s
	Overvoltage protection	When the bus voltage is higher than the set overvoltage, report overvoltage
	Undervoltage protection	When the bus voltage is lower than the set undervoltage, report undervoltage
	Protection against input phase loss	Input phase loss detection
	Protection against output phrase loss	Output phase loss detection
	Overcurrent protection	Protect instantly at 220% of rated current, including ACC, DEC and constant speed overcurrent
	Protection against overheating	Rectifier diode and IGBT module temperature detection

Description		Specifications
	Overvoltage stalling protection	ACC, DEC and constant speed running protection, can set separately
	Protection against overcurrent stalling	ACC, DEC and constant speed running protection, can set separately
	Short-circuit protection	Short circuit protection in output phases and grounding short circuit protection
Other	Keypad	Standard configuration: LCD and 8 keys, with the copying function; compatible with the LED keypad
	Braking unit	A braking unit interface is available for externally connecting to braking circuit.
	Input reactor Output reactor	Optional parts
	Input filter Output filter	Optional parts
	Temperature of running environment	-10°C – +50°C. Derating is required when the ambient temperature exceeds 40°C.
	Relative humidity	5%–95%
	Storage temperature	-40°C–+70°C
	Altitude	Less than 1000 meters When the VFD installation site altitude exceeds 1000 meters, derate by 1% for every increase of 100 meters.
	IP rating	Main module: IP00 Cabinet of a standard product: IP20, IP54

2.3 Goodrive3000 four-quadrant VFD technical specifications

2.3.1 Goodrive3000 rectifier technical specifications

Table 2-3 Goodrive3000 PWM rectifier technical specifications

Description		Specifications
Power input	Rated input voltage (V)	AC 3PH 560V–760V; rated voltage: 660V AC 3PH 970V–1310V; rated voltage: 1140V AC 3PH 2805V–3795V; rated voltage: 3300V
	Rated input current (A)	See section 2.4.2
	Rated input frequency (Hz)	50Hz or 60Hz; Allowed range: 47–63Hz
	Efficiency (%)	More than 98%
	Input power factor	More than 0.99
Important protection function	Overload protection	150% of rated current: 60s, 180% of rated current: 10s
	Overvoltage protection	When the bus voltage is higher than the set overvoltage, report overvoltage
	Undervoltage protection	When the bus voltage is lower than the set undervoltage, report undervoltage

Description		Specifications
	Input overvoltage protection	When the input voltage is higher than the set overvoltage, report overvoltage
	Input undervoltage protection	When the input voltage is lower than the set undervoltage, report undervoltage
	Protection against input phase loss	Input phase loss detection
	Overcurrent protection	Protection against input overcurrent
	Protection against overheating	IGBT module temperature detection
Other	Keypad	Standard configuration: LCD and 8 keys, with the copying function; compatible with the LED keypad
	Temperature of running environment	-10°C – +50°C. Derating is required when the ambient temperature exceeds 40°C.
	Relative humidity	5%95%
	Storage temperature	-40°C–+70°C
	Altitude	Less than 1000 meters When the VFD installation site altitude exceeds 1000 meters; derate by 1% for every increase of 100 meters.
	IP rating	Main module: IP00 Cabinet of a standard product: IP20, IP54
	RS485	Support for MODBUS

2.3.2 Goodrive3000 inverter technical specifications

Table 2-4 Goodrive3000 inverter technical specifications

Description		Specifications
Power output	Rated output current (A)	See section 2.4.2.
	Rated output voltage (V)	0–Input voltage of rectifier
	Output power factor	0.85–0.95 (depend on different motors)
Running control feature	Control mode	V/F (V/F separation function), open loop vector, closed loop vector
	Max. output frequency	400Hz
	Motor parameter autotuning	Support for static and rotation autotuning
	Speed range	Closed loop vector: 1:1000 Open loop vector: 1:100
	Speed control accuracy	Closed loop vector: ±0.1% of max. speed Open loop vector: ±0.5% of max. speed
	Speed fluctuation	±0.3% (open loop vector) ±0.1% (closed loop vector)
	Current limit	Max. value can be set to 200% of rated current
	Speed tracking restart	Used to implement impact-free smooth startup for rotating motors

Description		Specifications
	Torque control accuracy	10% (open loop vector) 5% (closed loop vector)
	Starting torque	0.5Hz 150% (open loop vector) Zero frequency 180% (closed loop vector)
	Important functions	Master-slave control, multi-step speed running, simple PLC, ACC/DEC time switch, S curve ACC/DEC, energy saving running, PID adjustment, MODBUS communication, droop control, torque control, switch between torque and speed control mode, and so on
Peripheral interface	Analog input	Two AIs: 12-bit resolution, error of ±1%, at 25°C One input of 0–10V or 0–20mA, which can be selected through J3 One input of -10–10V, which can be selected through function codes
	Analog output	Two AOs: 12-bit resolution, error of ±1%, at 25°C Output range: -10V–+10V or -20mA–+20mA Whether voltage or current is selected as the output type is set through J1 and J2
	Digital input	6 digital inputs
	Digital output	One open collector output; two relay output
	RS485	Support for MODBUS
	CAN communication	CAN communication can be use for master-slave control.
	Optical-fiber communication	Optical-fiber communication can be use for master-slave control.
Important protection function	Motor overtemperature protection	PT100 can be connected externally.
	Overload protection	150% of rated current: 60s, 180% of rated current: 10s
	Overvoltage protection	When the bus voltage is higher than the set overvoltage, report overvoltage
	Undervoltage protection	When the bus voltage is lower than the set undervoltage, report undervoltage
	Overcurrent protection	Protect instantly at 220% of rated current, including ACC, DEC and constant speed overcurrent
	Protection against overheating	IGBT module temperature detection
	Overvoltage stalling protection	ACC, DEC and constant speed running protection, can set separately
	Protection against overcurrent stalling	ACC, DEC and constant speed running protection, can set separately
	Short-circuit protection	Short circuit protection in output phases and grounding short circuit protection
Other	Keypad	Standard configuration: LCD and 8 keys, with the copying function.
	Braking unit	A braking unit interface is available for externally connecting to braking circuit.
	Output reactor Input filter Output filter	Optional parts

Description		Specifications
	Temperature of running environment	-10°C – +50°C. Derating is required when the ambient temperature exceeds 40°C.
	Relative humidity	5%95%
	Storage temperature	-40°C–+70°C
	Altitude	Less than 1000 meters When the VFD installation site altitude exceeds 1000 meters, derate by 1% for every increase of 100 meters.
	IP rating	Main module: IP00 Cabinet of a standard product: IP20, IP54

2.4 Product ratings

2.4.1 Goodrive3000 two-quadrant VFD main ratings

Table 2-5 Goodrive3000 two-quadrant VFD main ratings

VFD model	Rated power (kW)	Rated input current (A)	Rated output current (A)
U_N=660V			
GD3000-01-110G-06	110	118	120
GD3000-01-160G-06	160	165	175
GD3000-01-200G-06	200	210	220
GD3000-01-250G-06	250	255	270
GD3000-01-315G-06	315	334	350
GD3000-01-400G-06	400	411	430
GD3000-01-500G-06	500	518	540
GD3000-01-630G-06	630	668	700
GD3000-01-800G-06	800	822	860

VFD model	Rated power (kW)	Rated input current (A)	Rated output current (A)
U_N=1140V			
GD3000-01-055G-12	55	34	36
GD3000-01-075G-12	75	47	50
GD3000-01-090G-12	90	56	60
GD3000-01-110G-12	110	68	73
GD3000-01-132G-12	132	82	85
GD3000-01-160G-12	160	98	104
GD3000-01-200G-12	200	122	128
GD3000-01-250G-12	250	150	160
GD3000-01-315G-12	315	185	195
GD3000-01-400G-12	400	235	250
GD3000-01-500G-12	500	300	310
GD3000-01-630G-12	630	380	395
GD3000-01-800G-12	800	480	500
GD3000-01-1000G-12	1000	600	620

VFD model	Rated power (kW)	Rated input current (A)	Rated output current (A)
U_N=3300V			
GD3000-01-1250G-33	1250	260	280

VFD model	Rated power (kW)	Rated input current (A)	Rated output current (A)
U_N=3300V			
GD3000-01-1500G-33	1500	300	320
GD3000-01-1600G-33	1600	330	360
GD3000-01-2500G-33	2500	540	565

2.4.2 Goodrive3000 four-quadrant VFD main ratings

Table 2-6 Goodrive3000 four-quadrant VFD main ratings

VFD model	Rated power (kW)	Rated input current (A)	Rated output current (A)
U_N=660V			
GD3000-11-110G-06	110	101	120
GD3000-11-160G-06	160	147	175
GD3000-11-200G-06	200	184	220
GD3000-11-250G-06	250	230	270
GD3000-11-315G-06	315	290	350
GD3000-11-400G-06	400	368	430
GD3000-11-500G-06	500	460	540
GD3000-11-630G-06	630	580	700
GD3000-11-800G-06	800	736	860

VFD model	Rated power (kW)	Rated input current (A)	Rated output current (A)
U_N=1140V			
GD3000-11-055G-12	55	30	36
GD3000-11-075G-12	75	40	50
GD3000-11-090G-12	90	49	60
GD3000-11-110G-12	110	58	73
GD3000-11-132G-12	132	70	85
GD3000-11-160G-12	160	85	104
GD3000-11-200G-12	200	106	128
GD3000-11-250G-12	250	133	160
GD3000-11-315G-12	315	168	195
GD3000-11-400G-12	400	213	250
GD3000-11-500G-12	500	265	310
GD3000-11-630G-12	630	335	395
GD3000-11-800G-12	800	425	500
GD3000-11-1000G-12	1000	530	620

VFD model	Rated power (kW)	Rated input current (A)	Rated output current (A)
U_N=3300V			
GD3000-11-1500G-33	1500	265	320
GD3000-11-2500G-33	2500	442	565

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
GB/T 12668.502-2013	Adjustable speed electrical power drive systems Part 5-2: Safety
GB/T 4208-2017	Degree of protection provided by enclosure (IP code)
GB/T 17626	Electromagnetic compatibility Testing and measurement techniques
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 standard)
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 guidance

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

Item	Specifications	
Transport and storage temperature	-40°C–70°C	No condensation or icing, which may be caused by sudden temperature change
Relative humidity	5%–95%. Even if the humidity meets the requirement, avoid the situations which can cause condensation and icing due to sudden temperature change.	
Air	Store the VFD in a place free of dust, direct sunshine, flammable gas, oil pollution, steam and vibration.	

(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℃. 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%
Air	Store the VFD in a place free of dust, direct sunshine, flammable gas, oil pollution, steam and vibration.

Item	Specifications
Altitude	Lower than 1000 meters. Derating is required when the altitude exceeds 1000 meters. See Table 3-3.
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 Derating due to altitude

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

3.4 Goodrive3000 control circuit terminals

3.4.1 Wiring diagram of Goodrive3000 control circuit

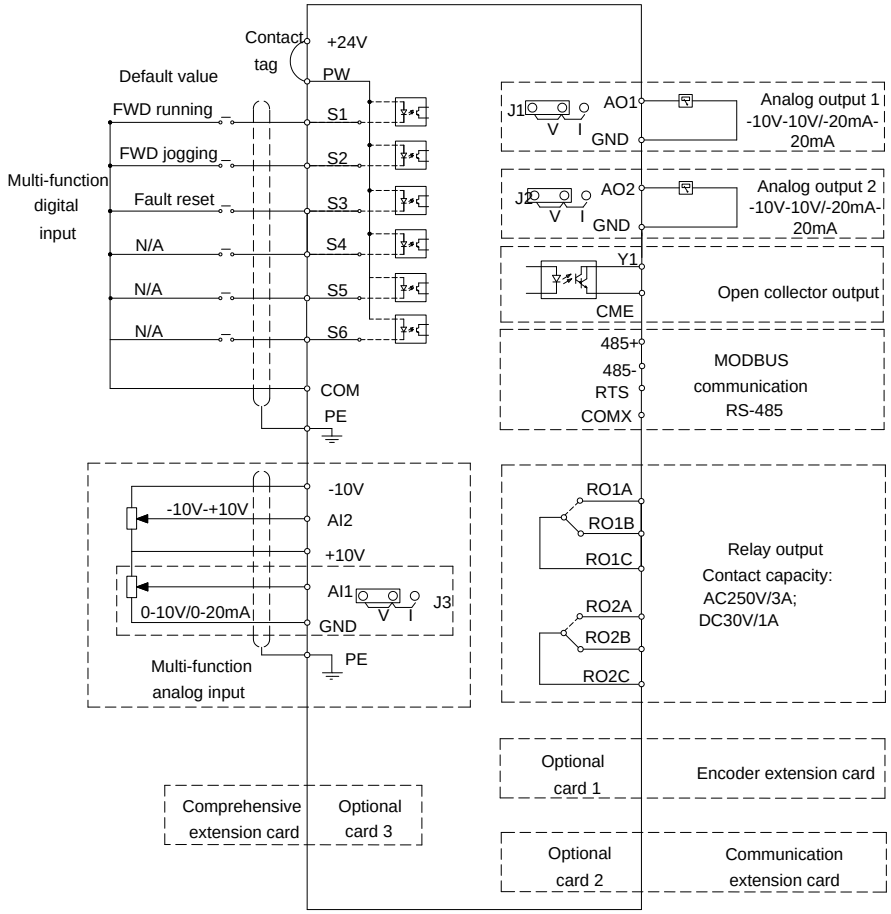


Figure 3-1 Wiring diagram of Goodrive3000 control circuit

3.4.2 Control circuit terminals

The control circuit terminal layout is as follows.

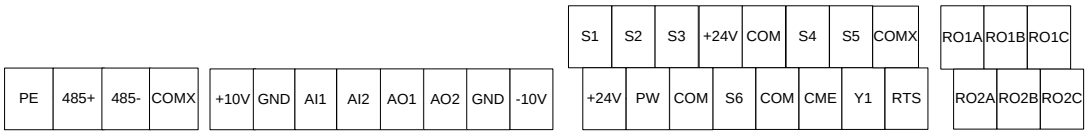


Figure 3-2 Control circuit terminals

The control circuit terminals are described in the following table.

Table 3-5 Control circuit terminals

Category	Terminal symbol	Terminal name	Description
Power supply	+10V	+10V reference power supply	GND reference Set point of 10.5V, Max. output current of 100mA, with output shortcircuit protection, accuracy of 1%
	-10V	-10V reference power supply	GND reference Set point of -10.5V, Max. output current of 20mA, with output shortcircuit protection, accuracy of 1%
	24V	24V power supply	COM reference With output shortcircuit protection, provide the power supply with a maximum current of 100mA, accuracy of 10%, generally as the the working power of switch input/output or the power of external sensor
	PW	External power	COM reference Provide the working power supply for switch input/output from external to internal Input voltage range: DC12–30V
Analog input	AI1	Analog input 1	GND reference 1. Input range: 0–10V or 0–20mA, 12bit resolution, error±1%, 25°C 2. Voltage or current input is determined by J3
	AI2	Analog input 2	GND reference 1. Input range: -10–10V, 12bit resolution, error±1%, 25°C 2. Voltage input is determined by the function code
Analog output	AO1	Analog output 1	GND reference 1. Output range: -10V–10V or -20mA–20mA, error±1%, 25°C 2. Voltage or current output is determined by J1 and J2
	AO2	Analog output 2	
Digital input/ output	S1	Digital input 1	COM reference 1. Internal impedance: 3.3kΩ 2. Bi-direction input terminal, supporting both NPN and PNP 3. 12–30V voltage input is acceptable 4. Max. input frequency: 1kHz
	S2	Digital input 2	
	S3	Digital input 3	
	S4	Digital input 4	
	S5	Digital input 5	
	S6	Digital input 6	
	Y1	Open collector output	CME reference 1. Switch capacity: 200mA/30V 2. Output frequency range: 0–1kHz, OC output 3. Input power: DC12–30V

Category	Terminal symbol	Terminal name	Description
Relay output	RO1A	NO contact of relay 1	1. Contact capacity: AC250V/3A, DC30V/1A 2. 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	
Communication	485+ 485- RTS COMX	RS485 communication	RS485 communication terminals, using the Modbus protocol RTS is 485 control signal
Other	PE	Shielding ground	For the grounding of shielded layers during terminal connections; can be connected to shielded layers of analog signal cable, 485 communication cable and motor cable

Note: The I/O extension card, communication card and PG card are optional. For details, see Chapter 11.

4 HMI

4.1 Keypad display

The LCD keypad is a standard configuration for Goodrive3000 series VFD. The following figures show the keypad appearances.

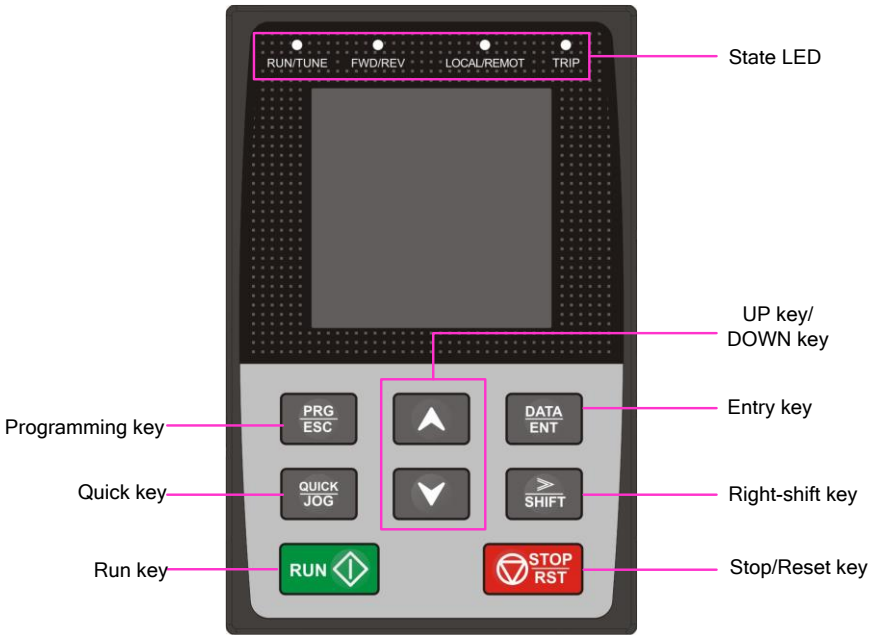


Figure 4-1 Keypad

4.1.1 Function of keys

Table 4-1 Function of keys

Key	Name	Function
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 display 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	When the VFD is in running state, this key is used to stop the VFD and the function of this key is restricted by P07.04. When the VFD is in faulty state, this key can be used to reset faults and it 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	Function
RUN + STOP RST	Combination	When RUN key and STOP/RST key are pressed simultaneously, the VFD will coast to stop

4.1.2 Indicator instruction

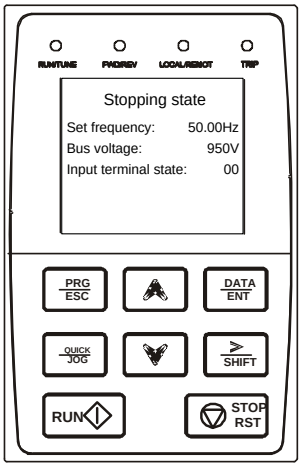
Table 4-2 Indicators

Indicator	Name	Indicator instruction
RUN/TUNE	State indicator	Off: The VFD is stopped Blinking: The VFD is in parameter autotuning 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	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

4.2 Keypad display

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

4.2.1 Displaying stopped-state parameters

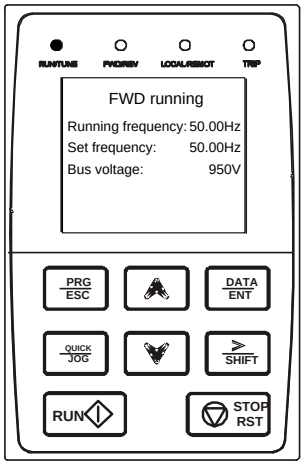


When the VFD is in stopped state, the keypad displays stopped-state parameters.

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 in Chapter 5 and the description of P07.07 in Chapter 6.

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

4.2.2 Displaying running-state parameters

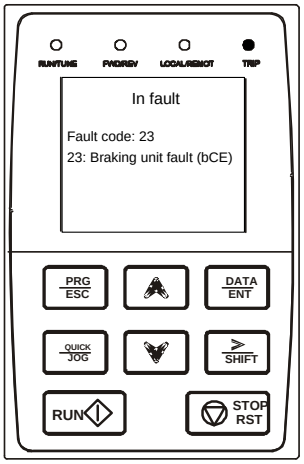


After receiving a valid running command, the VFD enters the running state, and the keypad displays running-state parameters, with the RUN/TUNE indicator on. The on/off state of the FWD/REV indicator is determined by the actual running direction. See the figure.

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, P07.05. For definitions of the bits, see the description of P07.05 in Chapter 5 and the description of P07.05 and P07.06 in Chapter 6.

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

4.2.3 Displaying fault information



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

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

4.2.4 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: GD3000; Other: reserved.

Goodrive3000 series English mode is selected by default.

4.2.5 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 both VFD rectifier and inverter). You can press the DATA/ENT key to enter the function parameter display interface. In 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.

4.3 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.

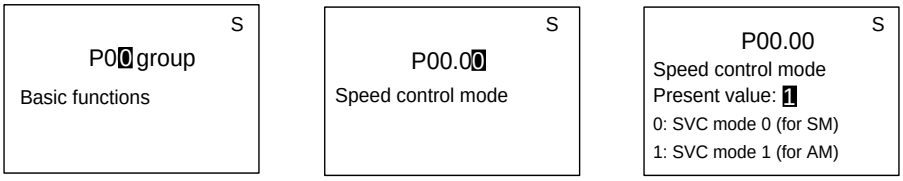


Figure 4-2 Three-level menu operation flowchart

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.

4.4 Keypad dimensions

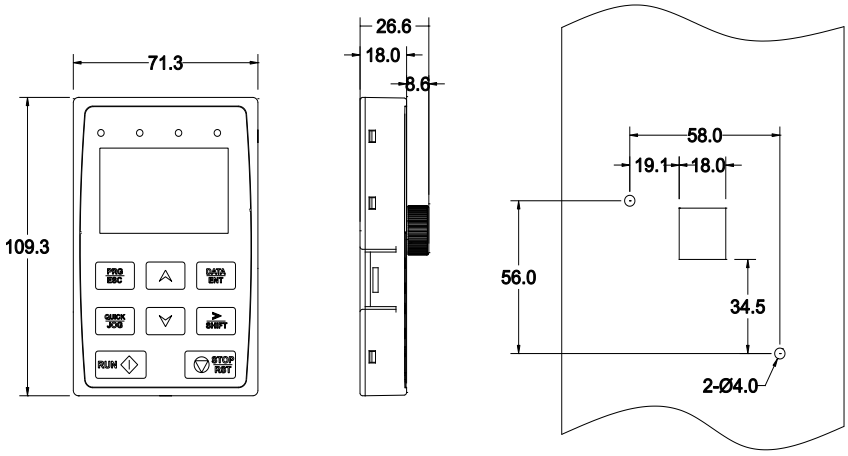


Figure 4-3 LCD keypad dimension

5 Goodrive3000 rectifier

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

5.1 Overview

The main circuit of PWM rectifier unit includes the LCL filter circuit, main contactor, buffer contactor, buffer resistor, IGBT power modules and bus 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.

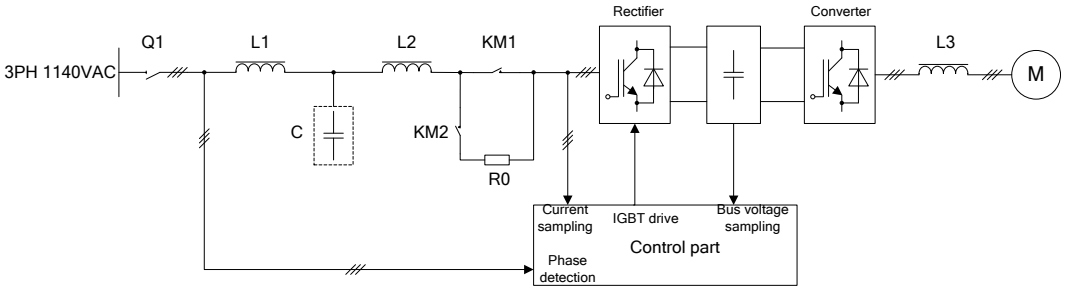


Figure 5-1 PWM rectifier working principle

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

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

After the conversion of PWM rectifier, 3-phase AC current can be provided as DC current into the DC bus and the DC circuit provides power to the motor.

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

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
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 (“LOCAL/REMOT” indicator off)

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

1: Terminal (“LOCAL/REMOT” indicator blinking)

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

2: Communication (“LOCAL/REMOT” indicator 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 3: CANopen 4–6: Reserved	0–6	0

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

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

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

The function code is used to select the running mode of the PWM rectifier.

0: COSφ mode. The reactive current is determined by the power factor.

Note: The mode 0 has voltage loop and the parameters in P03 group should be set for mode 0.

Function code	Name	Description	Setting range	Default
P00.04	DC bus voltage setting method	0: Automatic 1: Keypad 2: Reserved	0–2	1
P00.05	DC bus voltage setting	300.0–2100.0V	300.0–2100.0	Model depended

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

Mapping between voltages and DC bus voltages

Model	Factory default DC bus voltage (P00.05)	Overvoltage point
660V	1050V	1200V
1140V	1850V	2150V
3300V	5000V	6000V

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

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

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

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

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

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

Function code	Name	Description	Setting range	Default
P00.14	Carrier frequency	2.0–8.0kHz	2.0–8.0	Model depended
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.

P01 group—Power-on control and protection

Function code	Name	Description	Setting range	Default
P01.01	Detecting main contactor actuation feedback	0: Not detect 1: Detect	0–1	1

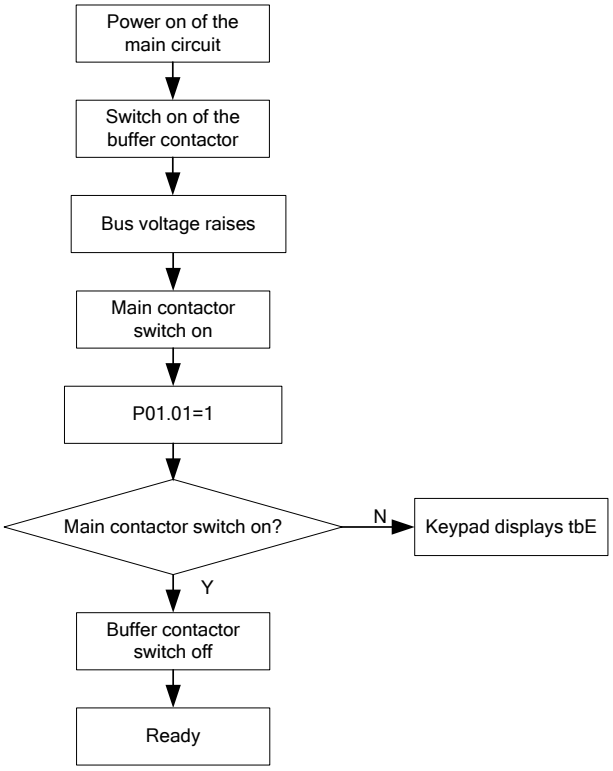
Pre-charging buffer circuit is in the rectification part and when the charging voltage exceeds the set value, the contactor is switched on and the charging resistor is switched off.

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

When P01.01=0, then there is no detection on main contactor fault (TbE).

Note: 1. The switching-on signal is only controlled by the control board.

2. For other power-on logics, a non-standard solution can be offered.



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

Function code	Name	Description	Setting range	Default
P01.06	Auto-running wait time	0–3600.0s	0–3600.0	0.0s

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

When P01.06 is set to a value but not 0.0s: the system will lock phase after power on. The system will operate automatically if it locks phase and detects successfully.

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

Note: 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
P01.08	Auto fault reset count	0–10	0–10	0

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. Fault reset is invalid for EF, dIS, PC_T1, OH1, OUT1, OUT2, and OUT3.

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

P02 group—Reserved parameters

Function code	Name	Description	Setting range	Default
P02.00–P02.07	Reserved			

P03 group—Control parameters

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

P03.10 indicates the max. current output limited by the rectifier automatic current limit function.

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

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	Bus voltage filter coefficient	0–1.000s	0–1.000s	0.000s

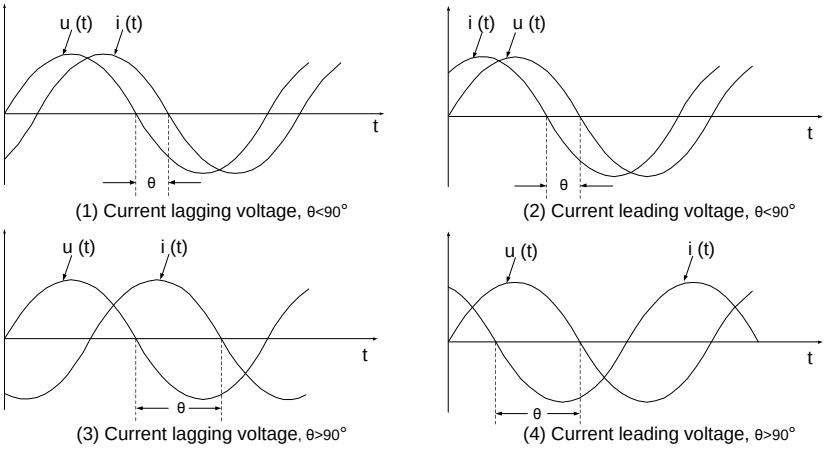
The function code indicates the bus voltage displayed on the keypad.

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

Note: 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: Reserved	0–1	0
P03.20	Rectifier power factor angle	-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			0.0°

P03.19–P03.21 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.



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

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.

Function code	Name	Description	Setting range	Default
P03.24	Overmodulation control selection	Determines whether to take inductive reactive power injection to improve the active current output capacity when the modulation system exceeds the overmodulation	0–1	0

Function code	Name	Description	Setting range	Default
		entry point 0: Invalid 1: Valid		
P03.25	Overmodulation entry point	0.0–100.0% (modulation degree)	0.0–100.0%	90.0%
P03.26	Overmodulation proportional coefficient P	0.001–60.000	0.001–60.000	5.000
P03.27	Overmodulation integral coefficient I	0.01–30.000	0.01–30.000	5.00
P03.28	Phase-lock loop integral	0–10	0–10	10
P03.29	Reserved			
P03.30	Enabling high grid voltage	0: Disable 1: Enable	0–1	
P03.31	High grid voltage adjustment Kp	0–10	0–10	0.2
P03.32	High grid voltage adjustment Ki	0–100	0–100	4
P03.33	PLL impedance adjustment coefficient	0.00–5.00	0.00–5.00	0
P03.34–P03.35	Reserved			
P03.36	Rectifier phase shifting compensation angle	The function code is used to compensate the phase angle of phase lock. A positive value indicates that the phase-locked angle is shifted right by the angle set by the function code, while a negative value indicates the phase-locked angle is shifted left. (Valid only for the six-pulse rectifier)	-30–+30	0
P03.37	Upper limit of voltage hysterisis	Bus voltage judgment hysteresis upper limit V_ZH = Input voltage (P08.06)*1.414 + P03.37; When the actual bus voltage is greater than V_ZH, the IGBT feedback enabling angle starts to increase slowly until it reaches 120 degrees. When the actual bus voltage is less than V_ZL (see P28.05), the IGBT feedback enabling angle starts to decrease slowly until it reaches the lower limit (see P03.38). (Valid only for the six-pulse rectifier)	-800.0–300.0	30.0V
P03.38	IGBT feedback enabling angle	During six-pulse rectifier mode, the feedback angle can be set through	0–120	100°

Function code	Name	Description	Setting range	Default
		the function code. The changes on the feedback angle will effect the current waveform. It is not recommended to modify this parameter. The feedback angle is set properly by default. (Valid only for the six-pulse rectifier)		
P03.39–P03.40	Reserved			

P05 group—Input terminals

Function code	Name	Description	Setting range	Default
P05.01	Digital input terminal polarity	0x0–0xF	0x0–0xF	0x0

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.

BIT3	BIT2	BIT1	BIT0
S4	S3	S2	S1

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

The function code is used to set the filter time for S1–S4. In strong interference cases, increase the value to avoid maloperation.

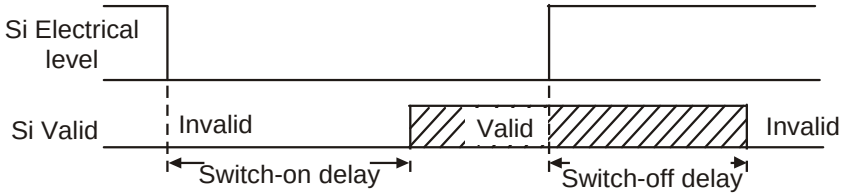
Function code	Name	Description	Setting range	Default
P05.04	Function of S1 terminal	0: No function 1: Run 2: Reset faults 3: External fault 4: Reserved 5: Enable 6–12: Reserved 13: Clear accumulative electricity consumption 14: Keep accumulative electricity consumption 15: Reserved	0–15	1
P05.05	Function of S2 terminal			2
P05.06	Function of S3 terminal			0
P05.07	Function of S4 terminal			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 to "no function" to avoid misaction.
1	Run	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.

Setting	Function	Description
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	Reserved	
5	Enabling run	The PWM rectifier can run only after the terminal function is enabled.
6–12	Reserved	
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
P05.12	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.	0.000–60.000	0.000s
P05.13	S1 switch-off delay			0.000s
P05.14	S2 switch-on delay			0.000s
P05.15	S2 switch-off delay			0.000s
P05.16	S3 switch-on delay			0.000s
P05.17	S3 switch-off delay			0.000s
P05.18	S4 switch-on delay			0.000s
P05.19	S4 switch-off delay			0.000s



Function code	Name	Description	Setting range	Default
P05.28	AI1 lower limit	0.00V–P05.30	0.00–P05.30	0.00V
P05.29	Corresponding setting of AI1 lower limit	-100.0%–100.0%	-100.0–100.0	0.0%
P05.30	AI1 upper limit	P05.28–10.00V	P05.28–10.00	10.00V
P05.31	Corresponding setting of AI1 upper limit	-100.0%–100.0%	-100.0–100.0	100.0%
P05.32	AI1 input filter time	0.000s–10.000s	0.000–10.000	0.100s
P05.33	AI2 lower limit	-10.00V–P05.35	-10.00–P05.35	0.00V
P05.34	Corresponding setting of AI2 lower limit	-100.0%–100.0%	-100.0–100.0	0.0%
P05.35	AI2 middle value	P05.33–P05.37	P05.33–P05.37	0.00V

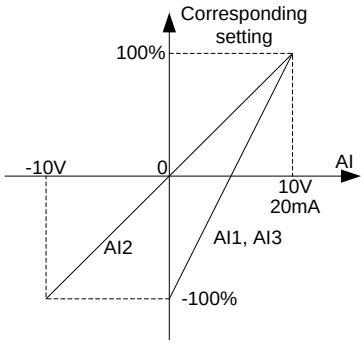
Function code	Name	Description	Setting range	Default
P05.36	Corresponding setting of AI2 middle value	-100.0%–100.0%	-100.0–100.0	0.0%
P05.37	AI2 upper limit	P05.35–10.00V	P05.35–10.00	10.00V
P05.38	Corresponding setting of AI2 upper limit	-100.0%–100.0%	-100.0–100.0	100.0%
P05.39	AI2 input filter time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

The function code is used to 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 AI3 support the 0–10V/0–20mA input. When AI1 and AI3 select the 0–20mA input, the corresponding voltage of 20mA is 10V. AI2 supports the -10V–+10V input.

P06 group—Output terminals

Function code	Name	Description	Setting range	Default
P06.00	Digital output terminal polarity	0x0–0xF	0x0–0xF	0x0

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.

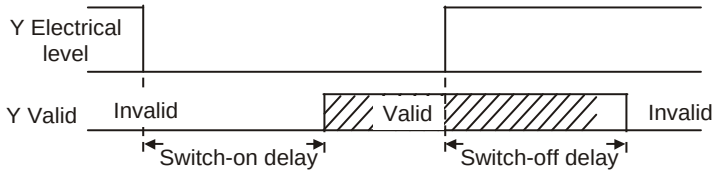
BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	RO2	RO1

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

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.
4–31	Reserved	

Function code	Name	Description	Setting range	Default
P06.05	RO1 switch-on delay	0.000–60.000s	0.000–60.000	0.000s
P06.06	RO1 switch-off delay			0.000s
P06.07	RO2 switch-on delay			0.000s
P06.08	RO2 switch-off delay			0.000s



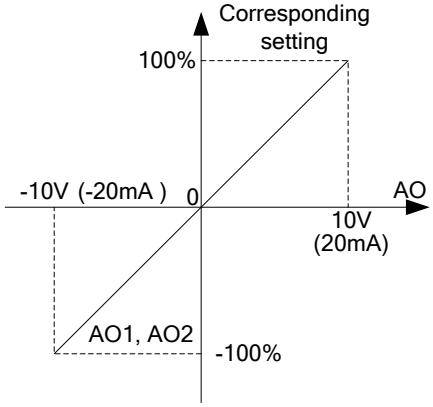
Function code	Name	Description	Setting range	Default
P06.13	AO1 output	0: None 1: Set value of DC voltage (For AC1140V, 100% corresponds to 3000V) 2: Actual value of DC voltage (For 1140V, 100% corresponds to 3000V) 3: Input voltage valid value (100% corresponds to 2*Vn) 4: Input current valid value (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) 8–20: Reserved	0–20	1
P06.14	AO2 output			2

Function code	Name	Description	Setting range	Default
P06.15	AO1 output lower limit	-100.0%–P06.17	-100.0–P06.17	0.0%
P06.16	AO1 output corresponding to lower limit	-10.00V–10.00V	-10.00–10.00	0.00V
P06.17	AO1 output upper limit	P06.15–100.0%	P06.15–100.0	100.0%
P06.18	AO1 output corresponding to upper limit	-10.00V–10.00V	-10.00–10.00	10.00V
P06.19	AO1 output filter time	0.000–10.000s	0.000–10.000	0.000s
P06.20	AO2 output lower limit	-100.0%–P06.22	-100.0–P06.22	0.0%
P06.21	AO2 output corresponding to lower limit	-10.00–10.00V	-10.00–10.00	0.00V
P06.22	AO2 output upper limit	P06.20–100.0%	P06.20–100.0	100.0%
P06.23	AO2 output corresponding to upper limit	-10.00V–10.00V	-10.00–10.00	10.00V
P06.24	AO2 output filter time	0.000–10.000s	0.000–10.000	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.



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 Press **QUICK/JOG** to shift the displayed function code from right to left. 2: Reserved 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
P07.04	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 is used to specify 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	Parameter selection in rectification state	0x0000–0xFFFF	0x0000–0xFFFF	0x000F

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

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. 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	0–65535kWh	0–65535	0kWh
P07.18	Accumulative electricity consumption low-order bits	0.0–999.9kWh	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	Software version (DSP)	0.00–655.35	0.00–655.35	0.00

The function code displays the software version of DSP.

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

The function code displays the software version of FPGA.

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

The function code displays the local accumulative running time.

P08 group—Overall status information

This group is used to view overall status information.

Function code	Name	Description	Setting range	Default
P08.00	Rectifier rated power	Displays the rectifier rated power. 0–6000kW	0–6000.0	Model depended
P08.01	Rectifier rated current	Displays the rectifier rated current. 0.0–6000.0A	0.0–6000.0	Model depended
P08.04	DC voltage	Displays the DC voltage of the rectifier. 0.0–6000.0V	0.0–6000.0	0.0V
P08.05	Grid frequency	Displays the grid frequency. 0.00–120.0Hz	0.00–120.0	0.0Hz
P08.06	Grid voltage	Displays the grid voltage. 0.0–4000.0V	0.0–4000.0	0.0V
P08.07	Grid input current	Displays the grid input current. 0.0–6000.0A	0.0–6000.0	0.0A
P08.08	Power factor	Displays the power factor of the rectifier. -1.00–1.00	-1.00–1.00	0.00
P08.09	Active current percentage	Displays the active current percentage of the rectifier. -200.0–200.0%	-200.0–200.0	0.0%
P08.10	Reactive current percentage	Displays the reactive current percentage of the rectifier. -200.0–200.0%	-200.0–200.0	0.0%
P08.11	Digital input terminal status	0x0–0xF Bit 0 corresponds to S1 Displays the present digital input terminal status.	0x0–0xF	0x0
P08.12	Digital output terminal status	0x0–0xF Bit 0 corresponds to RO1 Displays the present digital output terminal status.	0x0–0xF	0x0
P08.13	AI1 input voltage	Displays the AI1 input signal. 0.00–10.00V	0.00–10.00	0.00V
P08.14	AI2 input voltage	Displays the AI2 input signal. -10.00–10.00V	-10.00–10.00	0.00V
P08.15	AI3 input voltage	Displays the AI3 input signal. 0.00–10.00V	0.00–10.00	0.00V
P08.16	Input apparent power	Displays the input apparent power of the rectifier. 0–6000.0kVA	0–6000.0	0.0kVA
P08.17	Input active power	Displays the input active power of the rectifier. 0–6000.0kW	0–6000.0	0.0kW
P08.18	Input reactive power	Displays the input reactive power of the rectifier. 0–6000.0kVar	0–6000.0	0.0kVar
P08.19	3PH voltage unbalance factor	Displays the three-phase voltage unbalance factor of the rectifier. It is the ratio of the maximum value of rectifier input voltage to the minimum	1.00–10.00	0.00

Function code	Name	Description	Setting range	Default
		value. 1.00–10.00		
P08.20	IGBT temperature	Displays the IGBT temperature of the rectifier. -20.0–120.0℃	-20.0–120.0	0.0°C

P10 group—Fault information

Function code	Name	Description	Setting range	Default
P10.00	Present fault type	Common fault type: 00: No fault 01: Input overcurrent (OC) 02: Grid undervoltage (Lv1) 03: Grid overvoltage (Ov1) 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 (CE) 11: CANopen communication fault (E-CAN) 12: Ethernet communication fault (E-NET) 13: Half bus overvoltage (HOV) 14: Upper and lower bus voltage imbalance (VH2) 15: Rectifier overload (OL) 16: EEPROM operation error (EEP) 17: Main contactor actuation failure (TbE) 18: 3PH current imbalance detection (PIF) 19: DSP-FPGA communication fault (dF_CE) 20: External fault (EF) 21: Rectifier disabled (dIS) 22: Keypad fault (PCE) 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: Slave communication fault (E_ASC) 28: Slave fault (E-SLE)	0–31 or m.01–m.16 (m=1, 2, 3…6)	0
P10.01	Last fault type			0
P10.02	2nd-last fault type			0
P10.03	3rd-last fault type			0
P10.04	4th-last fault type			0
P10.05	5th-last fault type			0

Function code	Name	Description	Setting range	Default
		29: IGBT overheat fault (OH1) 30: Phase-U Vce check fault (Out1) 31: Phase-V Vce check fault (Out2) 32: Phase-W Vce check fault (Out3) Pre-alarm type: 05: IGBT temperature pre-alarm (A-vH1)		

For details, see fault information.

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

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

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

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

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

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

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

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

Function code	Name	Description	Setting range	Default
P10.10	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
P10.13	Max. IGBT temperature at present fault	-20.0–120.0°C	-20.0–120.0	0.0°C

The function code is used to record the IGBT temperature when fault occurs and display 3PH IGBT temperature at no fault.

Function code	Name	Description	Setting range	Default
P10.22	Input terminal status at last fault	0x0–0xF	0x0–0xF	0x0

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

The function code is used to record the IGBT temperature when fault occurs and display 3PH IGBT temperature at no fault.

The function codes are used to record display information when the last fault occurs. For details, see P10.22–P10.29.

Function code	Name	Description	Setting range	Default
P10.38	Input terminal status at 2nd-last fault	0x0–0xF	0x0–0xF	0x0
P10.39	Output terminal status at 2nd-last fault	0x0–0xF	0x0–0xF	0x0
P10.40	DC voltage at 2nd-last fault	0.0–6000.0V	0.0–6000.0	0.0V
P10.41	Grid voltage at 2nd-last fault	0.0–4000.0V	0.0–4000.0	0.0V
P10.42	Input current at 2nd-last fault	0.0–6000.0A	0.0–6000.0	0.0A
P10.45	Max. IGBT temperature at 2nd-last fault	-20.0–120.0°C	-20.0–120.0	0.0°C

The function code is used to record the IGBT temperature when fault occurs and display 3PH IGBT temperature at no fault.

The function codes are used to record display information when the 2nd-last fault occurs. For details, see P10.38–P10.45.

P11 group—Serial communication and CANopen communication

Function code	Name	Description	Setting range	Default
P11.00	Local communication address	1–247; 0 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
P11.01	Communication baud rate	0: 1200BPS 1: 2400BPS 2: 4800BPS 3: 9600BPS	0–5	4

Function code	Name	Description	Setting range	Default
		4: 19200BPS 5: 38400BPS		

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
P11.02	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

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
P11.03	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 host controller. 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
P11.04	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 to a non-zero value, the system reports the "485 communication fault" (CE) if the communication interval exceeds the value.

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

Function code	Name	Description	Setting range	Default
P11.05	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
P11.06	Communication processing action	0x00–0x11 Ones place: 0: Respond to write operations 1: Not respond to write operations Tens place: 0: Reserved 1: Reserved	0x00–0x11	0x00

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.

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

P12 group—PROFIBUS communication

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

The function code is used to identify the address of 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 host controller but not respond to the host controller.

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

Function code	Name	Description	Setting range	Default
P12.11	Received PZD11		0–13	0
P12.12	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.

Value	Name	Description
0	Invalid	
1	DC voltage	0–60000; Unit: 0.1V
2–4	Reserved	
5	AO setting 1	-1000–1000, 1000 corresponding to 100.0%
6	AO setting 2	-1000–1000, 1000 corresponding to 100.0%
7–13	Reserved	

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

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

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

Value	Name	Description
0	Invalid	
1	DC voltage	*10, V
2	DC voltage feedback	*10, V
3	Input voltage valid	*10, 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	100% corresponds to the rectifier rated current.

Value	Name	Description
	feedback	
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	

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

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

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

P12.24 can be written in any state.

Function code	Name	Description	Setting range	Default
P12.25	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.

P13 group—Ethernet communication

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

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

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

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

IP address format: P13.01.P13.02.P13.03.P13.04

IP address example: 192.168.0.1

Subnet mask format: P13.05.P13.06.P13.07.P13.08

Subnet mask example: 255.255.255.0

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

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 the rectifier with larger power
Lv1	Input undervoltage	Abnormal input power outage Input voltage detection circuit exception	Check the input power for recovery. Ask for technical support.
Ov1	Input 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.
SPI	Phase loss on input side	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 bus 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 bus 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	Poor contact of the connector of control board	Check the connector and re-plug Ask for technical support.

Fault code	Fault type	Possible cause	Solution
		Auxiliary power supply is damaged Hall components are broken Exception occurred to amplification circuit.	Ask for technical support. Ask for technical support.
E-DP	PROFIBUS communication fault	PROFIBUS communication disconnected Incorrect PROFIBUS communication settings	Check and restore the connection. Set parameters correctly.
CE	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	CANopen communication disconnected Incorrect parameter settings	Check the external wiring and parameter settings, and restore the connection
E-NET	Ethernet communication fault	Communication disconnection Incorrect parameter settings	Check and restore the connection. Set parameters correctly.
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 EEPROM is damaged.	Press STOP/RST for reset or ask for technical support. Ask for technical support.
TbE	Main contactor actuation failure	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.
dF_CE	DSP-FPGA communication fault	Strong electromagnetic interference The quality of electric power is too low FPGA chip damage DSP chip damage	Check the status of the unit and ensure FPGA is not damaged Contact us
EF	External fault	SI external fault input terminal acts.	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
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.	Check for and remove the external interference source. Replace the hardware and seek maintenance services.

Fault code	Fault type	Possible cause	Solution
		Data storage error occurred to the keypad.	Re-back up the data on the keypad.
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 Buffer resistor damage Buffer contactor fault	Ensure the rectifier enabling bit is set correctly Ensure the buffer resistor without damage is used Ensure the buffer contactor without fault is used.
OH1	IGBT overheat fault	Instantaneous overcurrent of the rectifier Three-phase output have interphase or the grounding is short circuited Air duct is blocked or fan is damaged Ambient temperature is too high Control board cables or plugs are loose Auxiliary power supply is damaged, and undervoltage occurred for drive voltage The short through of bridge arm of power modules occurred Control board is abnormal	See solutions for overcurrent Re-wiring Dredge the vent duct or replace the fan Lower the ambient temperature Check and reconnect the control board Ask for technical support; Ask for technical support; Ask for technical support.
Out1	Phase-U Vce check fault	The corresponding IGBT is damaged Strong interference External short circuit	Ask for technical support; Update the parameter settings and restart Check the external circuit and eliminate the load fault
Out2	Phase-V Vce check fault		
Out3	Phase-W Vce check fault		
A-vH1	IGBT temperature pre-alarm	Air duct is blocked or fan is damaged Ambient temperature is too high Control board cables or plugs are loose Auxiliary power supply is damaged, and undervoltage occurred for drive voltage The short through of bridge arm of power modules occurred Control board is abnormal	Dredge the vent duct or replace the fan Lower the ambient temperature Check and reconnect the control board Ask for technical support; Ask for technical support; Ask for technical support.

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 P0 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 parameter can be modified, and conditions for the modification.

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

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

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

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

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

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

To better protect parameters, the VFD provides the password protection function. After a password is set (that is, P7.00 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	Reserved				●
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 3: CANopen 4–6: Reserved	0–6	0	◎
P00.03	Running mode	0: COSφ 1: Reserved **Note:** In COSφ mode, the reactive current is determined by the power factor.	0–2	0	◎

Function code	Name	Description	Setting range	Default	Modify
P00.04	DC bus voltage setting method	0: Automatic 1: Keypad 2: Reserved	0–2	1	◎
P00.05	DC bus voltage setting	300.0–2100.0V	300.0–2100.0V	Model depended	○
P00.06–P00.07	Reserved				●
P00.08	Resonance suppression factor	0–10	0–10	0	●
P00.09	Overmodulation selection	0: Disable 1: Enable	0–1	1	◎
P00.10	Cooling-fan running mode	0: Normal mode 1: Permanent running after power-on	0–1	0	○
P00.11	Reserved				●
P00.12	Reserved				●
P00.13	Reserved				●
P00.14	Carrier frequency	2.0–8.0kHz	2.0–8.0	Model depended	●
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	Reserved				●
P01.01	Detecting main contactor actuation feedback	0: Not detect 1: Detect	0–1	1	◎
P01.02	Undervoltage setting value of input voltage	75.0–95.0%	75.0–95.0	85.0%	●
P01.03	Overvoltage setting value of input voltage	105.0–125.0%	105.0–125.0	115.0%	●
P01.04	Reserved				●
P01.05	Reserved				●
P01.06	Auto-running wait time	0–3600.0s	0–3600.0	0.0s	○
P01.07	Delay of auto fault reset	0.0–3600.0s	0.0–3600.0	1.0s	○
P01.08	Auto fault reset count	0–10	0–10	0	○
P02 group—Reserved parameters					
P02.00–P02.07	Reserved				●
P03 group—Control parameters					
P03.00–P03.05	Reserved				●

Function code	Name	Description	Setting range	Default	Modify
P03.06	Positive limit on active current (rectification)	0.0–200.0% (of the rectifier rated current)	0.0–200.0	150.0%	○
P03.07	Negative limit on active current (feedback)	0.0–200.0% (of the rectifier rated current)	0.0–200.0	150.0%	○
P03.08	Positive limit on reactive current (rectification)	0.0–200.0% (of the rectifier rated current)	0.0–200.0	150.0%	○
P03.09	Negative limit on reactive current (feedback)	0.0–200.0% (of the rectifier rated current)	0.0–200.0	150.0%	○
P03.10	Max. current setting	0.0–250.0% (of the rectifier rated current)	0.0–250.0	200.0%	○
P03.11	Voltage-loop proportional coefficient 1	0.001–30.000	0.001–30.000	2.000	○
P03.12	Voltage-loop integral coefficient 1	0.01–300.00	0.01–300.00	20.00	○
P03.13	Voltage-loop proportional coefficient 2	0.001–30.000	0.001–30.000	5.500	○
P03.14	Voltage-loop integral coefficient 2	0.01–300.00	0.01–300.00	10.00	○
P03.15	PI parameter switching voltage	0.01–30.000	0.01–30.000	10.00V	○
P03.16	Bus voltage filter coefficient	0.000–1.000s	0.000–1.000	0.000s	○
P03.17	Current-loop proportional coefficient P	0.001–30.000	0.001–30.000	1.000	○
P03.18	Current-loop integral coefficient I	0.01–300.00	0.01–300.00	1.00	○
P03.19	Power factor setting method	0: Angle based 1: Reserved	0–1	0	◎
P03.20	Rectifier power factor angle	-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	-90.0°–90.0° A positive value indicates inductive, while a negative value indicates capacitive.	-90.0–90.0	0.0°	○
P03.22–P03.23	Reserved				
P03.24	Overmodulation control selection	Determines whether to take inductive reactive power injection to improve the active current output capacity when the modulation system exceeds the overmodulation entry point 0: Invalid 1: Valid	0–1	0	○
P03.25	Overmodulation entry point	0.0–100.0% (modulation degree)	0.0–100.00%	90.0%	○

Function code	Name	Description	Setting range	Default	Modify
P03.26	Overmodulation proportional coefficient P	0.001–60.000	0.001–60.000	5.000	○
P03.27	Overmodulation integral coefficient I	0.01–30.000	0.01–30.000	5.00	○
P03.28	Phase-lock loop integral	0–10	0–10	10%	○
P03.29–P03.30	Reserved				●
P05 group—Input terminals					
P05.00	Reserved				
P05.01	Digital input terminal polarity	0x0–0xF 0 indicates positive. BIT0: S1 BIT1: S2 BIT2: S3 BIT3: S4	0x0–0xF	0x0	◎
P05.02	Reserved				●
P05.03	Digital input filter time	0.000–1.000s	0.000–1.000	0.000s	○
P05.04	Function of S1 terminal	0: No function 1: Run 2: Reset faults 3: External fault 4: Reserved 5: Enable 6: Reserved 7–12: Reserved 13: Clear accumulative electricity consumption 14: Keep accumulative electricity consumption 15: Reserved	0–15	1	◎
P05.05	Function of S2 terminal			2	◎
P05.06	Function of S3 terminal			0	◎
P05.07	Function of S4 terminal			0	◎
P05.08–P05.11	Reserved			0	●
P05.12	S1 switch-on delay	0.000–60.000s	0.000–60.000	0.000s	○
P05.13	S1 switch-off delay	0.000–60.000s	0.000–60.000	0.000s	○
P05.14	S2 switch-on delay	0.000–60.000s	0.000–60.000	0.000s	○
P05.15	S2 switch-off delay	0.000–60.000s	0.000–60.000	0.000s	○
P05.16	S3 switch-on delay	0.000–60.000s	0.000–60.000	0.000s	○
P05.17	S3 switch-off delay	0.000–60.000s	0.000–60.000	0.000s	○
P05.18	S4 switch-on delay	0.000–60.000s	0.000–60.000	0.000s	○
P05.19	S4 switch-off delay	0.000–60.000s	0.000–60.000	0.000s	○

Function code	Name	Description	Setting range	Default	Modify
P05.20–P05.27	Reserved				
P05.28	AI1 lower limit	0.00V–P05.30	0.00–P05.30	0.00V	○
P05.29	Corresponding setting of AI1 lower limit	-100.0%–100.0%	-100.0–100.0	0.0%	○
P05.30	AI1 upper limit	P05.28–10.00V	P05.28–10.00	10.00V	○
P05.31	Corresponding setting of AI1 upper limit	-100.0%–100.0%	-100.0–100.0	100.0%	○
P05.32	AI1 input filter time	0.000s–10.000s	0.000–10.000	0.100s	○
P05.33	AI2 lower limit	-10.00V–P05.35	-10.00–P05.35	-10.00V	○
P05.34	Corresponding setting of AI2 lower limit	-100.0%–100.0%	-100.0–100.0	-100.0%	○
P05.35	AI2 middle value	P05.33–P05.37	P05.33–P05.37	0.00V	○
P05.36	Corresponding setting of AI2 middle value	-100.0%–100.0%	-100.0–100.0	0.0%	○
P05.37	AI2 upper limit	P05.35–10.00V	P05.35–10.00	10.00V	○
P05.38	Corresponding setting of AI2 upper limit	-100.0%–100.0%	-100.0–100.0	100.0%	○
P05.39	AI2 input filter time	0.000s–10.000s	0.000–10.000	0.100s	○
P05.40	AI3 lower limit	0.00V–P05.42	0.00–P05.42	0.00V	○
P05.41	Corresponding setting of AI3 lower limit	-100.0%–100.0%	-100.0–100.0	0.0%	○
P05.42	AI3 upper limit	P05.40–10.00V	P05.40–10.00	10.00V	○
P05.43	Corresponding setting of AI3 upper limit	-100.0%–100.0%	-100.0–100.0	100.0%	○
P05.44	AI3 input filter time	0.000s–10.000s	0.000–10.000	0.100s	○
P06 group—Output terminals					
P06.00	Digital output terminal polarity	0x0–0xF 0 indicates positive. BIT0: RO1 BIT1: RO2 BIT2–BIT7: Reserved	0x0–0xF	0x0	○
P06.01	Relay RO1 output	0: No output 1: Ready for running 2: Running 3: Fault output 4–31: Reserved	0–31	1	○
P06.02	Relay RO2 output			2	○
P06.03–P06.04	Reserved				

Function code	Name	Description	Setting range	Default	Modify
P06.05	RO1 switch-on delay	0.000–60.000s	0.000–60.000	0.000s	○
P06.06	RO1 switch-off delay	0.000–60.000s	0.000–60.000	0.000s	○
P06.07	RO2 switch-on delay	0.000–60.000s	0.000–60.000	0.000s	○
P06.08	RO2 switch-off delay	0.000–60.000s	0.000–60.000	0.000s	○
P06.09–P06.12	Reserved				
P06.13	AO1 output	0: None 1: Set value of DC voltage (For AC1140V, 100% corresponds to 3000V) 2: Actual value of DC voltage (For 1140V, 100% corresponds to 3000V) 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) 8–20: Reserved	0–20	1	○
P06.14	AO2 output			2	○
P06.15	AO1 output lower limit	-100.0%–P06.17	-100.0–P06.17	0.0%	○
P06.16	AO1 output corresponding to lower limit	-10.00V–10.00V	-10.00–10.00	0.00V	○
P06.17	AO1 output upper limit	P06.15–100.0%	P06.15–100.0	100.0%	○
P06.18	AO1 output corresponding to upper limit	-10.00V–10.00V	-10.00–10.00V	10.00V	○
P06.19	AO1 output filter time	0.000–10.000s	0.000–10.000	0.000s	○
P06.20	AO2 output lower limit	-100.0%–P06.22	-100.0–P06.22	0.0%	○
P06.21	AO2 output corresponding to lower limit	-10.00V–10.00V	-10.00–10.00V	0.00V	○
P06.22	AO2 output upper limit	P06.20–100.0%	P06.20–100.0	100.0%	○
P06.23	AO2 output corresponding to upper limit	-10.00V–10.00V	-10.00–10.00	10.00V	○

Function code	Name	Description	Setting range	Default	Modify
P06.24	AO2 output filter time	0.000–10.000s	0.000–10.000	0.000s	○
P07 group—Human-machine interface					
P07.00	User password	0–65535	0–65535	0	○
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	◎
P07.02	**QUICK/JOG** key function selection	0: No function 1: Switch between states 2: (Reserved) 3: Quick debugging	0–3	0	○
P07.03	Reserved				
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	○
P07.05	Parameter selection in rectification 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	0x0000–0xFFFF	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				

Function code	Name	Description	Setting range	Default	Modify
P07.17	Accumulative electricity consumption high-order bits	0–65535kWh	0–65535	0kWh	●
P07.18	Accumulative electricity consumption low-order bits	0.0–999.9kWh	0.0–999.9	0.0kWh	●
P07.19	Software version (DSP)	0.00–655.35	0.00–655.35	0.00	●
P07.20	Software version (FPGA)	0.00–655.35	0.00–655.35	0.00	●
P07.21	Local accumulative running time	0–65535h	0–65535	0	●
P08 group—Overall status information					
P08.00	Rectifier rated power	0–6000.0kW	0–6000.0	Model depended	●
P08.01	Rectifier rated current	0.0–6000.0A	0.0–6000.0	Model depended	●
P08.02–P08.03	Reserved				●
P08.04	DC voltage	0.0–6000.0V	0.0–6000.0	0.0V	●
P08.05	Grid frequency	0.0–120.0Hz	0.0–120.0	0.0Hz	●
P08.06	Grid voltage	0–4000V	0–4000	0V	●
P08.07	Grid input current	0.0–6000.0A	0.0–6000.0	0.0A	●
P08.08	Power factor	-1.00–1.00	-1.00–1.00	0.00	●
P08.09	Active current percentage	-200.0–200.0%	-200.0–200.0	0.0%	●
P08.10	Reactive current percentage	-200.0–200.0%	-200.0–200.0	0.0%	●
P08.11	Digital input terminal status	0x0–0xF Bit 0 corresponds to S1	0x0–0xF	0x0	●
P08.12	Digital output terminal status	0x0–0xF Bit 0 corresponds to RO1	0x0–0xF	0x0	●
P08.13	AI1 input voltage	0.00–10.00V	0.00–10.00	0.00V	●
P08.14	AI2 input voltage	-10.00V–10.00V	-10.00–10.00	0.00V	●
P08.15	AI3 input voltage	0.00–10.00V	0.00–10.00	0.00V	●
P08.16	Input apparent power	0.0–6000.0kVA	0.0–6000.0	0. 0kVA	●
P08.17	Input active power	0.0–6000.0kW	0.0–6000.0	0.0kW	●
P08.18	Input reactive power	0.0–6000.0kVar	0.0–6000.0	0. 0kVar	●
P08.19	3PH voltage unbalance factor	1.00–10.00	1.00–10.00	0.00	●
P08.20	IGBT temperature	-20.0–120.0℃	-20.0–120	0.0°C	●
P10 group—Fault information					
P10.00	Present fault type	Common fault type: 00: No fault	0–31 or	0	●
P10.01	Last fault type			0	●

Function code	Name	Description	Setting range	Default	Modify
P10.02	2nd-last fault type	01: Input overcurrent (OC) 02: Grid undervoltage (Lv1) 03: Grid overvoltage (Ov1) 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 (CE) 11: CANopen communication fault (E-CAN) 12: Ethernet communication fault (E-NET) 13: Half bus overvoltage (HOV) 14: Upper and lower bus voltage imbalance (VH2) 15: Rectifier overload (OL) 16: EEPROM operation error (EEP) 17: Main contactor actuation failure (TbE) 18: 3PH current imbalance detection (PIF) 19: DSP-FPGA communication fault (dF_CE) 20: External fault (EF) 21: Rectifier disabled (dIS) 22: Keypad fault (PCE) 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: Slave communication fault (E-ASC) 28: Slave fault (E-SLE) 29: IGBT overheat fault (OH1) 30: Phase-U Vce check fault (Out1) 31: Phase-V Vce check fault (Out2) 32: Phase-W Vce check fault (Out3) Pre-alarm type: 05: IGBT temperature pre-alarm (A-vH1)	m.01–m.16 (m=1, 2, 3…6)	0	●
P10.03	3rd-last fault type			0	●
P10.04	4th-last fault type			0	●
P10.05	5th-last fault type			0	●
P10.06	Input terminal status at present fault	0x0–0xF	0x0–0xF	0x0	●
P10.07	Output terminal status at	0x0–0xF	0x0–0xF	0x0	●

Function code	Name	Description	Setting range	Default	Modify
	present fault				
P10.08	DC voltage at present fault	0.0–6000.0V	0.0–6000.0	0.0V	●
P10.09	Grid voltage at present fault	0.0–4000.0V	0.0–4000.0	0.0V	●
P10.10	Input current at present fault	0.0–6000.0A	0.0–6000.0	0.0A	●
P10.11–P10.12	Reserved				
P10.13	IGBT temperature at present fault	-20.0–120.0℃	-20.0–120.0	0.0°C	●
P10.14–P10.21	Reserved				●
P10.22	Input terminal status at last fault	0x0–0xF	0x0–0xF	0x0	●
P10.23	Output terminal status at last fault	0x0–0xF	0x0–0xF	0x0	●
P10.24	DC voltage at last fault	0.0–6000.0V	0.0–6000.0	0.0V	●
P10.25	Grid voltage at last fault	0.0–4000.0V	0.0–4000.0	0.0V	●
P10.26	Input current at last fault	0.0–6000.0A	0.0–6000.0	0.0A	●
P10.27–P10.28	Reserved				●
P10.29	IGBT temperature at last fault	-20.0–120.0℃	-20.0–120.0	0.0°C	●
P10.30–P10.37	Reserved				●
P10.38	Input terminal status at 2nd-last fault	0x0–0XF	0x0–0XF	0x0	●
P10.39	Output terminal status at 2nd-last fault	0x0–0XF	0x0–0XF	0x0	●
P10.40	DC voltage at 2nd-last fault	0.0–6000.0V	0.0–6000.0	0.0V	●
P10.41	Grid voltage at 2nd-last fault	0.0–4000.0V	0.0–4000.0	0.0V	●
P10.42	Input current at 2nd-last fault	0.0–6000.0A	0.0–6000.0	0.0A	●
P10.43–P10.44	Reserved				●
P10.45	IGBT temperature at 2nd-last fault	-20.0–120.0℃	-20.0–120.0	0.0°C	●
P10.46–P10.53	Reserved				
P11 group—Serial communication and CANopen communication					
P11.00	Local communication address	1–247; 0 indicates a broadcast address	1–247	1	○

Function code	Name	Description	Setting range	Default	Modify
P11.01	Communication baud rate	0: 1200BPS 1: 2400BPS 2: 4800BPS 3: 9600BPS 4: 19200BPS 5: 38400BPS	0–5	4	○
P11.02	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	○
P11.03	Communication response delay	0–200ms	0–200	5ms	○
P11.04	Communication timeout time	0.0 (invalid); 0.1–60.0s	0.0–60.0	0.0s	○
P11.05	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	◎
P11.06	Communication processing action	0x00–0x11 Ones place: 0: Respond to write operations 1: Not respond to write operations Tens place: 0: Reserved 1: Reserved	0x00–0x11	0x00	◎
P11.07–P11.08	Reserved				
P11.09	CANopen communication address	0–127	0–127	1	◎
P11.10	CANopen communication baud rate	0: 50K BPS 1: 125K BPS 2: 250K BPS 3: 500K BPS 4: 1M BPS	0–4	3	◎
P11.11	CANopen communication fault delay	0.0 (invalid); 0.1–100.0s	0.1–100.0	0.0s	◎
P11.12	CANopen communication protocol	0: Common control protocol 1: Internal master/salve communication protocol	0–1	0	◎

Function code	Name	Description	Setting range	Default	Modify
P11.13–P11.16	Reserved				●
P12 group—PROFIBUS communication					
P12.00	Module type	0: PROFIBUS	0	0	●
P12.01	Module address	0–127	0–127	2	◎
P12.02	Received PZD2	0: Disable 1: DC voltage setting (0–60000; Unit: 0.1V) 2–4: Reserved 5: AO setting 1 (-1000–1000, 1000 corresponding to 100.0%) 6: AO setting 2 (-1000–1000, 1000 corresponding to 100.0%) 7–13: Reserved	0–13	0	○
P12.03	Received PZD3		0–13	0	○
P12.04	Received PZD4		0–13	0	○
P12.05	Received PZD5		0–13	0	○
P12.06	Received PZD6		0–13	0	○
P12.07	Received PZD7		0–13	0	○
P12.08	Received PZD8		0–13	0	○
P12.09	Received PZD9		0–13	0	○
P12.10	Received PZD10		0–13	0	○
P12.11	Received PZD11		0–13	0	○
P12.12	Received PZD12		0–13	0	○
P12.13	Sent PZD2	0: Disable 1: DC voltage (* 10, V) 2: DC voltage feedback (* 10, V) 3: Input voltage valid value (* 10, 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	○
P12.14	Sent PZD3		0–20	0	○
P12.15	Sent PZD4		0–20	0	○
P12.16	Sent PZD5		0–20	0	○
P12.17	Sent PZD6		0–20	0	○
P12.18	Sent PZD7		0–20	0	○
P12.19	Sent PZD8		0–20	0	○
P12.20	Sent PZD9		0–20	0	○
P12.21	Sent PZD10		0–20	0	○
P12.22	Sent PZD11		0–20	0	○
P12.23	Sent PZD12		0–20	0	○
P12.24	Temporary variable 1 for PZD sending	0–65535	0–65535	0	○
P12.25	DP communication timeout time	0.0 (invalid), 0.1–60.0s	0.0–60.0	0.0s	○
P12.26–P12.29	Reserved				●

Function code	Name	Description	Setting range	Default	Modify
P13 group—Ethernet communication					
P13.00	Ethernet communication rate	0: Self adaptive 1: 100M full duplex 2: 100M half duplex 3: 10M full duplex 4: 10M half duplex	0–4	3	◎
P13.01	IP address 1	0–255	0–255	192	◎
P13.02	IP address 2		0–255	168	◎
P13.03	IP address 3		0–255	0	◎
P13.04	IP address 4		0–255	1	◎
P13.05	Subnet mask 1	0–255	0–255	255	◎
P13.06	Subnet mask 2		0–255	255	◎
P13.07	Subnet mask 3		0–255	255	◎
P13.08	Subnet mask 4		0–255	0	◎
P13.09	Gateway address 1	0–255	0–255	192	◎
P13.10	Gateway address 2		0–255	168	◎
P13.11	Gateway address 3		0–255	1	◎
P13.12	Gateway address 4		0–255	1	◎
P13.13–P13.14	Reserved				●

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

6.1 Function description

P00 group—Basic functions

Function code	Name	Description	Setting range	Default
P00.00	Speed control mode	0: SVC mode 0 (for SM) 1: SVC mode 1 (for AM) 2: V/F control 3: Closed-loop vector control mode **Note:** AM-asynchronous motor SM-synchronous motor	0–3	2

1: SVC mode 1 (for AM)

No need to install encoders. Applicable to scenarios with requirements for low frequency, great torque, and high speed control accuracy at all power ratings.

2: V/F control

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

3: Closed-loop vector control mode (for AM, SM)

Need to install encoders. Applicable to scenarios with requirements for low frequency, great torque, and high speed control accuracy.

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 running VFD control commands.

The VFD control commands include the start, stop, forward run, reverse run, jogging, and fault reset commands.

0: Keypad (“LOCAL/REMOT” indicator off)

The running commands are controlled through keypad keys, such as the RUN and STOP/RST keys. In running state, you can press both RUN and STOP/RST to enable the VFD to coast to stop.

1: Terminal (“LOCAL/REMOT” indicator blinking)

The running commands are controlled through multifunction input terminals.

2: Communication (“LOCAL/REMOT” indicator 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	0: MODBUS 1: PROFIBUS/CANopen	0–3	0

Function code	Name	Description	Setting range	Default
	commands	2: Ethernet 3: Reserved		

The function code is used to select the channel that VFD controls communication commands.

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

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

The function code is used to set the max. output frequency of the VFD. Pay attention to the function code because it is the foundation of the frequency setting and the speed of acceleration (ACC) and deceleration (DEC).

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

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

When the set frequency is higher than the upper limit of the running frequency, the upper limit of the running frequency is used for running.

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

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

When the set frequency is lower than the lower limit of the running frequency, the lower limit of the running frequency is used for running.

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

Function code	Name	Description	Setting range	Default
P00.06	Setting channel of A frequency command	0: Keypad 1: AI1 2: AI2 3: AI3 4: High-speed pulse HDI 5: Simple PLC program 6: Multi-step speed running 7: PID control 8: MODBUS communication 9: PROFIBUS/CANopen communication 10: Ethernet communication 11: Reserved	0–11	0
P00.07	Setting channel of B frequency command		0–11	1

0: Keypad

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

1: AI1

2: AI2

3: AI3

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

Note: When AI1 and AI3 select 0–20mA input, the corresponding voltage of 20mA is 10V.

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

4: High-speed pulse HDI

Set the frequency by high-speed pulse terminals. The VFD provides 1 channel high-speed pulse input in the range of 0.00–50.00kHz. Pulse frequency range: 0.00–50.00kHz.

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

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

5: Simple PLC program

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

6: Multi-step speed running

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

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

7: PID control

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

8: MODBUS communication

Set the frequency by MODBUS communication. Please see the description of P14 group.

9: PROFIBUS/CANopen communication

Set the frequency by PROFIBUS/ CANopen communication.

Please see the description of P15 group for PROFIBUS communication. PROFIBUS communication card is required.

Please see the description of P15 group for CANopen communication. CANopen communication card is required.

10: Ethernet communication

Set the frequency by Ethernet communication. Please see the description of P16 group. Ethernet communication card is required.

11: Reserved

Note:

1. **A frequency and B frequency cannot be set to the same frequency reference mode.**
2. **The options 3, 4, 9, and 10 are available only when corresponding expansion cards are configured.**

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

The function code is used to select the reference object of B frequency command.

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

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

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

The function code is used to set the combination mode of setting source.

0: A. The present frequency is set to A frequency command.

1: B. The present frequency is set to B frequency command.

2: A+B. The present frequency is set to A+B frequency command.

3: A-B. The present frequency is set to A-B frequency command.

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

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

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

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

When A and B frequency commands select the keypad for setting, the value of the function code is the original setting one of the frequency data of the VFD.

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

Function code	Name	Description	Setting range	Default
P00.11	ACC time 1	0.0–3600.0s	0.0–3600.0	Model depended
P00.12	DEC time 1	0.0–3600.0s	0.0–3600.0	Model depended

ACC time means the time needed if the VFD speeds up from 0Hz to the max. output frequency (P00.03).

DEC time means the time needed if the VFD speeds down from the max. output frequency (P00.03) to 0Hz.

The inverter unit has four groups of ACC/DEC time, which can be selected by P05. The factory default ACC/DEC time of the VFD is the first group.

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

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

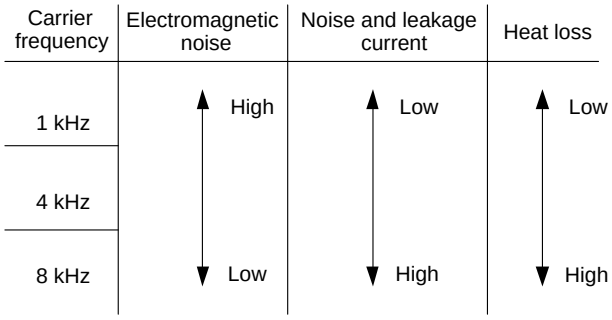
1: Run at the opposite direction. The VFD runs in the reverse direction. FWD/REV LED is on.

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

Note: When the parameter is restored to the default value, the motor's running direction is restored to the default one. Exercise caution before using this function if the change of motor rotation direction is disallowed after commissioning.

2: Disable reverse running. It can be used in some special scenarios where reverse running is disallowed.

Function code	Name	Description	Setting range	Default
P00.14	Carrier frequency	1.0–4.0kHz	1.0–4.0	Model depended



Advantage of high carrier frequency: ideal current waveform, little current harmonic wave and motor noise.

Disadvantage of high carrier frequency: increasing the switch loss, increasing VFD temperature and the impact to the output capacity. The VFD needs to derate on high carrier frequency. At the same time, the leakage and electrical magnetic interference will increase.

On the contrary, an extremely-low carrier frequency may cause unstable operation at low frequency, decrease the torque, or even lead to oscillation.

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

When the frequency used exceeds the default carrier frequency, the VFD needs to derate by 10% for each increase of 1k carrier frequency.

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

The function code is used to select a motor parameter autotuning mode.

0: No operation

1: Rotary autotuning.

Comprehensive motor parameter autotuning. It is recommended to use rotating autotuning when high control accuracy is needed.

2: Static autotuning 1

Comprehensive motor parameter autoning. It is applicable in scenarios where the motor cannot be disconnected from load.

3: Static autotuning 2

Only the first 3 parameters are autotuned. It is applicable in scenarios where the motor cannot be disconnected from load.

Note:

1. Rotary autotuning is recommended.
2. For 4-quadrant VFDs, it is recommended not to run the rectifier during parameter autotuning, otherwise the accuracy is affected.
3. The power difference between the motor and the VFD should be in 2 grades during parameter autotuning, otherwise affect the accuracy.

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

The function code is used to enable the AVR function.

0: Invalid

1: Valid during the whole procedure

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

Function code	Name	Description	Setting range	Default
P00.18	Function parameter restore	0: No operation 1: Restore default values 2: Clear fault records	0–2	0

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.

P01 group—Start and stop control

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

0: Direct start. Start from the starting frequency P01.01.

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

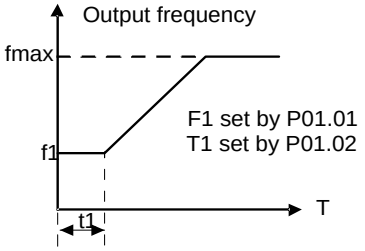
2. Start after rotating speed tracking. The VFD automatically tracks the rotating speed and direction of the motor, and start the rotating motor smoothly. It is suitable in cases where reverse rotation may occur to the large inertia load during starting.

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

The function code indicates the initial frequency during VFD start. See P01.02 (Starting frequency hold time) for detailed information.

Function code	Name	Description	Setting range	Default
P01.02	Starting frequency hold time	0.0–50.0s	0.0–50.0	0.0s

Setting a proper starting frequency can increase the torque during VFD start. During the hold time of the starting frequency, the output frequency of the VFD is the starting frequency. And then, the VFD runs from the starting frequency to the set frequency. If the set frequency is lower than the starting frequency, the VFD stops running and keeps in the standby state. The starting frequency is not limited in the lower limit frequency.



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

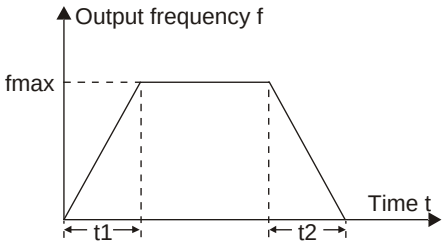
The VFD performs DC braking with the braking current before start and it speeds up after the DC braking time. If the set DC braking time is 0, DC braking is invalid.

Stronger braking current indicates larger braking power. The DC braking current before start is a percentage of the VFD rated current.

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

The function code is used to indicate the changing mode of the frequency during start and running.

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

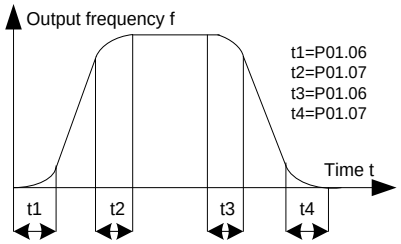


1: S curve. The output frequency increases or decreases according to the S curve.

The S curve is generally applied to elevators, conveyors, and other application scenarios where smoother start or stop is required.

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

The curvature of S curve is determined by the ACC range, ACC/DEC time, starting time, and ending time.



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

0: Decelerate to stop. When a stop command takes effect, the VFD lowers output frequency based on the DEC mode and the defined DEC time; when the frequency drops to 0Hz, the VFD stops.

1: Coast to stop. After a stop command takes effect, the VFD stops output immediately; and the load coasts to stop according to mechanical inertia.

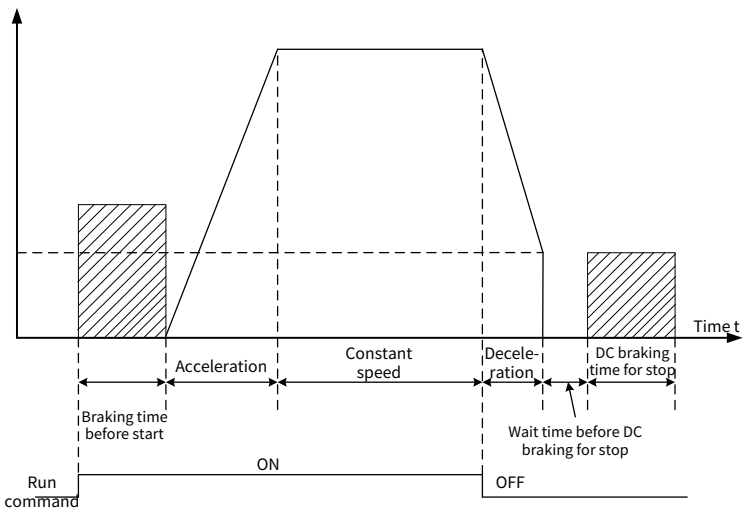
Function code	Name	Description	Setting range	Default
P01.09	Starting frequency of DC braking for stop	0.00–P00.03 (Max. output frequency)	0.00–P00.03	0.00Hz
P01.10	Wait time before DC braking for stop	0.00–50.00s	0.00–50.00	0.00s
P01.11	DC braking current for stop	0.0–100.0% (of the VFD rated current)	0.0–100.0	0.0%
P01.12	DC braking time for stop	0.00–50.00s	0.00–50.00	0.00s

Starting frequency of braking for stop: During the deceleration to stop, the VFD starts DC braking for stop when running frequency reaches the starting frequency determined by P01.09.

Wait time before braking: The VFD blocks the output before starting DC braking. After this wait time, DC braking is started so as to prevent overcurrent caused by DC braking at high speed.

DC braking current for stop: It indicates the applied DC braking energy. Stronger current indicates greater DC braking effect.

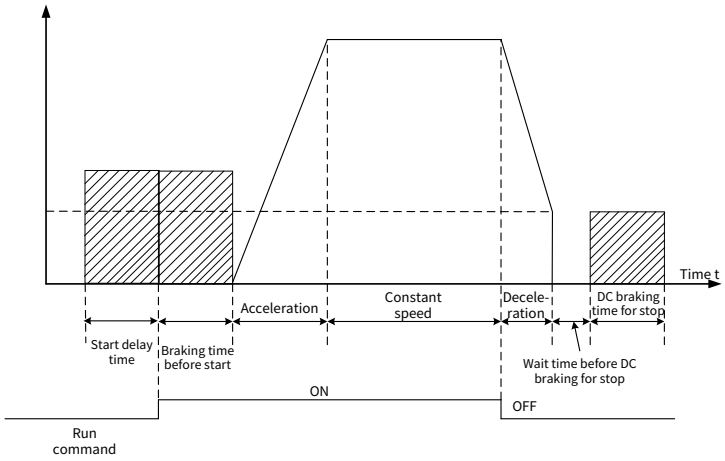
DC braking time for stop: It indicates the hold time of DC braking. If the time is 0, DC braking is invalid, and the VFD decelerates to stop within the specified time.



Function code	Name	Description	Setting range	Default
P01.13	FWD/REV running deadzone time	0.0–3600.0s	0.0–3600.0	0.0s
P01.14	FWD/REV running switching mode	0: Switch at zero frequency 1: Switch at the starting frequency 2: Switch after the speed reaches the stop speed with a delay	0–2	0

The function code is used to set the shifting mode between forward running and reverse running.

This function code indicates the transition time specified in P01.13 during FWD/REV rotation switching. See the following figure:



Function code	Name	Description	Setting range	Default
P01.15	Stop speed	0.00–100.00Hz	0.00–100.0	0.50Hz
P01.16	Stop speed detection mode	0: Detect by the speed setting (without speed delay) 1: Detect by speed feedback (valid only for vector control)	0–1	0
P01.17	Feedback speed detection time	0.0–100.00 s (valid when P01.16=1)	0.0–100.0	0.5s

The function code is used to set the stop speed detection mode.

0: Detect by the speed setting (without speed delay). This is the only detection method in V/F mode.

1: Detect by speed feedback (valid only for vector control)

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

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

Function code	Name	Description	Setting range	Default
P01.18	Terminal-based running command protection at power-on	0: The terminal running command is invalid at power-on 1: The terminal running command is valid at power-on	0–1	0

When the channel of running commands is terminal control, the system detects the state of the running terminal during power-on.

0: The terminal running command is invalid at power-on. Even the running command is considered as valid during power-on, the VFD does not run and it keeps the protection state until the running command is canceled and enabled again.

1: The terminal running command is valid at power-on. If the running command is considered as valid during power-on, the VFD is started automatically after the initialization.

Note: Exercise caution before using this function. Otherwise, serious result may follow.

Function code	Name	Description	Setting range	Default
P01.19	Action selected when running frequency less than frequency lower limit (valid when frequency lower limit greater than 0)	0: Run at the frequency lower limit 1: Stop 2: Sleep	0–2	0

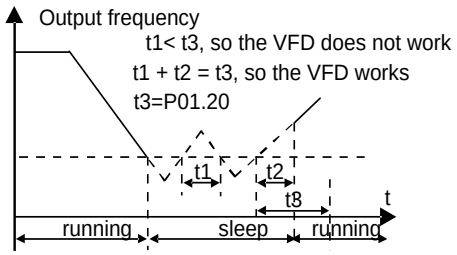
The function code determines the running state of the VFD when the set frequency is lower than the lower-limit one.

The VFD coasts to stop when the set frequency is lower than the lower-limit one. If the set frequency exceeds the lower limit one again and it lasts for the time set by P01.20, the VFD resumes the running state automatically.

Function code	Name	Description	Setting range	Default
P01.20	Wake-up-from-sleep delay	0.0–3600.0s (valid when P01.19 is 2)	0.0–3600.0	0.0s

The function code determines the wake-up-from-sleep delay time. When the running frequency of the VFD is lower than the lower limit, the VFD becomes standby.

When the set frequency exceeds the lower limit one again and it lasts for the time set by P01.20, the VFD runs automatically.



Function code	Name	Description	Setting range	Default
P01.21	Power-off restart selection	0: Disable 1: Enable	0–1	0

The function code indicates whether the VFD automatically runs after re-power on.

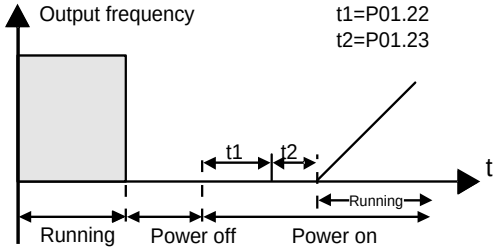
0: Disable

1: Enable. If the restart condition is met, the VFD will run automatically after waiting the time defined by P01.22.

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

This function is valid when P01.21 is set to 1.

The function code indicates the wait time before the automatic running of the VFD that is re-powered on.

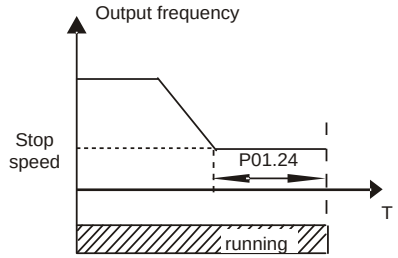


Function code	Name	Description	Setting range	Default
P01.23	Start delay	0.0–60.0s	0.0–60.0	0.0s

After a VFD running command is given, the VFD is in standby state and restarts with the delay defined by P01.23 to implement brake release.

Function code	Name	Description	Setting range	Default
P01.24	Stop speed delay	0.0–100.0s	0.0–100.0	0.0s

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



Function code	Name	Description	Setting range	Default
P01.25	0Hz output selection	0: Output without voltage 1: Output with voltage 2: Output with the DC braking current for stop	0–2	0

The function code is used to select the output type of the VFD at 0Hz.

P02 group—Parameters of motor 1

Function code	Name	Description	Setting range	Default
P02.00	Type of motor 1	0: Asynchronous motor (AM) 1: Synchronous motor (SM)	0–1	0

The function code is used to select the type of motor 1.

Function code	Name	Description	Setting range	Default
P02.01	Rated power of AM 1	0.1–3000.0kW	0.1–3000.0	Model depended
P02.02	Rated frequency of AM 1	0.01Hz–P00.03 (Max. output frequency)	0.01–P00.03	50.00Hz
P02.03	Rated speed of AM 1	1–36000rpm	1–36000	Model depended

Function code	Name	Description	Setting range	Default
P02.04	Rated voltage of AM 1	0–4000V	0–4000	Model depended
P02.05	Rated current of AM 1	0.8–6000.0A	0.8–6000.0	Model depended

The function codes are used to set the parameters for the controlled AM.

To ensure the control performance, set P02.01–P02.05 correctly according to the information on the nameplate of the AM.

The VFD provides the parameter autotuning function. Whether parameter autotuning can be performed properly depends on the settings of the motor nameplate parameters.

In addition, you need to configure a motor according to the standard motor configuration of the VFD. If the power of the motor is greatly different from that of the standard motor configuration, the control performance of the VFD degrades significantly.

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

Function code	Name	Description	Setting range	Default
P02.06	Stator resistance of AM 1	0.001–65.535Ω	0.001–65.535	Model depended
P02.07	Rotor resistance of AM 1	0.001–65.535Ω	0.001–65.535	Model depended
P02.08	Leakage inductance of AM 1	0.1–6553.5mH	0.1–6553.5	Model depended
P02.09	Mutual inductance of AM 1	0.1–6553.5mH	0.1–6553.5	Model depended
P02.10	No-load current of AM 1	0.1–6553.5A	0.1–6553.5	Model depended

Note: Do not modify these parameters unless it is necessary.

After motor parameter autotuning is properly performed, the values of P02.06–P02.10 are automatically updated. These parameters are the benchmark parameters for high-performance vector control, directly affecting the control performance.

Function code	Name	Description	Setting range	Default
P02.11	Magnetic saturation coefficient 1 of iron core of AM 1	0.0–100.0%	0.0–100.0	80.0%
P02.12	Magnetic saturation coefficient 2 of iron core of AM 1	0.0–100.0%	0.0–100.0	68.0%
P02.13	Magnetic saturation coefficient 3 of iron core of AM 1	0.0–100.0%	0.0–100.0	57.0%
P02.14	Magnetic saturation coefficient 4 of iron core of AM 1	0.0–100.0%	0.0–100.0	40.0%

The function codes indicate the magnetic saturation coefficients of AM in flux-weakening control.

Function code	Name	Description	Setting range	Default
P02.15	Rated power of SM 1	0.1–3000.0kW	0.1–3000.0	Model depended

Function code	Name	Description	Setting range	Default
P02.16	Rated frequency of SM 1	0.01Hz–P00.03 (Max. output frequency)	0.01–P00.03	50.00Hz
P02.17	Number of pole pairs of SM 1	1–50	1–50	2
P02.18	Rated voltage of SM 1	0–4000V	0–4000	Model depended
P02.19	Rated current of SM 1	0.8–6000.0A	0.8–6000.0	Model depended

The function codes are used to set the parameters for the controlled SM.

To ensure the control performance, set P02.15–P02.19 correctly according to the information on the nameplate of the SM.

The VFD provides the parameter autotuning function. Whether parameter autotuning can be performed properly depends on the settings of the motor nameplate parameters.

In addition, you need to configure a motor according to the standard motor configuration of the VFD. If the power of the motor is greatly different from that of the standard motor configuration, the control performance of the VFD degrades significantly.

Function code	Name	Description	Setting range	Default
P02.20	Stator resistance of SM 1	0.001–65.535Ω	0.001–65.535	Model depended
P02.21	Direct-axis inductance of SM 1	0.01–655.35mH	0.01–655.35	Model depended
P02.22	Quadrature-axis inductance of SM 1	0.01–655.35mH	0.01–655.35	Model depended
P02.23	Counter-emf constant of SM 1	0–10000	0–10000	300
P02.24	Initial pole position of SM 1	0x0000–0xFFFF	0x0000–0xFFFF	0x0000
P02.25	Identification current of SM 1	0%–50% (of the motor rated current)	0–50	10%

Note: Do not modify these parameters unless it is necessary.

After motor parameter autotuning is properly performed, the values of P02.20–P02.25 are automatically updated. These parameters are the benchmark parameters for high-performance vector control, directly affecting the control performance.

Function code	Name	Description	Setting range	Default
P02.26	Overload protection of motor 1	0: No protection 1: Common motor (with low-speed compensation) 2: Frequency-variable motor (without low-speed compensation)	0–2	2

0: No protection

1: Common motor protection (with low-speed compensation). As the cooling effect of a common motor is degraded at low speed running, the corresponding electronic thermal protection value needs to be adjusted properly, the low compensation indicates lowering the overload protection threshold of the motor whose running frequency is lower than 30Hz.

2: Variable-frequency motor protection (without low speed compensation). Because the heat dissipation function for a

variable-frequency motor is not impacted by the rotation speed, it is not necessary to adjust the protection value at low speed running.

Function code	Name	Description	Setting range	Default
P02.27	Overload protection coefficient of motor 1	20.0%–120.0%	20.0–120.0	100.0%

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

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

Function code	Name	Description	Setting range	Default
P02.28	Power calibration coefficient of motor 1	0.01–3.00	0.00–3.00	1.00

Function code	Name	Description	Setting range	Default
P02.29	Parameter display of motor 1	0: Display based on motor type 1: Display all	0–1	0

The function code is used to select the parameter display mode of motor 1.

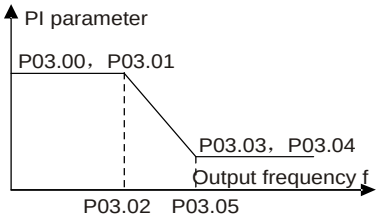
0: Display by motor type. In this mode, only parameters related to the present motor type are displayed.

1: Display all. In this mode, all the motor parameters are displayed.

P03 group—Vector control

Function code	Name	Description	Setting range	Default
P03.00	Speed-loop proportional gain 1	0–200.0	0–200.0	20.0
P03.01	Speed-loop integral time 1	0.000–10.000s	0.000–10.000	1.000s
P03.02	Low-point frequency for switching	0.00Hz–P03.05	0.00–P03.05	5.00Hz
P03.03	Speed-loop proportional gain 2	0.0–200.0	0.0–200.0	20.0
P03.04	Speed-loop integral time 2	0.000–10.000s	0.000–10.000	1.000s
P03.05	High-point frequency for switching	P03.02–P00.03 (Max. frequency)	P03.02–P00.03	10.00Hz

The parameters P03.00–P03.05 are applicable only to vector control mode. Below the switching frequency 1 (P03.02), the speed-loop PI parameters are: P03.00 and P03.01. Above the switching frequency 2 (P03.05), the speed-loop PI parameters are: P03.03 and P03.04. PI parameters are obtained according to the linear change of two groups of parameters. See the following figure:



The speed loop dynamic response characteristics of vector control can be adjusted by setting the proportional coefficient and integral time of speed regulator. Increasing proportional gain or reducing integral time can accelerate dynamic

response of speed loop; however, if the proportional gain is too large or integral time is too small, system oscillation and overshoot may occur; if proportional gain is too small, stable oscillation or speed offset may occur.

PI parameters have a close relationship with the inertia of the system. Adjust PI parameters depending on different loads to meet various demands.

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

The function code is used to set the filter time of the speed loop.

Function code	Name	Description	Setting range	Default
P03.07	Electromotive slip compensation coefficient of vector control	50%–200%	50–200	100%
P03.08	Braking slip compensation coefficient of vector control	50%–200%	50–200	100%

Slip compensation coefficient is used to adjust the slip frequency of the vector control and improve the speed control accuracy of the system. Adjusting the parameter properly can control the speed steady-state error.

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

Note:

1. 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.

2. Applicable to SVC mode 1 (P00.00=1) only.

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

The function code is used to enable the torque control mode and set the torque setting method.

Note:

1. For setting methods 2–15, 100% corresponds to triple the motor rated current.

2. The options 4, 5, 8, and 9 are available only when corresponding expansion cards are configured.

Function code	Name	Description	Setting range	Default
P03.12	Torque set through keypad	-300.0%–300.0% (of the motor rated current)	-300.0–300.0	50.0%

When P03.11=1, the torque is set on the keypad.

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

The function code is used to set the torque reference filter time.

Function code	Name	Description	Setting range	Default
P03.14	Setting source of forward rotation upper-limit frequency in torque control	0: Keypad (Set P03.16 for P03.14, and set P03.17 for P03.15) 1: AI1 2: AI2 3: AI3 4: Pulse frequency HDI 5: Multi-step setting 6: MODBUS communication 7: PROFIBUS/CANopen communication 8: Ethernet communication 9: Reserved	0–9	0
P03.15	Setting source of reverse rotation upper-limit frequency in torque control		0–9	0

Note: For setting methods 1–9, 100% corresponds to the maximum frequency. The options 3, 4, 7, and 8 are available only when corresponding expansion cards are configured.

Function code	Name	Description	Setting range	Default
P03.16	Forward rotation upper-limit frequency set through keypad in torque control	0.00Hz–P00.03	0.00–P00.03	20.00Hz
P03.17	Reverse rotation upper-limit frequency set through keypad in torque control	0.00Hz–P00.03	0.00–P00.03	20.00Hz

The function code is used to set the frequency upper limits. 100% corresponds to the max. frequency. P03.16 sets the value for P03.14, and P03.17 sets the value for P03.15.

Function code	Name	Description	Setting range	Default
P03.18	Setting source of electromotive torque upper limit	0: Keypad (Set P03.20 for P03.18, and set P03.21 for P03.19) 1: AI1 2: AI2 3: AI3 4: Pulse frequency HDI 5: MODBUS communication	0–8	0
P03.19	Setting source of braking torque upper limit		0–8	0

Function code	Name	Description	Setting range	Default
		6: PROFIBUS/CANopen communication 7: Ethernet communication 8: Reserved		

The function code is used to set the source of electromotive torque upper limit.

Note:

1. For setting sources 1–8, 100% corresponds to three times the rated motor current.

2. The options 3, 4, 6, and 7 are available only when corresponding expansion cards are configured.

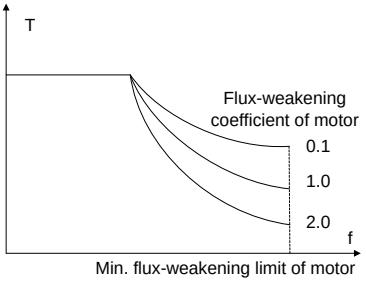
Function code	Name	Description	Setting range	Default
P03.20	Electromotive torque upper limit set through keypad	0.0–300.0% (of the motor rated current)	0.0–300.0	180.0%
P03.21	Braking torque upper limit set through keypad	0.0–300.0% (of the motor rated current)	0.0–300.0	180.0%

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

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

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

The function code is used when the motor is in flux-weakening control.



The function codes P03.22 and P03.23 are valid at constant power. The motor enters the flux-weakening state when the motor runs above the rated speed. Change the flux-weakening curvature by modifying the flux-weakening control coefficient. The larger the coefficient, the steeper the curve, the smaller the coefficient, the smoother the curve.

Function code	Name	Description	Setting range	Default
P03.24	Max. voltage limit	0.0–120.0% (of the motor rated voltage)	0.0–120.0	100.0%
P03.25	Pre-exciting time	0.000–10.000s	0.000–10.000	0.300s
P03.26	Flux-weakening proportional gain	0–4000	0–4000	300

P03.24: It sets the max. output voltage of the VFD. Set the value according to onsite conditions.

P03.25: Pre-exciting is performed for the motor when the VFD starts up. A magnetic field is built up inside the motor to improve the torque performance during the start process.

P03.26: It is used when the AM is in flux-weakening control. The running performance of the motor can be improved by adjusting the parameters properly.

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

Function code	Name	Description	Setting range	Default
P03.27	Flux-weakening integral gain	0–4000	0–4000	300
P03.28	Enabling SM integral separation	0: Disable 1: Enable	0–1	0
P03.29	Exciting current expansion coefficient in SVC 1 for AM	100–200	100–200	100
P03.30	Speed feedforward coefficient in SVC 1 for AM	0.000–30.000	0.000–30.000	0
P03.31	Speed feedforward limit in SVC 1 for AM	0.0–150.0%	0.0–150.0	30.0%

P04 group—V/F control

Function code	Name	Description	Setting range	Default
P04.00	V/F curve setting of motor 1	0: Straight-line 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 curve (V/F separation)	0–5	0

The function code defines the V/F curve of motor 1 to meet the needs of different loads.

0: Straight-line V/F curve, applicable to constant torque loads

1: Multi-point V/F curve

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

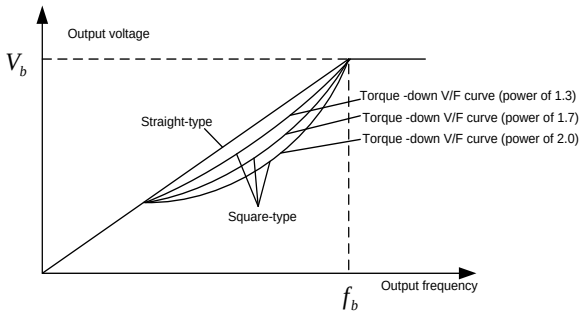
3: Torque-down V/F curve (power of 1.7)

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

Curves 2 – 4 are applicable to the torque loads such as fans and water pumps. You can adjust according to the characteristics of the loads to achieve best performance.

5: Customized V/F (V/F separation); in this mode, V can be separated from F and F can be adjusted through the frequency setting channel set by P00.06 or the voltage setting channel set by P04.27 to change the characteristics of the curve.

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



Function code	Name	Description	Setting range	Default
P04.01	Torque boost of motor 1	0.0%: (automatic) 0.1%–10.0%	0.0–10.0	0.0%
P04.02	Torque boost cut-off of motor 1	0.0%–50.0% (of the rated frequency of motor 1)	0.0–50.0	20.0%

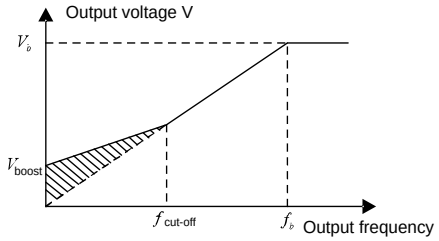
In order to compensate for low-frequency torque characteristics, you can make some boost compensation for the output voltage. P04.01 is relative to the max. output voltage V_b.

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 need to select torque boost based on the load. For example, larger load requires larger torque boost, however, if the torque boost is too large, the motor will run at over-excitation, which may cause increased output current and motor overheating, thus decreasing the efficiency.

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

Torque boost cut-off threshold: Below this frequency threshold, torque boost is valid; exceeding this threshold will invalidate torque boost.

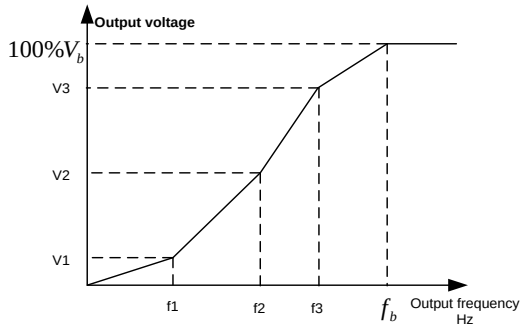


Function code	Name	Description	Setting range	Default
P04.03	V/F frequency point 1 of motor 1	0.00Hz–P04.05	0.00–P04.05	0.00Hz
P04.04	V/F voltage point 1 of motor 1	0.0%–110.0% (of the rated voltage of motor 1)	0.0–110.0	00.0%
P04.05	V/F frequency point 2 of motor 1	P04.03–P04.07	P04.03–P04.07	00.00Hz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

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

The V/F curve is generally set according to the load characteristics of the motor.

Note: V1 < V2 < V3, f1 < f2 < f3. Too high voltage for low frequency will cause motor overheat or damage and cause VFD overcurrent stall or overcurrent protection.



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

The function code is used to compensate for the motor rotating speed change caused by load change in V/F control 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:

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

Of which, f_b is the rated frequency of the motor, corresponding to function code P02.02. n is the rated rotating speed of the motor, corresponding to function code P02.03. p is the number of pole pairs of the motor. 100.0% corresponds to the rated slip frequency Δf of the motor.

Function code	Name	Description	Setting range	Default
P04.10	Low-frequency oscillation control factor of motor 1	0–100	0–100	10
P04.11	High-frequency oscillation control factor of motor 1	0–100	0–100	10
P04.12	Oscillation control threshold of motor 1	0.00Hz–P00.03 (Max. output frequency)	0.00–P00.03	30.00Hz

In V/F control mode, the motor, especially the large-power motor, may experience current oscillation at certain frequencies, which may cause unstable motor running, or even VFD overcurrent. Eliminate the results by adjusting the parameters properly.

Function code	Name	Description	Setting range	Default
P04.13	V/F curve setting of motor 2	0: Straight-line 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 curve (V/F separation)	0–5	0
P04.14	Torque boost of motor 2	0.0%: (automatic) 0.1%–10.0%	0.0–10.0	0.0%
P04.15	Torque boost cut-off of motor 2	0.0%–50.0% (of the rated frequency of motor 2)	0.0–50.0	20.0%

Function code	Name	Description	Setting range	Default
P04.16	V/F frequency point 1 of motor 2	0.00Hz–P04.18	0.00–P04.18	0.00Hz
P04.17	V/F voltage point 1 of motor 2	0.0%–110.0% (of the rated voltage of motor 2)	0.0–110.0	0.0%
P04.18	V/F frequency point 2 of motor 2	P04.16–P04.20	P04.16–P04.20	0.00Hz
P04.19	V/F voltage point 2 of motor 2	0.0%–110.0% (of the rated voltage of motor 2)	0.0–110.0	0.0%
P04.20	V/F frequency point 3 of motor 2	P04.18–P12.02 (Rated frequency of motor 2) or P04.18–P12.16 (Rated frequency of motor 2)	P04.18–P12.02 or P04.18–P12.16	0.00Hz
P04.21	V/F voltage point 3 of motor 2	0.0%–110.0% (of the rated voltage of motor 2)	0.0–110.0	0.0%
P04.22	V/F slip compensation gain of motor 2	0.0–200.0%	0.0–200.0	100.0%
P04.23	Low-frequency oscillation control factor of motor 2	0–100	0–100	10
P04.24	High-frequency oscillation control factor of motor 2	0–100	0–100	10
P04.25	Oscillation control threshold of motor 2	0.00Hz–P00.03 (Max. output frequency)	0.00Hz–P00.03	30.00Hz

The function codes define the V/F setting method of motor 2 to meet the needs of different loads. For details, see P04.13–P04.25.

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

Function code	Name	Description	Setting range	Default
P04.26	Energy-saving run	0: Disable 1: Automatic energy-saving run	0–1	0

The function code is used to enable an energy-saving run. In light-load state, the motor can adjust the output voltage automatically to achieve energy saving.

Function code	Name	Description	Setting range	Default
P04.27	Voltage setting channel	0: Keypad (The output voltage is determined by P04.28.) 1: AI1 2: AI2 3: AI3 4: HDI 5: Multi-step speed running (The setting is determined by group P10.) 6: PID	0–10	0

Function code	Name	Description	Setting range	Default
		7: MODBUS communication 8: PROFIBUS/CANopen communication 9: Ethernet communication 10: Reserved		

The function code is used to select the output voltage setting channel at V/F curve separation.

Note: 100% corresponds to the motor rated voltage. The options 3, 4, 8, and 9 are available only when corresponding expansion cards are configured.

Function code	Name	Description	Setting range	Default
P04.28	Voltage set through keypad	0.0%–100.0% (of the motor rated voltage)	0.0–100.0	100.0%

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

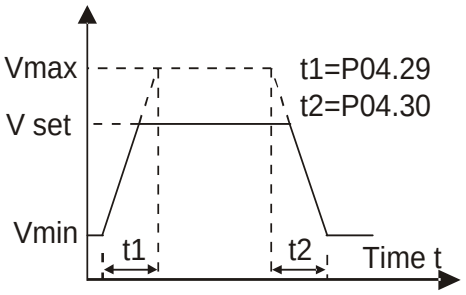
Function code	Name	Description	Setting range	Default
P04.29	Voltage increase time	0.0–3600.0s	0.0–3600.0	5.0s
P04.30	Voltage decrease time	0.0–3600.0s	0.0–3600.0	5.0s

Voltage increase time means the time needed for the VFD to accelerate from 0V to the motor rated frequency.

Voltage decrease time means the time needed for the VFD to decelerate from the rated output frequency to 0V.

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

The function codes are used to set the upper and lower limits of output voltage.



Function code	Name	Description	Setting range	Default
P04.33	VF automatic torque boost cut-in frequency	0.00–400.00Hz	0.00–400.00	2.00Hz
P04.34	Reactive closed-loop proportional gain in VF control	0–5000 (Canceled when P04.34=0)	0–5000	50
P04.35	Reactive closed-loop integral gain in VF control	0–5000	0–5000	30

The function codes are used to set the reactive current closed-loop function when the synchronous motor is at VF mode.

Function code	Name	Description	Setting range	Default
P04.36	Reactive current closed-loop integral switch-over frequency	0–400.00Hz	0–400.00	50.00Hz
P04.37	Reactive current closed-loop high-frequency integral	0–5000	0–5000	30
P04.38	Reactive closed-loop voltage limit in PM-VF control	0–16000V	0–16000	8000
P04.39	IF enabling selection	0: Invalid 1: Valid	0–1	0
P04.40	IF control current	0.0–200.0%	0.0–200.0	50.0%
P04.41	IF control proportional gain	0–5000	0–5000	350
P04.42	IF control integral gain	0–5000	0–5000	10
P04.43	IF switching off frequency	0.00–20.00Hz	0.00–20.00	10.00Hz

P05 group—Input terminals

Function code	Name	Description	Setting range	Default
P05.00	HDI input type	0: HDI is high-speed pulse input 1: HDI is digital input	0–1	0

The function code is used to set the S8 input type.

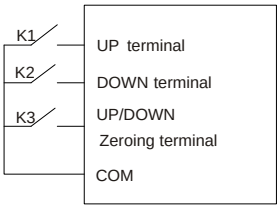
Function code	Name	Description	Setting range	Default
P05.01	Function of S1 terminal	0: No function 1: Run forward 2: Run reversely 3: Three-wire running control 4: Jog forward 5: Jog reversely 6: Coast to stop 7: Reset faults 8: Pause running 9: External fault input 10: Increase frequency setting (UP) 11: Decrease frequency setting (DOWN) 12: Clear the frequency increase/decrease setting 13: Switch between A setting and B	0–63	1
P05.02	Function of S2 terminal		0–63	4
P05.03	Function of S3 terminal		0–63	7
P05.04	Function of S4 terminal		0–63	0
P05.05	Function of S5 terminal		0–63	0
P05.06	Function of S6 terminal		0–63	0
P05.07	Function of S7 terminal		0–63	0
P05.08	Function of S8 terminal		0–63	0

Function code	Name	Description	Setting range	Default
		setting 14: Switch between combination setting and A setting 15: Switch between combination setting and B setting 16: Multi-step speed terminal 1 17: Multi-step speed terminal 2 18: Multi-step speed terminal 3 19: Multi-step speed terminal 4 20: Pause multi-step speed running 21: ACC/DEC time selection 1 22: ACC/DEC time selection 2 23: Simple PLC stop reset 24: Pause simple PLC 25: Pause PID control 26: Reserved 27: Reserved 28: Reserved 29: Disable torque control 30: Disable ACC/DEC 31: Reserved 32: Reserved 33: Clear the frequency increase/decrease setting temporarily 34: DC braking for stop 35: Switch from motor 1 to motor 2 36: Switch the running command channel to keypad 37: Switch the running command channel to terminal 38: Switch the running command channel to communication 39: Pre-exciting command 40: Clear electricity consumption 41: Keep electricity consumption 42: External fault input 2 43: Enable switching to power frequency run 44: Switch to the master 45: Switch to the slave 46: Switch-on signal feedback of rectifier 47–63: Reserved		

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

Note: Two different multifunction input terminals cannot be configured with a same function.

Setting	Function	Description
0	No function	The VFD does not act even if there is signal input. Set unused terminals to "no function" to avoid misaction.
1	Run forward	External terminals are used to control the forward/reverse running of the VFD.
2	Run reversely	

<table>
<tr><th>Setting</th><th>Function</th><th>Description</th></tr>
<tr><td>3</td><td>Three-wire running control (Sln)</td><td>The terminal is used to determine the three-wire running control of the VFD. For details, see the description for P05.12.</td></tr>
<tr><td>4</td><td>Jog forward</td><td rowspan="2">For details about frequency of jogging running and ACC/DEC time of jogging running, see the description for P08.06, P08.07, and P08.08.</td></tr>
<tr><td>5</td><td>Jog reversely</td></tr>
<tr><td>6</td><td>Coast to stop</td><td>The VFD blocks output, and the stop process of motor is uncontrolled by the VFD. This mode is applied in the scenarios with large-inertia loads and without stop time requirements.
Its definition is the same as P01.08, and it is mainly used in remote control.</td></tr>
<tr><td>7</td><td>Fault reset</td><td>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.</td></tr>
<tr><td>8</td><td>Pause running</td><td>The VFD decelerates to stop, however, all the run parameters are in memory state, such as PLC parameter, wobbling frequency, and PID parameter. After this signal disappears, the VFD will revert to the state before stop.</td></tr>
<tr><td>9</td><td>External fault input</td><td>When external fault signal is transmitted to the VFD, the VFD releases fault alarm and stops.</td></tr>
<tr><td>10</td><td>Increase frequency setting (UP)</td><td rowspan="3">Used to change the frequency increase/decrease command when the frequency is given by external terminals.
 

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>12</td><td>Decrease frequency setting (DOWN)</td></tr>
<tr><td>12</td><td>Clear the frequency increase/decrease setting</td></tr>
<tr><td>13</td><td>Switch between A setting and B setting</td><td rowspan="3">The function is used to switch between the frequency setting channels.
A frequency reference channel and B frequency reference channel can be switched by function 13; the combination channel set by P00.09 and the A frequency reference channel can be switched by function 14; the combination channel set by P00.09 and the B frequency reference channel can be switched by function 15.</td></tr>
<tr><td>14</td><td>Switch between combination setting and A setting</td></tr>
<tr><td>15</td><td>Switch between combination setting and B setting</td></tr>
<tr><td>16</td><td>Multi-step speed terminal 1</td><td rowspan="4">A total of 16-step speeds can be set by combining digital states of these four terminals.
Note: Multi-step speed 1 is the LSB, and multi-step speed 4 is the MSB.
<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>Pause multi-step speed running</td><td>The multi-step speed selection function can be screened to keep the set value in the present state.</td></tr>
<tr><td>21</td><td>ACC/DEC time selection 1</td><td>The status of the two terminals can be combined to select four</td></tr>
</table>

<table>
<tr><th>Setting</th><th>Function</th><th>Description</th></tr>
<tr><td>22</td><td>ACC/DEC time selection 2</td><td>groups of ACC/DEC time.
<table>
<tr><th>Terminal 1</th><th>Terminal 2</th><th>ACC/DEC time</th><th>Parameter</th></tr>
<tr><td>OFF</td><td>OFF</td><td>ACC/DEC time 1</td><td>P00.11/P00.12</td></tr>
<tr><td>ON</td><td>OFF</td><td>ACC/DEC time 2</td><td>P08.00/P08.01</td></tr>
<tr><td>OFF</td><td>ON</td><td>ACC/DEC time 3</td><td>P08.02/P08.03</td></tr>
<tr><td>ON</td><td>ON</td><td>ACC/DEC time 4</td><td>P08.04/P08.05</td></tr>
</table></td></tr>
<tr><td>23</td><td>Simple PLC stop reset</td><td>In the stopped state, it is used to clear the previous PLC state memory information and restart the simple PLC process.</td></tr>
<tr><td>24</td><td>Pause simple PLC</td><td>It is used to pause the simple PLC. When the function is revoked, the simple PLC resumes the running.</td></tr>
<tr><td>25</td><td>Pause PID control</td><td>PID is ineffective temporarily, and the VFD maintains current frequency output.</td></tr>
<tr><td>29</td><td>Disable torque control</td><td>The VFD switches from torque control mode to speed control mode.</td></tr>
<tr><td>30</td><td>Disable ACC/DEC</td><td>It is used to ensure the VFD is not impacted by external signals (except for stop command), and maintains the present output frequency.</td></tr>
<tr><td>33</td><td>Clear the frequency increase/decrease setting temporarily</td><td>When the terminal is closed, the frequency value set by UP/DOWN can be cleared to restore the set frequency to the frequency given by frequency command channel; when the terminal is opened, it restores to the frequency value after frequency increase/decrease setting.</td></tr>
<tr><td>34</td><td>DC braking for stop</td><td>In the process of decelerating to stop, after the command becomes valid, the VFD will decrease to P01.15 (stop speed) and then begin DC braking immediately. The braking time is not limited by P01.12 (DC braking time at stopping).</td></tr>
<tr><td>35</td><td>Switch from motor 1 to motor 2</td><td>When the function is enabled, the motor 1 is switched to motor 2. When the function is disabled, the running command channel is restored to the previous setting.</td></tr>
<tr><td>36</td><td>Switch the running command channel to keypad</td><td>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.</td></tr>
<tr><td>37</td><td>Switch the running command channel to terminal</td><td>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.</td></tr>
<tr><td>38</td><td>Switch the running command channel to communication</td><td>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.</td></tr>
<tr><td>39</td><td>Pre-exciting command</td><td>When the function is enabled, motor pre-exciting is started until the function becomes invalid.</td></tr>
<tr><td>40</td><td>Clear power consumption quantity</td><td>After this command becomes valid, the power consumption quantity of the VFD will be zeroed out.</td></tr>
<tr><td>41</td><td>Keep power consumption quantity</td><td>When the function is enabled, the present operation of the VFD does not impact the power consumption quantity.</td></tr>
<tr><td>42</td><td>External fault input 2</td><td>When external fault signal is transmitted to the VFD, the VFD releases fault alarm and stops.</td></tr>
<tr><td>43</td><td>Enable switching to power frequency run</td><td>When the synchronous switchover has been done and the output is power frequency, this signal is valid.</td></tr>
<tr><td>44</td><td>Switch to the master</td><td>when the terminal is valid, the current VFD is switched from the slave mode to the master mode.</td></tr>
<tr><td>45</td><td>Switch to the slave</td><td>when the terminal is valid, the current VFD is switched from the</td></tr>
</table>

Setting	Function	Description
		master mode to the slave mode.
46	Switch-on signal feedback of rectifier	When the rectifier is switched on, this terminal is used as a feedback signal to confirm the start of buffering
47–63	Reserved	

Function code	Name	Description	Setting range	Default
P05.10	Input terminal polarity	0x000–0x1FF	0x000–0x1FF	0x000

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

When a bit is 0, the input terminal is positive;

when a bit is 1, the input terminal is negative.

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

Function code	Name	Description	Setting range	Default
P05.11	Digital input filter time	0.000–1.000s	0.000–1.000	0.010s

The function code is used to specify the filter time of S1–S8 terminal sampling. In strong interference cases, increase the value to avoid maloperation.

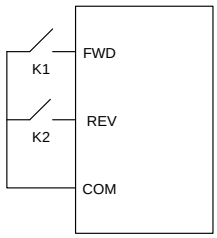
Function code	Name	Description	Setting range	Default
P05.12	Virtual terminal setting	0: Virtual input terminals are invalid 1: MODBUS communication virtual terminals are valid 2: PROFIBUS/CANopen communication virtual terminals are valid 3: Ethernet virtual terminals are valid 4: Reserved	0–4	0

Specifies whether to enable the virtual input terminals in communication mode. The options 2 and 3 are expansion functions and are available only when corresponding expansion cards are configured.

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

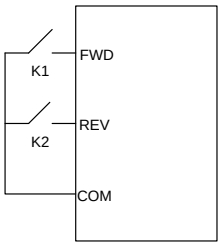
The function code is used to set the mode of terminal control.

0: Two-wire control 1, the enabling consistent with the direction. This mode is widely used. The defined FWD/REV terminal command determines the motor rotation direction.



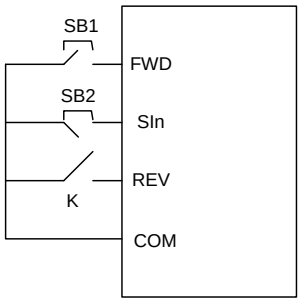
FWD	REV	Running command
OFF	OFF	Stop
ON	OFF	Forward running
OFF	ON	Reverse running
ON	ON	Hold

1: Two-wire control 2, the enabling separated from the direction. In this mode, FWD is the enabling terminal. The direction depends on the defined REV state.



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

2: Three-wire control 1. This mode defines Sin as the enabling terminal, and the running command is generated by FWD, while the direction is controlled by REV. During running, the Sin terminal needs to be closed, and terminal FWD generates a rising edge signal, then the VFD starts to run in the direction set by the state of terminal REV; the VFD needs to be stopped by disconnecting terminal Sin.

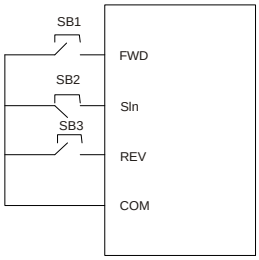


The direction control is as follows during running:

Sin	REV	Previous direction	Present direction
ON	OFF→ON	FWD run	REV run
		Run reversely	FWD run
ON	ON→OFF	REV run	FWD run
		FWD run	REV run
ON→OFF	ON	Decelerate to stop	
	OFF		

Sin Three-wire control; FWD: Forward running; REV: Reverse running

3: Three-wire control 2. This mode defines Sin as the enabling terminal, and the running command is generated by FWD or REV, but the direction is controlled by both FWD and REV. During running, the Sin terminal needs to be closed, and terminal FWD or REV generates a rising edge signal to control the running and direction of the VFD; the VFD needs to be stopped by disconnecting terminal Sin.



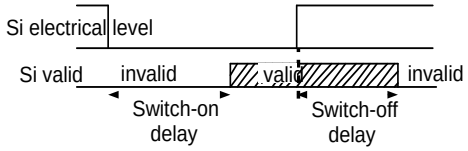
Sin	FWD	REV	Running direction
ON	OFF→ON	ON	FWD run
		OFF	FWD run
ON	ON	OFF→ON	REV run
	OFF		REV run
ON→OFF			Decelerate to stop

Sin Three-wire control; FWD: Forward running; REV: Reverse running

Note: For two-wire controlled running mode, when the FWD/REV terminal is valid, if the VFD stops due to a stop command given by another source, the VFD does not run again after the stop command disappears even if the control terminal FWD/REV is still valid. To make the VFD run, you need to trigger FWD/REV again, for example, PLC single-cycle stop, fixed-length stop, and valid STOP/RST stop during terminal control. (See P07.04.)

Function code	Name	Description	Setting range	Default
P05.14	S1 switch-on delay	0.000–50.000s	0.000–50.000	0.000s
P05.15	S1 switch-off delay	0.000–50.000s	0.000–50.000	0.000s
P05.16	S2 switch-on delay	0.000–50.000s	0.000–50.000	0.000s
P05.17	S2 switch-off delay	0.000–50.000s	0.000–50.000	0.000s
P05.18	S3 switch-on delay	0.000–50.000s	0.000–50.000	0.000s
P05.19	S3 switch-off delay	0.000–50.000s	0.000–50.000	0.000s
P05.20	S4 switch-on delay	0.000–50.000s	0.000–50.000	0.000s
P05.21	S4 switch-off delay	0.000–50.000s	0.000–50.000	0.000s
P05.22	S5 switch-on delay	0.000–50.000s	0.000–50.000	0.000s
P05.23	S5 switch-off delay	0.000–50.000s	0.000–50.000	0.000s
P05.24	S6 switch-on delay	0.000–50.000s	0.000–50.000	0.000s
P05.25	S6 switch-off delay	0.000–50.000s	0.000–50.000	0.000s
P05.26	S7 switch-on delay	0.000–50.000s	0.000–50.000	0.000s
P05.27	S7 switch-off delay	0.000–50.000s	0.000–50.000	0.000s
P05.28	S8 switch-on delay	0.000–50.000s	0.000–50.000	0.000s
P05.29	S8 switch-off delay	0.000–50.000s	0.000–50.000	0.000s
P05.30	HDI switch-on delay	0.000–50.000s	0.000–50.000	0.000s
P05.31	HDI switch-off delay	0.000–50.000s	0.000–50.000	0.000s

Used to 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
P05.32	AI1 lower limit	0.00V–P05.34	0.00–P05.34	0.00V
P05.33	Corresponding setting of AI1 lower limit	-100.0%–100.0%	-100.0–100.0	0.0%
P05.34	AI1 upper limit	P05.32–10.00V	P05.32–10.00	10.00V
P05.35	Corresponding setting of AI1 upper limit	-100.0%–100.0%	-100.0–100.0	100.0%
P05.36	AI1 input filter time	0.000s–10.000s	0.000–10.000	0.100s
P05.37	AI2 lower limit	-10.00V–P05.39	-10.00V–P05.39	0.00V
P05.38	Corresponding setting of AI2 lower limit	-100.0%–100.0%	-100.0–100.0	0.0%
P05.39	AI2 middle value	P05.37–P05.41	P05.37–P05.41	0.00V
P05.40	Corresponding setting of AI2 middle value	-100.0%–100.0%	-100.0–100.0	0.0%
P05.41	AI2 upper limit	P05.39–10.00V	P05.39–10.00	10.00V

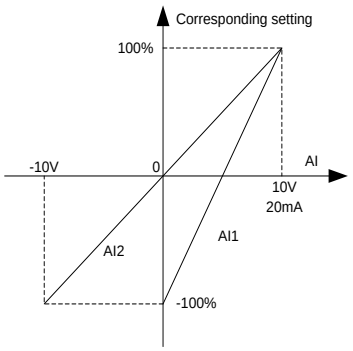
Function code	Name	Description	Setting range	Default
P05.42	Corresponding setting of AI2 upper limit	-100.0%–100.0%	-100.0–100.0	100.0%
P05.43	AI2 input filter time	0.000s–10.000s	0.000–10.000	0.100s
P05.44	AI3 lower limit	0.00V–P05.46	0.00–P05.46	0.00V
P05.45	Corresponding setting of AI3 lower limit	-100.0%–100.0%	-100.0–100.0	-100.0%
P05.46	AI3 middle value	P05.44–P05.48	P05.44–P05.48	0.00V
P05.47	Corresponding setting of AI3 middle value	-100.0%–100.0%	-100.0–100.0	0.0%
P05.48	AI3 upper limit	P05.46–10.00V	P05.46–10.00	10.00V
P05.49	Corresponding setting of AI3 upper limit	-100.0%–100.0%	-100.0–100.0	100.0%
P05.50	AI3 input filter time	0.000s–10.000s	0.000–10.000	0.100s

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

Function code	Name	Description	Setting range	Default
P05.51	HDI high-speed pulse input function selection	0: Input set through frequency 1–2: Reserved	0	0

The function code is used to select function when the HDI terminal is used as pulse input.

0: Frequency setting input. The high-speed pulse can be used as input of frequency, torque, PID reference, and PID feedback. The corresponding relationship is determined by the function codes of P05.52–P05.56.

Function code	Name	Description	Setting range	Default
P05.52	HDI lower limit frequency	0.00 kHz–P05.54	0.00–P05.54	0.00kHz
P05.53	Corresponding setting of HDI lower limit frequency	-100.0%–100.0%	-100.0–100.0	0.0%

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

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

P06 group—Output terminals

Function code	Name	Description	Setting range	Default
P06.00	HDO output type	0: Open collector high-speed pulse output 1: Reserved	0–1	0
P06.01	Y1 output	0: Invalid 1: Running 2: Running forward 3: Running reversely 4: Jogging 5: VFD in fault 6: Frequency level detection FDT1 7: Frequency level detection FDT2 8: Frequency reached 9: Running at 0Hz 10: Upper limit frequency reached 11: Lower limit frequency reached 12: Ready for running 13: Pre-exciting 14: Overload pre-alarm 15: Underload pre-alarm 16: Simple PLC stage completed 17: Simple PLC cycle completed 18: Reserved 19: Reserved 20: External fault is valid 21: Reserved 22: Running time reached 23: Modbus communication virtual terminal output 24: PROFIBUS/CANopen communication virtual terminal output 25: Ethernet communication virtual terminal output 26: DC bus voltage established 27–28: Reserved 29: Motor OH pre-alarm 30: Phase-locked and synchronous output at power frequency	0–30	0
P06.02	HDO output		0–30	0
P06.03	Relay RO1 output		0–30	1
P06.04	Relay RO2 output		0–30	5
P06.05	Relay RO3 output		0–30	0

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

Setting	Function	Description
0	Invalid	The output terminal does not have any function.
1	Running	Output is valid when there is frequency output during running.
2	Running forward	Output is valid when there is frequency output during forward running.
3	Running reversely	Output is valid when there is frequency output during reverse running.
4	Jogging	Output is valid when there is frequency output during jogging.
5	VFD fault	Output is valid when VFD fault occurred.
6	Frequency level detection FDT1	Refer to the descriptions for P08.32–P08.33.
7	Frequency level detection FDT2	Refer to the descriptions for P08.34–P08.35.
8	Frequency reached	Refer to the description for P08.36.
9	Running at zero speed	Output is valid when the VFD output frequency and reference frequency are both zero.
10	Upper limit frequency reached	Output is valid when the running frequency reaches upper limit frequency.
11	Lower limit frequency reached	Output is valid when the running frequency reached lower limit frequency.
12	Ready for running	Main circuit and control circuit powers are established, the protection functions do not act; when the VFD is ready to run, output is valid.
13	Pre-exciting	Output is valid during pre-exciting of the VFD.
14	Overload pre-alarm	Output is valid after the pre-alarm detection time elapsed based on the overload pre-alarm threshold. For details, see the descriptions for P11.08–P11.10.
15	Underload pre-alarm	Output is valid after the pre-alarm detection time elapsed based on the underload pre-alarm threshold. For details, see the descriptions for P11.11–P11.12.
16	Simple PLC stage completed (Reserved)	When the present state of the simple PLC is completed, output is valid.
17	Simple PLC cycle completed (Reserved)	When a single cycle of the simple PLC is completed, output is valid.
18	Reserved	
19	Reserved	
20	External fault is valid	Output is valid when the external fault (EF) occurs.
21	Reserved	
22	Running time reached	The output is valid after the accumulated running time of the VFD exceeds the time set in P08.27.
23	MODBUS communication virtual terminal output	Output corresponding signals based on the set value of MODBUS. Output ON signal when it is set to 1, and output OFF signal when it is set to 0.
24	POROFIBUS/CANopen communication virtual terminal output	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	Ethernet communication virtual terminal output	A signal is output based on the value set through Ethernet communication. When the value is 1, the ON signal is output; when

Setting	Function	Description
		the value is 0, the OFF signal is output.
26	DC bus voltage established	Output is valid when the bus voltage exceeds the undervoltage threshold.
27–28	Reserved	
29	Motor OH pre-alarm	The signal is valid when the temperature of the motor is larger than the set pre-alarm temperature and less than motor overheat protection point.
30	Phase-locked and synchronous output at power frequency	When this terminal is valid and P22.00 is set to 1, the running command performs the switchover from variable frequency to power frequency.

Function code	Name	Description	Setting range	Default
P06.06	Output terminal polarity selection	0x00–0x1F	0x00–0x1F	0x00

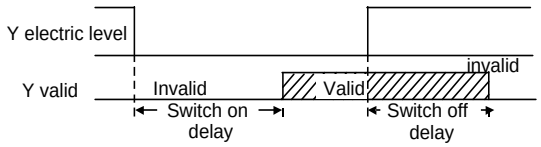
The function code is used to set the polarity of output terminals.

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

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

Function code	Name	Description	Setting range	Default
P06.07	Y switch-on delay	0.000–50.000s	0.000–50.000	0.000s
P06.08	Y switch-off delay	0.000–50.000s	0.000–50.000	0.000s
P06.09	HDO switch-on delay	0.000–50.000s (valid when P06.00 is 1)	0.000–50.000	0.000s
P06.10	HDO switch-off delay	0.000–50.000s (valid when P06.00 is 1)	0.000–50.000	0.000s
P06.11	RO1 switch-on delay	0.000–50.000s	0.000–50.000	0.000s
P06.12	RO1 switch-off delay	0.000–50.000s	0.000–50.000	0.000s
P06.13	RO2 switch-on delay	0.000–50.000s	0.000–50.000	0.000s
P06.14	RO2 switch-off delay	0.000–50.000s	0.000–50.000	0.000s
P06.15	RO3 switch-on delay	0.000–50.000s	0.00–50.00	0.000s
P06.16	RO3 switch-off delay	0.000–50.000s	0.00–50.00	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
P06.17	AO1 output	0: Running frequency 1: Set frequency 2: Ramp reference frequency 3: Rotational speed 4: Output current (relative to the VFD)	0–30	0
P06.18	AO2 output		0–30	0
P06.19	AO3 output		0–30	0
P06.20	HDO high-speed			

Function code	Name	Description	Setting range	Default
	pulse output	5: Output current (relative to the motor) 6: Output voltage 7: Output power 8: Set torque 9: Output torque 10: AI1 input 11: AI2 input 12: AI3 input 13: High-speed pulse HDI input 14: Value 1 set through MODBUS communication 15: Value 2 set through MODBUS communication 16: Value 1 set through PROFIBUS/CANopen communication 17: Value 2 set through PROFIBUS/CANopen communication 18: Value 1 set through Ethernet communication 19: Value 2 set through Ethernet communication 20–21: Reserved 22: Torque current (relative to the motor rated current) 23: Ramp reference frequency (signed) 24–30: Reserved		

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	Rotational speed	0–Twice the motor rated synchronous rotation speed
4	Output current (relative to the VFD)	0–Twice the VFD rated current
5	Output current (relative to motor)	0–Twice the motor rated current
6	Output voltage	0–1.5 times the motor rated voltage
7	Output power	0–Twice the motor rated power
8	Set torque	0–Twice the motor rated current
9	Output torque	0–Twice the motor rated current
10	AI1 input	0–10V/0–20mA
11	AI2 input	-10V–10V
12	AI3 input	0–10V/0–20mA
13	High-speed pulse HDI input	0–50KHz
14	Value 1 set through MODBUS communication	-1000–1000, 1000 corresponding to 100.0%
15	Value 2 set through MODBUS communication	-1000–1000, 1000 corresponding to 100.0%
16	Value 1 set through	-1000–1000, 1000 corresponding to 100.0%

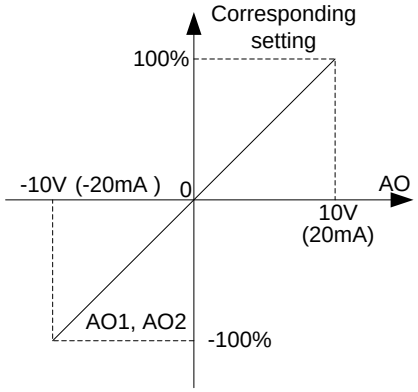
Setting	Function	Description
	PROFIBUS/CANopen communication	
17	Value 2 set through PROFIBUS/CANopen communication	-1000–1000, 1000 corresponding to 100.0%
18	Value 1 set through Ethernet communication	-1000–1000, 1000 corresponding to 100.0%
19	Value 2 set through Ethernet communication	-1000–1000, 1000 corresponding to 100.0%
20–21	Reserved	Reserved
22	Torque current (relative to the motor rated current)	0–Triple the motor rated current
23	Ramp reference frequency	Symbol
24–30	Reserved	Reserved

Function code	Name	Description	Setting range	Default
P06.21	AO1 output lower limit	-100.0%–P06.23	-100.0–P06.23	0.0%
P06.22	AO1 output corresponding to lower limit	-10.00V–10.00V	-10.00–10.00	0.00V
P06.23	AO1 output upper limit	P06.21–100.0%	P06.21–100.0	100.0%
P06.24	AO1 output corresponding to upper limit	-10.00V–10.00V	-10.00–10.00	10.00V
P06.25	AO1 output filter time	0.000s–10.000s	0.000–10.000	0.000s
P06.26	AO2 output lower limit	-100.0%–P06.28	-100.0–P06.28	0.0%
P06.27	AO2 output corresponding to lower limit	-10.00V–10.00V	-10.00–10.00	0.00V
P06.28	AO2 output upper limit	P06.26–100.0%	P06.26–100.0	100.0%
P06.29	AO2 output corresponding to upper limit	-10.00V–10.00V	-10.00–10.00	10.00V
P06.30	AO2 output filter time	0.000s–10.000s	0.000–10.000	0.000s
P06.31	AO3 output lower limit	-100.0%–P06.33	-100.0–P06.33	0.0%
P06.32	AO3 output corresponding to lower limit	-10.00V–10.00V	-10.00–10.00	0.00V
P06.33	AO3 output upper limit	P06.31–100.0%	P06.31–100.0	100.0%
P06.34	AO3 output corresponding to upper limit	-10.00V–10.00V	-10.00–10.00	10.00V
P06.35	AO3 output filter time	0.000s–10.000s	0.000–10.000	0.000s
P06.36	HDO output lower limit	-100.0%–P06.38	-100.0%–P06.38	-100.0%
P06.37	HDO output corresponding to lower limit	0.00–50.00kHz	0.00–50.00	0.0kHz
P06.38	HDO output upper limit	P06.36–100.0%	P06.36–100.0	100.0%
P06.39	HDO output corresponding to upper limit	0.00–50.00kHz	0.00–50.00	50.00kHz
P06.40	HDO output filter time	0.000s–10.000s	0.000–10.000	0.000s

The function 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.



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 (including motor parameters) from the keypad to the local address 3: Download parameters (excluding motor parameters) from the keypad to the local address 4: Download parameters (only including motor parameters) from the keypad to the local address	0–4	0

Used to set the parameter copy mode.

Note: After any operation among 1–4 is complete, the parameter restores to 0. The upload and download functions are not applicable to group P29.

Function code	Name	Description	Setting range	Default
P07.02	Function of QUICK/JOG	0: No function 1: Jog 2: Switch between states	0–7	1

Function code	Name	Description	Setting range	Default
		3: Switch between forward and reverse rotating 4: Clear the UP/DOWN setting 5: Coast to stop 6: Switch command channels in sequence 7: Quick commissioning mode (based on non-factory parameter settings)		

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

0: No function

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

2: Switch displayed function codes from right to left by Press **QUICK/JOG** to shift the displayed function code from right to left.

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

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

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

6: Switch command channels in sequence Press QUICK/ JOG to switch command channels in sequence.

7: Quick commissioning mode (based on non-factory parameter settings)

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

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

When P07.02=6, set the sequence of switching running-command channels by pressing this key.

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	0

Used to specify 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	Selection 1 of parameters to be	BIT0: Running frequency (Hz on) BIT1: Set frequency (Hz blinking)	0x0000–0xFFFF	0x03FF

Function code	Name	Description	Setting range	Default
	displayed in the running state	BIT2: Bus voltage (V on) BIT3: Output voltage (V on) BIT4: Output current (A on) BIT5: Running speed (rpm on) Bit 6: Output power (% on) Bit 7: Output torque (% on) Bit 8: PID reference value (% blinking) Bit 9: PID feedback value (% on) BIT10: Input terminal status BIT11: Output terminal status Bit 12: Set torque (% on) Bit 13: Pulse count value BIT14: Reserved Bit 15: PLC and current step number of multi-step speed		
P07.06	Selection 2 of parameters to be displayed in the running state	Bit 0: AI1 (V on) Bit 1: AI1 (V on) Bit 2: AI3 (V on) BIT3: HDI frequency BIT14: Motor overload percentage (% on) BIT15: VFD overload percentage (% on) Bit 6: Ramp frequency reference (Hz on) BIT7: Reserved BIT8: Reserved Bit 9–15: Reserved	0x0000–0xFFFF	0x0000

The function code P07.06 determines parameter display at VFD running state. 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 P07.05 and P07.06, convert the binary number to a hex number before the input to the function code.

Note: The options AI3 and HDI are available only when corresponding expansion cards are configured.

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

Function code	Name	Description	Setting range	Default
P07.07	Selection of parameters to be displayed in the stop state	BIT0: Set frequency (Hz on, blinking slowly) BIT1: Bus voltage (V on) BIT2: Input terminal state BIT3: Output terminal state BIT4: PID reference value (% blinking) BIT5: PID feedback value (% on) BIT6: Set torque (% on) BIT7: AI1 (V on) BIT8: AI2 (V on) BIT9: AI3 (V on) BIT10: HDI frequency BIT11: PLC and actual step of multi-step speed BIT12: Reserved BIT13: Reserved BIT14–BIT15: Reserved	0x0000–0xFFFF	0x00FF

The setting method of P07.07 is the same with that of P07.06. The function code P07.07 determines the parameter display at VFD stopped state.

Note: The options AI3 and HDI are available only when corresponding expansion cards are configured.

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

Function code	Name	Description	Setting range	Default
P07.08	Frequency display coefficient	0.01–10.00	0.01–10.00	1.00
P07.09	Rotational speed display coefficient	0.1–999.9%	0.1–999.9	100.0%
P07.10	Linear speed display coefficient	0.1–999.9%	0.1–999.9	1.0%

Display frequency = Running frequency * P07.08

Mechanical rotation speed = 60 * (Displayed running frequency) * P07.09/(Number of motor pole pairs)

Linear speed = (Mechanical rotation speed) * P07.10.

Function code	Name	Description	Setting range	Default
P07.11	Rectifier bridge temperature	0.0–100.0℃		

Function code	Name	Description	Setting range	Default
P07.12	Inverter module temperature	0.0–100.0℃		
P07.13	DSP software version	1.00–655.35		
P07.14	Local accumulative running time	0–65535h		

The parameters above are read-only.

Function code	Name	Description	Setting range	Default
P07.15	VFD electricity consumption high-order bits	0–65535kWh (*1000)		
P07.16	VFD electricity consumption low-order bits	0.0–999.9kWh		

Used to display the electricity consumption of the VFD.

VFD electricity consumption = P07.15 * 1000 + P07.16.

Function code	Name	Description	Setting range	Default
P07.18	VFD rated power	0.4–3000.0kW		
P07.19	VFD rated voltage	0–4000V		
P07.20	VFD rated current	0.1–6000.0A		
P07.21	Factory bar code 1	0x0000–0xFFFF		
P07.22	Factory bar code 2	0x0000–0xFFFF		
P07.23	Factory bar code 3	0x0000–0xFFFF		
P07.24	Factory bar code 4	0x0000–0xFFFF		
P07.25	Factory bar code 5	0x0000–0xFFFF		
P07.26	Factory bar code 6	0x0000–0xFFFF		

The parameters above are read-only.

Function code	Name	Description	Setting range	Default
P07.27	Present fault type	Common fault type: 0: No fault 1: Inverter unit U-phase protection (OUt1) 2: Inverter unit V-phase protection (OUt2) 3: Inverter unit W-phase protection (OUt3) 4: Overcurrent during acceleration (OC1) 5: Overcurrent during deceleration (OC2) 6: Overcurrent during constant speed running (OC3) 7: Overvoltage during acceleration (Ov1)		
P07.28	Last fault type			
P07.29	2nd-last fault type			
P07.30	3rd-last fault type			
P07.31	4th-last fault type			
P07.32	5th-last fault type			

Function code	Name	Description	Setting range	Default
		8: Overvoltage during deceleration (Ov2) 9: Overvoltage during constant speed running (Ov3) 10: Bus undervoltage fault (Uv) 11: Motor overload (OL1) 12: VFD overload (OL2) 13: Phase loss on input side (SPI) 14: Phase loss on output side (SPO) 15: Rectifier module overheat (OH1) 16: Inverter module overheat (OH2) 17: External fault (EF) 18: RS485 communication fault (CE) 19: Current detection fault (ItE) 20: Motor autotuning fault (tE) 21: EEPROM operation error (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 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 disconnection fault (EnC1o) 38: Encoder direction reversal fault (EnC1d) 39: Encoder Z-pulse disconnection fault (EnC1Z) 40: (Reserved)/ Control fan feedback fault 1 41: (Reserved)/ Control fan feedback fault 2 42: (Reserved) Power-on buffer fault		

Function code	Name	Description	Setting range	Default
		43: Motor overtemperature fault (Ot) 44: SCR fault (SCE) 45: Slave fault (SF) (valid when the VFD is the master in master-slave control mode) 46: Slave speed deviation fault (SdEu) (valid when the VFD is the slave in master-slave torque mode) 47: Phase lock failure (PLLF) 48: Optical fiber offline fault (FCE) 49: FPGA no-program fault (FPGA) 50: Low temperature fault (Lt) 51: Hardware overcurrent (HoC) 52: Leakage current fault (PIF) 53: Runaway fault (OS) 54: Large DC for long periods (LDC) 55: Protection against PID feedback low limit (LF)/hardware overvoltage fault (Hov) Pre-alarm: 1: Motor OH pre-alarm (A-Ot) 2: Overload pre-alarm (A-OL) 3: PROFIBUS communication pre-alarm (A_dP) 4: RS485 communication pre-alarm (A- CE) 5: Ethernet communication pre-alarm (A-nEt) 6: CAN communication pre-alarm (A_CAn) 7: DEVICE_NET communication pre-alarm (A-dEv) 8: Reserved		

For details, see fault information.

Function code	Name	Description	Setting range	Default
P07.33	Running frequency at present fault			0.00Hz
P07.34	Ramp reference frequency at present fault			0.00Hz
P07.35	Output current at present fault			0V
P07.36	Output current at present fault			0.0A
P07.37	Bus voltage at present fault			0.0V
P07.38	Upper half bus voltage at present fault			0.0V
P07.39	Lower half bus voltage at			0.0V

Function code	Name	Description	Setting range	Default
	present fault			
P07.40	Max. temperature at present fault			0.0°C
P07.41	Input terminal status at present fault			0
P07.42	Output terminal status at present fault			0

The function codes are used to record the display information at present fault. For details, see P07.33–P07.40.

Function code	Name	Description	Setting range	Default
P07.43	Running frequency at last fault			0.00Hz
P07.44	Ramp reference frequency at last fault			0.00Hz
P07.45	Output voltage at last fault			0V
P07.46	Output current at last fault			0.0A
P07.47	Bus voltage at last fault			0.0V
P07.48	Upper half bus voltage at last 1 fault			0.0V
P07.49	Lowe half bus voltage at last 1 fault			0.0V
P07.50	Max. temperature at last fault			0.0°C
P07.51	Input terminal status at last fault			0
P07.52	Output terminal status at last fault			0

The function codes are used to record display information when the last fault occurs. For details, see P07.43–P07.52.

Function code	Name	Description	Setting range	Default
P07.53	Running frequency at 2nd-last fault			0.00Hz
P07.54	Ramp reference frequency at 2nd-last fault			0.00Hz
P07.55	Output voltage at 2nd-last fault			0V
P07.56	Output current at 2nd-last fault			0.0A
P07.57	Bus voltage at 2nd-last fault			0.0V
P07.58	Upper half bus voltage at last 2 fault			0.0V
P07.59	Lowe half bus voltage at last 2 fault			0.0V
P07.60	Max. temperature at 2nd-last fault			0.0°C
P07.61	Input terminal status at			0

Function code	Name	Description	Setting range	Default
	2nd-last fault			
P07.62	Output terminal status at 2nd-last fault			0

The function codes are used to record display information when the 2nd-last fault occurs. For details, see P07.53–P07.62.

P08 group—Enhanced functions

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

For details, see P00.11 and P00.12.

The inverter unit has four groups of ACC/DEC time, which can be selected by P05. The factory default ACC/DEC time of the VFD is the first group.

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

The function code is used to define the reference frequency during jogging.

Function code	Name	Description	Setting range	Default
P08.07	ACC time for jogging	0.0–3600.0s	0.0–3600.0	Model depended
P08.08	DEC time for jogging	0.0–3600.0s	0.0–3600.0	Model depended

ACC time for jogging means the time needed for the VFD to accelerate from 0Hz to the max. output frequency (P00.03).

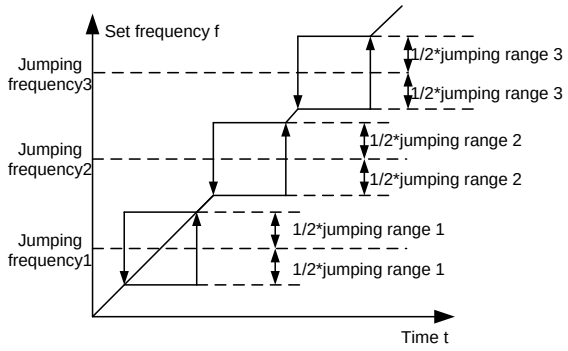
DEC time for jogging means the time needed for the VFD to decelerate from the max. output frequency (P00.03) to 0Hz.

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

Function code	Name	Description	Setting range	Default
P08.14	Jump frequency amplitude 3	0.00–P00.03 (Max. output frequency)	0.00–P00.03	0.00Hz

When the set frequency is within the range of jump frequency, the VFD runs at the boundary of jump frequency.

The VFD can avoid mechanical resonance points by setting jump frequencies. The VFD supports the setting of three jump frequencies. If the jump frequency points are set to 0, this function is invalid.



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

The function code is used to preset the running tine of the VFD. When the accumulative running time achieves the set time, the multi-function digital output terminal will output the signal of "running time reached".

Function code	Name	Description	Setting range	Default
P08.28	Auto fault reset count	0–10	0–10	0
P08.29	Auto fault reset interval	0.1–3600.0s	0.1–3600.0	1.0s

Auto fault reset count: When the VFD uses automatic fault reset, it is used to set the number of automatic fault reset times. When the number of continuous reset times exceeds the value, the VFD reports a fault and stops.

Auto fault reset interval: Time interval from when a fault occurred to when automatic fault reset takes effect.

Function code	Name	Description	Setting range	Default
P08.30	Frequency decrease ratio in drop control	0.00–50.00Hz	0.00–50.00	0.00Hz

The output frequency of the VFD changes as the load changes. The function code is mainly used to balance the power when several motors drive a same load.

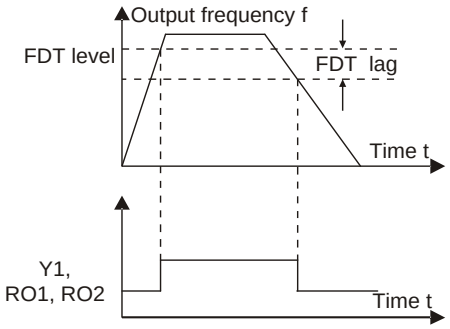
Function code	Name	Description	Setting range	Default
P08.31	Switching between motor 1 and motor 2	0: Terminal 1: MODBUS communication 2: PROFIBUS/CANopen communication 3: Ethernet communication 4: Reserved	0–4	0

The VFDs support the switchover between two motors and the function code is used to switch the channels.

Function code	Name	Description	Setting range	Default
P08.32	FDT1 electrical level detection value	0.00–P00.03 (Max. output frequency)	0.00–P00.03	50.00Hz

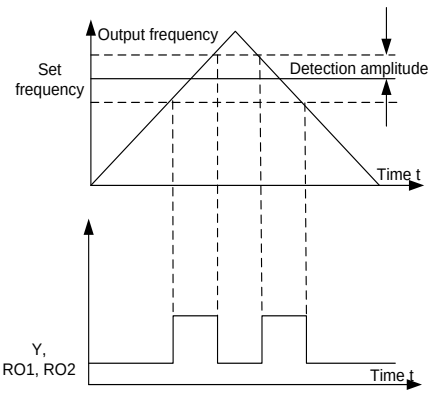
Function code	Name	Description	Setting range	Default
P08.33	FDT1 lagging detection value	0.0–100.0% (FDT1 electrical level)	0.0–100.0	5.0%
P08.34	FDT2 electrical level detection value	0.00–P00.03 (Max. output frequency)	0.00–P00.03	50.00Hz
P08.35	FDT2 lagging detection value	0.0–100.0% (FDT2 electrical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

When the output frequency exceeds the corresponding frequency of FDT electrical level, the multifunction digital output terminal continuously outputs the signal of "Frequency level detection FDT". The signal is invalid only when the output frequency decreases to a value lower than the frequency corresponding to (FDT electrical level—FDT lagging detection value).



Function code	Name	Description	Setting range	Default
P08.36	Detection value for frequency being reached	0.0–P00.03 (Max. output frequency)	0.0–P00.03	0.00Hz

When the output frequency is within the detection range, the multifunction digital output terminal outputs the signal of "Frequency reached".



Function code	Name	Description	Setting range	Default
P08.37	Enabling dynamic braking	0: Disable 1: Enable	0–1	0

The function code is used to enable dynamic braking.

Note:

1. After enabling the energy braking, the overvoltage speed loss point automatically raise at 20V.

2. The parameter is only applicable to the type with built-in braking pipe.

Function code	Name	Description	Setting range	Default
P08.38	Dynamic braking threshold voltage	200.0–6000.0V	200.0–6000.0	Model depended

The function code is used to set the starting bus voltage of energy consumption braking. Adjust this value properly to achieve effective braking for the load. The default value varies depending on the voltage class.

The relationship between voltage and dynamic brake threshold voltage is as follows:

Model	Default dynamic braking threshold voltage (P08.38)	Overvoltage point
660V	1100V	1200V
1140V	1950V	2150V
3300V	5500V	6000V

Function code	Name	Description	Setting range	Default
P08.39	Cooling-fan running mode	0: Normal mode 1: Run immediately after power-on	0–1	0

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

0: Normal running mode: after the module receives the running command or the detection temperature of the rectifier is higher than 45°C or the current of the module is higher than 20% of the rated current, the cooling fan will run.

1: Run immediately after power-on (applicable to high temperature and humidity situations only)

Function code	Name	Description	Setting range	Default
P08.41	Overmodulation selection	0: Disable 1: Enable	0–1	0

The function code is used to enable the overmodulation function

Function code	Name	Description	Setting range	Default
P08.42	Keypad digit control setting	0x0000–0x1223 Ones place: Frequency setting selection 0: Controls through both the ∧/∨ key and digital potentiometer are valid. 1: Only control through the ∧/∨ key is valid. 2: Only control through the digital potentiometer is valid. 3: Controls through the ∧/∨ key and digital potentiometer are invalid. Tens place: Frequency control selection 0: Valid only when P00.06=0 or P00.07=0 1: Valid for all frequency setting methods 2: Invalid for multi-step speed running when multi-step speed running has the priority Hundreds place: Action selection for stop 0: Setting is valid. 1: Valid during running, cleared after stop	0x0000–0x1223	0x0000

Function code	Name	Description	Setting range	Default
		2: Valid during running, cleared after a stop command is received Thousands place: Integral function of the ∧/∨ key and digital potentiometer 0: Enable the integral function 1: Disable the integral function		

The function code is used to set the control function of the keypad.

Function code	Name	Description	Setting range	Default
P08.43	Keypad digital potentiometer integral time	0.01–10.00s	0.01–10.00	0.1
P08.44	UP/DOWN terminal control setting	0x000–0x221 Ones place: Frequency setting enabling 0: The setting made through UP/DOWN is valid. 1: The setting made through UP/DOWN is invalid. Tens place: Frequency setting selection 0: Valid only when P00.06=0 or P00.07=0 1: Valid for all frequency setting methods 2: Invalid for multi-step speed running when multi-step speed running has the priority Hundreds place: Action selection for stop 0: Setting is valid. 1: Valid during running, cleared after stop 2: Valid during running, cleared after a stop command is received	0x000–0x221	0x000

The function codes set the control functions of UP/DOWN terminals.

Function code	Name	Description	Setting range	Default
P08.45	Frequency increment change rate of the UP terminal	0.01–50.00s	0.01–50.00	0.50s
P08.46	Frequency change rate of the DOWN terminal	0.01–50.00 s	0.01–50.00	0.50s

The function codes are used to set the integral ratio of UP/DOWN terminals.

Function code	Name	Description	Setting range	Default
P08.47	Action selection at power-off during frequency setting	0x000–0x111 Ones place: Action selection at power-off during frequency adjusting through digitals. 0: Save the setting at power-off. 1: Clear the setting at power-off. Tens place: Action selection at power-off during frequency adjusting through MODBUS communication 0: Save the setting at power-off. 1: Clear the setting at power-off. Hundreds place: Action selection at power-off during frequency adjusting through other communication methods 0: Save the setting at power-off. 1: Clear the setting at power-off.	0x000–0x111	0x000

The function code is used to set the frequency processing mode at power off.

Function code	Name	Description	Setting range	Default
P08.50	Magnetic flux braking coefficient	0: Invalid 100–150: A larger coefficient indicates stronger braking.	0–150	0

The finction code is used to enable magnetic flux braking.

0: Disable

100–150: A larger coefficient indicates stronger braking.

The VFD can quickly slow down the motor by increasing the magnetic flux. The energy generated by the motor during braking can be transformed into heat energy by increasing the magnetic flux.

The VFD monitors the state of the motor continuously even during the magnetic flux period. Magnetic flux braking can be used for motor stop, as well as for motor rotation speed change. The other advantages include:

Braking is performed immediately after the stop command is given. The braking can be started without waiting for magnetic flux weakening.

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

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

The function code adjusts the displayed current value of the input side of the VFD at AC input.

Note: The function is not applicable at DC input.

P09 group— PID control

Function code	Name	Description	Setting range	Default
P09.00	PID reference source	0: Set by P09.01 1: AI1	0–9	0

Function code	Name	Description	Setting range	Default
		2: AI2 3: AI3 4: High-speed pulse HDI 5: Multi-step running 6: MODBUS communication 7: PROFIBUS/CANopen communication 8: Ethernet communication 9: Reserved		

The function code determines the target given channel during the PID process. When the frequency command selection (P00.06, P00.07) is 7 or the voltage setting channel selection (P04.27) is 6, the VFD is process PID controlled.

The 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 performs calculation by using a relative value (0–100.0%).

Note:

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

2. The options 3, 4, 7, and 8 are available only when corresponding expansion cards are configured.

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

When P09.00=0, the parameter is set on the keypad.

Function code	Name	Description	Setting range	Default
P09.02	PID feedback source	0: AI1 1: AI2 2: AI3 3: High-speed pulse HDI 4: MODBUS communication 5: PROFIBUS/CANopen communication 6: Ethernet communication 7: Reserved	0–7	0

The function code is used to select PID feedback channel.

Note:

1. The reference channel and feedback channel cannot be duplicate. Otherwise, effective PID control cannot be achieved.

2. The options 2, 3, 5, and 6 are available only when corresponding expansion cards are configured.

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

The function code is used to select PID output characteristics.

0: PID output is positive. When the feedback signal is greater than the PID reference value, the output frequency of the VFD will decrease to balance the PID. Example: PID control on strain during unwinding.

1: PID output is negative. When the feedback signal is greater than the PID reference value, the output frequency of the VFD will increase to balance the PID. Example: PID control on strain during unwinding.

Function code	Name	Description	Setting range	Default
P09.04	Proportional gain (Kp)	0.00–100.0	0.00–100.0	1.00

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

P determines the strength of the whole PID adjuster. The value 100 indicates that when the difference between the PID feedback value and given value is 100%, the range within which the PID regulator can regulate the output frequency command is the max. frequency (ignoring integral function and differential function).

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

The function is used to determine the speed of the integral adjustment on the deviation of PID feedback and reference from the PID regulator.

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

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

The function is used to determine the strength of the change ratio adjustment on the deviation of PID feedback and reference from the PID regulator.

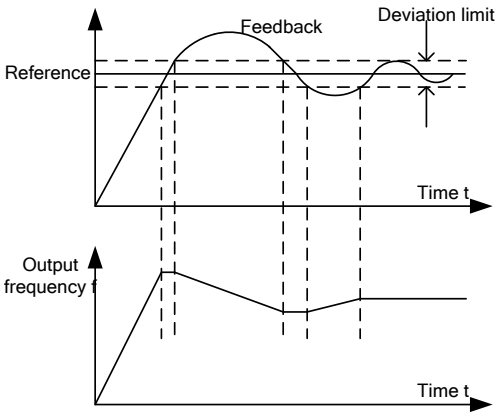
If the PID feedback changes 100% during the time, the adjustment of the differential regulator (ignoring proportional and integral function) is the max. output frequency (P00.03) or the max. voltage (P04.31). Longer differential time indicates stronger adjustment.

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

The function is used to indicate the sampling cycle of feedback. The regulator calculates in each sampling cycle. A longer sampling cycle indicates slower response.

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

The output of the PID system is relative to the max. deviation of the closed loop reference. As shown in the following figure, the PID regulator stops regulating in the range of deviation limit. Set the function parameter properly to adjust the accuracy and stability of the PID system.



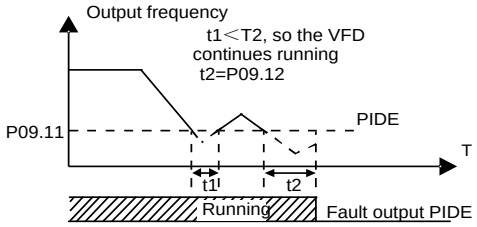
Function code	Name	Description	Setting range	Default
P09.09	PID output upper limit	P09.10–100.0% (Max. frequency or voltage)	P09.10–100.0	100.0%
P09.10	PID output lower limit	-100.0%–P09.09 (Max. frequency or voltage)	-100.0–P09.09	0.0%

The function code is used to set the upper and lower limits of PID regulator output values.

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

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

Used to set the PID feedback offline detection value. When the feedback value is smaller than or equal to the feedback offline detection value, and the duration exceeds the value specified by P09.12, the VFD reports "PID feedback offline fault" and the keypad displays PIDE.



Function code	Name	Description	Setting range	Default
P09.13	PID control selection	0x0000–0x1111 Ones place: 0: Continue integral control after the frequency reaches upper/lower limit 1: Stop integral control after the frequency reaches upper/lower limit Tens place: 0: Same as the main reference direction 1: Contrary to the main reference direction Hundreds place: 0: Limit as per the max. frequency	0x0000–0x1111	0x0001

Function code	Name	Description	Setting range	Default
		1: Limit as per A frequency Thousands place: 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. The acceleration/deceleration is determined by P08.04 (acceleration time 4).		

Ones place:

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

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

Function code	Name	Description	Setting range	Default
P09.14	Low frequency proportional gain (Kp)	0.00–100.0	0.00–100.0	1.00
P09.15	ACC/DEC time of PID command	0.0–1000.0s	0.0–1000.0	0.0s
P09.16	PID output filter time	0.000–10.000s	0.000–10.000	0.000s

P10 group—Simple PLC and multi-step speed control

Function code	Name	Description	Setting range	Default
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

The function code is used to set simple PLC mode.

0: Stop after running once. The VFD stops automatically after running for one cycle, and it can be started only after receiving the running command.

1: Keep running in the final value after running for one cycle. The VFD keeps the running frequency and direction of the last section after a single cycle.

2: Cyclic running. The VFD enters the next cycle after completing one cycle until receiving the stop command.

Function code	Name	Description	Setting range	Default
P10.01	Simple PLC memory selection	0: Without memory at power off 1: With memory after power off	0–1	0

The function code is used to set the simple PLC memory mode at power off.

0: Without memory at power off

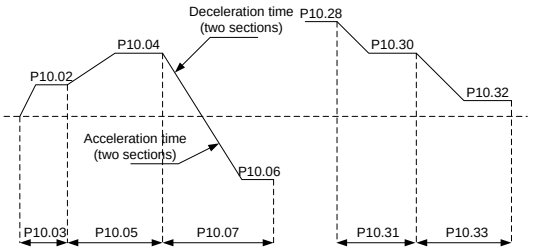
1: Memory after power-off. The PLC memories its running stage and running frequency before power-off.

Function code	Name	Description	Setting range	Default
P10.02	Multi-step speed 0	-100.0–100.0%	-100.0–100.0	0.0%
P10.03	Running time of step 0	0.0–6553.5s (m)	0.0–6553.5	0.0s
P10.04	Multi-step speed 1	-100.0–100.0%	-100.0–100.0	0.0%
P10.05	Running time of step 1	0.0–6553.5s (m)	0.0–6553.5	0.0s
P10.06	Multi-step speed 2	-100.0–100.0%	-100.0–100.0	0.0%
P10.07	Running time of step 2	0.0–6553.5s (m)	0.0–6553.5	0.0s
P10.08	Multi-step speed 3	-100.0–100.0%	-100.0–100.0	0.0%
P10.09	Running time of step 3	0.0–6553.5s (m)	0.0–6553.5	0.0s
P10.10	Multi-step speed 4	-100.0–100.0%	-100.0–100.0	0.0%
P10.11	Running time of step 4	0.0–6553.5s (m)	0.0–6553.5	0.0s
P10.12	Multi-step speed 5	-100.0–100.0%	-100.0–100.0	0.0%
P10.13	Running time of step 5	0.0–6553.5s (m)	0.0–6553.5	0.0s
P10.14	Multi-step speed 6	-100.0–100.0%	-100.0–100.0	0.0%
P10.15	Running time of step 6	0.0–6553.5s (m)	0.0–6553.5	0.0s
P10.16	Multi-step speed 7	-100.0–100.0%	-100.0–100.0	0.0%
P10.17	Running time of step 7	0.0–6553.5s (m)	0.0–6553.5	0.0s
P10.18	Multi-step speed 8	-100.0–100.0%	-100.0–100.0	0.0%
P10.19	Running time of step 8	0.0–6553.5s (m)	0.0–6553.5	0.0s
P10.20	Multi-step speed 9	-100.0–100.0%	-100.0–100.0	0.0%
P10.21	Running time of step 9	0.0–6553.5s (m)	0.0–6553.5	0.0s
P10.22	Multi-step speed 10	-100.0–100.0%	-100.0–100.0	0.0%
P10.23	Running time of step 10	0.0–6553.5s (m)	0.0–6553.5	0.0s
P10.24	Multi-step speed 11	-100.0–100.0%	-100.0–100.0	0.0%
P10.25	Running time of step 11	0.0–6553.5s (m)	0.0–6553.5	0.0s
P10.26	Multi-step speed 12	-100.0–100.0%	-100.0–100.0	0.0%
P10.27	Running time of step 12	0.0–6553.5s (m)	0.0–6553.5	0.0s
P10.28	Multi-step speed 13	-100.0–100.0%	-100.0–100.0	0.0%
P10.29	Running time of step 13	0.0–6553.5s (m)	0.0–6553.5	0.0s
P10.30	Multi-step speed 14	-100.0–100.0%	-100.0–100.0	0.0%
P10.31	Running time of step 14	0.0–6553.5s (m)	0.0–6553.5	0.0s
P10.32	Multi-step speed 15	-100.0–100.0%	-100.0–100.0	0.0%
P10.33	Running time of step 15	0.0–6553.5s (m)	0.0–6553.5	0.0s

The setting 100.0% corresponds to the max. output frequency (P00.03).

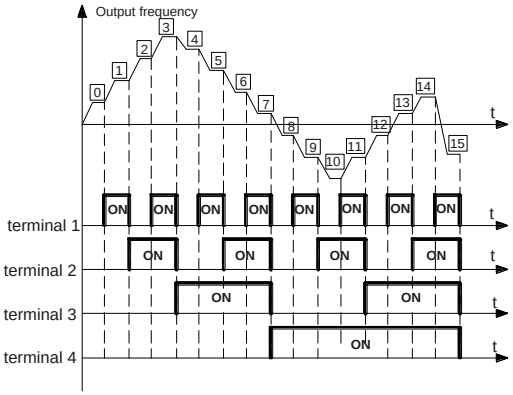
When simple PLC operation is selected, it is required to set P10.02–P10.33 to determine the running frequency and direction of each step.

Note: The symbol of multi-step speed determines the running direction of simple PLC, and the negative value means reverse running.



Multi-step speed can be set continuously in the range of -fmax–fmax.

The VFD 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.



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

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

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

Function code	Name	Description	Setting range	Default
P10.34	ACC/DEC time of steps 0–7 of simple PLC	0x0000–0xFFFF	0x00000–0xFFFF	0x0000
P10.35	ACC/DEC time of steps 8–15 of simple PLC	0x0000–0xFFFF	0x00000–0xFFFF	0x0000

The description is as follows:

Function code	Binary		Step	ACC/DEC time 1	ACC/DEC T2	ACC/DEC T3	ACC/DEC T4
P10.34	BIT1	BIT0	0	00	01	10	11
	BIT3	BIT2	1	00	01	10	11
	BIT5	BIT4	2	00	01	10	11
	BIT7	BIT6	3	00	01	10	11
	BIT9	BIT8	4	00	01	10	11
	BIT11	BIT10	5	00	01	10	11
	BIT13	BIT12	6	00	01	10	11
	BIT15	BIT14	7	00	01	10	11
P10.35	BIT1	BIT0	8	00	01	10	11
	BIT3	BIT2	9	00	01	10	11
	BIT5	BIT4	10	00	01	10	11
	BIT7	BIT6	11	00	01	10	11
	BIT9	BIT8	12	00	01	10	11
	BIT11	BIT10	13	00	01	10	11
	BIT13	BIT12	14	00	01	10	11
	BIT15	BIT14	15	00	01	10	11

Select corresponding acceleration/deceleration time, and then convert 16-bit binary number into decimal number, finally, and then set corresponding function codes.

Function code	Name	Description	Setting range	Default
P10.36	PLC restart mode	0: Restart from step 1 1: Resume from the paused step	0–1	0

The function code is used to set the PLC restart mode.

0: Restart from the first step, namely if the VFD stops during running (caused by stop command, fault or power down), it will run from the first step after restart.

1: Continue running from the step frequency when interruption occurred, namely if the VFD stops during running (caused by stop command or fault), it will record the running time of current step, and enters this step automatically after restart, then continue running at the frequency defined by this step in the remaining time.

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

The function code is used to set the time unit.

0: second; the running time of each step is counted in seconds

1: minute; the running time of each step is counted in minutes

P11 group—Protection

Function code	Name	Description	Setting range	Default
P11.00	Protection against phase loss	0x00–0x11 Ones place: 0: Protection against input phrase loss disabled 1: Protection against input phrase	0x00–0x11	0x11

Function code	Name	Description	Setting range	Default
		loss enabled Tens place: 0: Protection against output phrase loss disabled 1: Protection against output phrase loss enabled		

The function code is used to enable protection against phase loss.

Function code	Name	Description	Setting range	Default
P11.01	Frequency drop at transient power-off	0: Disable 1: Enable	0–1	0

The function code is used to enable the frequency decrease at sudden power loss.

Function code	Name	Description	Setting range	Default
P11.02	Frequency drop rate at transient power-off	0.00Hz/s–P00.03 (Max. output frequency)	0.00–P00.03	1.00Hz/s

If the bus voltage drops to the sudden frequency decreasing point due to the power loss of the grid, the VFD begins to decrease the running frequency according to P11.02 to make the motor in power generation state. The feedback power can maintain the bus voltage to ensure the continuous running of the VFD until the recovery of power.

Voltage class	660V	1140V	3300V
Frequency decrease point at sudden	700V	1350V	3900V

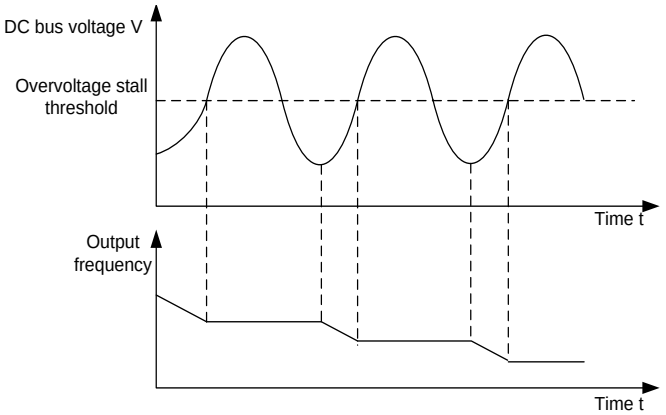
Note:

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

2. This function can be enabled only when the input phase protection function is disabled.

Function code	Name	Description	Setting range	Default
P11.03	Overvoltage stalling protection	0: Disable 1: Enable	0–1	0

The function code is used to enable the protection against overvoltage stalling.



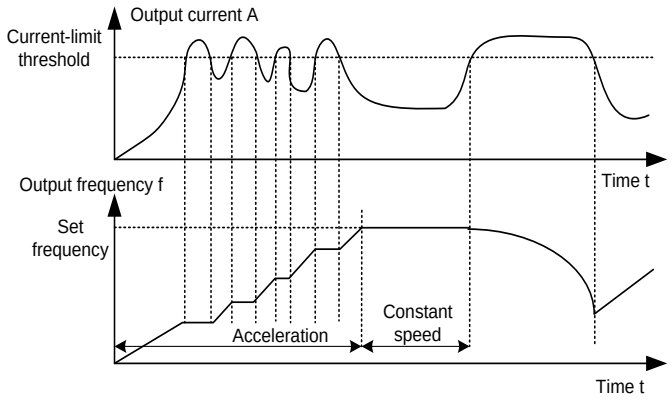
Function code	Name	Description	Setting range	Default
P11.04	Overvoltage stalling protection voltage	110–150% (standard bus voltage)	110–150	125%

The function code is used to set the protection against overvoltage stalling.

Function code	Name	Description	Setting range	Default
P11.05	Current limit mode	0x00–0x11 Ones place: Current limit action 0: Invalid 1: Always valid Tens place: Hardware current limit overload alarm 0: Valid 1: Invalid	0x00–0x11	0x01
P11.06	Automatic current limit threshold	50.0–200.0% (100% corresponds to rated current))	50.0–200.0	150.0%
P11.07	Frequency drop rate during current limit	0.00–50.00Hz/s	0.00–50.00	10.00Hz/s

During accelerated running, as the load is too large, the actual acceleration rate of motor is lower than that of output frequency, if no measures are taken, the VFD may trip due to overcurrent during acceleration.

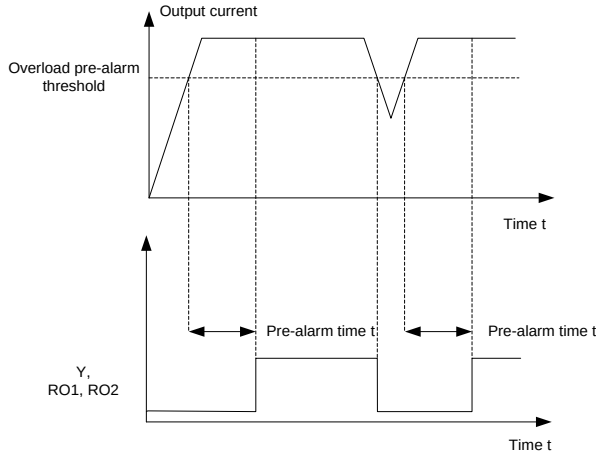
Current-limit protection function detects output current during running, and compares it with the current-limit level defined by P11.06, if it exceeds the current-limit level, the VFD will run at stable frequency during accelerated running, or run in decreased frequency during constant-speed running; if it exceeds the current-limit level continuously, the VFD output frequency will drop continuously until reaching lower limit frequency. When the output current is detected to be lower than the current-limit level again, it will continue accelerated running.



Function code	Name	Description	Setting range	Default
P11.08	Pre-alarm selection for VFD/motor OL/UL	0x000–0x131 Ones place: 0: Motor OL/UL pre-alarm, relative to the rated motor current. 1: VFD OL/UL pre-alarm, relative to the VFD rated current Tens place: 0: The VFD continues to work for an OL/UL alarm. 1: The VFD continues to work for a UL alarm but stops running for an OL fault. 2: The VFD continues to work for an OL alarm but stops running for a UL fault. 3. The VFD stops running for an OL/UL alarm.	0x000–0x131	0x000

Function code	Name	Description	Setting range	Default
		Hundreds place: 0: Detect all the time. 1: Detect during constant speed running.		
P11.09	Overload pre-alarm detection threshold	P11.11–200%	P11.11–200	150%
P11.10	Overload pre-alarm detection time	0.1–60.0s	0.1–60.0	1.0s
P11.11	Underload pre-alarm detection threshold	0%– P11.09	0–P11.09	50%
P11.12	Underload pre-alarm detection time	0.1–60.0s	0.1–60.0	1.0s

If the VFD 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.



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

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

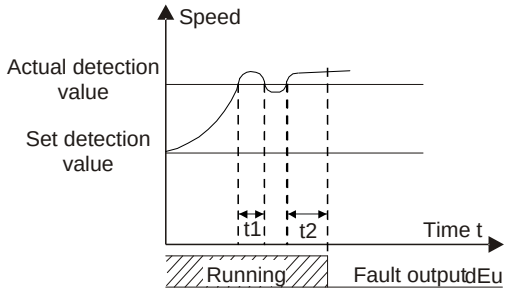
Function code	Name	Description	Setting range	Default
P11.13	Fault output terminal action upon fault occurring	0x00–0x11 Ones place: 0: Act upon an undervoltage fault 1: Do not act upon an undervoltage fault Tens place: 0: Act during automatic reset 1: Do not act during the automatic reset period	0x00–0x11	0x00

Function code	Name	Description	Setting range	Default
P11.14	Speed deviation detection value	0.0–50.0%	0.0–50.0	10.0%

Function code	Name	Description	Setting range	Default
P11.15	Speed deviation detection time	0.0–10.0s (No speed deviation protection for the value=0.0)	0.0–10.0	0.5s

The function code P11.14 is used to determine the speed deviation (1) at vector mode of synchronous motor or (2) at slave torque mode.

The function code P11.15 is used to set the speed deviation detection time.



t1<t2, so the VFD continues running
t2=P11.15

Function code	Name	Description	Setting range	Default
P11.16	Automatic frequency-reduction during voltage drop	0: Invalid 1: Valid	0–1	0
P11.17	Overvoltage stalling voltage loop proportion	0–60000	0–60000	60
P11.18	Leakage current threshold	0–2048	0–2048	0
P11.19	Reserved			
P11.20	Start frequency of speed deviation determination	0–50.00Hz	0–50.00	5.00Hz
P11.21	Reserved			
P11.22	Phase loss determination threshold on input side	1.00–10.00	1.00–10.00	1.50
P11.23	Reserved			
P11.24	Phase loss determination threshold on AM output	0–100.0	0–100.0	50.00
P11.25	Rectifier overtemperature point setting	0–100.0°C	0–100.0	85.0°C
P11.26	Inverter overtemperature point setting	0–100.0°C	0–100.0	85.0°C
P11.27	Time threshold of large DC determination	0–10.000s	0–10.000	5.000s
P11.28	Pre-alarm enabling	bit0: Motor OH pre-alarm enabling bit1: Overload pre-alarm enabling bit2–bit7: Reserved	0–255	3

Function code	Name	Description	Setting range	Default
P11.29	Overload calculation method	0: Traditional method 1: Integral method	0–2	0
P11.30	Reserved			

P12 group—Parameters of motor 2

Function code	Name	Description	Setting range	Default
P12.00	Type of motor 2	0: Asynchronous motor (AM) 1: Reserved	0–1	0
P12.01	Rated power of AM 2	0.1–3000.0kW	0.1–3000.0	Model depended
P12.02	Rated frequency of AM 2	0.01Hz–P00.03 (Max. output frequency)	0.01–P00.03	50.00Hz
P12.03	Rated speed of AM 2	1–36000rpm	1–36000	Model depended
P12.04	Rated voltage of AM 2	0–4000V	0–4000	Model depended
P12.05	Rated current of AM 2	0.8–6000.0A	0.8–6000.0	Model depended
P12.06	Stator resistance of AM 2	0.001–65.535Ω	0.001–65.535Ω	Model depended
P12.07	Rotor resistance of AM 2	0.001–65.535Ω	0.001–65.535Ω	Model depended
P12.08	Leakage inductance of AM 2	0.1–6553.5mH	0.1–6553.5mH	Model depended
P12.09	Mutual inductance of AM 2	0.1–6553.5mH	0.1–6553.5mH	Model depended
P12.10	No-load current of AM 2	0.1–6553.5A	0.1–6553.5A	Model depended
P12.11	Magnetic saturation coefficient 1 of iron core of AM 2	0.0–100.0%	0.0–100.0	80.0%
P12.12	Magnetic saturation coefficient 2 of iron core of AM 2	0.0–100.0%	0.0–100.0	68.0%
P12.13	Magnetic saturation coefficient 3 of iron core of AM 2	0.0–100.0%	0.0–100.0	57.0%
P12.14	Magnetic saturation coefficient 4 of iron core of AM 2	0.0–100.0%	0.0–100.0	40.0%
P12.15	Rated power of SM 2	0.1–3000.0kW	0.1–3000.0	Model depended
P12.16	Rated frequency of SM 2	0.01Hz–P00.03 (Max. output frequency)	0.01–P00.03	50.00Hz
P12.17	Number of pole pairs of SM 2	1–50	1–50	2
P12.18	Rated voltage of SM 2	0–4000V	0–4000	Model depended

Function code	Name	Description	Setting range	Default
P12.19	Rated current of SM 2	0.8–6000.0A	0.8–6000.0	Model depended
P12.20	Stator resistance of SM 2	0.001–65.535Ω	0.001–65.535	Model depended
P12.21	Direct-axis inductance of SM 2	0.01–655.35mH	0.01–655.35	Model depended
P12.22	Quadrature-axis inductance of SM 2	0.01–655.35mH	0.01–655.35	Model depended
P12.23	Counter-emf constant of SM 2	0–10000V	0–10000	300
P12.24	Initial pole position of SM 2 (reserved)	0x0000–FFFFH	0x0000–FFFFH	0x0000
P12.25	Identification current of SM 2 (Reserved)	0%–50% (of the motor rated current)	0–50	10%
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)	0–2	2
P12.27	Overload protection coefficient of motor 2	20.0%–120.0%	20.0–120.0	100.0%
P12.28	Power calibration coefficient of motor 2	0.00–3.00	0.00–3.00	1.00
P12.31	Parameter display of motor 2	0: Display based on motor type 1: Display all	0–1	0

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

P13 group—SM control

Function code	Name	Description	Setting range	Default
P13.00	Reduction coefficient of pull-in current	0.0–100.0%	0.0–100.0	80.0%
P13.01	Detection mode of initial pole	0: Not detect 1: Reserved 2: Pulse superposition	0–3	0
P13.02	Pull-in current 1	0.0%–100.0% (of the motor rated current)	0.0–100.0	20.0%
P13.03	Pull-in current 2	0.0%–100.0% (of the motor rated current)	0.0–100.0	10.0%
P13.04	Switch-over frequency of pull-in current	0.00Hz–P00.03 (Max. output frequency)	0.00–P00.03	10.00Hz

The function codes are used to set the no-load exciting current reference under the vector control mode. The function code P13.04 is the switch-over frequency of pull-in current.

Function code	Name	Description	Setting range	Default
P13.05	VF oscillation control method/High frequency overlay frequency (reserved)	0: Reactive+ active 1: Reactive 2: Active	0–2	0
P13.06	High frequency superimposed voltage	0.0–300.0% (of the motor rated voltage)	0.0–300.0	50.0%
P13.07	Frequency drop rate during current limit	0.0–400.0	0.0–400.0	0.0
P13.08	Control parameter 1	0–65535	0–65535	0
P13.09	Control parameter 2	0–655.35	0–655.35	2.00
P13.10	Angle compensation	0–6553.5	0–6553.5	0
P13.11	Maladjustment detection time	0.0–10.0s	0.0–10.0	0.5s
P13.12	High frequency compensation coefficient	0–100.0%	0–100.0	0.0%
P13.13	Short-circuit braking current	0.0–150.0% (of the VFD rated current)	0.0–150.0	0.0%
P13.14	Hold time of short-circuit braking for start	0.00–50.00s	0.00–50.00	0.00s
P13.15	Hold time of short-circuit braking for stop	0.00–50.00s	0.00–50.00	0.00s
P13.16	SM brake component enabling	0–1	0–1	0
P13.17	SM brake component enabling threshold voltage	200.0–6000.0V	200.0–6000.0	Model depended
P13.18	SM brake component conduction time	0.000–4.000s	0.000–4.000	1.000
P13.19–P13.20	Reserved			
P13.21	Start frequency of mal-adjustment fault determination	0.00–50.00Hz	0.00–50.00	5.00Hz
P13.22	Mal-adjustment fault detection deviation angle	0.00–359.99	0.00–359.99	36.00
P13.23	Enabling protection against runaway fault	0: Invalid 1: Valid	0–1	0
P13.24–P13.25	Reserved			

When the counter-emf of SM is high, a new synchronous machine brake component is required to ensure that the counter-emf does not lead to bus voltage overvoltage in case of emergency stop and it can be controlled via P13.16 and P13.17.

P14 group—Serial communication

Function code	Name	Description	Setting range	Default
P14.00	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
P14.01	Communication baud rate	0: 1200BPS 1: 2400BPS 2: 4800BPS 3: 9600BPS 4: 19200BPS 5: 38400BPS 6: 57600BPS	0–6	4

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

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

Function code	Name	Description	Setting range	Default
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

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

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

The function code indicates the communication response delay, that is, the interval from when the VFD completes receiving data to when it sends response data to the upper computer. If the response delay is shorter than the 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
P14.04	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 to a non-zero value, the system reports the "485 communication fault" (CE) if the communication interval exceeds the value.

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

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

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

Function code	Name	Description	Setting range	Default
P14.06	Communication processing action	0x00–0x11 Ones place: Action upon the write operation 0: Respond to write operations 1: Not respond to write operations Tens place: Communication encryption 0: Disabled 1: Enabled	0x00–0x11	0x00

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

0: Respond to write operations. The VFD responds to both read and write commands from the host controller.

1: Do not respond to write operations. The VFD does not respond to the write commands, but responds only to the read commands from the host controller. This setting can improve the communication efficiency.

Function code	Name	Description	Setting range	Default
P14.07	Reserved/Three-phase input grid voltage display	Reserved/0–65535	Reserved/0–65535	Reserved/0
P14.08	Reserved/control_step	Reserved/0–65535	Reserved/0–65535	Reserved/0

P15 group—PROFIBUS communication

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

The function code is used to select a communication protocol.

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

The function code is used to identify the address of the current VFD 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
P15.02	Received PZD2	0: Disable 1: Set frequency 2: PID reference 3: PID feedback 4: Torque setting 5: FWD rotation upper-limit frequency setting 6: REV rotation upper-limit frequency setting 7: Electromotive torque upper limit 8: Braking torque upper limit 9: Virtual input terminal command 10: Virtual output terminal command 11: Voltage setting (special for V/F separation) 12: AO setting 1 13: AO setting 2	0–20	0
P15.03	Received PZD3		0–20	0
P15.04	Received PZD4		0–20	0
P15.05	Received PZD5		0–20	0
P15.06	Received PZD6		0–20	0
P15.07	Received PZD7		0–20	0
P15.08	Received PZD8		0–20	0
P15.09	Received PZD9		0–20	0
P15.10	Received PZD10		0–20	0
P15.11	Received PZD11		0–20	0
P15.12	Received PZD12		0–20	0

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

Function code	Name	Description
0	Invalid	
1	Set frequency	0–Fmax (Unit: 0.01Hz)
2	PID reference	Range (0–1000, 1000 corresponds to 100.0%)
3	PID feedback	Range (0–1000, 1000 corresponds to 100.0%)
4	Torque setting value	Range (-3000–3000, 1000 corresponds to the 100% of the motor rated current)
5	FWD rotation upper-limit frequency setting	0–Fmax (Unit: 0.01Hz)
6	REV rotation upper-limit frequency setting	0–Fmax (Unit: 0.01Hz)
7	Electromotive torque upper limit	0–3000, 1000 corresponds to the 100% of the motor rated current
8	Braking torque upper limit	0–2000, 1000 corresponding to 100.0% of the motor rated current
9	Virtual input terminal command	Range: 0x000–0x1FF
10	Virtual output terminal command	Range: 0x00–0x0F
11	Voltage setting	Used for V/F separation, range (0–1000, 1000 corresponds to 100% of the motor rated voltage)
12	AO setting 1	Range (-1000–1000, 1000 corresponds to 100.0%)
13	AO setting 2	Range (-1000–1000, 1000 corresponds to 100.0%)

Function code	Name	Description	Setting range	Default
P15.13	Sent PZD2	0: Disable 1: Running frequency 2: Set frequency 3: Bus voltage 4: Output voltage 5: Output Current 6: Actual output torque 7: Actual output power 8: Rotational speed 9: Running linear speed 10: Ramp reference frequency 11: Fault code 12: AI1 input 13: AI2 input 14: AI3 input 15: PULSE frequency 16: Terminal input status 17: Terminal output status 18: PID reference 19: PID feedback 20: Motor rated torque	0–20	0
P15.14	Sent PZD3		0–20	0
P15.15	Sent PZD4		0–20	0
P15.16	Sent PZD5		0–20	0
P15.17	Sent PZD6		0–20	0
P15.18	Sent PZD7		0–20	0
P15.19	Sent PZD8		0–20	0
P15.20	Sent PZD9		0–20	0
P15.21	Sent PZD10		0–20	0
P15.22	Sent PZD11		0–20	0
P15.23	Sent PZD12		0–20	0

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

Function code	Name	Description
0	Invalid	
1	Running frequency	(*100, Hz)
2	Set frequency	(*100, Hz)
3	Bus voltage	(*10, V)
4	Output voltage	(*1, V)
5	Output current	(*10, A)
6	Actual output torque	(*10, %)
7	Actual output power	(*10, %)
8	Rotational speed	(*1, RPM)
9	Running linear speed	(*1, m/s)
10	Ramp reference frequency	
11	Fault code	
12	AI1 input	(*100, V)
13	AI2 input	(*100, V)
14	AI3 input	(*100, V)
15	PULSE frequency	(*100, kHz)
16	Terminal input status	
17	Terminal output status	
18	PID reference	(*100, %)
19	PID feedback	(*100, %)
20	Motor rated torque	

Function code	Name	Description	Setting range	Default
P15.24	Temporary variable 1 for PZD sending	0–65535	0–65535	0

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

P15.24 can be written in any state.

Function code	Name	Description	Setting range	Default
P15.25	DP communication 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
P15.26	CAN communication Communication timeout time	0.0 (invalid) 0.1–60.0S (master-slave CAN communication mode)	0.0–60.0	0.0s

When the function code is set to 0.0s, CAN communication timeout is not considered as a fault.

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
P15.27	CANopen communication baud rate	0: 1000k 1: 800k 2: 500k 3: 250k 4: 125k 5: 100k 6: 50k 7: 20k	0–7	0

Function code	Name	Description	Setting range	Default
P15.28	CAN communication address	0–127 0 indicates a broadcast address	0–127	1
P15.29	CAN communication baud rate	0: 1000k 1: 500k 2: 250k 3: 125k 0K	0–4	1

P16 group—Ethernet communication

Function code	Name	Description	Setting range	Default
P16.00	Ethernet communication rate	0: Self adaptive 1: 100M full duplex	0–4	3

Function code	Name	Description	Setting range	Default
		2: 100M half duplex 3: 10M full duplex 4: 10M half duplex		

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

Function code	Name	Description	Setting range	Default
P16.01	IP address 1	0–255	0–255	192
P16.02	IP address 2	0–255	0–255	168
P16.03	IP address 3	0–255	0–255	0
P16.04	IP address 4	0–255	0–255	1
P16.05	Subnet mask 1	0–255	0–255	255
P16.06	Subnet mask 2	0–255	0–255	255
P16.07	Subnet mask 3	0–255	0–255	255
P16.08	Subnet mask 4	0–255	0–255	0

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

IP address format: P16.01. P16.02. P16.03. P16.04.

IP address example: 192.168.0.1

IP subnet mask format: P16.05. P16.06. P16.07. P16.08.

Subnet mask example: 255.255.255.0

Function code	Name	Description	Setting range	Default
P16.09	Gateway 1	0–255	0–255	192
P16.10	Gateway 2	0–255	0–255	168
P16.11	Gateway 3	0–255	0–255	1
P16.12	Gateway 4	0–255	0–255	1
P16.13	Function code setting variable 1	0000–FFFF	0000–FFFF	0000
P16.14	Function code setting variable 2	0000–FFFF	0000–FFFF	0000

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

P17 group—Status viewing

Function code	Name	Description	Setting range	Default
P17.00	Set frequency	Displays the present set frequency of the VFD. 0.00Hz–P00.03	0.00–P00.03	0.00Hz
P17.01	Output frequency	Displays the present output frequency of the VFD. 0.00Hz–P00.03	0.00–P00.03	0.00Hz
P17.02	Ramp reference frequency	Displays the present ramp reference frequency of the VFD. 0.00Hz–P00.03	0.00–P00.03	0.00Hz
P17.03	Output voltage	Displays the present output voltage of the VFD. 0–4000V	0–4000	0V
P17.04	Output current	Displays the valid value of current output	0.0–3000.0	0.0A

Function code	Name	Description	Setting range	Default
		current of the VFD. 0.0–3000.0A		
P17.05	Motor rotation speed	Displays the current motor speed. 0–65535RPM	0–65535	0 rpm
P17.06	Torque current	Displays the present torque current of the VFD. -3000.0–3000.0A	-3000.0–3000.0	0.0A
P17.07	Exciting current	Displays the present exciting current of the VFD. -3000.0–3000.0A	-3000.0–3000.0	0.0A
P17.08	Motor power	Displays the present motor power. 100% corresponds to the rated motor power. The positive value is the motoring state while the negative value is the generating state. -300.0 –300.0% (of the motor rated power)	-300.0–300.0	0.0%
P17.09	Output torque	Displays the present output torque of the VFD. 100% corresponds to the motor rated torque. The positive value is the motoring state while the negative value is the generating state. -250.0–250.0%	-250.0–250.0	0.0%
P17.10	Estimated motor frequency	Displays the estimated motor rotor frequency under the open-loop vector condition. 0.00Hz–P00.03	0.00–P00.03	0.00Hz
P17.11	DC bus voltage	Displays the present DC bus voltage of the VFD. 0.0V–6000.0V	0.0–6000.0	0V
P17.12	Digital input terminal status	Displays the present digital input terminal state of the VFD. 0x0000–0x00FF	0x0000–0x00FF	0x0000
P17.13	Digital output terminal status	Displays the present digital output terminal state of the VFD. 0x0000–0x000F	0x0000–0x000F	0x0000
P17.14	Digital adjustment value	Displays the adjustment on the VFD through the keypad. 0.00Hz–P00.03	0.00–P00.03	0.00Hz
P17.15	Torque reference value	Relative to the percentage of the rated torque of the present motor, displaying the torque reference. -300.0%–300.0% (of the motor rated current)	-300.0–300.0	0.0%
P17.19	AI1 input voltage	Displays the AI1 input signal. 0.00–10.00V	0.00–10.00	0.00V
P17.20	AI2 input voltage	Displays the AI2 input signal. -10.00–10.00V	-10.00–10.00	0.00V
P17.21	AI3 input voltage	Displays the AI3 input signal. 0.00–10.00V	0.00–10.00	0.00V
P17.22	HDI input frequency	Display HDI input frequency. 0.00–50.00kHz	0.00–50.00	0.00kHz
P17.23	PID reference value	Displays the PID reference value. -100.0–100.0%	-100.0–100.0	0.0%

Function code	Name	Description	Setting range	Default
P17.24	PID feedback value	Displays the PID feedback value. -100.0–100.0%	-100.0–100.0	0.0%
P17.25	Motor power factor	Displays the power factor of the current motor. -1.00–1.00	-1.00–1.00	0.0
P17.26	Duration of this run	Displays the duration of this run of the VFD. 0–65535min	0–65535	0min
P17.27	Actual steps of multi-step speed	Displays the actual steps of multi-step speed. 0–15	0–15	0
P17.28	ASR controller output	Displays the ASR controller output value under the vector control mode, relative to the percentage of rated motor torque. -300.0%–300.0% (of the motor rated current)	-300.0–300.0	0.0%
P17.29	Magnetic pole angle of SM	0.0–360.0	0.0–360.0	0.0
P17.30	Phase compensation of SM	-180.0–180.0	-180.0–180.0	0.0
P17.31	High-frequency superimposed current of SM	0.0%–200.0% (of the motor rated current)	0.0–200.0	0.0%
P17.32	Flux linkage	Display the motor flux linkage value. 0.0%–200.0%	0.0–200.0	0.0%
P17.33	Exciting current reference	Displays the exciting current reference value under the vector control mode. -3000.0–3000.0A	-3000.0–3000.0	0.0A
P17.34	Torque current reference	Displays the torque current reference value under the vector control mode. -3000.0–3000.0A	-3000.0–3000.0	0.0A
P17.35	AC incoming current	Displays the valid value of incoming current on AC side. 0.0–5000.0A	0.0–5000.0	0.0A
P17.36	Output torque	Displays the output torque. The positive value is the motoring state while the negative value is generating state. -3000.0Nm–3000.0Nm	0–65535	0.0Nm
P17.37	Motor overload counting value	Displays the motor overload count value 0–100 (100: OL1 fault)	0–100	0
P17.38	PID output	-100.00–100.00%	-100.00–100.0	0.00%
P17.39	Parameter download error	0.00–99.99	0.00–99.99	0.00

P18 group—Status viewing 2

Function code	Name	Description	Setting range	Default
P18.00	Actual frequency of encoder	-327.7–327. 7Hz	-327.7–327.7	0.00Hz
P18.01	Encoder position count value	0–65535	0–65535	0

Function code	Name	Description	Setting range	Default
P18.02	Encoder Z pulse count value	0–65535	0–65535	0
P18.03	Count value of resolver	0–65535	0–65535	0
P18.04	Resolver angle	0–359.99	0–359.99	0
P18.05	Magnetic pole angle	0–359.99	0–359.99	0
P18.06	Motor temperature display	-200.0–200.0℃	-200.0–200.0°C	0.0°C
P18.07	Frequency reference sent by master	-100.00–100.0% (of the max. VFD frequency)	-100.00–100.0	0
P18.08	Frequency command received by slave	-300.00–300.0% (of the motor rated current)	-300.00–300.00	0
P18.09	Speed loop output sent by master	-100.00–100.0% (of the max. VFD frequency)	-100.00–100.0	0
P18.10	Torque command received by slave	-300.00–300.0% (of the motor rated current)	-300.00–300.00	0
P18.11	Voltage of upper half bus	0–65535	0–65535	
P18.12	Voltage of lower half bus	0–65535	0–65535	
P18.13	Software version (FPGA)	1.00–655.35	1.00–655.35	
P18.14	Reserved/Max. midpoint voltage balance compensation	Reserved/0–512	Reserved/ 0–512	Reserved /400
P18.15	Reserved/Midpoint voltage balance mode	Reserved/ 0: bang-bang control 1: P control 2: PI control	Reserved/0–2	Reserved /1
P18.16	Max. midpoint voltage balance compensation/Midpoint voltage balance algorithm Kp	0–512/0–500	0–512/0–500	100/200
P18.17	Midpoint voltage balance mode/Midpoint voltage balance algorithm Ki	0: bang-bang control 1: P control 2: PI control /0–10	0–2/0–10	0/6
P18.18	Midpoint voltage balance algorithm Kp/Grid voltage and main contactor condition selection	0–5000/ 0: Grid voltage calculation 1: Set by P20.14	0–5000/0–1	400/0
P18.19	Midpoint voltage balance algorithm Ki/Input grid voltage balance degree	0–10/0–65535	0–10/0–65535	6/0
P18.20	Max. bus voltage recorded by the system	0.0–6550.0V	0.0–6550.0	0.0
P18.21	Max. upper bus voltage recorded by the system	0.0–3275.0V	0.0–3275.0	0.0

Function code	Name	Description	Setting range	Default
P18.22	Max. lower bus voltage recorded by the system	0.0–3275.0V	0.0–3275.0	0.0
P18.23	Sum of three phase currents	0–65535	0–65535	0
P18.24	Speed display selection in vector control	0: Identification speed 1: Ramp reference	0–1	0

P19 group—External temperature detection

Function code	Name	Description	Setting range	Default
P19.00	Motor temperature detection	0: Invalid 1: PT100 2: PTC 3–4: Reserved	0–4	0
P19.01	Motor temperature pre-alarm point	0℃–200℃	0°C–200°C (0°C: pre-alarm invalid)	125°C
P19.02	Motor over-temperature fault point	0℃–200℃	0°C–200°C (0°C: pre-alarm invalid)	150°C
P19.03	Motor overtemperature action	0: Report a fault and coast to stop 1: Keep running without reporting a fault 2: Stop according to the stop mode without generating a fault	0–2	0
P19.04	Starting temperature of motor temperature compensation	0–60.0℃	0–60.0	40.0°C
P19.05	Motor temperature compensation coefficient	0.0–200.0%	0.0–200.0	100.0%
P19.06	Output voltage compensation enabling	0: Disabled 1: Enable	0–1	1
P19.07	Deadzone compensation regulation coefficient	0.0–50.0	0.0–50.0	1.0
P19.08	Overvoltage stalling current inner loop Kp	0–1000	0–1000	50
P19.09	Overvoltage stalling current inner loop Ki	0–1000	0–1000	250
P19.10	PT100 temperature display channel	0–6	0–6	0.0
P19.11	Temperature of the channel selected by P19.10	0.0–120.0°C	0.0–120.0	0.0°C

P20 group—Encoders

Function code	Name	Description	Setting range	Default
P20.00	Encoder type selection	0: Incremental encoder 1: Reserved 2: Resolver-type encoder 3: Reserved	0–3	0

The function code is used to select an encoder type.

Note: An expansion card is required.

Function code	Name	Description	Setting range	Default
P20.01	Encoder pulse count	0–60000	0–60000	1024

The function code is used to set the encoder pulse number per rotation.

Function code	Name	Description	Setting range	Default
P20.02	Encoder direction	0x00–0x11 Ones place: AB direction 0: Forward 1: Reverse Tens place: Z pulse direction 0: Forward 1: Reverse	0x00–0x11	0x00

Note: Please set the encoder pulse number correctly under the closed loop vector control mode (P20.01); otherwise, the motor will not run properly. If it still cannot run properly after parameter setting of the encoder, change the encoder direction (P20.02).

Function code	Name	Description	Setting range	Default
P20.03	Detection time of encoder offline fault	0.0–100.0s	0.0–100.0	0.5s
P20.04	Detection time of encoder reversal fault	0.0–100.0s	0.0–100.0	0.8s
P20.05	Filter times of encoder detection	Ones place: Low-speed filter time Tens place: High-speed filter time	00xx–0x99	0x23

P20.03 defines encoder offline detection time. When the offline time exceeds the set time, the VFD will alarm encoder offline fault (ENCIO).

P20.04 defines encoder reverse detection time. When the reverse detection time exceeds the set time, the VFD will alarm encoder reverse fault (ENCID).

Note: Adjusting above parameters will influence the flexibility of encoder fault protection and sometimes abnormal actions may occur, so adjust carefully.

Function code	Name	Description	Setting range	Default
P20.06	Speed ratio between motor and encoder	0.000–65.535	0.000–65.535	1.000

The function code is used to set the speed ratio between motor and encoder. Set the value according to the actual conditions.

Function code	Name	Description	Setting range	Default
P20.10	Pole initial angle	0.00–359.99	0.00–359.99	0.00
P20.11	Autotuning pole initial angle	0–2 0: No operation 1: Rotary autotuning 2: Static autotuning (suitable for resolver-type encoder feedback)	0–2	0
P20.12	Initial angle of SM U pulse	0–65535	0–65535	0
P20.13–P20.14	Reserved			

P21 group—Master/slave control

Function code	Name	Description	Setting range	Default
P21.00	Master/slave mode	0: Master/slave control is invalid. 1: The local device is the master. 2: The local device is the slave.	0–2	0

The function code is used to select the master/slave control mode.

Function code	Name	Description	Setting range	Default
P21.01	Master/slave communication data selection	0: CAN 1: RS485	0–1	0

The function code is used to select the master/slave communication data selection.

Function code	Name	Description	Setting range	Default
P21.02	Master/slave control multifunction mode	0x000–0x113 Ones place: Master/slave running mode 0: Master/slave mode 0 (Both the master and slave use speed control, and power balancing is performed 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-controlled and the slave will be forced into torque control mode.) 2: Master/slave mode 2 (Both the master and slave use speed control, and the slave is balanced by using the speed loop integration result of the master.) 3: Combination mode The slave switches from speed mode (master/slave mode 0) to torque mode (master/slave mode 1) at a frequency point.	0x000–0x113	0x100

Function code	Name	Description	Setting range	Default
		Tens place: Slave start command source 0: Master 1: Determined by P00.01 Hundreds place: Slave transmitting/master receiving data enable 0: Enable 1: Disable		

0: Master/slave mode 0. Both the master and slave use speed control, and power balancing is performed by droop control.

1: Master/slave mode 1. The master and slave must be in the same type of vector control. When the master is in speed control, the slave is automatically set into torque control.

2: Master/slave mode 2. Both the master and slave use speed control, and the slave is balanced by using the speed loop integration result of the master.

3: Combination mode. The slave switches from speed mode (master/slave mode 0) to torque mode (master/slave mode 1) at a frequency point.

Function code	Name	Description	Setting range	Default
P21.03	Slave speed gain	0.0–500.0%	0.0–500.0	100.00%
P21.04	Slave torque gain	0.0–500.0%	0.0–500.0	100.00%

During master-slave control, slave reference signal=master reference signal×P23.03, facilitate the users adjust the power of the master and slave flexibly.

Function code	Name	Description	Setting range	Default
P21.05	Combination mode, speed mode/torque mode switching frequency point	0.00–10.00Hz	0.00–10.00	5.00
P21.06	Master/slave communication address	0–15	0–15	0
P21.07	Number of slaves	0–15	0–15	1
P21.08	Power-on communication detection delay	0–1000	0–1000	30
P21.09	Master/slave communication timeout time	0–60.0s	0–60.0	0.5
P21.10	Communication fault type	0: No fault 1: Inconsistent number of slaves 2: Optical fiber offline fault 3. Abnormal number of loop masters and slaves 4: Slave status exception	0–4	0

P22 group—Synchronous switchover

Function code	Name	Description	Setting range	Default
P22.00	Grid synchronization mode selection	0: Common mode 1: Grid synchronization mode	0–1	0
P22.01	Power frequency mode switchover selection	0: With reactor 1: Without reactor (Reserved)	0–1	0
P22.02	Upper limit frequency of positive sequence adjustment	0.00–10.00Hz	0.00–10.00	0.00Hz
P22.03	Angle compensation value of positive sequence phase	-180.0–180.0°	-180.0–180.0	0.0°
P22.04	Upper limit frequency of negative sequence adjustment	0.00–10.00Hz	0.00–10.00	0.00Hz
P22.05	Angle compensation value of negative sequence phase	-180.0–180.0°	-180.0–180.0	0.0°
P22.06	Phase-lock test mode	0: Invalid 1: Valid (The grid voltage input can be simulated according to the setting value of P22.07–P22.08, and the actual grid input will be masked in the test mode.)	0–1	0
P22.07	Analog grid frequency	-60.0–60.0Hz	-60.0–60.0	0.00Hz
P22.08	Simulated grid voltage	0–6000.0V	0–6000.0	0V
P22.09	Power/variable frequency synchronous output filtering times	0–16 The smaller the value, the faster the synchronization speed.	0–16	8

P23 group—Storage function of communication SD card

Function code	Name	Description	Setting range	Default
P23.00	Memory enabling	0: Disable (Ethernet communication) 1: Enable (SD card storage)	0–1	1
P23.01	Year setting	0000–9999	0000–9999	2019
P23.02	Date setting	01.01–12.31	01.01–12.31	01.01
P23.03	Time setting	00.00–23.59	00.00–23.59	0.00
P23.04	Seconds setting	00–59	00–59	00
P23.05	Recorded value of half bus voltage deviation	0–1000.0	0–1000.0	200.0
P23.06	Size of file 2	0–1024	0–1024	50
P23.07	Data logging trigger conditions	0: Start upon power-on and stop upon power-off 1: Start upon running and stop upon	0–2	0

Function code	Name	Description	Setting range	Default
		stop 2: Triggered through terminals (electrical level)		
P23.08	Sampling channel 1	0: No function 1: Running frequency 2: Set frequency 3: Ramp reference frequency 4: Output current 5: Output torque 6: Output voltage 7: Bus voltage 8: Running speed 9: AI1 10: AI2 11: AI3 12: AO1 13: AO2 14: HDI input frequency 15: HDO output frequency 16: Terminal input status 17: Relay output status 18: Reserved 19:control_step 20:run_step 21:comd_control 22:status_run_stop 23:status_control 24:comd_run_stop 25:ft_flag 26:ft_sch 27:pre_magtok 28:SynRotorZeroFlag1 29–41:Reserved 42: VFD CW (Uint16) 43: Torque setting (int16) 44: Torque current feedback (int16) 45: Exciting current feedback(int16) 46: Linear speed (int16) 47: PID reference (Uint16) 48: PID feedback (Uint16) 49: ASR controller output (int16) 50: Magnetic pole angle of SM (Uint16) 51: Phase U current (instantaneous value) (int16) 52: Phase V current (instantaneous value) (int16) 53: Phase W current (instantaneous value) (int16) 54: Self-test signal 1 (Uint16) 55: Self-test signal 2 (Uint16)	0–79	1
P23.09	Sampling channel 2		0–79	3
P23.10	Sampling channel 3		0–79	4
P23.11	Sampling channel 4		0–79	6
P23.12	Sampling channel 5		0–79	7
P23.13	Sampling channel 6		0–79	29
P23.14	Sampling channel 7		0–79	22
P23.15	Sampling channel 8		0–79	52
P23.16	Sampling channel 9		0–79	53
P23.17	Sampling channel 10		0–79	62

Function code	Name	Description	Setting range	Default
		56: Test variable 1 (int16) 57: Test variable 2 (int16) 58: Test variable 3 (int16) 59: Test variable 4 (int16) 60: Function code setting variable 1 (int16) 61: Function code setting variable 2 (int16) 62: Upper half bus voltage (Uint16) 63: Lower half bus voltage (Uint16) 64–79: Reserved		
P23.18	Set storage time enabling	0: Record upon running 1: Stop recording when the set time is reached	0–1	0
P23.19	Running record time	0–65535s	0–65535	10s
P23.20	IGBT tube voltage drop	0–65535	0–65535	110
P23.21	Leakage inductance deadzone compensation enabling	0: Disable 1: Enable	0–1	1
P23.22–P23.29	Reserved			

6.2 Fault information and fault handling

Fault code	Fault type	Possible cause	Solution
OUt1	Inverter unit U-phase fault	ACC is too fast. IGBT module is damaged Misoperation caused by interference Poor grounding	Increase ACC time Ask for technical support Check whether there is strong interference surrounding the peripheral device.
OUt2	Inverter unit V-phase fault		
OUt3	Inverter unit W-phase fault		
OC1	Overcurrent during acceleration	ACC is too fast. The voltage of the grid is too low; VFD power is too small	Increase ACC time Check the input power Select the VFD with larger power
OC2	Overcurrent during deceleration	DEC is too fast The load inertia torque is too large VFD power is too small	Increase DEC time Install dynamic brake components Select the VFD with larger power
OC3	Overcurrent during constant speed running	Load transient or exception occurred The voltage of the grid is too low VFD power is too small During high-speed running in closed-loop vector mode, the encoder is disconnected or faulty	Check the load or reduce the sudden change of load Check the input power Select the VFD with larger power Check the encoder and its wiring

Fault code	Fault type	Possible cause	Solution
OV1	Overvoltage during acceleration	Exception occurred to input voltage Reset the rotating motor after a momentary power failure	Check the input power Avoid restart after stop
OV2	Overvoltage during deceleration	DEC is too fast Load inertia is too high Exception occurred to input voltage	Increase DEC time Install dynamic brake components Check the input power
OV3	Overvoltage during constant speed running	Exception occurred to input voltage Load inertia is too high	Install the input reactor Install dynamic brake components
UV	Bus undervoltage	The voltage of the grid is too low;	Check the grid input power.
OL1	Motor overload	The grid voltage is too low The motor rated current is set incorrectly Motor stall or load jumps violently In closed-loop vector control mode, the encode runs reversely and the motor runs at low speed for a long period The motor power is too large	Check the grid voltage Reset the motor rated current Check the load and adjust torque boost. Change the signal direction of the encoder Select proper motor.
OL2	VFD overload	ACC is too fast The motor in rotating is restarted The grid voltage is too low Load is too large In closed-loop vector control mode, the encoder runs reversely and the motor runs at low speed for a long period	Increase ACC time Avoid restart after stop Check the grid voltage Select a VFD with larger power Change the signal direction of the encoder
SPI	Phase loss on input side	Phase loss on input R, S, T	Check the input power Check the installation wiring.
SPO	Phase loss on output side	Phase loss occurred to U, V, W output (or the three phases of motor is asymmetrical). If the motor is not connected, the pre-excitation cannot be ended during pre-excitation	Check the output wiring Check the motor and cable.
OH1	Rectifier module overheating	Instantaneous overcurrent occurred to the VFD Three-phase output have interphase or the grounding is short circuited Air duct is blocked or fan is damaged Ambient temperature is too high	See solutions for overcurrent Re-wiring Dredge the vent duct or replace the fan Lower the ambient temperature.
OH2	Inverter module overheat	Control board cables or plugs are loose Auxiliary power supply is damaged, and undervoltage occurred for drive voltage The short through of bridge arm of power modules occurred Control board is abnormal	Check and reconnect the control board Ask for technical support. Ask for technical support. Ask for technical support.
EF	External fault	SI external fault input terminal acts.	Check external device input.
CE	Communication fault	Incorrect baud rate Serial communication error	Set a proper baud rate. Press STOP/RST for reset or

Fault code	Fault type	Possible cause	Solution
		Long period of communication interruption	ask for technical support. Check the communication port cable.
ItE	Fault occurred to the current detection circuit	Poor contact of the connector of control board Auxiliary power supply is damaged Hall components are broken Exception occurred to amplification circuit.	Check the connector and re-plug Ask for technical support. Ask for technical support. Ask for technical support.
tE	Motor autotuning fault	The motor capacity does not match the VFD capacity Motor rated parameter is set improperly The parameters gained from autotuning deviate sharply from the standard parameters Autotuning timeout.	Change the VFD model Set rated parameters based on the motor nameplate Empty the motor load and carry out autotuning again Check the motor wiring and parameter setup
EEP	EEPROM read/write error	Error in reading or writing control parameters EEPROM is damaged.	Press STOP/RST for reset or ask for technical support. Ask for technical support.
PIDE	PID feedback offline fault	PID feedback offline; PID feedback source disappears.	Check PID feedback signal wires; Check PID feedback source.
bCE	Braking unit fault	Fault occurred to the brake circuit or the braking pipe is damaged; Resistance of the external braking resistor is small.	Check the braking unit, and replace with new braking pipe; Increase the brake resistance.
END	Running time reached	The actual running time is longer than the set time.	Ask the supplier to adjust the preset running time.
OL3	Electronic overload fault	The VFD reports overload pre-alarm according to the setting	Check the load and overload pre-alarm threshold
PCE	Keypad communication error	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 error	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 error	Keypad cable connected improperly or disconnected; Keypad cable too long, causing strong interference.	Check for and remove the external interference source. Replace the hardware and seek maintenance services.

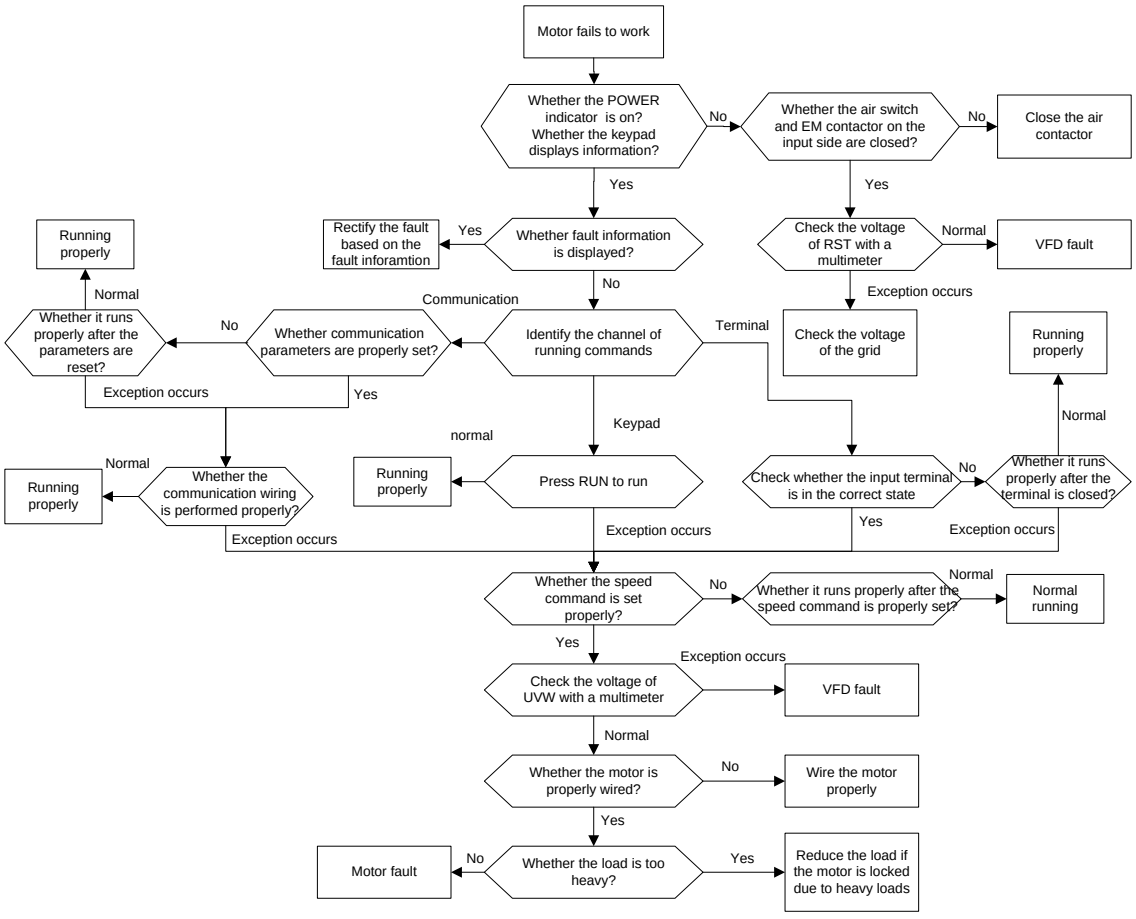
Fault code	Fault type	Possible cause	Solution
		Keypad data storage error	Re-back up the data on the keypad.
E-DP	PROFIBUS communication fault	Communication address is not correct. The matching resistance is not set well. The master GSD file is not set up. The peripheral interference is too large.	Check the related settings; Check the surrounding environment, and eliminate interference effects
E-NET	Ethernet communication fault	Ethernet communication fault The communication mode is set improperly. The peripheral interference is too large.	Check the related settings; Check the communication mode selection; Check the surrounding environment, and eliminate interference effects
E-CAN	CANopen communication fault	Line contact is poor. The matching resistor is not switched on. Communication baud rates do not match. The peripheral interference is too large	Check the line: switch on the matching resistor. Set the same baud rate; Check the surrounding environment, and eliminate interference effects
ETH1	To-ground short-circuit fault 1	VFD output is short connected to the ground Current detection circuit is faulty	Check whether the motor wiring is normal Replace the hall component; Replace the main control board.
dEu	Speed deviation fault	The load is too heavy or stalled.	Check the load to ensure it is proper, and increase the detection time; Check whether the control parameters are set properly.
STo	Mal-adjustment fault	SM control parameters are set incorrectly; The parameter gained from autotuning is inaccurate; The VFD is not connected to the motor.	Check the load and ensure the load is normal; Check whether the control parameters are set correctly; Increase the maladjustment detection time.
LL	Electronic underload fault	The VFD reports underload pre-alarm according to the setting	Check the load and overload pre-alarm threshold
ENC1O	Encoder offline fault	In closed-loop vector control the encoder signal cables is disconnected Encoder is damaged.	Check the encoder wiring and re-connect the cables Check for encoder output
ENC1D	Encoder reversal fault	In closed-loop vector control, the encoder is disconnected or damaged VFD wiring is improper	Check the encoder wiring and adjust the wiring
ENC1Z	Encoder Z pulse offline fault	In closed-loop vector control, the encoder Z pulse signal cables is disconnected Encoder is damaged.	Check the encoder wiring and re-connect the cables Check for encoder output
Ot	Motor overtemperature fault	Long-time overload running or exception occurred. The temperature detection resistance is abnormal	Check the motor, and perform maintenance on the motor Check whether the temperature sensor is proper

Fault code	Fault type	Possible cause	Solution
		Motor overtemperature protection threshold is set improperly	Reset the motor overtemperature protection threshold
SCE	SCR fault	SCR is damaged SCR drive board is damaged SCR drive cable is connected reversely	Replace SCR and drive board Replace the drive cable
SF	Slave fault	Fault occurred to the slave in master/slave control mode	Check for the fault type and rectify the fault
SdEu	Slave speed deviation fault	In master/slave control mode, the load is too heavy or stalled	Check the load of the slave to ensure it is proper, and increase the detection time Check whether the control parameters of the slave are set properly
PLLF	Synchronous switchover phase lock failure	Phase lock failed during synchronous switchover	Check the fluctuation of the grid frequency

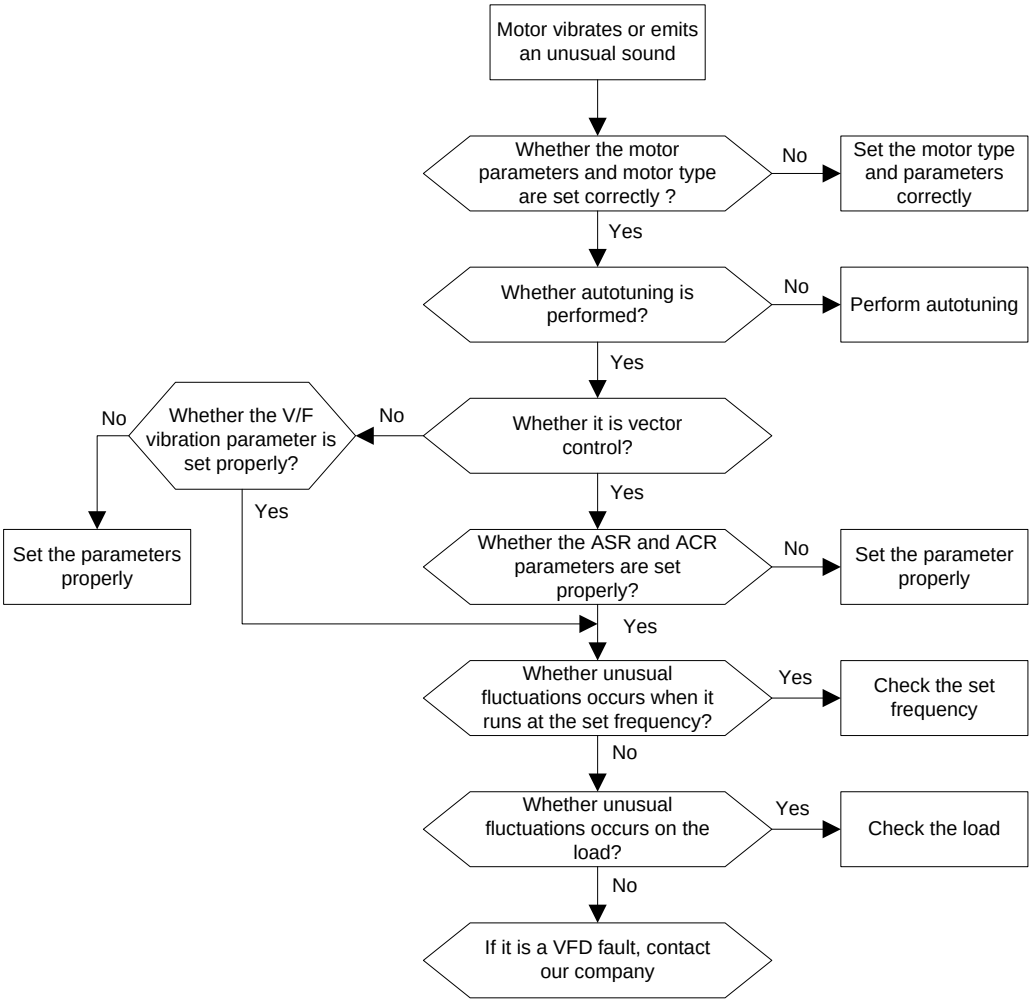
6.3 Common faults and solutions

The following table lists the common faults that the VFD may encounter and the solutions.

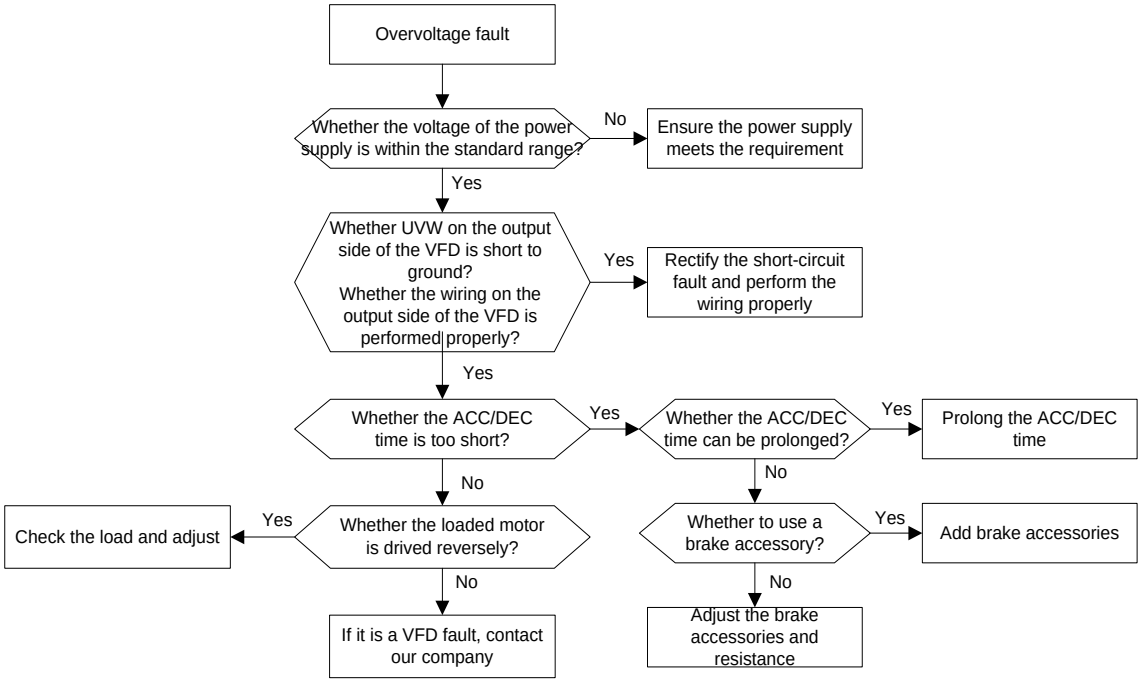
6.3.1 Motor fails to work



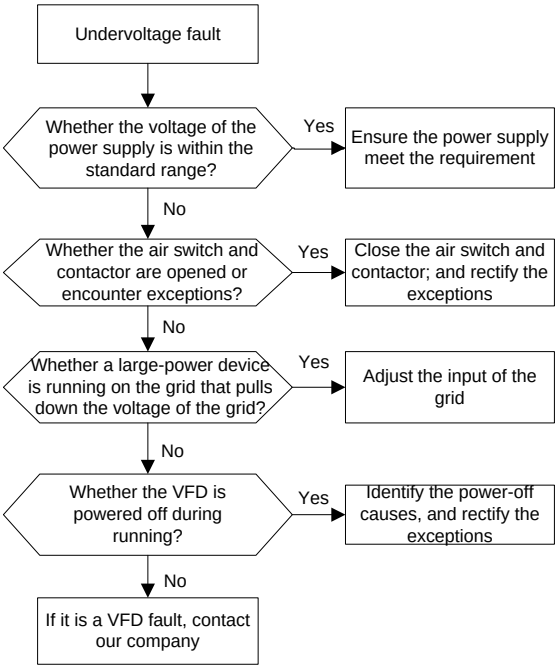
6.3.2 Motor vibrates



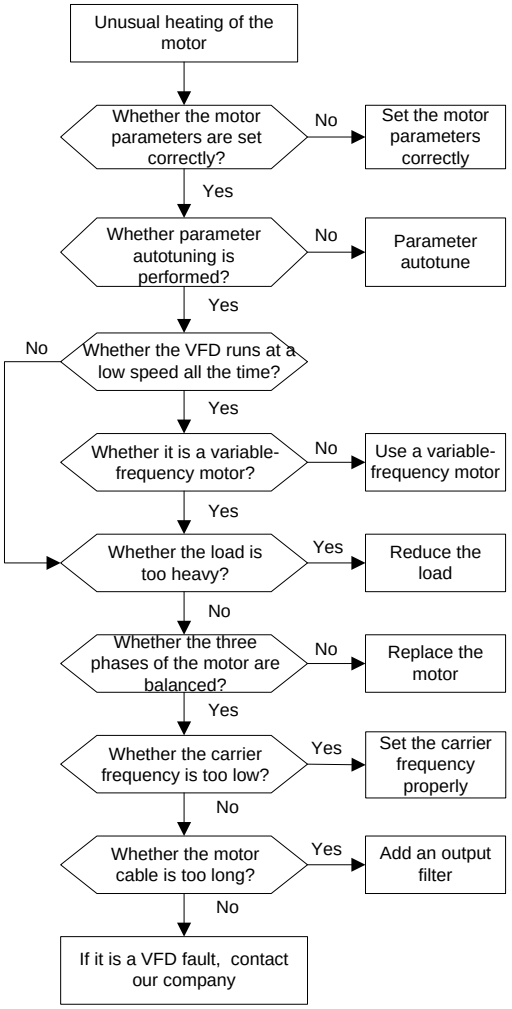
6.3.3 Overvoltage



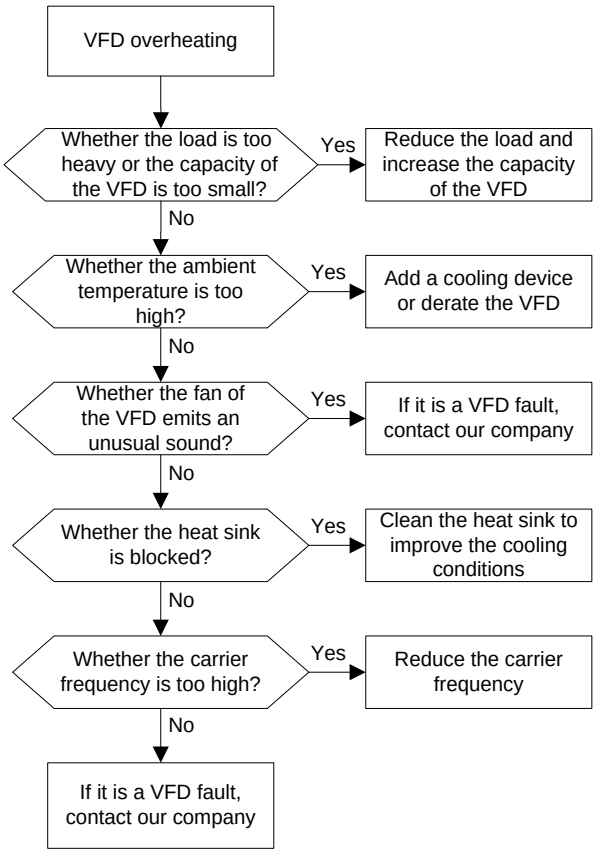
6.3.4 Undervoltage



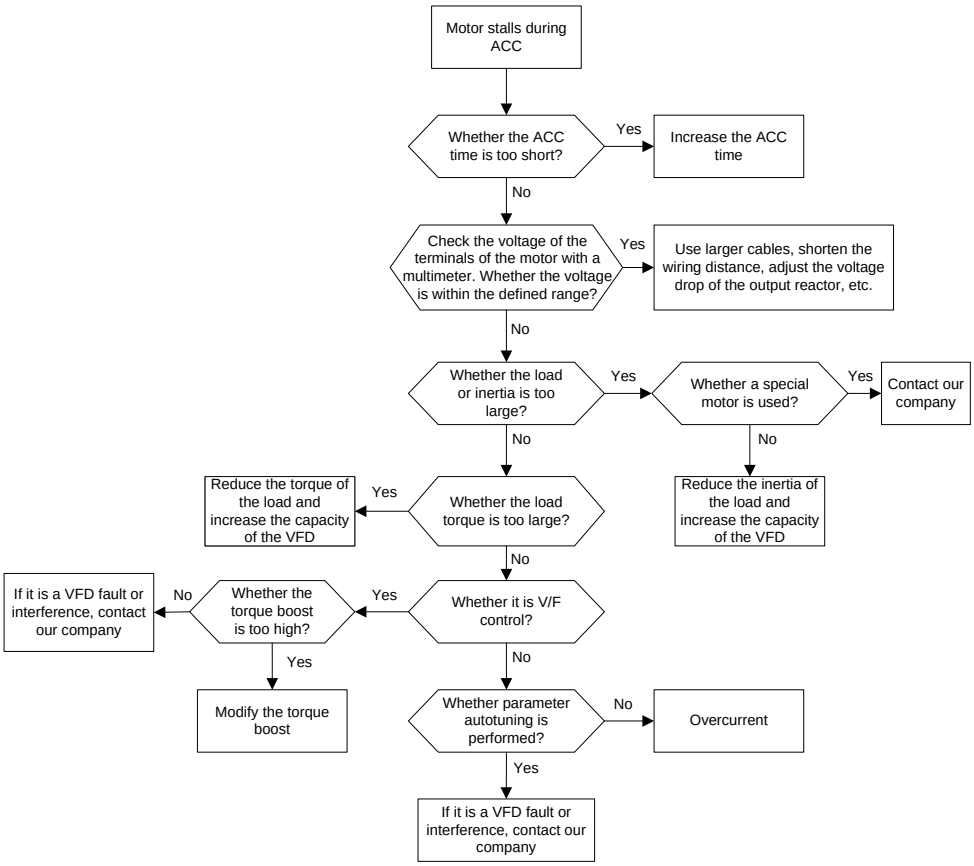
6.3.5 Motor overheating



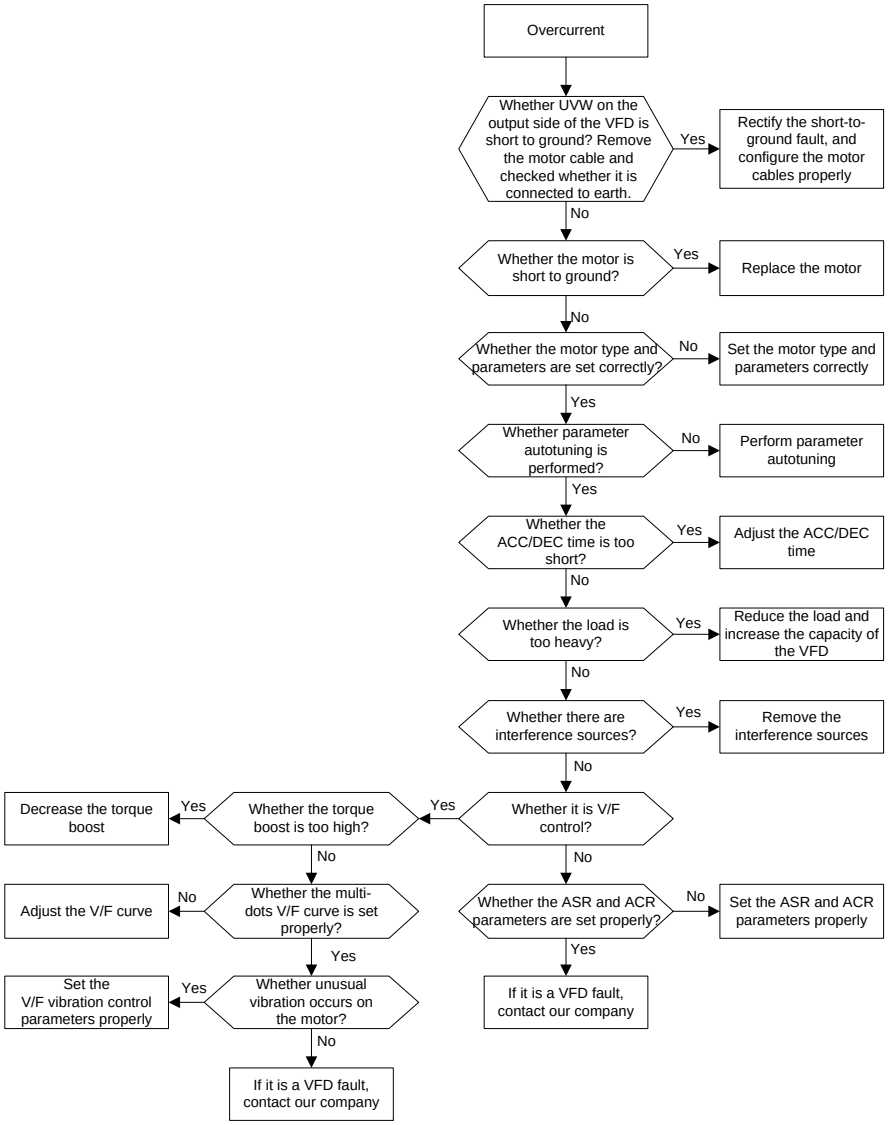
6.3.6 VFD overheating



6.3.7 Motor stalls during ACC



6.3.8 Overcurrent



6.4 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, "P08.08" indicates the 8th function code in the P8 group. The P29 group consist of factory function parameters, which are user inaccessible.

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

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 parameter can be modified, and conditions for the modification.

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

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

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

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

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

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

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	Speed control mode	0: SVC mode 0 (for SM) 1: SVC mode 1 (for AM) 2: V/F control 3: Closed-loop vector control mode (for AM, SM) **Note:** AM-asynchronous motor SM-synchronous motor	0–3	2	◎
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: MODBUS 1: PROFIBUS/CANopen 2: Ethernet 3: Reserved	0–3	0	○
P00.03	Max. output frequency	P00.04–400.00Hz	P00.04–400.00	50.00Hz	◎
P00.04	Upper limit of running frequency	P00.05–P00.03 (Max. frequency)	P00.05–P00.03	50.00Hz	◎
P00.05	Lower limit of running frequency	0.00Hz–P00.04 (Upper limit of running frequency)	0.00–P00.04	0.00Hz	◎
P00.06	Setting channel of A frequency command	0: Keypad 1: AI1 2: AI2 3: AI3 4: High-speed pulse HDI 5: Simple PLC program	0–11	0	○

Function code	Name	Description	Setting range	Default	Modify
		6: Multi-step speed running 7: PID control 8: MODBUS communication 9: PROFIBUS/CANopen communication 10: Ethernet communication 11: Reserved			
P00.07	Setting channel of B frequency command	0: Keypad 1: AI1 2: AI2 3: AI3 4: High-speed pulse HDI 5: Simple PLC program 6: Multi-step speed running 7: PID control 8: MODBUS communication 9: PROFIBUS/CANopen communication 10: Ethernet communication 11: Reserved	0–11	1	○
P00.08	Reference object of B frequency command	0: Max. output frequency 1: A frequency command	0–1	0	○
P00.09	Combination mode of setting source	0: A 1: B 2: (A+B) 3: (A-B) 4: Max(A, B) 5: Min(A, B)	0–5	0	○
P00.10	Frequency set through keypad	0.00 Hz–P00.03 (Max. output frequency)	0.00–P00.03	50.00Hz	○
P00.11	ACC time 1	0.0–3600.0s	0.0–3600.0	Model depended	○
P00.12	DEC time 1	0.0–3600.0s	0.0–3600.0	Model depended	○
P00.13	Running direction	0: Run at the default direction. 1: Run at the opposite direction. 2: Disable reverse running	0–2	0	○
P00.14	Carrier frequency	1.0–4.0kHz	1.0–4.0	Model depended	○
P00.15	Motor parameter autotuning	0: No operation 1: Rotary autotuning 2: Static autotuning 3: Static autotuning 2 (partial autotuning, the first 3 parameters only)	0–3	0	◎
P00.16	AVR function selection	0: Invalid 1: Valid during the whole procedure	0–1	1	○

Function code	Name	Description	Setting range	Default	Modify
P00.17	Reserved				◎
P00.18	Function parameter restore	0: No operation 1: Restore default values 2: Clear fault records	0–2	0	◎
P01 group—Start and stop control					
P01.00	Start mode	0: Direct start 1: Start after DC braking 2: Start after rotating speed tracking	0–2	0	◎
P01.01	Starting frequency of direct start	0.00–50.00Hz	0.00–50.00	0.50Hz	◎
P01.02	Starting frequency hold time	0.00–50.00s	0.0–50.00	0.00s	◎
P01.03	Braking current before start	0.0–100.0% (of the VFD rated current)	0.0–100.0	0.0%	◎
P01.04	Braking time before start	0.00–50.00s	0.00–50.00	0.00s	◎
P01.05	ACC/DEC mode	0: Linear 1: S curve	0–1	0	◎
P01.06	S curve starting segment proportion	0.0–50.0% (ACC/DEC time)	0.0–50.0	30.0%	◎
P01.07	S curve ending segment proportion	0.0–50.0% (ACC/DEC time)	0.0–50.0	30.0%	◎
P01.08	Stop mode	0: Decelerate to stop 1: Coast to stop	0–1	0	○
P01.09	Starting frequency of DC braking for stop	0.00–P00.03 (Max. output frequency)	0.00–P00.03	0.00Hz	○
P01.10	Wait time before DC braking for stop	0.00–50.00s	0.00–50.00	0.00s	○
P01.11	DC braking current for stop	0.0–100.0% (of the VFD rated current)	0.0–100.0	0.0%	○
P01.12	DC braking time for stop	0.00–50.00s	0.00–50.00	0.00s	○
P01.13	FWD/REV running deadzone time	0.0–3600.0s	0.0–3600.0	0.0s	○
P01.14	FWD/REV running switching mode	0: Switch at zero frequency 1: Switch at the starting frequency 2: Switch after the speed reaches the stop speed with a delay	0–2	0	◎
P01.15	Stop speed	0.00–100.00Hz	0.00–100.0	0.50 Hz	◎
P01.16	Stop speed detection mode	0: Detect by the speed setting (without speed delay) 1: Detect by speed feedback (valid only for vector control)	0–1	0	◎
P01.17	Feedback speed detection time	0.00–100.00 s (valid when P01.16=1)	0.00–100.0	0.50s	◎
P01.18	Terminal-based running command protection at	0: The terminal running command is invalid at power-on	0–1	0	○

Function code	Name	Description	Setting range	Default	Modify
	power-on	1: The terminal running command is valid at power-on			
P01.19	Action selected when running frequency less than frequency lower limit (valid when frequency lower limit greater than 0)	0: Run at the frequency lower limit 1: Stop 2: Sleep	0–2	0	◎
P01.20	Wake-up-from-sleep delay	0.0–3600.0s (valid when P01.19=2)	0.0–3600.0	0.0s	○
P01.21	Power-off restart selection	0: Disable 1: Enable	0–1	0	○
P01.22	Wait time for restart after power-off	0.0–3600.0s (valid when P01.21=1)	0.0–3600.0	1.0s	○
P01.23	Start delay	0.0–60.0s	0.0–60.0	0.0s	○
P01.24	Stop speed delay	0.0–100.0 s	0.0–100.0	0.0s	○
P01.25	0Hz output selection	0: Output without voltage 1: Output with voltage 2: Output with the DC braking current for stop	0–2	0	○
P02 group—Parameters of motor 1					
P02.00	Type of motor 1	0: Asynchronous motor (AM) 1: Synchronous motor (SM)	0–1	0	◎
P02.01	Rated power of AM 1	0.1–3000.0kW	0.1–3000.0	Model depended	◎
P02.02	Rated frequency of AM 1	0.01Hz–P00.03 (Max. output frequency)	0.01–P00.03	50.00Hz	◎
P02.03	Rated speed of AM 1	1–36000rpm	1–36000	Model depended	◎
P02.04	Rated voltage of AM 1	0–4000V	0–4000	Model depended	◎
P02.05	Rated current of AM 1	0.8–6000.0A	0.8–6000.0	Model depended	◎
P02.06	Stator resistance of AM 1	0.001–65.535Ω	0.001–65.535	Model depended	○
P02.07	Rotor resistance of AM 1	0.001–65.535Ω	0.001–65.535	Model depended	○
P02.08	Leakage inductance of AM 1	0.1–6553.5mH	0.1–6553.5	Model depended	○
P02.09	Mutual inductance of AM 1	0.1–6553.5mH	0.1–6553.5	Model depended	○
P02.10	No-load current of AM 1	0.1–6553.5A	0.1–6553.5	Model depended	○
P02.11	Magnetic saturation coefficient 1 of iron core of AM 1	0.0–100.0%	0.0–100.0	80.0%	○
P02.12	Magnetic saturation coefficient 2 of iron core of	0.0–100.0%	0.0–100.0	68.0%	○

Function code	Name	Description	Setting range	Default	Modify
	AM 1				
P02.13	Magnetic saturation coefficient 3 of iron core of AM 1	0.0–100.0%	0.0–100.0	57.0%	○
P02.14	Magnetic saturation coefficient 4 of iron core of AM 1	0.0–100.0%	0.0–100.0	40.0%	○
P02.15	Rated power of SM 1	0.1–3000.0kW	0.1–3000.0	Model depended	◎
P02.16	Rated frequency of SM 1	0.01Hz–P00.03 (Max. output frequency)	0.01–P00.03	50.00Hz	◎
P02.17	Number of pole pairs of SM 1	1–50	1–50	2	◎
P02.18	Rated voltage of SM 1	0–4000V	0–4000	Model depended	◎
P02.19	Rated current of SM 1	0.8–6000.0A	0.8–6000.0	Model depended	◎
P02.20	Stator resistance of SM 1	0.001–65.535Ω	0.001–65.535	Model depended	○
P02.21	Direct-axis inductance of SM 1	0.01–655.35mH	0.01–655.35	Model depended	○
P02.22	Quadrature-axis inductance of SM 1	0.01–655.35mH	0.01–655.35	Model depended	○
P02.23	Counter-emf constant of SM 1	0–10000	0–10000	300	○
P02.24	Initial pole position of SM 1	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●
P02.25	Identification current of SM 1	0%–50% (of the motor rated current)	0–50	10%	●
P02.26	Overload protection of motor 1	0: No protection 1: Common motor (with low-speed compensation) 2: Frequency-variable motor (without low-speed compensation)	0–2	2	◎
P02.27	Overload protection coefficient of motor 1	20.0%–120.0%	20.0–120.0	100.0%	○
P02.28	Power calibration coefficient of motor 1	0.00–3.00	0.00–3.00	1.00	○
P02.29	Parameter display of motor 1	0: Display based on motor type 1: Display all	0–1	0	○
P03 group—Vector control					
P03.00	Speed-loop proportional gain 1	0–200.0	0–200.0	20.0	○
P03.01	Speed-loop integral time 1	0.000–10.000s	0.000–10.000	1.000s	○
P03.02	Low-point frequency for	0.00Hz–P03.05	0.00–P03.05	5.00Hz	○

Function code	Name	Description	Setting range	Default	Modify
	switching				
P03.03	Speed-loop proportional gain 2	0–200.0	0–200.0	20.0	○
P03.04	Speed-loop integral time 2	0.000–10.000s	0.000–10.000	1.000s	○
P03.05	High-point frequency for switching	P03.02–P00.03 (Max. frequency)	P03.02–P00.03	10.00Hz	○
P03.06	Speed-loop output filter	0–8 (corresponding to 0–2^8/10ms)	0–8	0	○
P03.07	Electromotive slip compensation coefficient of vector control	50%–200%	50–200	100%	○
P03.08	Braking slip compensation coefficient of vector control	50%–200%	50–200	100%	○
P03.09	Current-loop proportional coefficient P	0–65535	0–65535	1000	○
P03.10	Current-loop integral coefficient I	0–65535	0–65535	1000	○
P03.11	Torque setting method	0: Torque control invalid 1: Keypad (P03.12) 2: AI1 (100% corresponding to three times the motor rated current) 3: AI2 (Same as the above) 4: AI3 (Same as the above) 5: Pulse frequency HDI (Same as the above) 6: Multi-step torque (same as the above) 7: MODBUS communication (same as the above) 8: PROFIBUS/CANopen communication (same as the above) 9: Ethernet communication (same as the above) 10: Reserved	0–10	0	○
P03.12	Torque set through keypad	-300.0%–300.0% (of the motor rated current)	-300.0–300.0	50.0%	○
P03.13	Torque reference filter time	0.000–10.000s	0.000–10.000	0.100s	○
P03.14	Setting source of forward rotation upper-limit frequency in torque control	0: Keypad (P03.16) 1: AI1 2: AI2 (same as the above) 3: AI3 (same as the above) 4: Pulse frequency HDI 5: Multi-step setting (same as the	0–9	0	○

Function code	Name	Description	Setting range	Default	Modify
		above) 6: MODBUS communication (same as the above) 7: PROFIBUS/CANopen communication (same as the above) 8: Ethernet communication (same as the above) 9: Reserved			
P03.15	Setting source of reverse rotation upper-limit frequency in torque control	0: Keypad (P03.17) 1: AI1 2: AI2 (same as the above) 3: AI3 (same as the above) 4: Pulse frequency HDI 5: Multi-step setting (same as the above) 6: MODBUS communication (same as the above) 7: PROFIBUS/CANopen communication (same as the above) 8: Ethernet communication (same as the above) 9: Reserved	0–9	0	○
P03.16	Forward rotation upper-limit frequency set through keypad in torque control	0.00Hz–P00.03	0.00–P00.03	20.00Hz	○
P03.17	Reverse rotation upper-limit frequency set through keypad in torque control	0.00 Hz–P00.03	0.00–P00.03	20.00Hz	○
P03.18	Setting source of electromotive torque upper limit	0: Keypad (P03.20) 1: AI1 (100% corresponding to triple the motor rated current) 2: AI2 (same as the above) 3: AI3 (same as the above) 4: Pulse frequency HDI (same as the above) 5: MODBUS communication (same as the above) 6: PROFIBUS/CANopen communication (same as the above) 7: Ethernet communication (same as the above) 8: Reserved	0–8	0	○
P03.19	Setting source of braking torque upper limit	0: Keypad (P03.21) 1: AI1 (100% corresponding to triple the motor rated current)	0–8	0	○

Function code	Name	Description	Setting range	Default	Modify
		2: AI2 (same as the above) 3: AI3 (same as the above) 4: Pulse frequency HDI (same as the above) 5: MODBUS communication (same as the above) 6: PROFIBUS/CANopen communication (same as the above) 7: Ethernet communication (same as the above) 8: Reserved			
P03.20	Electromotive torque upper limit set through keypad	0.0–300.0% (of the motor rated current)	0.0–300.0	180.0%	○
P03.21	Braking torque upper limit set through keypad	0.0–300.0% (of the motor rated current)	0.0–300.0	180.0%	○
P03.22	Weakening coefficient in constant power zone	0.1–2.0	0.1–2.0	0.3	○
P03.23	Lowest weakening point in constant power zone	10%–100%	10–100	20%	○
P03.24	Max. voltage limit	0.0–120.0%	0.0–120.0	100.0%	◎
P03.25	Pre-exciting time	0.000–10.000s	0.000–10.000	0.300s	○
P03.26	Flux-weakening proportional gain	0–4000	0–4000	300	○
P03.27	Flux-weakening integral gain	0–4000	0–4000	300	○
P03.28	Enabling SM integral separation	0: Disable 1: Enable	0–1	0	○
P03.29	Exciting current expansion coefficient in SVC 1 for AM	100–200	100–200	100	○
P03.30	Speed feedforward coefficient in SVC 1 for AM	0.000–30.000	0.000–30.000	0	○
P03.31	Speed feedforward limit in SVC 1 for AM	0.0–150.0%	0.0–150.0	30.0%	○
P04 group—V/F control					
P04.00	V/F curve setting of motor 1	0: Straight-line 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 curve (V/F separation)	0–5	0	◎
P04.01	Torque boost of motor 1	0.0%: (automatic) 0.1%–10.0%	0.0–10.0	0.0%	○

Function code	Name	Description	Setting range	Default	Modify
P04.02	Torque boost cut-off of motor 1	0.0%–50.0% (of the rated frequency of motor 1)	0.0–50.0	20.0%	○
P04.03	V/F frequency point 1 of motor 1	0.00Hz–P04.05	0.00–P04.05	0.00Hz	○
P04.04	V/F voltage point 1 of motor 1	0.0%–110.0% (of the rated voltage of motor 1)	0.0–110.0	0.0%	○
P04.05	V/F frequency point 2 of motor 1	P04.03–P04.07	P04.03–P04.07	0.00Hz	○
P04.06	V/F voltage point 2 of motor 1	0.0%–110.0% (of the rated voltage of motor 1)	0.0–110.0	0.0%	○
P04.07	V/F frequency point 3 of motor 1	P04.05–P02.02 (Rated frequency of motor 1) or P04.05–P02.16 (Rated frequency of motor 1)	P04.05–Rated frequency of motor 1	0.00Hz	○
P04.08	V/F voltage point 3 of motor 1	0.0%–110.0% (of the rated voltage of motor 1)	0.0–110.0	0.0%	○
P04.09	V/F slip compensation gain of motor 1	0.0–200.0%	0.0–200.0	100.0%	○
P04.10	Low-frequency oscillation control factor of motor 1	0–100	0–100	10	○
P04.11	High-frequency oscillation control factor of motor 1	0–100	0–100	10	○
P04.12	Oscillation control threshold of motor 1	0.00Hz–P00.03 (Max. output frequency)	0.00–P00.03	30.00 Hz	○
P04.13	V/F curve setting of motor 2	0: Straight-line 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 curve (V/F separation)	0–5	0	◎
P04.14	Torque boost of motor 2	0.0%: (automatic) 0.1%–10.0%	0.0–10.0	0.0%	○
P04.15	Torque boost cut-off of motor 2	0.0%–50.0% (of the rated frequency of motor 2)	0.0–50.0	20.0%	○
P04.16	V/F frequency point 1 of motor 2	0.00Hz–P04.18	0.00–P04.18	0.00Hz	○
P04.17	V/F voltage point 1 of motor 2	0.0%–110.0% (of the rated voltage of motor 2)	0.0–110.0	0.0%	○
P04.18	V/F frequency point 2 of motor 2	P04.16–P04.20	P04.16–P04.20	0.00Hz	○
P04.19	V/F voltage point 2 of motor 2	0.0%–110.0% (of the rated voltage of motor 2)	0.0–110.0	0.0%	○

Function code	Name	Description	Setting range	Default	Modify
P04.20	V/F frequency point 3 of motor 2	P04.18–P12.02 (Rated frequency of motor 2) or P04.18–P12.16 (Rated frequency of motor 2)	P04.18–P12.02 or P04.18–P12.16	0.00Hz	○
P04.21	V/F voltage point 3 of motor 2	0.0%–110.0% (of the rated voltage of motor 2)	0.0–110.0	0.0%	○
P04.22	V/F slip compensation gain of motor 2	0.0–200.0%	0.0–200.0	100.0%	○
P04.23	Low-frequency oscillation control factor of motor 2	0–100	0–100	10	○
P04.24	High-frequency oscillation control factor of motor 2	0–100	0–100	10	○
P04.25	Oscillation control threshold of motor 2	0.00Hz–P00.03 (Max. output frequency)	0.00–P00.03	30.00 Hz	○
P04.26	Energy-saving run	0: Disable 1: Automatic energy-saving run	0–1	0	◎
P04.27	Voltage setting channel	0: Keypad (The output voltage is determined by P04.28.) 1: AI1 2: AI2 3: AI3 4: HDI 5: Multi-step speed running (The setting is determined by group P10.) 6: PID 7: MODBUS communication 8: PROFIBUS/CANopen communication 9: Ethernet communication 10: Reserved	0–10	0	○
P04.28	Voltage set through keypad	0.0%–100.0%	0.0–100.0	100.0%	○
P04.29	Voltage increase time	0.0–3600.0s	0.0–3600.0	5.0s	○
P04.30	Voltage decrease time	0.0–3600.0s	0.0–3600.0	5.0s	○
P04.31	Max. output voltage	P04.32 –100.0% (of the motor rated voltage)	0.0–100.0	100.0%	◎
P04.32	Min. output voltage	0.0%–P04.31 (motor rated voltage)	0.0–100.0	0.0%	◎
P04.33	Weakening coefficient in constant power zone V/F	0.00–1.30	0.00–1.30	1.00	○
P04.34	VF reactive closed-loop enable	0–5000	0–5000	50	○
P04.35	VF reactive closed-loop integral coefficient	0–5000	0–5000	30	○
P04.36	Reactive current closed-loop integral switch-over frequency	0–400.00Hz	0–400.00	50.00Hz	○

Function code	Name	Description	Setting range	Default	Modify
P04.37	Reactive current closed-loop high-frequency integral	0–5000	0–5000	30	○
P04.38	Reactive closed-loop voltage limit in PM-VF control	0–16000V	0–16000	8000V	○
P04.39	IF enabling selection	0: Invalid 1: Valid	0–1	0	◎
P04.40	IF control current	0.0–200.0%	0.0–200.0	50.0%	○
P04.41	IF control proportional gain	0–5000	0–5000	350	○
P04.42	IF control integral gain	0–5000	0–5000	10	○
P04.43	IF switching off frequency	0.00–20.00Hz	0.00–20.00	10.00Hz	○
P05 group—Input terminals					
P05.00	HDI input type	0: HDI is high-speed pulse input 1: HDI is digital input	0–1	0	◎
P05.01	Function of S1 terminal	0: No function 1: Forward running 2: Reverse running 3: Three-wire running control 4: Jog forward 5: Jog reversely 6: Coast to stop 7: Fault reset 8: Pause running 9: External fault input 10: Increase frequency setting (UP) 11: Decrease frequency setting (DOWN) 12: Clear the frequency increase/decrease setting 13: Switch between A setting and B setting 14: Switch between combination setting and A setting 15: Switch between combination setting and B setting 16: Multi-step speed terminal 1 17: Multi-step speed terminal 2 18: Multi-step speed terminal 3 19: Multi-step speed terminal 4 20: Pause multi-step speed running 21: ACC/DEC time selection 1 22: ACC/DEC time selection 2 23: Simple PLC stop reset 24: Pause simple PLC 25: Pause PID control 26: Reserved	0–63	1	◎
P05.02	Function of S2 terminal		0–63	4	◎
P05.03	Function of S3 terminal		0–63	7	◎
P05.04	Function of S4 terminal		0–63	0	◎
P05.05	Function of S5 terminal		0–63	0	◎
P05.06	Function of S6 terminal		0–63	0	◎
P05.07	Function of S7 terminal		0–63	0	◎
P05.08	Function of S8 terminal		0–63	0	◎
P05.09	Function of HDI		0–63	0	◎

Function code	Name	Description	Setting range	Default	Modify
		27: Reserved 28: Reserved 29: Disable torque control 30: Disable ACC/DEC 31: Reserved 32: Reserved 33: Clear the frequency increase/decrease setting temporarily 34: DC braking for stop 35: Switch from motor 1 to motor 2 36: Switch the running command channel to keypad 37: Switch the running command channel to terminal 38: Switch the running command channel to communication 39: Pre-exciting command 40: Clear electricity consumption 41: Keep electricity consumption 42: External fault input 2 43: Enable switching to power frequency run 44: Switch to the master 45: Switch to the slave 46: Switch-on signal feedback of rectifier 47–63: Reserved			
P05.10	Input terminal polarity	0x000–0x1FF	0x000–0x1FF	0x000	○
P05.11	Digital input filter time	0.000–1.000s	0.000–1.000	0.010s	○
P05.12	Virtual terminal setting	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: Reserved	0–4	0	◎
P05.13	Terminal control mode	0: Two-wire control mode 1 1: Two-wire control mode 2 2: Three-wire control mode 1 3: Three-wire control mode 2	0–3	0	◎
P05.14	S1 switch-on delay	0.000–50.000s	0.000–50.000	0.000s	○

Function code	Name	Description	Setting range	Default	Modify
P05.15	S1 switch-off delay	0.000–50.000s	0.000–50.000	0.000s	○
P05.16	S2 switch-on delay	0.000–50.000s	0.000–50.000	0.000s	○
P05.17	S2 switch-off delay	0.000–50.000s	0.000–50.000	0.000s	○
P05.18	S3 switch-on delay	0.000–50.000s	0.000–50.000	0.000s	○
P05.19	S3 switch-off delay	0.000–50.000s	0.000–50.000	0.000s	○
P05.20	S4 switch-on delay	0.000–50.000s	0.000–50.000	0.000s	○
P05.21	S4 switch-off delay	0.000–50.000s	0.000–50.000	0.000s	○
P05.22	S5 switch-on delay	0.000–50.000s	0.000–50.000	0.000s	○
P05.23	S5 switch-off delay	0.000–50.000s	0.000–50.000	0.000s	○
P05.24	S6 switch-on delay	0.000–50.000s	0.000–50.000	0.000s	○
P05.25	S6 switch-off delay	0.000–50.000s	0.000–50.000	0.000s	○
P05.26	S7 switch-on delay	0.000–50.000s	0.000–50.000	0.000s	○
P05.27	S7 switch-off delay	0.000–50.000s	0.000–50.000	0.000s	○
P05.28	S8 switch-on delay	0.000–50.000s	0.000–50.000	0.000s	○
P05.29	S8 switch-off delay	0.000–50.000s	0.000–50.000	0.000s	○
P05.30	HDI switch-on delay	0.000–50.000s	0.000–50.000	0.000s	○
P05.31	HDI switch-off delay	0.000–50.000s	0.000–50.000	0.000s	○
P05.32	AI1 lower limit	0.00V–P05.34	0.00–P05.34	0.00V	○
P05.33	Corresponding setting of AI1 lower limit	-100.0%–100.0%	-100.0–100.0	0.0%	○
P05.34	AI1 upper limit	P05.32–10.00V	P05.23–10.00	10.00V	○
P05.35	Corresponding setting of AI1 upper limit	-100.0%–100.0%	-100.0–100.0	100.0%	○
P05.36	AI1 input filter time	0.000s–10.000s	0.000–10.000	0.100s	○
P05.37	AI2 lower limit	-10.00V–P05.39	-10.00V–P05.39	-10.00V	○
P05.38	Corresponding setting of AI2 lower limit	-100.0%–100.0%	-100.0–100.0	-100.0%	○

Function code	Name	Description	Setting range	Default	Modify
P05.39	AI2 middle value	P05.37–P05.41	P05.37–P05.41	0.00V	
P05.40	Corresponding setting of AI2 middle value	-100.0%–100.0%	-100.0–100.0	0.0%	
P05.41	AI2 upper limit	P05.39–10.00V	P05.39–10.00	10.00V	○
P05.42	Corresponding setting of AI2 upper limit	-100.0%–100.0%	-100.0–100.0	100.0%	○
P05.43	AI2 input filter time	0.000s–10.000s	0.000–10.000	0.100s	○
P05.44	AI3 lower limit	0V–P05.46	0–P05.46	0.00V	○
P05.45	Corresponding setting of AI3 lower limit	-100.0%–100.0%	-100.0–100.0	-100.0%	○
P05.46	AI3 middle value	P05.44–P05.48	P05.44–P05.48	5.00V	○
P05.47	Corresponding setting of AI3 middle value	-100.0%–100.0%	-100.0–100.0	0.0%	○
P05.48	AI3 upper limit	P05.46–10.00V	P05.46–10.00	10.00V	○
P05.49	Corresponding setting of AI3 upper limit	-100.0%–100.0%	-100.0–100.0	100.0%	○
P05.50	AI3 input filter time	0.000s–10.000s	0.000–10.000	0.100s	○
P05.51	HDI high-speed pulse input function selection	0: Input set through frequency 1–2: Reserved	0	0	◎
P05.52	HDI lower limit frequency	0.00kHz–P05.54	0.00–P05.54	0.00kHz	○
P05.53	Corresponding setting of HDI lower limit frequency	-100.0%–100.0%	-100.0–100.0	0.0%	○
P05.54	HDI upper limit frequency	P05.52–50.00kHz	P05.52–50.00	50.00kHz	○
P05.55	Corresponding setting of HDI upper limit frequency	-100.0%–100.0%	-100.0–100.0	100.0%	○
P05.56	HDI frequency input filter time	0.000s–10.000s	0.000–10.000	0.100s	○
P06 group—Output terminals					
P06.00	HDO output type	0: Open collector high-speed pulse output 1: Reserved	0–1	0	◎
P06.01	Y1 output	0: Invalid 1: Running 2: Running forward 3: Running reversely 4: Jogging 5: VFD in fault 6: Frequency level detection FDT1 7: Frequency level detection	0–30	0	○
P06.02	HDO output		0–30	0	○
P06.03	Relay RO1 output		0–30	1	○
P06.04	Relay RO2 output		0–30	5	
P06.05	Relay RO3 output		0–30	0	○

Function code	Name	Description	Setting range	Default	Modify
		FDT2 8: Frequency reached 9: Running at zero speed 10: Upper limit frequency reached 11: Lower limit frequency reached 12: Ready for running 13: Pre-exciting 14: Overload pre-alarm 15: Underload pre-alarm 16: Simple PLC stage completed 17: Simple PLC cycle completed 18: Reserved 19: Reserved 20: External fault is valid 21: Reserved 22: Running time reached 23: Modbus communication virtual terminal output 24: PROFIBUS/CANopen communication virtual terminal output 25: Ethernet communication virtual terminal output 26: DC bus voltage established 27–28: Reserved 29: Motor OH pre-alarm 30: Phase-locked and synchronous output at power frequency			
P06.06	Output terminal polarity selection	0x00–0x1F	0x00–0x1F	0x00	○
P06.07	Y switch-on delay	0.000–50.000s	0.000–50.000	0.000s	○
P06.08	Y switch-off delay	0.000–50.000s	0.000–50.000	0.000s	○
P06.09	HDO switch-on delay	0.000–50.000s (valid when P06.00 is 1)	0.000–50.000	0.000s	○
P06.10	HDO switch-off delay	0.000–50.000s (valid when P06.00 is 1)	0.000–50.000	0.000s	○
P06.11	RO1 switch-on delay	0.000–50.000s	0.000–50.000	0.000s	○
P06.12	RO1 switch-off delay	0.000–50.000s	0.000–50.000	0.000s	○
P06.13	RO2 switch-on delay	0.000–50.000s	0.00–50.00	0.000s	○
P06.14	RO2 switch-off delay	0.000–50.000s	0.00–50.00	0.000s	○
P06.15	RO3 switch-on delay	0.000–50.000s	0.00–50.00	0.000s	○

Function code	Name	Description	Setting range	Default	Modify
P06.16	RO3 switch-off delay	0.000–50.000s	0.00–50.00	0.000s	○
P06.17	AO1 output	0: Running frequency 1: Set frequency 2: Ramp reference frequency 3: Rotational speed 4: Output current (relative to the VFD) 5: Output current (relative to the motor) 6: Output voltage 7: Output power 8: Set torque 9: Output torque 10: AI1 input 11: AI2 input 12: AI3 input 13: High-speed pulse HDI input 14: Value 1 set through MODBUS communication 15: Value 2 set through MODBUS communication 16: Value 1 set through PROFIBUS/CANopen communication 17: Value 2 set through PROFIBUS/CANopen communication 18: Value 1 set through Ethernet communication 19: Value 2 set through Ethernet communication 20: PID reference 21: PID feedback 22: Torque current (relative to the motor rated current) 23: Ramp reference frequency (signed) 24–30: Reserved	0–30	0	○
P06.18	AO2 output		0–30	0	○
P06.19	AO3 output		0–30	0	
P06.20	HDO high-speed pulse output		0–30	0	○
P06.21	AO1 output lower limit	-100.0%–P06.23	-100.0–P06.23	0.0%	○
P06.22	AO1 output corresponding to lower limit	-10.00V–10.00V	-10.00–10.00	0.00V	○
P06.23	AO1 output upper limit	P06.21–100.0%	P06.21–100.0	100.0%	○
P06.24	AO1 output corresponding to upper limit	-10.00V–10.00V	-10.00–10.00	10.00V	○
P06.25	AO1 output filter time	0.000s–10.000s	0.000–10.000	0.000s	○

Function code	Name	Description	Setting range	Default	Modify
P06.26	AO2 output lower limit	-100.0%–P06.28	-100.0–P06.28	0.0%	○
P06.27	AO2 output corresponding to lower limit	-10.00V–10.00V	-10.00–10.00	0.00V	○
P06.28	AO2 output upper limit	P06.26–100.0%	P06.26–100.0	100.0%	○
P06.29	AO2 output corresponding to upper limit	-10.00V–10.00V	-10.00–10.00	10.00V	○
P06.30	AO2 output filter time	0.000s–10.000s	0.000–10.000	0.000s	○
P06.31	AO3 output lower limit	-100.0%–P06.33	-100.0–P06.33	0.0%	○
P06.32	AO3 output corresponding to lower limit	-10.00V–10.00V	-10.00–10.00	0.00V	○
P06.33	AO3 output upper limit	P06.31–100.0%	P06.31–100.0	100.0%	○
P06.34	AO3 output corresponding to upper limit	-10.00V–10.00V	-10.00–10.00	10.00V	○
P06.35	AO3 output filter time	0.000s–10.000s	0.000–10.000	0.000s	○
P06.36	HDO output lower limit	-100.0%–P06.38	-100.0–P06.38	-100.00%	○
P06.37	HDO output corresponding to lower limit	0.00–50.00kHz	0.00–50.00	0.0kHz	○
P06.38	HDO output upper limit	P06.36–100.0%	P06.36–100.0	100.0%	○
P06.39	HDO output corresponding to upper limit	0.00–50.00kHz	0.00–50.00	50.00kHz	○
P06.40	HDO output filter time	0.000s–10.000s	0.000–10.000	0.000s	○
P07 group—Human-machine interface					
P07.00	User password	0–65535	0–65535	0	○
P07.01	Parameter copy	0: No operation 1: Upload parameters from the local address to the keypad 2: Download parameters (including motor parameters) from the keypad to the local address 3: Download parameters (excluding groups P02 and P12) from the keypad to the local address 4: Download parameters (only including groups P02 and P12) from the keypad to the local address	0–4	0	◎

Function code	Name	Description	Setting range	Default	Modify
P07.02	**QUICK/JOG** key function selection	0: No function 1: Jog 2: Switch between states 3: Switch between forward and reverse rotating 4: Clear the UP/DOWN setting 5: Coast to stop 6: Switch command channels in sequence 7: Quick commissioning mode (based on non-factory parameter settings)	0–7	1	◎
P07.03	Sequence of switching running-command channels by pressing QUICK	0: Keypad→Terminal→Communication 1: Keypad←→Terminal 2: Keypad←→Communication 3: Terminal←→Communication	0–3	0	○
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	0	○
P07.05	Selection 1 of parameters to be displayed in the running state	0x0000–0xFFFF BIT0: Running frequency (Hz on) BIT1: Set frequency (Hz blinking) BIT2: Bus voltage (V on) BIT3: Output voltage (V on) BIT4: Output current (A on) BIT5: Running speed (rpm on) Bit 6: Output power (% on) Bit 7: Output torque (% on) Bit 8: PID reference value (% blinking) Bit 9: PID feedback value (% on) BIT10: Input terminal status BIT11: Output terminal status Bit 12: Set torque (% on) Bit 13: Pulse count value Bit 14: Length value Bit 15: PLC and current step number of multi-step speed	0x0000–0xFFFF	0x03FF	○
P07.06	Selection 2 of parameters to be displayed in the running state	0x0000–0xFFFF Bit 0: AI1 (V on) Bit 1: AI1 (V on) Bit 2: AI3 (V on) BIT3: HDI frequency	0x0000–0xFFFF	0x0000	

Function code	Name	Description	Setting range	Default	Modify
		BIT14: Motor overload percentage (% on) BIT15: VFD overload percentage (% on) Bit 6: Ramp frequency reference (Hz on) BIT7: Reserved BIT8: Reserved Bit 9–15: Reserved			
P07.07	Selection of parameters to be displayed in the stop state	0x0000–0xFFFF BIT0: Set frequency (Hz on, blinking slowly) BIT1: Bus voltage (V on) BIT2: Input terminal state BIT3: Output terminal state BIT4: PID reference value (% blinking) BIT5: PID feedback value (% on) BIT6: Set torque (% on) BIT7: AI1 (V on) BIT8: AI2 (V on) BIT9: AI3 (V on) BIT10: HDI frequency BIT11: PLC and actual step of multi-step speed BIT12: Reserved BIT13: Reserved BIT14–BIT15: Reserved	0x0000–0xFFFF	0x00FF	○
P07.08	Frequency display coefficient	0.01–10.00	0.01–10.00	1.00	○
P07.09	Rotational speed display coefficient	0.1–999.9%	0.1–999.9	100.0%	○
P07.10	Linear speed display coefficient	0.1–999.9%	0.1–999.9	1.0%	○
P07.11	Rectifier bridge temperature	0–100.0℃			●
P07.12	Inverter module temperature	0–100.0℃			●
P07.13	DSP version number	1.00–655.35			●
P07.14	Local accumulative running time	0–65535h			●
P07.15	VFD electricity consumption high-order bits	0–65535kWh (*1000)			●
P07.16	VFD electricity consumption low-order bits	0.0–999.9kWh			●
P07.17	Reserved				
P07.18	VFD rated power	0.4–3000.0kW			●
P07.19	VFD rated voltage	0–4000V			●
P07.20	VFD rated current	0.1–6000.0A			●

Function code	Name	Description	Setting range	Default	Modify
P07.21	Factory bar code 1	0x0000–0xFFFF			●
P07.22	Factory bar code 2	0x0000–0xFFFF			●
P07.23	Factory bar code 3	0x0000–0xFFFF			●
P07.24	Factory bar code 4	0x0000–0xFFFF			●
P07.25	Factory bar code 5	0x0000–0xFFFF			●
P07.26	Factory bar code 6	0x0000–0xFFFF			●
P07.27	Present fault type	Common fault type: 0: No fault 1: Inverter unit U-phase protection (OUt1) 2: Inverter unit V-phase protection (OUt2) 3: Inverter unit W-phase protection (OUt3) 4: Overcurrent during acceleration (OC1) 5: Overcurrent during deceleration (OC2) 6: Overcurrent during constant speed running (OC3) 7: Overvoltage during acceleration (OV1) 8: Overvoltage during deceleration (OV2) 9: Overvoltage during constant speed running (OV3) 10: Bus undervoltage fault (UV) 11: Motor overload (OL1) 12: VFD overload (OL2) 13: Phase loss on input side (SPI) 14: Phase loss on output side (SPO) 15: Rectifier module overheat (OH1) 16: Inverter module overheat (OH2) 17: External fault (EF) 18: RS485 communication fault (CE) 19: Current detection fault (ItE) 20: Motor autotuning fault (tE) 21: EEPROM operation error (EEP) 22: PID feedback offline fault (PIDE) 23: Braking unit fault (bCE) 24: Running time reached (END)			●
P07.28	Last fault type				●
P07.29	2nd-last fault type				●
P07.30	3rd-last fault type				●
P07.31	4th-last fault type				●
P07.32	5th-last fault type				●

Function code	Name	Description	Setting range	Default	Modify
		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: Mal-adjustment fault (STo) 36: Underload fault (LL) 37: Encoder disconnection fault (ENC1O) 38: Encoder direction reversal fault (ENC1D) 39: Encoder Z-pulse disconnection fault (ENC1Z) 40: (Reserved)/ Control fan feedback fault 1 41: (Reserved)/ Control fan feedback fault 2 42: (Reserved) Power-on buffer fault 43: Motor overtemperature fault (Ot) 44: SCR fault (SCE) 45: Slave fault (SF) (valid when the VFD is the master in master-slave control mode) 46: Slave speed deviation fault (SdEu) (valid when the VFD is the slave in master-slave torque mode) 47: Phase lock failure (PLLF) 48: Optical fiber offline fault (FCE) 49: FPGA no-program fault (FPGA) 50: Low temperature fault (Lt)			

Function code	Name	Description	Setting range	Default	Modify
		51: Hardware overcurrent fault (HOC) 52: Leakage current fault (PIF) 53: Runaway fault (OS) 54: Large DC for long periods (LDC) 55: PID feedback low limit (LF)/hardware overvoltage (Hov) Pre-alarm: 1: Motor OH pre-alarm (A-OT) 2: Overload pre-alarm (A-OL) 3: PROFIBUS communication pre-alarm (A_DP) 4: RS485 communication pre-alarm (A-CE) 5: Ethernet communication pre-alarm (A-NET) 6: CAN communication pre-alarm (A-CAN) 7: DN communication pre-alarm (A-DEV)			
P07.33	Running frequency at present fault			0.00Hz	●
P07.34	Ramp reference frequency at present fault			0.00Hz	●
P07.35	Output current at present fault			0V	●
P07.36	Output current at present fault			0.0A	●
P07.37	Bus voltage at present fault			0.0V	●
P07.38	Upper half bus voltage at present fault			0.0V	●
P07.39	Lower half bus voltage at present fault			0.0V	●
P07.40	Max. temperature at present fault			0.0°C	●
P07.41	Input terminal status at present fault			0	●
P07.42	Output terminal status at present fault			0	●
P07.43	Running frequency at last fault			0.00Hz	●
P07.44	Ramp reference frequency at last fault			0.00Hz	●
P07.45	Output voltage at last fault			0V	●
P07.46	Output current at last fault			0.0A	●
P07.47	Bus voltage at last fault			0.0V	●

Function code	Name	Description	Setting range	Default	Modify
P07.48	Upper half bus voltage at last 1 fault			0.0V	●
P07.49	Lowe half bus voltage at last 1 fault			0.0V	●
P07.50	Max. temperature at last fault			0.0°C	●
P07.51	Input terminal status at last fault			0	●
P07.52	Output terminal status at last fault			0	●
P07.53	Running frequency at 2nd-last fault			0.00Hz	●
P07.54	Ramp reference frequency at 2nd-last fault			0.00Hz	●
P07.55	Output voltage at 2nd-last fault			0V	●
P07.56	Output current at 2nd-last fault			0.0A	●
P07.57	Bus voltage at 2nd-last fault			0.0V	●
P07.58	Upper half bus voltage at last 2 fault			0.0V	●
P07.59	Lowe half bus voltage at last 2 fault			0.0V	●
P07.60	Max. temperature at last 2 fault			0.0°C	●
P07.61	Input terminal status at 2nd-last fault			0	●
P07.62	Output terminal status at 2nd-last fault			0	●
P08 group—Enhanced functions					
P08.00	ACC time 2	0.0–3600.0s	0.0–3600.0	Model depended	○
P08.01	DEC time 2	0.0–3600.0s	0.0–3600.0	Model depended	○
P08.02	ACC time 3	0.0–3600.0s	0.0–3600.0	Model depended	○
P08.03	DEC time 3	0.0–3600.0s	0.0–3600.0	Model depended	○
P08.04	ACC time 4	0.0–3600.0s	0.0–3600.0	Model depended	○
P08.05	DEC time 4	0.0–3600.0s	0.0–3600.0	Model depended	○
P08.06	Running frequency of jog	0.00Hz–P00.03 (Max. output frequency)	0.00–P00.03	5.00Hz	○
P08.07	ACC time for jogging	0.0–3600.0s	0.0–3600.0	Model depended	○
P08.08	DEC time for jogging	0.0–3600.0s	0.0–3600.0	Model	○

Function code	Name	Description	Setting range	Default	Modify
				depended	
P08.09	Jump frequency 1	0.00Hz–P00.03 (Max. output frequency)	0.00–P00.03	0.00Hz	○
P08.10	Jump frequency amplitude 1	0.00Hz–P00.03 (Max. output frequency)	0.00–P00.03	0.00Hz	○
P08.11	Jump frequency 2	0.00Hz–P00.03 (Max. output frequency)	0.00–P00.03	0.00Hz	○
P08.12	Jump frequency amplitude 2	0.00Hz–P00.03 (Max. output frequency)	0.00–P00.03	0.00Hz	○
P08.13	Jump frequency 3	0.00Hz–P00.03 (Max. output frequency)	0.00–P00.03	0.00Hz	○
P08.14	Jump frequency amplitude 3	0.00Hz–P00.03 (Max. output frequency)	0.00–P00.03	0.00Hz	○
P08.15–P08.26	Reserved				
P08.27	Set running time	0–65535min	0–65535	0min	○
P08.28	Auto fault reset count	0–10	0–10	0	○
P08.29	Auto fault reset interval	0.1–3600.0s	0.1–3600.0	1.0s	○
P08.30	Frequency decrease ratio in drop control	0.00Hz–50.00Hz	0.00–50.00	0.00Hz	○
P08.31	Switching between motor 1 and motor 2	0: Terminal 1: MODBUS communication 2: PROFIBUS/CANopen communication 3: Ethernet communication 4: Reserved	0–4	0	◎
P08.32	FDT1 electrical level detection value	0.00Hz–P00.03 (Max. output frequency)	0.00–P00.03	50.00Hz	○
P08.33	FDT1 lagging detection value	0.0–100.0% (FDT1 electrical level)	0.0–100.0	5.0%	○
P08.34	FDT2 electrical level detection value	0.00Hz–P00.03 (Max. output frequency)	0.00–P00.03	50.00Hz	○
P08.35	FDT2 lagging detection value	0.0–100.0% (FDT2 electrical level)	0.0–100.0	5.0%	○
P08.36	Detection value for frequency being reached	0.0Hz–P00.03 (Max. output frequency)	0.0–P00.03	0.00Hz	○
P08.37	Enabling dynamic braking	0: Disable 1: Enable	0–1	0	○
P08.38	Dynamic braking threshold voltage	200.0–6000.0V	200.0–6000.0	Model depended	○
P08.39	Cooling-fan running mode	0: Normal mode 1: Permanent running after power-on	0–1	0	○
P08.40	Reserved				◎
P08.41	Overmodulation selection	0x0–0x1 Ones place 0: Disable	0x0–0x1	0x0	◎

Function code	Name	Description	Setting range	Default	Modify
		1: Enable			
P08.42	Keypad digit control setting	0x0000–0x1223 Ones place: Frequency setting selection 0: Controls through both the ∧/∨ key and digital potentiometer are valid. 1: Only control through the ∧/∨ key is valid. 2: Only control through the digital potentiometer is valid. 3: Controls through the ∧/∨ key and digital potentiometer are invalid. Tens place: Frequency control selection 0: Valid only when P00.06=0 or P00.07=0 1: Valid for all frequency setting methods Hundreds place: Action selection for stop 0: Setting is valid. 1: Valid during running, cleared after stop 2: Valid during running, cleared after a stop command is received Thousands place: Integral function of the ∧/∨ key and digital potentiometer 0: Enable the integral function 1: Disable the integral function	0x0000–0x1223	0x0000	○
P08.43	Keypad digital potentiometer integral time	0.01–10.00s	0.01–10.00	0.10s	○
P08.44	UP/DOWN terminal control setting	0x000–0x221 Ones place: Frequency setting selection 0: The setting made through UP/DOWN is valid. 1: The setting made through UP/DOWN is invalid. Tens place: Frequency control selection 0: Valid only when P00.06=0 or P00.07=0 1: Valid for all frequency setting methods Hundreds place: Action selection	0x000–0x221	0x000	○

Function code	Name	Description	Setting range	Default	Modify
		for stop 0: Setting is valid. 1: Valid during running, cleared after stop 2: Valid during running, cleared after a stop command is received			
P08.45	Frequency increment time of the UP terminal	0.01–50.00s	0.01–50.00	0.50s	○
P08.46	Frequency increment time of the DOWN terminal	0.01–50.00s	0.01–50.00	0.50s	○
P08.47	Action selection at power-off during frequency setting	0x000–0x111 Ones place: Action selection at power-off during frequency adjusting through digitals. 0: Save the setting at power-off. 1: Clear the setting at power-off. Tens place: Action selection at power-off during frequency adjusting through MODBUS communication 0: Save the setting at power-off. 1: Clear the setting at power-off. Hundreds place: Action selection at power-off during frequency adjusting through other communication methods 0: Save the setting at power-off. 1: Clear the setting at power-off.	0x000–0x111	0x000	○
P08.48–P08.49	Reserved				
P08.50	Magnetic flux braking coefficient	0: Invalid 100–150: A larger coefficient indicates stronger braking.	0–150	0	○
P08.51	VFD input power factor	0.00–1.00	0.00–1.00	0.56	○
P09 group— PID control					
P09.00	PID reference source	0: Set by P09.01 1: AI1 2: AI2 3: AI3 4: High-speed pulse HDI 5: Multi-step running 6: MODBUS communication 7: PROFIBUS/CANopen communication 8: Ethernet communication 9: Reserved	0–9	0	○
P09.01	PID digital setting	-100.0%–100.0%	-100.0–100.0	0.0%	○

Function code	Name	Description	Setting range	Default	Modify
P09.02	PID feedback source	0: AI1 1: AI2 2: AI3 3: High-speed pulse HDI 4: MODBUS communication 5: PROFIBUS/CANopen communication 6: Ethernet communication 7: Reserved	0–7	0	○
P09.03	PID output characteristics selection	0: PID output is positive. 1: PID output is negative.	0–1	0	○
P09.04	Proportional gain (Kp)	0.00–100.0	0.00–100.0	1.00	○
P09.05	Integral time (Ti)	0.00–10.00s	0.00–10.00	0.10s	○
P09.06	Differential time (Td)	0.00–10.00s	0.00–10.00	0.00s	○
P09.07	Sampling cycle (T)	0.001–10.000s	0.001–10.000	0.100s	○
P09.08	PID control deviation limit	0.0–100.0%	0.0–100.0	0.0%	○
P09.09	PID output upper limit	P09.10–100.0% (Max. frequency or voltage)	P09.10–100.0	100.0%	○
P09.10	PID output lower limit	-100.0%–P09.09 (Max. frequency or voltage)	-100.0–P09.09	0.0%	○
P09.11	Feedback offline detection value	0.0–100.0%	0.0–100.0	0.0%	○
P09.12	Feedback offline detection time	0.0–3600.0s	0.0–3600.0	1.0s	○
P09.13	PID control selection	0x0000–0x1111 Ones place: 0: Continue integral control after the frequency reaches upper/lower limit 1: Stop integral control after the frequency reaches upper/lower limit Tens place: 0: Same as the main reference direction 1: Contrary to the main reference direction Hundreds place: 0: Limit as per the max. frequency 1: Limit as per A frequency Thousands place: 0: A+B frequency. Acceleration /deceleration of main reference A frequency source buffering is invalid. 1: A+B frequency. Acceleration/	0x0000–0x1111	0x0001	○

Function code	Name	Description	Setting range	Default	Modify
		deceleration of main reference A frequency source buffering is valid. The acceleration/deceleration is determined by P08.04 (acceleration time 4).			
P09.14	Low frequency proportional gain (Kp)	0.00–100.0	0.00–100.0	1.00	○
P09.15	ACC/DEC time of PID command	0.0–1000.0s	0.0–1000.0	0.0s	○
P09.16	PID output filter time	0.000–10.000s	0.000–10.000	0.000s	○
P10 group—Simple PLC and multi-step speed control					
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 at power off 1: With memory after power off	0–1	0	○
P10.02	Multi-step speed 0	-100.0–100.0%	-100.0–100.0	0.0%	○
P10.03	Running time of step 0	0.0–6553.5s (m)	0.0–6553.5	0.0s	○
P10.04	Multi-step speed 1	-100.0–100.0%	-100.0–100.0	0.0%	○
P10.05	Running time of step 1	0.0–6553.5s (m)	0.0–6553.5	0.0s	○
P10.06	Multi-step speed 2	-100.0–100.0%	-100.0–100.0	0.0%	○
P10.07	Running time of step 2	0.0–6553.5s (m)	0.0–6553.5	0.0s	○
P10.08	Multi-step speed 3	-100.0–100.0%	-100.0–100.0	0.0%	○
P10.09	Running time of step 3	0.0–6553.5s (m)	0.0–6553.5	0.0s	○
P10.10	Multi-step speed 4	-100.0–100.0%	-100.0–100.0	0.0%	○
P10.11	Running time of step 4	0.0–6553.5s (m)	0.0–6553.5	0.0s	○
P10.12	Multi-step speed 5	-100.0–100.0%	-100.0–100.0	0.0%	○
P10.13	Running time of step 5	0.0–6553.5s (m)	0.0–6553.5	0.0s	○
P10.14	Multi-step speed 6	-100.0–100.0%	-100.0–100.0	0.0%	○
P10.15	Running time of step 6	0.0–6553.5s (m)	0.0–6553.5	0.0s	○
P10.16	Multi-step speed 7	-100.0–100.0%	-100.0–100.0	0.0%	○
P10.17	Running time of step 7	0.0–6553.5s (m)	0.0–6553.5	0.0s	○
P10.18	Multi-step speed 8	-100.0–100.0%	-100.0–100.0	0.0%	○
P10.19	Running time of step 8	0.0–6553.5s (m)	0.0–6553.5	0.0s	○
P10.20	Multi-step speed 9	-100.0–100.0%	-100.0–	0.0%	○

Function code	Name	Description	Setting range	Default	Modify
			100.0		
P10.21	Running time of step 9	0.0–6553.5s (m)	0.0–6553.5	0.0s	○
P10.22	Multi-step speed 10	-100.0–100.0%	-100.0–100.0	0.0%	○
P10.23	Running time of step 10	0.0–6553.5s (m)	0.0–6553.5	0.0s	○
P10.24	Multi-step speed 11	-100.0–100.0%	-100.0–100.0	0.0%	○
P10.25	Running time of step 11	0.0–6553.5s (m)	0.0–6553.5	0.0s	○
P10.26	Multi-step speed 12	-100.0–100.0%	-100.0–100.0	0.0%	○
P10.27	Running time of step 12	0.0–6553.5s (m)	0.0–6553.5	0.0s	○
P10.28	Multi-step speed 13	-100.0–100.0%	-100.0–100.0	0.0%	○
P10.29	Running time of step 13	0.0–6553.5s (m)	0.0–6553.5	0.0s	○
P10.30	Multi-step speed 14	-100.0–100.0%	-100.0–100.0	0.0%	○
P10.31	Running time of step 14	0.0–6553.5s (m)	0.0–6553.5	0.0s	○
P10.32	Multi-step speed 15	-100.0–100.0%	-100.0–100.0	0.0%	○
P10.33	Running time of step 15	0.0–6553.5s (m)	0.0–6553.5	0.0s	○
P10.34	ACC/DEC time of steps 0–7 of simple PLC	0x0000–0xFFFF	0x00000–0xFFFF	0x0000	○
P10.35	ACC/DEC time of steps 8–15 of simple PLC	0x0000–0xFFFF	0x00000–0xFFFF	0x0000	○
P10.36	PLC restart mode	0: Restart from step 1 1: Resume from the paused step	0–1	0	◎
P10.37	Multi-step time unit	0: second 1: minute	0–1	0	◎
P11 group—Protection parameters					
P11.00	Protection against phase loss	0x00–0x11 Ones place: 0: Protection against input phrase loss disabled 1: Protection against input phrase loss enabled Tens place: 0: Protection against output phrase loss disabled 1: Protection against output phrase loss enabled	0x00–0x11	0x11	○
P11.01	Frequency drop at transient power-off	0: Disable 1: Enable	0–1	0	○
P11.02	Frequency drop rate at transient power-off	0.00Hz/s–P00.03 (Max. frequency)/s	0.00–P00.03	1.00Hz/s	○
P11.03	Overvoltage stalling protection	0: Disable 1: Enable	0–1	1	○
P11.04	Overvoltage stalling	110–150% (standard bus	110–150	125%	○

Function code	Name	Description	Setting range	Default	Modify
	protection voltage	voltage)			
P11.05	Current limit mode	0x00–0x11 Ones place: Current limit action 0: Invalid 1: Always valid Tens place: Hardware current limit overload alarm 0: Valid 1: Invalid	0x00–0x11	0x01	◎
P11.06	Automatic current limit threshold	50.0–200.0%	50.0–200.0	150.0%	◎
P11.07	Frequency drop rate during current limit	0.00–50.00Hz/s	0.00–50.00	10.00Hz/s	◎
P11.08	Pre-alarm selection for VFD/motor OL/UL	0x000–0x131 Ones place: 0: Motor OL/UL pre-alarm, relative to the rated motor current. 1: VFD OL/UL pre-alarm, relative to the VFD rated current Tens place: 0: The VFD continues to work for an OL/UL alarm. 1: The VFD continues to work for a UL alarm but stops running for an OL fault. 2: The VFD continues to work for an OL alarm but stops running for a UL fault. 3. The VFD stops running for an OL/UL alarm. Hundreds place: 0: Detect all the time. 1: Detect during constant speed running.	0x000–0x131	0x000	○
P11.09	Overload pre-alarm detection threshold	P11.11–200%	P11.11–200	150%	○
P11.10	Overload pre-alarm detection time	0.1–60.0s	0.1–60.0	1.0s	○
P11.11	Underload pre-alarm detection threshold	0%– P11.09	0–P11.09	50%	○
P11.12	Underload pre-alarm detection time	0.1–60.0s	0.1–60.0	1.0s	○
P11.13	Fault output terminal action upon fault occurring	0x00–0x11 Ones place: 0: Act upon an undervoltage fault 1: Do not act upon an undervoltage fault	0x00–0x11	0x00	○

Function code	Name	Description	Setting range	Default	Modify
		Tens place: 0: Act during automatic reset 1: Do not act during the automatic reset period			
P11.14	Speed deviation detection value	0.0–50.0% (determine the speed deviation at slave torque mode)	0.0–50.0	10.0%	○
P11.15	Speed deviation detection time	0.0–10.0s (No speed deviation protection for the value=0.0)	0.0–10.0	0.5s	○
P11.16	Automatic frequency-reduction during voltage drop	0: Invalid 1: Valid	0–1	0	○
P11.17	Overvoltage stalling voltage loop proportion	0–60000	0–60000	60	○
P11.18	Leakage current threshold	0–2048	0–2048	0	○
P11.19	Reserved				
P11.20	Start frequency of speed deviation determination	0–50.00Hz	0–50.00	5.00Hz	○
P11.21	Reserved				
P11.22	Phase loss determination threshold on input side	1.00–10.00	1.00–10.00	1.50	○
P11.23	Reserved				
P11.24	Phase loss determination threshold on AM output	0–100.0	0–100.0	50.00	○
P11.25	Rectifier overtemperature point setting	0–100.0°C	0–100.0	85.0°C	○
P11.26	Inverter overtemperature point setting	0–100.0°C	0–100.0	85.0°C	○
P11.27	Time threshold of large DC determination	0–10.000s	0–10.000	5.000s	○
P11.28	Pre-alarm enabling	bit0: Motor OH pre-alarm enabling bit1: Overload pre-alarm enabling bit2–bit7: Reserved	0–255	3	○
P11.29	Overload calculation method	0: Traditional method 1: Integral method	0–2	0	○
P11.30	Reserved				
P12 group—Parameters of motor 2					
P12.00	Type of motor 2	0: Asynchronous motor (AM) 1: Reserved	0–1	0	◎
P12.01	Rated power of AM 2	0.1–3000.0kW	0.1–3000.0	Model depended	◎
P12.02	Rated frequency of AM 2	0.01Hz–P00.03 (Max. output frequency)	0.01–P00.03	50.00Hz	◎
P12.03	Rated speed of AM 2	1–36000rpm	1–36000	Model depended	◎

Function code	Name	Description	Setting range	Default	Modify
P12.04	Rated voltage of AM 2	0–4000V	0–4000	Model depended	◎
P12.05	Rated current of AM 2	0.8–6000.0A	0.8–6000.0	Model depended	◎
P12.06	Stator resistance of AM 2	0.001–65.535Ω	0.001–65.535	Model depended	○
P12.07	Rotor resistance of AM 2	0.001–65.535Ω	0.001–65.535	Model depended	○
P12.08	Leakage inductance of AM 2	0.1–6553.5mH	0.1–6553.5	Model depended	○
P12.09	Mutual inductance of AM 2	0.1–6553.5mH	0.1–6553.5	Model depended	○
P12.10	No-load current of AM 2	0.1–6553.5A	0.1–6553.5	Model depended	○
P12.11	Magnetic saturation coefficient 1 of iron core of AM 2	0.0–100.0%	0.0–100.0	80.0%	◎
P12.12	Magnetic saturation coefficient 2 of iron core of AM 2	0.0–100.0%	0.0–100.0	68.0%	◎
P12.13	Magnetic saturation coefficient 3 of iron core of AM 2	0.0–100.0%	0.0–100.0	57.0%	◎
P12.14	Magnetic saturation coefficient 4 of iron core of AM 2	0.0–100.0%	0.0–100.0	40.0%	◎
P12.15	Rated power of SM 2	0.1–3000.0kW	0.1–3000.0	Model depended	◎
P12.16	Rated frequency of SM 2	0.01Hz–P00.03 (Max. output frequency)	0.01–P00.03	50.00Hz	◎
P12.17	Number of pole pairs of SM 2	1–50	1–50	2	◎
P12.18	Rated voltage of SM 2	0–4000V	0–4000	Model depended	◎
P12.19	Rated current of SM 2	0.8–6000.0A	0.8–6000.0	Model depended	◎
P12.20	Stator resistance of SM 2	0.001–65.535Ω	0.001–65.535	Model depended	○
P12.21	Direct-axis inductance of SM 2	0.01–655.35mH	0.01–655.35	Model depended	○
P12.22	Quadrature-axis inductance of SM 2	0.01–655.35mH	0.01–655.35	Model depended	○
P12.23	Counter-emf constant of SM 2	0–10000V	0–10000	300V	○
P12.24	Initial pole position of SM 2 (reserved)	0x0000–0xFFFFH	0x0000–0xFFFFH	0x0000	●
P12.25	Identification current of SM 2 (reserved)	0%–50% (of the motor rated current)	0–50	10%	●

Function code	Name	Description	Setting range	Default	Modify
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)	0–2	2	◎
P12.27	Overload protection coefficient of motor 2	20.0%–120.0%	20.0–120.0	100.0%	○
P12.28	Power calibration coefficient of motor 2	0.00–3.00	0.00–3.00	1.00	○
P12.29	Parameter display of motor 2	0: Display based on motor type 1: Display all	0–1	0	○
P13 group—SM control					
P13.00	Reduction coefficient of pull-in current	0.0–100.0%	0.0–100.0	80.0%	○
P13.01	Detection mode of initial pole	0: Not detect 1: High frequency superimposition (reserved) 2: Pulse superimposition (reserved)	0–3	0	◎
P13.02	Pull-in current 1	0.0%–100.0% (of the motor rated current)	0.0–100.0	20.0%	○
P13.03	Pull-in current 2	0.0%–100.0% (of the motor rated current)	0.0–100.0	10.0%	○
P13.04	Switch-over frequency of pull-in current	0.00Hz–P00.03 (Max. output frequency)	0.00–P00.03	10.00Hz	○
P13.05	High frequency superimposed frequency	200Hz–1000Hz	200–1000	500Hz	◎
P13.06	High frequency superimposed voltage	0.0–300.0% (of the motor rated voltage)	0.0–300.0	50.0%	◎
P13.07	Frequency drop rate during current limit	0–400.0	0–400.0	0	○
P13.08	BUG control word	0–65535	0–65535	0	○
P13.09	Frequency switchover point	0–655.35	0–655.35	2.00	○
P13.10	Angle compensation	0–6553.5	0–6553.5	0	○
P13.11	Maladjustment detection time	0.0–10.0s	0.0–10.0	0.5s	○
P13.12	High frequency compensation coefficient	0–100.0%	0–100.0	0.0%	○
P13.13	Short-circuit braking current	0.0–150.0% (relative to the VFD)	0.0–150.0	0.0%	○
P13.14	Hold time of short-circuit braking for start	0.00–50.00s	0.00–50.00	0.00s	○
P13.15	Hold time of short-circuit braking for stop	0.00–50.00s	0.00–50.00	0.00s	○
P13.16	SM brake component enabling	0–1	0–1	0	○

Function code	Name	Description	Setting range	Default	Modify
P13.17	SM brake component enabling threshold voltage	200.0–6000.0V	200.0–6000.0	Model depended	○
P13.18	SM brake component enabling time setting	0.000–4.000s	0.000–4.000	1.000s	○
P13.19–P13.20	Reserved				
P13.21	Start frequency of mal-adjustment fault determination	0.00–50.00Hz	0.00–50.00	5.00Hz	
P13.22	Mal-adjustment fault detection deviation angle	0.00–359.99°	0.00–359.99	36.00°	
P13.23	Enabling protection against runaway fault	0: Invalid 1: Valid	0–1	0	
P13.24–P13.25	Reserved				
P14 group—Serial communication					
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	0–6	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	5ms	○
P14.04	Communication timeout time	0.0 (invalid); 0.1–60.0s	0.0–60.0	0.0s	○
P14.05	Transmission error processing	0: Report an alarm and coast to stop 1: Keep running without reporting an alarm 2: Stop in enabled stop mode without reporting an alarm (applicable only to communication mode) 3: Stop in enabled stop mode without reporting an alarm (applicable to any mode)	0–3	0	○
P14.06	Communication processing action	0x00–0x11 Ones place: Action upon the	0x00–0x11	0x00	○

Function code	Name	Description	Setting range	Default	Modify
		write operation 0: Respond to write operations 1: Not respond to write operations Tens place: Communication encryption 0: Disabled 1: Enabled			
P14.07	Reserved/Three-phase input grid voltage display	Reserved/0–65535	Reserved/0–65535	Reserved/0	●
P14.08	Reserved/control_step	Reserved/0–65535	Reserved/0–65535	Reserved/0	●
P15 group—PROFIBUS communication					
P15.00	Module type	0: PROFIBUS 1: Reserved	0–1	0	◎
P15.01	PROFIBUS/CANopen module address	0–127	0–127	2	◎
P15.02	Received PZD2	0: Disable 1: Set frequency (0–Fmax (Unit: 0.01Hz)) 2: PID reference (0–1000, in which 1000 corresponds to 100.0%) 3: PID feedback (0–1000, 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 the electromotive torque (0–3000, in which 1000 corresponds to 100.0% of the motor rated current) 8: Upper limit of braking torque (0–2000, in which 1000 corresponds to 100% of the motor rated current) 9: Virtual input terminal command. Range: 0x000–0x1FF 10: Virtual output terminal	0–20	0	
P15.03	Received PZD3		0–20	0	○
P15.04	Received PZD4		0–20	0	○
P15.05	Received PZD5		0–20	0	○
P15.06	Received PZD6		0–20	0	○
P15.07	Received PZD7		0–20	0	○
P15.08	Received PZD8		0–20	0	○
P15.09	Received PZD9		0–20	0	○
P15.10	Received PZD10		0–20	0	○
P15.11	Received PZD11		0–20	0	○
P15.12	Received PZD12		0–20	0	○

Function code	Name	Description	Setting range	Default	Modify
		command. Range: 0x00–0x0F 11: Voltage setting (special for V/F separation) (0–1000, in which 1000 corresponding to 100.0% of the motor rated voltage) 12: AO output setting 1 (-1000–+1000, in which 1000 corresponds to 100.0%) 13: AO output setting 2 (-1000–+1000, in which 1000 corresponds to 100.0%)			
P15.13	Sent PZD2	0: Disable 1: Running frequency (x100, Hz) 2: Set frequency (x100, Hz) 3: Bus voltage (x10, V) 4: Output voltage (×1, 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 (*100, V) 13: AI2 input (*100, V) 14: AI3 input (* 100, V) 15: PULSE frequency value (x100, kHz) 16: Terminal input status 17: Terminal output status 18: PID reference (x100, %) 19: PID feedback (x100, %) 20: Motor rated torque	0–20	0	○
P15.14	Sent PZD3		0–20	0	○
P15.15	Sent PZD4		0–20	0	○
P15.16	Sent PZD5		0–20	0	○
P15.17	Sent PZD6		0–20	0	○
P15.18	Sent PZD7		0–20	0	○
P15.19	Sent PZD8		0–20	0	○
P15.20	Sent PZD9		0–20	0	○
P15.21	Sent PZD10		0–20	0	○
P15.22	Sent PZD11		0–20	0	○
P15.23	Sent PZD12		0–20	0	○
P15.24	Temporary variable 1 for PZD sending	0–65535	0–65535	0	○
P15.25	DP communication timeout time	0.0 (invalid), 0.1–60.0s	0.0–60.0	0.0s	○
P15.26	CAN communication timeout time	0.0 (invalid), 0.1–60.0s	0.0–60.0	0.0s	○
P15.27	CANopen communication baud rate	0: 1000k 1: 800k 2: 500k 3: 250k 4: 125k 5: 100k 6: 50k 7: 20k	0–7	0	◎

Function code	Name	Description	Setting range	Default	Modify
P15.28	CAN communication address	0–127 0 indicates a broadcast address	0–127	1	◎
P15.29	CAN communication baud rate	0: 1000k 1: 500k 2: 250k 3: 125k 4: 100k	0–4	1	
P16 group—Ethernet communication					
P16.00	Ethernet communication rate	0: Self adaptive 1: 100M full duplex 2: 100M half duplex 3: 10M full duplex 4: 10M half duplex	0–4	3	◎
P16.01	IP address 1	0–255	0–255	192	◎
P16.02	IP address 2	0–255	0–255	168	◎
P16.03	IP address 3	0–255	0–255	0	◎
P16.04	IP address 4	0–255	0–255	1	◎
P16.05	Subnet mask 1	0–255	0–255	255	◎
P16.06	Subnet mask 2	0–255	0–255	255	◎
P16.07	Subnet mask 3	0–255	0–255	255	◎
P16.08	Subnet mask 4	0–255	0–255	0	◎
P16.09	Gateway 1	0–255	0–255	192	◎
P16.10	Gateway 2	0–255	0–255	168	◎
P16.11	Gateway 3	0–255	0–255	1	◎
P16.12	Gateway 4	0–255	0–255	1	◎
P16.13	Function code setting variable 1	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	○
P16.14	Function code setting variable 2	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	○
P17 group—Status viewing					
P17.00	Set frequency	0.00Hz–P00.03	0.00–P00.03	0.00Hz	●
P17.01	Output frequency	0.00Hz–P00.03	0.00–P00.03	0.00Hz	●
P17.02	Ramp reference frequency	0.00Hz–P00.03	0.00–P00.03	0.00Hz	●
P17.03	Output voltage	0–4000V	0–4000	0V	●
P17.04	Output current	0.0–3000.0A	0.0–3000.0	0.0A	●
P17.05	Motor rotation speed	0–65535rpm	0–65535	0 rpm	●
P17.06	Torque current	-3000.0–3000.0A	-3000.0–3000.0	0.0A	●
P17.07	Exciting current	-3000.0–3000.0A	-3000.0–3000.0	0.0A	●
P17.08	Motor power	-300.0 –300.0% (of the motor rated power)	-300.0–300.0	0.0%	●
P17.09	Output torque	-250.0–250.0%	-250.0–250.0	0.0%	●
P17.10	Estimated motor frequency	0.00Hz–P00.03	0.00–600.00	0.00Hz	●
P17.11	DC bus voltage	0.0–6000.0V	0.0–6000.0	0V	●
P17.12	Digital input terminal status	0x0000–0x00FF	0x0000–0x00FF	0x0000	●

Function code	Name	Description	Setting range	Default	Modify
P17.13	Digital output terminal status	0x0000–0x000F	0x0000–0x000F	0x0000	●
P17.14	Digital adjustment value	0.00Hz–P00.03	0.00–P00.03	0.00Hz	●
P17.15	Torque reference value	-300.0%–300.0% (of the motor rated current)	-300.0–300.0	0.0%	●
P17.16–P17.18	Reserved				
P17.19	AI1 input voltage	0.00–10.00V	0.00–10.00	0.00V	●
P17.20	AI2 input voltage	-10.00–10.00V	-10.00–10.00	0.00V	●
P17.21	AI3 input voltage	0.00–10.00V	0.00–10.00	0.00V	●
P17.22	HDI input frequency	0.00–50.00kHz	0.00–50.00	0.00 kHz	●
P17.23	PID reference value	-100.0–100.0%	-100.0–100.0	0.0%	●
P17.24	PID feedback value	-100.0–100.0%	-100.0–100.0	0.0%	●
P17.25	Motor power factor	-1.00–1.00	-1.00–1.00	0.0	●
P17.26	Duration of this run	0–65535min	0–65535	0min	●
P17.27	Actual steps of multi-step speed	0–15	0–15	0	●
P17.28	ASR controller output	-300.0%–300.0% (of the motor rated current)	-300.0–300.0	0.0%	●
P17.29–P17.31	Reserved				●
P17.32	Flux linkage	0.0%–200.0%	0.0–200.0	0.0%	●
P17.33	Exciting current reference	-3000.0–3000.0A	-3000.0–3000.0	0.0A	●
P17.34	Torque current reference	-3000.0–3000.0A	-3000.0–3000.0	0.0A	●
P17.35	AC incoming current	0.0–5000.0A	0.0–5000.0	0.0A	●
P17.36	Output torque	-3000.0Nm–3000.0Nm	-3000.0–3000.0	0.0Nm	●
P17.37	Motor overload counting value	0–100 (When the value=100, OL1 is reported)	0–100	0	●
P17.38	PID output	-100.00–100.00%	-100.00–100.0	0.00%	●
P17.39	Parameter download error	0.00–99.99	0.00–99.99	0.00	●
P18 group—Status viewing 2					
P18.00	Actual frequency of encoder	-327.7–327.7Hz	-327.7–327.7	0.0Hz	●
P18.01	Encoder position count value	0–65535	0–65535	0	●
P18.02	Encoder Z pulse count value	0–65535	0–65535	0	●
P18.03	Count value of resolver	0–65535	0–65535		●
P18.04	Resolver angle	0–359.99	0–359.99		●
P18.05	Magnetic pole angle	0–359.99	0–359.99		●

Function code	Name	Description	Setting range	Default	Modify
P18.06	Motor temperature display	-200.0–200.0	-200.0–200.0		●
P18.07	Frequency reference sent by master	-100.00–100.0% (of the max. VFD frequency)	-100.00–100.0		●
P18.08	Speed loop output sent by master	-300.00–300.0% (of the motor rated current)	-300.00–300.00		●
P18.09	Frequency reference command received by slave	-100.00–100.0% (of the max. VFD frequency)	-100.00–100.0		●
P18.10	Torque command received by slave	-300.00–300.0% (of the motor rated current)	-300.00–300.00		●
P18.11	Voltage of upper half bus	0–65535	0–65535		●
P18.12	Voltage of lower half bus	0–65535	0–65535		●
P18.13	Software version (FPAG)	1.00–655.35			●
P18.14	Reserved/Max. midpoint voltage balance compensation	Reserved/0–512	Reserved/ 0–512	Reserved /400	●
P18.15	Reserved/Midpoint voltage balance mode	Reserved/ 0: bang-bang control 1: P control 2: PI control	Reserved/ 0–2	Reserved /1	●
P18.16	Max. midpoint voltage balance compensation/Midpoint voltage balance algorithm Kp	0–512/0–500	0–512/ 0–500	100/200	●
P18.17	Midpoint voltage balance mode/Midpoint voltage balance algorithm Ki	0: bang-bang control 1: P control 2: PI control /0–10	0–2/0–10	0/6	●
P18.18	Midpoint voltage balance algorithm Kp/Grid voltage and main contactor condition selection	0–5000/ 0: Grid voltage calculation 1: P20.14	0–5000/0–1	400/0	●
P18.19	Midpoint voltage balance algorithm Ki/Input grid voltage balance degree	0–10/0–65535	0–10/0–65535	6/0	●
P18.20	Max. bus voltage recorded by the system	0.0–6550.0V	0.0–6550.0	0.0V	●
P18.21	Max. upper bus voltage recorded by the system	0.0–3275.0V	0.0–3275.0	0.0V	●
P18.22	Max. lower bus voltage recorded by the system	0.0–3275.0V	0.0–3275.0	0.0V	●
P18.23	Sum of three phase currents	0–65535	0–65535	0	●
P18.24	Speed display selection in vector control	0: Identification speed 1: Ramp reference	0–1	0	◎
P19 group—External temperature detection					
P19.00	Motor temperature detection	0: Invalid 1: PT100	0–4	0	○

Function code	Name	Description	Setting range	Default	Modify
		2: PTC 3: Reserved 4: Reserved			
P19.01	Motor temperature pre-alarm point	0.0°C–200.0°C (0.0°C: pre-alarm invalid)	0–200.0	125.0°	○
P19.02	Motor over-temperature fault point	0.0–200.0°	0–200.0	150.0°	○
P19.03	Motor overtemperature action	0: Report a fault and coast to stop 1: Keep running without reporting a fault 2: Stop according to the stop mode without generating a fault	0–2	0	○
P19.04	Starting temperature of motor temperature compensation	0–60.0°C	0–60.0	40.0°C	○
P19.05	Motor temperature compensation coefficient	0.0–200.0%	0.0–200.0	100.0%	○
P19.06	Output voltage compensation enabling	0: Disabled 1: Enable	0–1	1	●
P19.07	Deadzone compensation regulation coefficient	0.0–50.0	0.0–50.0	1.0	●
P19.08	Overvoltage stalling current inner loop Kp	0–1000	0–1000	50	●
P19.09	Overvoltage stalling current inner loop Ki	0–1000	0–1000	250	
P19.10	PT100 temperature display channel	0–6	0–6	0.0	●
P19.11	Temperature of the channel selected by P19.10	0.0–120.0°C	0.0–120.0	0.0°C	
P20 group—Encoders					
P20.00	Encoder type selection	0: Incremental encoder 1: Reserved 2: Resolver-type encoder 3: Reserved	0–3	0	◎
P20.01	Encoder pulse count	0–60000	0–60000	1024	◎
P20.02	Encoder direction	Ones place: AB direction 0: Forward 1: Reverse Tens place: Z pulse direction 0: Forward 1: Reverse	0x00–0x11	0x00	◎
P20.03	Detection time of encoder offline fault	0.0–100.0s	0.0–100.0	0.5s	○
P20.04	Detection time of encoder reversal fault	0.0–100.0s	0.0–100.0	0.8s	○
P20.05	Filter times of encoder detection	Ones place: Low-speed filter time Tens place: High-speed filter time	0x00–0x99	0x23	○
P20.06	Speed ratio between motor and encoder	0.000–65.535	0.000–65.535	1.000	○

Function code	Name	Description	Setting range	Default	Modify
P20.07–P20.09	Reserved				○
P20.10	Pole initial angle	0.00–359.99	0.00–359.99	0	○
P20.11	Autotuning pole initial angle	0–2 0: No operation 1: Rotary autotuning 2: Static autotuning (suitable for resolver-type encoder feedback)	0–2	0	◎
P20.12	Initial angle of SM U pulse	0–65535	0–65535	0	○
P20.13–P20.14	Reserved				
P21 group—Master/slave control					
P21.00	Master/slave mode	0: Master/slave control is invalid. 1: The local device is the master. 2: The local device is the slave.	0–2	0	◎
P21.01	Master/slave communication data selection	0: CAN 1: RS485	0–1	0	◎
P21.02	Master/slave control multifunction mode	Ones place: Master/slave running mode 0: Master/slave mode 0 (Both the master and slave use speed control, and power balancing is performed 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-controlled and the slave will be forced into torque control mode.) 2: Master/slave mode 2 (Both the master and slave use speed control, and the slave is balanced by using the speed loop integration result of the master.) 3: Combination mode The slave switches from speed mode (master/slave mode 0) to torque mode (master/slave mode 1) at a frequency point. Tens place: Slave start command source 0: Master 1: Determined by P00.01 Hundreds place: Slave transmitting/master receiving	0x000–0x113	0x100	◎

Function code	Name	Description	Setting range	Default	Modify
		data enable 0: Enable 1: Disable			
P21.03	Slave speed gain	0.0–500.0%	0.0–500.0	100.0%	◎
P21.04	Slave torque gain	0.0–500.0%	0.0–500.0	100.0%	◎
P21.05	Combination mode, speed mode/torque mode switching frequency point	0.00–10.00Hz	0.00–10.00	5.00Hz	◎
P21.06	Master/slave communication address	0–15	0–15	0	●
P21.07	Number of slaves	0–15	0–15	1	●
P21.08	Power-on communication detection delay	0–1000	0–1000	30	●
P21.09	Master/slave communication timeout time	0–60.0s	0–60.0	0.5s	●
P21.10	Communication fault type	0: No fault 1: Inconsistent number of slaves 2: Optical fiber offline fault 3. Abnormal number of loop masters and slaves 4: Slave status exception	0–4	0	
P22 group—Synchronous switchover					
P22.00	Grid synchronization mode selection	0: Common mode 1: Grid synchronization mode	0–1	0	◎
P22.01	Power frequency mode switchover selection	0: With reactor 1: Without reactor (Reserved)	0–1	0	◎
P22.02	Upper limit frequency of positive sequence adjustment	0.00–10.00Hz	0.00–10.00	0.00Hz	◎
P22.03	Angle compensation value of positive sequence phase	-180.0–180.0°	-180.0–180.0	0.0°	◎
P22.04	Upper limit frequency of negative sequence adjustment	0.00–10.00Hz	0.00–10.00	0.00Hz	◎
P22.05	Angle compensation value of negative sequence phase	-180.0–180.0°	-180.0–180.0	0.0°	◎
P22.06	Phase-lock test mode	0: Invalid 1: Valid (The grid voltage input can be simulated according to the setting value of P22.07–P22.08, and the actual grid input will be masked in the test mode.)	0–1	0	◎
P22.07	Analog grid frequency	-60.0–60.0Hz	-60.0–60.0	0.00Hz	◎
P22.08	Simulated grid voltage	0–4000V	0–4000	0V	◎
P22.09	Power/variable frequency synchronous output filtering times	0–16 The smaller the value, the faster the synchronization speed.	0–16	8	◎

Function code	Name	Description	Setting range	Default	Modify
P23 group—Storage function of communication SD card					
P23.00	Memory enabling	0: Disable (Ethernet communication) 1: Enable (SD card storage)	0–1	1	
P23.01	Year setting	0000–9999	0000–9999	2019	
P23.02	Date setting	01.01–12.31	01.01–12.31	01.01	
P23.03	Time setting	00.00–23.59	00.00–23.59	0.00	
P23.04	Seconds setting	00–59	00–59	00	
P23.05	Recorded value of half bus voltage deviation	0.0–1000.0	0.0–1000.0	200.0	
P23.06	Size of file 2	0–1024	0–1024	50	
P23.07	Data logging trigger conditions	0: Start upon power-on and stop upon power-off 1: Start upon running and stop upon stop 2: Triggered through terminals (electrical level)	0–2	0	
P23.08	Sampling channel 1	0: No function 1: Running frequency 2: Set frequency 3: Ramp reference frequency 4: Output current 5: Output torque 6: Output voltage 7: Bus voltage 8: Running speed 9: AI1	0–79	1	
P23.09	Sampling channel 2		0–79	3	
P23.10	Sampling channel 3		0–79	4	
P23.11	Sampling channel 4		0–79	6	
P23.12	Sampling channel 5		0–79	7	
P23.13	Sampling channel 6		0–79	29	
P23.14	Sampling channel 7		0–79	22	
P23.15	Sampling channel 8		0–79	52	
P23.16	Sampling channel 9		0–79	53	
P23.17	Sampling channel 10	10: AI2 11: AI3 12: AO1 13: AO2 14: HDI input frequency 15: HDO output frequency 16: Terminal input status 17: Relay output status 18: Reserved 19:control_step 20:run_step 21:comd_control 22:status_run_stop 23:status_control 24:comd_run_stop 25:ft_flag 26:ft_sch 27:pre_magtok 28:SynRotorZeroFlag1 29–41: Reserved 42: VFD CW (Uint16) 43: Torque setting (int16) 44: Torque current feedback (int16)	0–79	62	

Function code	Name	Description	Setting range	Default	Modify
		45: Exciting current feedback(int16) 46: Linear speed (int16) 47: PID reference (Uint16) 48: PID feedback (Uint16) 49: ASR controller output (int16) 50: Magnetic pole angle of SM (Uint16) 51: Phase U current (instantaneous value) (int16) 52: Phase V current (instantaneous value) (int16) 53: Phase W current (instantaneous value) (int16) 54: Self-test signal 1 (Uint16) 55: Self-test signal 2 (Uint16) 56: Test variable 1 (int16) 57: Test variable 2 (int16) 58: Test variable 3 (int16) 59: Test variable 4 (int16) 60: Function code setting variable 1 (int16) 61: Function code setting variable 2 (int16) 62: Upper half bus voltage (Uint16) 63: Lower half bus voltage (Uint16) 64–79: Reserved			
P23.18	Set storage time enabling	0: Record upon running 1: Stop recording when the set time is reached	0–1	0	
P23.19	Running record time	0–65535s	0–65535	10s	
P23.20	IGBT tube voltage drop	0–65535	0–65535	110	
P23.21	Leakage inductance deadzone compensation enabling	0: Disabled 1: Enable	0–1	1	
P23.22–P23.29	Reserved				

7 Maintenance

- **Maintenance must be carried out in 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

Daily maintenance of the VFD shall be conducted to avoid faults, ensure normal running and prolong its service life.

Item	Content
Thermometer/humidity	Ambient 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 Periodic maintenance

To avoid faults and ensure the VFD runs smoothly in high performance for a long time, users must inspect the VFD regularly.

Item	Content	Method	Criterion
Ambient 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
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	All exceptions are eliminated

Item		Content	Method	Criterion
Main circuit	Common items	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	All exceptions are eliminated **Note:** Color change of the copper blocks does not mean that there is something wrong with the features.
	Conductor and cable	1. No distortion or color-changing of the conductors caused by overheat 2. No damage, crackles or color-changing to the protective layers	Visual examination	All exceptions are eliminated
	Terminal block	The terminal block is not broken	Visual examination	All exceptions are eliminated
	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.	Visual examination	All exceptions are eliminated Capacitor capacity ≥ initial capacity * 0.85
	Transformer and reactor	No abnormal vibration, noise and odor	Hearing, visual examination, smelling	All exceptions are eliminated
	Contactor and relay	1. No abnormal sound when the relay and contactor act 2. The contacts are not rough	1. Hearing 2. Visual examination	All exceptions are eliminated
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 again 2. Smelling, visual examination 3. Visual examination 4. Visual examination	All exceptions are eliminated
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 again 3. Visual examination	1. The fan runs smoothly 2. All exceptions are eliminated 3. All exceptions are eliminated
	Ventilation duct	No foreign objects in the ventilating air duct	Visual examination	All exceptions are eliminated

7.3 Replacement of wearing parts

Fans and electrolytic capacitors are wearing parts. To ensure long-term safe operation of the VFD without faults, the wearing parts should be replaced regularly. The service life of wearing parts is as follows:

◆ Fan: 20,000 hours

◆ Electrolytic capacitor: 30,000–40,000 hours

8 Moudbus protocol

8.1 Overview

This chapter describes the communication of 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 code parameters, and monitoring the working state and fault information of the VFD) through PC/PLC, upper control computer, or other devices to meet specific application requirements.

8.2 MODBUS protocol instruction

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 units (RTU). On one Modbus network, all the device transmission modes, baud rates, data bits, check bits, end bits, and other basic parameters must be set consistently.

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 any single slave or with all slaves. For the single-visiting command, the slave must send back a response message; for the broadcasting message from the master, the slave does not need to send back a response message.

8.3 Application of Modbus

The VFD uses Modbus RTU mode and communicates through RS485 interfaces.

8.3.1 RS485

RS485 interfaces work in half-duplex mode and transmit data signals in the differential transmission way, which is also referred to as balanced transmission. The two-wire 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 +2V to +6V, the logic is "1"; and if it ranges from -2V to -6V, 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	Max. transmission distance	Baud rate	Max. transmission distance
2400BPS	1800m	9600BPS	800m
4800BPS	1200m	19200BPS	600m

In long-distance RS485 communication, it is recommended that you use shielded cables, and use the shielding layer as the ground wire.

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 120 Ω terminal resistor when the transmission distance is long.

8.3.1.1 Application to one VFD

Figure 8-1 is MODBUS wiring diagram for the network with one VFD and PC. Generally, PCs do not provide RS485

interfaces, so you need to convert an RS232 or USB interface of a PC to an RS485 interface through an adapter. 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 adapter is used, the cable used to connect the RS232 interface of the PC and the adapter cannot be longer than 15m. Use a short cable when possible. It is recommended that you insert the adapter directly into the PC. Similarly, when a USB-RS485 adapter 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 adapter) 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.

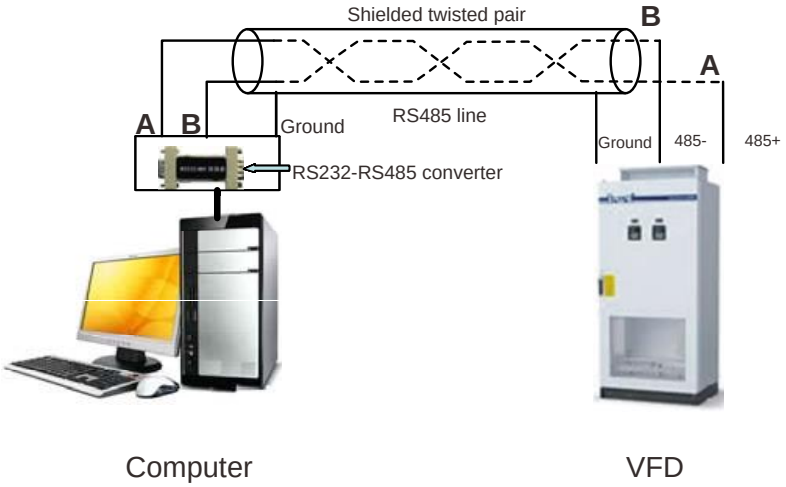


Figure 8-1 Wiring of RS485 applied to one VFD

8.3.1.2 Application to multiple VFDs

In pratical application to 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.

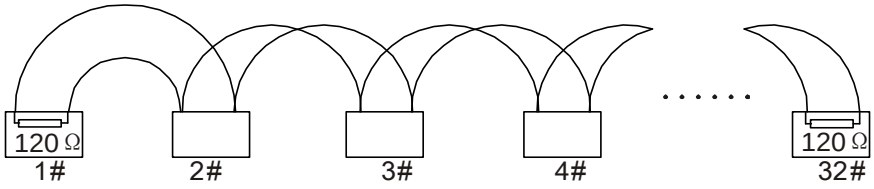


Figure 8-2 On-site chrysanthemum link connection diagram

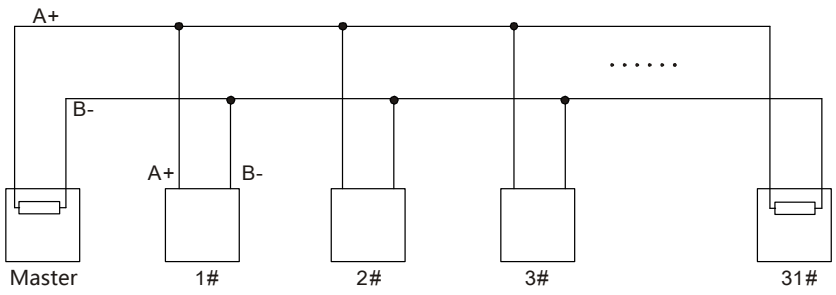


Figure 8-3 Simplified chrysanthemum connection diagram

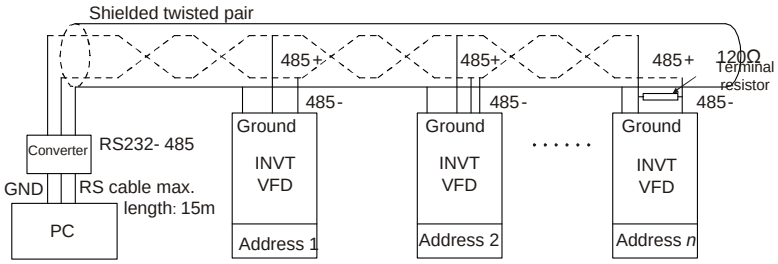


Figure 8-4 Practical application diagram of chrysanthemum link connection

Figure 8-1 shows the start connection diagram. When this connection mode is adopted, each of the two devices that are farthest away from each other on the line must be configured with a terminal resistor (in this figure, the two devices are devices 1# and 15#).

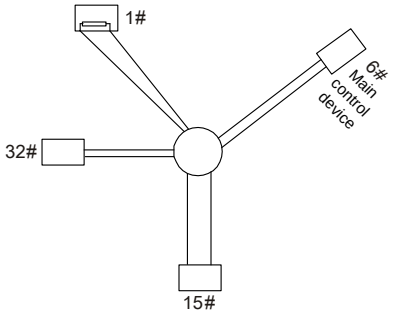


Figure 8-1 Star connection

Use shielded cable, if possible, in multi-device 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 mode

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 send more data at the same baud rate.

Code system

• 1 start bit

• 7 or 8 data bits; the minimum valid bit is transmitted 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 end bit (with check performed), 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)

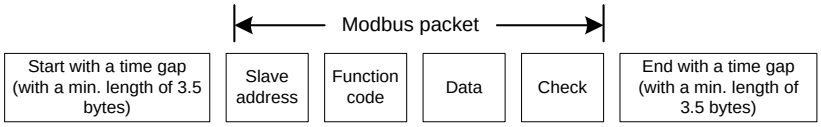
Start bit	BIT1	BIT2	BIT3	BIT4	BIT5	BIT6	BIT7	Check bit	Stop bit

In a character frame, only the data bits carry information. The start bit, check bit, and end 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 transmitted in the following sequence: slave address, operation command code, data, and CRC check character. Each byte sent in each domain includes 2 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 transmission time 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



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 (time gap with a min. length of 3.5 bytes)
ADDR (slave address domain)	Communication address: 0–247 (decimal system) (0 is 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 LSB	Detection value: CRC (16 bits)
CRC CHK MSB	
END (frame tail)	T1-T2-T3-T4 (time gap with a min. length 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 an incorrect response. The incorrect 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 incorrect.

The error check of a frame includes two parts, namely bit check on individual bytes (that is, odd/even check bit 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 sent 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.

CRC check mode

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 least significant bit (LSB) to the most significant bit (MSB), and 0 is placed in the MSB. Then, LSB is detected. If LSB is 1, the XOR operation is performed on the current value in the register and the preset value. If LSB is 0, no operation is performed. This process is repeated for 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 codes 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, to read two contiguous data content pieces from 0004H from the VFD with the address of 01H (that is, to read content from data addresses 0004H and 0005H), the frame structure is as follows:

RTU master command (from the master to the VFD)

START	T1-T2-T3-T4 (transmission time of 3.5 bytes)
ADDR (address)	01H
CMD (command code)	03H
Start address MSB	00H
Start address LSB	04H
Data count MSB	00H
Data count LSB	02H
CRC LSB	85H
CRC MSB	CAH
END	T1-T2-T3-T4 (transmission time of 3.5 bytes)

The value in START and END is "T1-T2-T3-T4 (transmission time of 3.5 bytes)", indicating that the RS485 needs to stay idle for at least the transmission time of 3.5 bytes. An idle time is required to distinguish on message from another to ensure that the two messages are not regarded as one.

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

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

"Start address" means reading data from the address and it occupies two bytes with the MSB on the left and LSB 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 LSB on the left, and MSB on the right.

RTU slave response (from the VFD to the master)

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

The response information is described as follows:

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

one byte.

"CMD" is "03H", indicating that the message is a response of the VFD to the 03H command of 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 LSB", that is, "MSB of data in 0004H", "LSB of data in 0004H", "MSB of data in 0005H", and "LSB of data in 0005H".

A piece of data contains two bytes, with the MSB on the left and LSB 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 LSB on the left, and MSB on the right.

8.4.2 Command code 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 structure is as follows.

RTU master command (from the master to the VFD)

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

RTU slave response (from the VFD to the master)

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

Note: The sections **8.4.1** and **8.4.2** mainly describe the command formats. For the detailed application, see the examples in section **8.4.7**.

8.4.3 Command code 08H, diagnosis

Sub-function code description:

Sub-function code	Description
0000	Returned data based on query information

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 format is described as follows.

RTU master command

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

RTU slave response

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

8.4.4 Data address definition

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

8.4.4.1 Function code address format rules

The address of a function code consists of two bytes, with the MSB on the left and LSB on the right. The MSB ranges from 00 to ffH, and the LSB also ranges from 00 to ffH. The MSB is the hexadecimal form of the group number before the dot mark, and LSB is that of the number behind the dot mark. Take P05.06 as an example: The group number is 05, that is, the MSB of the parameter address is the hexadecimal form of 05; and the number behind the dot mark is 06, that is, the LSB is the hexadecimal form of 05. Therefore, the function code address is 0506H in the hexadecimal form. For P10.01, the parameter address 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 at power off 1: With memory after power off	0–1	0	○

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

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

8.4.4.2 Address description of other MODBUS functions:

In addition to modifying the parameters of the VFD, the master can also control the VFD, such as starting and stopping the VFD, and monitoring the running status of the VFD. Table 8-1 describes the MODBUS function address of the rectifier unit, while Table 8-2 describes the MODBUS function address of the inverter unit.

Table 8-1 MODBUS function address of the rectifier unit

Function	Address	Data description	R/W
Communication-based control command	2000H	0001H: Running	W
		0002H: Reserved	
		0003H: Reserved	
		0004H: Reserved	
		0005H: Stop	
		0006H: Reserved	
		0007H: Fault reset	
		0008H: Reserved	
		0009H: Power-on buffer	
Communication-based setting address	2001H	Communication-based frequency setting (0–Fmax; unit: 0.01 Hz)	W
	2002H	PID reference (0–1000, in which 1000 corresponds to 100.0%)	
	2003H	PID feedback (0–1000, in which 1000 corresponds to 100.0%)	W
	2004H	Torque setting (-3000–3000, in which 1000 corresponds to 100.0% of the motor rated current)	W
	2005H	Upper limit setting of forward running frequency (0–Fmax; unit: 0.01 Hz)	W
	2006H	Upper limit setting of reverse running frequency (0–Fmax; unit: 0.01Hz)	W
	2007H	Upper limit of the electromotive torque (0–3000, in which 1000 corresponds to 100.0% of the motor rated current)	W
	2008H	Braking torque upper limit. (0–3000, in which 1000 corresponds to 100.0% of the VFD rated current)	W
	2009H	Special CW Bit0–1: = 00: Motor1 =01: Motor2 =10: Motor 3 =11: motor 4 Bit2: =1: Torque control =0: Speed control	W
	200AH	Virtual input terminal command (0x000–0x1FF)	W
	200BH	Virtual output terminal command (0x00–0x0F)	W
	200CH	Voltage setting (used when V/F separation is implemented) (0–1000, 1000 corresponding to 100.0% of the motor rated voltage)	W
	200DH	AO setting 1 (-1000–+1000, in which 1000 corresponding to 100.0%)	W
	200EH	AO setting 2 (-1000–+1000, in which 1000 corresponding to 100.0%)	W
VFD status word 1	2100H	0001H: Running	R
		0002H: Reverse running	
		0003H: Stopped	
		0004H: Faulty	
		0005H: POFF 0006H: Pre-exciting	
VFD status word 2	2101H	Bit0: =0: Not ready to run =1: Ready to run Bi1–2: = 00: Motor1 =01: Motor2	R

Function	Address	Data description	R/W
		=10: Motor 3 =11: motor 4 Bit3: =0: AM =1: SM Bit4: = 0: No pre-alarm upon overload =1: overload pre-alarm Bit5: = 0: Not exciting =1: Exciting	
VFD fault code	2102H	See the description of fault types.	R
VFD identification code	2103H	GD3000-----0x01A	R
Alarm flag	2014H	Bit 0: Motor OH pre-alarm (A-OT) Bit 1: Overload pre-alarm (A-OL) Bit 2: (Reserved) Bit 3: (Reserved) Bit 4: (Reserved) Bit 5: (Reserved) Bit 6: (Reserved) Bit 7: (Reserved)	R
Factory bar code 1	6000H	Range: 0x0000–0xFFFF	W
Factory bar code 2	6001H	Range: 0x0000–0xFFFF	W
Factory bar code 3	6002H	Range: 0x0000–0xFFFF	W
Factory bar code 4	6003H	Range: 0x0000–0xFFFF	W
Factory bar code 5	6004H	Range: 0x0000–0xFFFF	W
Factory bar code 6	6005H	Range: 0x0000–0xFFFF	W

Table 8-2 MODBUS function address of the inverter unit

Function	Address	Data description	R/W
Communication-based control command	2000H	0001H: Run forward	W
		0002H: Run reversely	
		0003H: Jog forward	
		0004H: Jog reversely	
		0005H: Stop	
		0006H: Coast to stop (in emergency)	
		0007H: Fault reset	
		0008H: Jogging stop	
		0009H: Pre-exciting	
Communication-based setting address	2001H	Communication-based frequency setting (0–Fmax; unit: 0.01 Hz)	W
	2002H	PID reference (0–1000, in which 1000 corresponds to 100.0%)	
	2003H	PID feedback (0–1000, in which 1000 corresponds to 100.0%)	W
	2004H	Torque setting (-3000–3000, in which 1000 corresponds to 100.0% of the motor rated current)	W
	2005H	Upper limit setting of forward running frequency (0–Fmax; unit: 0.01 Hz)	W

Function	Address	Data description	R/W
	2006H	Upper limit setting of reverse running frequency (0–Fmax; unit: 0.01Hz)	W
	2007H	Upper limit of the electromotive torque (0–3000, in which 1000 corresponds to 100.0% of the motor rated current)	W
	2008H	Braking torque upper limit. (0–3000, in which 1000 corresponds to 100.0% of the VFD rated current)	W
	2009H	Special CW Bit0–1: = 00: Motor1 =01: motor2 =10: Motor 3 =11: motor 4 Bit2: =1: Torque control disabling =0: Torque control disabling invalid	W
	200AH	Virtual input terminal command (0x000–0x1FF)	W
	200BH	Virtual output terminal command (0x00–0x0F)	W
	200CH	Voltage setting (used when V/F separation is implemented) (0–1000, 1000 corresponding to 100.0% of the motor rated voltage)	W
	200DH	AO setting 1 (-1000–+1000, in which 1000 corresponding to 100.0%)	W
	200EH	AO setting 2 (-1000–+1000, in which 1000 corresponding to 100.0%)	W
VFD status word 1	2100H	0001H: Forward running	R
		0002H: Reverse running	
		0003H: Stopped	
		0004H: Faulty	
		0005H: POFF	
VFD status word 2	2101H	Bit0: =0: Not ready to run =1: Ready to run Bi1–2: = 00: Motor1 =01: Motor2 =10: Motor 3 =11: motor 4 Bit3: =0: AM =1: SM Bit4: = 0: No pre-alarm upon overload =1: overload pre-alarm Bit5: = 0: Not exciting =1: Exciting	R
VFD fault code	2102H	See the description of fault types.	R
VFD identification code	2103H	GD3000-----0x0110	R
Alarm flag	2014H	Bit 0: Motor OH pre-alarm (A-OT) Bit 1: Overload pre-alarm (A-OL) Bit 2–Bit7: Reserved	
Running frequency	3000H	0–Fmax (Unit: 0.01Hz)	R
Set frequency	3001H	0–Fmax (Unit: 0.01Hz)	R
Bus voltage	3002H	0.0–6000.0V (Unit: 0.1V)	R
Output voltage	3003H	0–4000V (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

Function	Address	Data description	R/W
Closed-loop feedback	3009H	-100.0–100.0% (Unit: 0.1%)	R
Input IO status	300AH	000–1FF	R
Output IO 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
Read input of high-speed pulse 1	3010H	0.00–50.00kHz (Unit: 0.01Hz)	R
Read input of high-speed pulse 2	3011H		R
Read the actual step of multi-step speed	3012H	0–15	R
External length value	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 parameter 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. "R" indicates that a function code is read only, and "W" indicates that a function code is written only.

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

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

8 MSBs	Meaning	8 LSBs	Meaning
0x01	Goodrive	0x0110	GD3000 inverter

8.4.5 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, multiply 50.12 by 100 to obtain an integer 5012, and then 50.12 can be represented as 1394H in the hexadecimal form (5012 in the decimal 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 decimal places in the value specified in "Setting range" or "Default". If there are n decimal places in the value, the fieldbus scale m is the nth-power of 10. Take the following table as an example, m is the value of 10 to the power of n. Take the following table as an example.

Function code	Name	Description	Setting range	Default	Modify
P01.20	Wake-up-from-sleep delay	0.0–3600.0s (valid when P01.19=2)	0.0–3600.0	0.0s	○
P01.21	Power-off restart selection	0: Disable 1: Enable	0–1	0	○

If "Setting range" or "Default value" contains one decimal, the fieldbus scale is 10. If the value received by the upper computer is 50, "Delay of auto fault reset" of the rectifier is 5.0 (5.0=50/10).

To set "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 send 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 sends 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, and therefore 5.0 is obtained based on the fieldbus scale (50/10=5.0). In this case, the master identifies that "Wake-up-from-sleep delay" is 5.0s.

8.4.6 Error message response

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

Error message responses are sent from the VFD to the master. The following table lists the codes and definitions of the error message responses.

Table 8-3 Definition of fault code

Code	Name	Meaning
01H	Invalid command	The command code received by the host controller 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 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-sent 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	Incorrect password	The password entered in the password verification address is different from that set in P07.00.

Code	Name	Meaning
06H	Incorrect data frame	The data frame sent from the host controller is incorrect in the length, 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 host controller is a read-only parameter.
08H	Parameter can be modified in running	The parameter to be modified in the write operation of the host controller cannot be modified during the running of the VFD.
09H	Password protection	If the host controller does not provide the correct password to unlock the system to perform a read or write operation, the error of “system being locked” is reported.

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

For example, if the master sends a request message to a slave for reading a group of function code address data, the following code is generated:

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

In a normal response, the slave returns the same function code. In an exception response, the slave returns:

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

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

For example, to set the "Running command channel" (P00.01, the parameter address is 0001H) of the VFD whose address is 01H to 03, run the following command:

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

However, the "Running command channel" ranges from 0 to 2. The value 3 is out of 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, which indicates "Operation failure".

8.4.7 Reading and writing examples

For the formats of the read and write commands, see sections 8.4.1 and 8.4.2.

8.4.7.1 Example of reading command 03H

Example 1: Read state word 1 of the VFD whose address is 01H. According to the table of other Modbus function addresses, the parameter address of state 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	Most recent fault type	Last fault type	2nd-last fault type	3rd-last fault type	4th-last fault type	5th-last fault type	CRC

From the returned data, we can see that all the fault types are 0023H, that is, 35 in the decimal form, which means the maladjustment fault (STo).

8.4.7.2 Example of writing 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, as shown in the following table.

Function	Address	Data description	R/W
Communication-based control command	2000H	0001H: Run forward	W
		0002H: Run reversely	
		0003H: Jog forward	
		0004H: Jog reversely	
		0005H: Stop	
		0006H: Coast to stop (in emergency)	
		0007H: Fault reset	
		0008H: Jogging stop	
		0009H: Pre-exciting	

The command transmitted from 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 sent from 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 to 100 Hz for the VFD with the address of 03H.

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

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

The command transmitted from 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 sent from the master):

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

8.4.7.3 Example of MODBUS communication commissioning

A PC is used as the host, an RS232-RS485 converter is used for signal conversion, and the PC serial port used by the converter is COM1 (an RS232 port). The host controller 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 (MODBUSRTU)**, 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 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 adapter 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 resistor connected to 485 terminals on the terminal block of the VFD is set incorrectly.

8.6 Related function codes

8.6.1 Related function codes for Goodrive3000 rectifier

Function code	Name	Description	Setting range	Default
P11.00	Local communication address	1–247; 0 indicates a broadcast address	1–247	1
P11.01	Communication baud rate	0: 1200BPS 1: 2400BPS 2: 4800BPS 3: 9600BPS 4: 19200BPS 5: 38400BPS	0–5	4
P11.02	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
P11.03	Communication response delay	0–200ms	0–200	5
P11.04	Communication timeout time	0.0 (invalid); 0.1–60.0s	0.0–60.0s	0.0s
P11.05	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

Function code	Name	Description	Setting range	Default
P11.06	Communication processing action	0x00–0x11 Ones place: 0: Respond to write operations 1: Not respond to write operations Tens place: 0: Reserved 1: Reserved	0x00–0x11	0x00

8.6.2 Related function codes for Goodrive3000 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	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
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: Action upon the write operation 0: Respond to write operations 1: Not respond to write operations Tens place: Communication encryption 0: Disabled 1: Enabled	0x00–0x11	0x00

9 PROFIBUS communication

9.1 PROFIBUS introduction

(1) PROFIBUS is an international open fieldbus standard that can implement data exchange between various automation components. It is widely applicable to automation in various industries, such as the manufacturing, process, building, transportation, and power industries. It provides effective solutions for implementing integrated automation and intelligentization of field devices.

(2) PROFIBUS consists of three mutually compatible components, namely PROFIBUS-Decentralised Peripherals (DP), PROFIBUS-Process Automation (PA), and PROFIBUS-Fieldbus Message Specification (FMS). It adopts the master/slave mode and is generally used for periodic data exchange between VFD devices.

(3) The transmission media of a PROFIBUS field bus are twisted pairs (complying with the RS-485 standard), paired cables, or optical cables. The baud rate ranges from 9.6kbit/s to 12Mbit/s. The maximum length of a fieldbus cable must be within the range of 100 meters to 1200 meters, and the specific length depends on the selected transmission rate (see the chapter of "Technical Data"). A maximum of 31 nodes can be connected to one PROFIBUS network segment when no repeater is used. If repeaters are used, a maximum of 127 nodes (including the repeaters and master nodes) can be connected.

(4) In PROFIBUS communication, tokens are transmitted between master nodes or by master nodes to slave nodes. Single-master or multi-master systems are supported. The node to respond to the command of a master is selected by the master node, generally a programmable logic controller (PLC). For cyclic master/slave user data transmission and non-cyclic master-master data transmission, a master can also transmit commands to multiple nodes in broadcast mode. When the broadcast mode is adopted, the nodes do not need to transmit feedback signals to the master. On PROFIBUS networks, nodes cannot communicate with each other.

(5) The PROFIBUS protocol is described in details in the EN50170 standard. For details, refer to the EN50170 standard.

9.2 PROFIBUS-DP communication card

EC-TX103 communication card is an optional device to VFD which makes VFD connected to PROFIBUS network. In PROFIBUSN network, VFD is a subsidiary device. The following functions can be completed with EC-TX103 communication card:

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

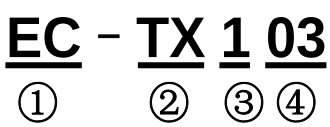
For commands supported by the VFD, see VFD operation manual.

Note:

1. **EC-TX103 communication card is compatible with all Goodrive3000 series VFD models and VFDs that support PROFIBUS expansion.**
2. **EC-TX103 communication card is compatible with all master nodes that support PROFIBUS-DP.**

9.2.1 Naming rule

Communication card model:



Symbol	Name	Description
①	Product category	EC: Expansion card
②	Board card category	TX: communication card
③	Technology version	Indicates the generation of a technical version by using odd numbers, for example, 1, 3, 5, and 7 indicate the 1st, 2nd, 3rd and 4th generations of the technical version.
④	Card type identification	03: PROFIBUS + Ethernet communication card 04: Ethernet + CAN communication card

9.2.2 EC-TX103 communication card

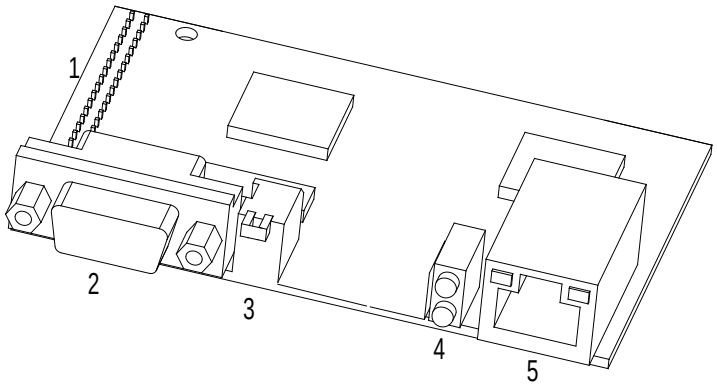


Figure 9-1 EC-TX103 communication card outline

No.	Name	Description
1	Interface with the control board	Used to connect to the control board
2	Bus communication interface	Shielded twisted-pair copper cabls are widely used transmission media for PROFIBUS and CAN.
3	Bus terminator	Configured only when EC-TX103 communication card is used. It is valid only for PROFIBUS communication. Each segment has a bus terminator at the head and one at the tail to ensure that the operation runs without errors. The bus terminator prevents signal reflection at the bus cable end. If the module is the last module or the first module in the network, the bus terminator must be set to ON. If you use a PROFIBUS D-sub connector with a built-in terminator, you must disconnect the EC-TX series communication card terminator.
4	Status LED	Used to display faults
5	Ethernet interface	Used to access the Ethernet

Figure 9-2 shows the structure of connecting multiple VFDs to a PROFIBUS bus system.

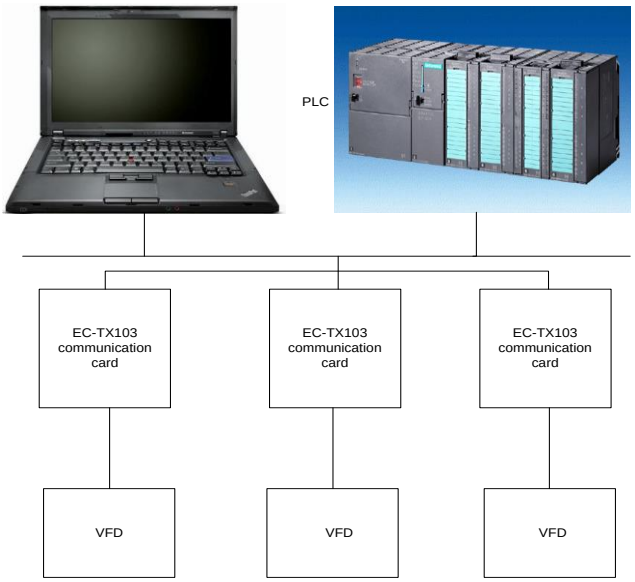


Figure 9-2 PROFIBUS communication structure

9.2.3 Deliverables for EC-TX103 communication card

The packaging box of EC-TX103 communication card includes:

1. EC-TX103 communication card

2. Three screws (M3×10)

3. Communication card manual

If any omission is found, please contact us or the supplier. Manual information may be subject to change without prior notice.

9.3 Card installation

9.3.1 Mechanical installation

Installation environment

1. Ambient temperature: 0°C–+40°C

2. Relative humidity: 5%–95%

3. Other weather conditions: No condensation, ice, rain, snow, or hail; solar radiation < 700W/m^2; air pressure: 70–106kPa

4. Salt spray and corrosive gas content: Pollution degree 2

5. Dust and solid particle content: Pollution degree 2

6. Vibration and impact: 5.9m/s^2 (0.6g) at the sine vibration of 9–200Hz

Assembly procedure

Step 1 Insert the EC-TX103 communication card to the target position on the control board, and fasten it.

Step 2 Place the bus terminator of EC-TX103 communication card to the required position.

Note:

- Before installation, disconnect power to the equipment and wait at least 3 minutes to ensure that the capacitor discharging is completed. Cut off dangerous voltages from external control circuits to unit inputs and inputs.
- Some electronic components on the communication card circuit board are sensitive to electrostatic discharge. Do not touch the circuit board with hands. If operating the electronic board is unavoidable, wear grounded wrist straps when handling the board.

9.3.2 Electrical installation

Node selection

The node address of a device is unique on a PROFIBUS fieldbus. The node address is a two-digit number, ranging from 00 to 99.

You can change a node address during operating, but the change takes effect only after re-initilization.

Bus terminator

Each segment has a bus terminator at the head and one at the tail to ensure that the operation runs without errors. The dual in-line package (DIP) switch on EC-TX103 communication card is used to connect to a bus terminator. The bus terminator prevents signal reflection at the bus cable end. If the communication card is the last communication card or the first communication card in the network, the bus terminator must be set to ON. If you use a PROFIBUS D-sub connector with a built-in terminator, the EC-TX103 communication card terminator must be disconnected.

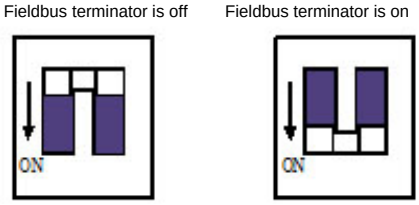


Figure 9-3 Bus terminator

Bus network connection

Shielded twisted copper wire (conform to RS-485 standard) transmission is one of the most common PROFIBUS transmission means.

The basic characteristics of transformation technology:

◆ Network topology: Linear bus with one active fieldbus terminal resistor on each end

◆ Transmission rate: 9.6k bit/s–12M bit/s

◆ Media: Shielded or unshielded twisted-pair cables, depending on the EMC environmental conditions

◆ Number of nodes: 32 on each network segment (without repeater); a maximum of 127 (with repeaters)

◆ Plug connection: 9-pin D-type plug. The following figure shows the pins of the connector.

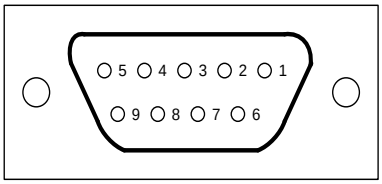


Figure 9-4 Connector pins

The connection pins are described as follows when PROFIBUS is used.

Connector pin		Description	Connector pin		Description
1	-	Unused	2	-	Unused
3	B-Line	Data+ (twisted pair 1)	4	RTS	Request sending
5	GND_BUS	Isolation ground	6	+5V BUS	Isolated power supply of 5 V DC
7	-	Unused	8	A-Line	Data- (twisted pair 2)
9	-	Unused	Metal housing	SHLD	PROFIBUS cable shielding line

+5V and GND_BUS are bus terminators. Some devices, such as the optical transceiver (RS485), may need to obtain power through these pins.

Some devices use RTS to determine the transmission directions. In normal applications, only A-Line, B-Line, and the shield layer need to be used.

It is recommended that you use the standard DB9 connectors manufactured by Siemens. If the communication baud rate is required to be higher than 187.5 kbps, strictly follow the wiring standards stipulated by Siemens.

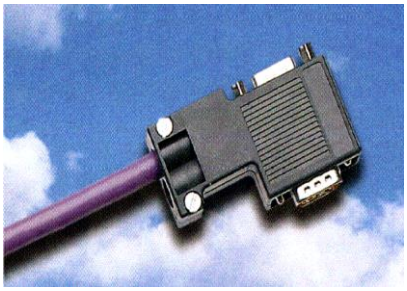


Figure 9-5 Standard PROFIBUS connector

Repeater

A maximum of 31 nodes (including the master node) can be connected to each bus segment. If the number of nodes to be connected to a bus segment exceeds 31, you need to use repeaters to connect the bus segment. Generally, the number of repeaters connected in series cannot exceed 3. **Note:** No station address is provided for repeaters, but they are calculated as stations.

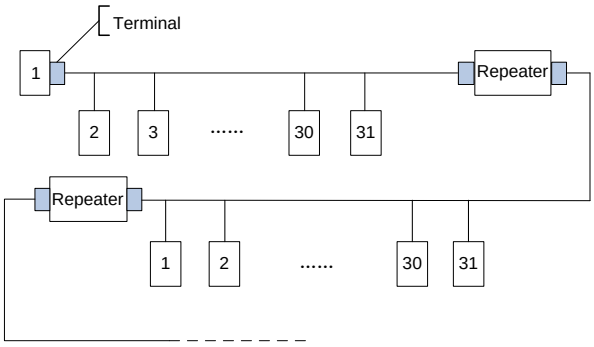


Figure 9-6 Network with repeaters

Transmission rates and max. transmission distance

The maximum length of a cable depends on the transmission rate. Table 9-1 lists the transmission rates and transmission distances.

Table 9-1 Transmission rates and transmission distances

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

Table 9-2 Transmission wire parameters

Parameters	A-type wire	B-type wire
Impedance (Ω)	135–165	100–130
Capacitance of a unit length (pF/m)	< 30	< 60
Circuit resistance (Ω/km)	110	--------
Wire core diameter (mm)	0.64	>0.53
Sectional area of wire core (mm^2)	>0.34	>0.22

In addition to the shielded twisted-pair copper cables, you can also use optical fibers for transmission in a PROFIBUS system. When a PROFIBUS system is applied in an environment with strong electromagnetic interference, you can use

optical fiber conductors to increase the high-speed transmission distance. Two types of optical fiber conductors can be used. One is low-cost plastic fiber conductors that can be used when the transmission distance is shorter than 50 meters; and the other is glass fiber conductors that can be used when the transmission distance is shorter than 1 kilometer.

PROFIBUS bus connection diagram

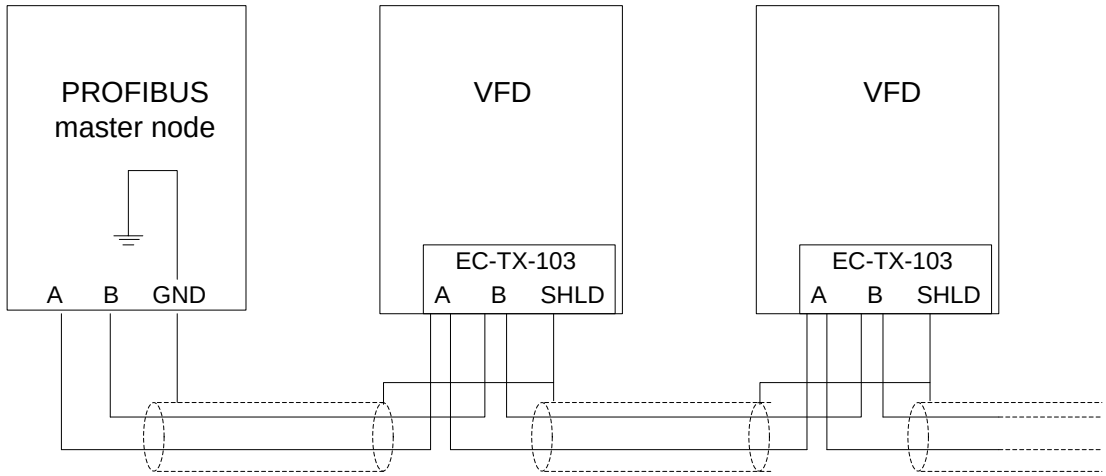


Figure 9-1 Standard PROFIBUS connection

Figure 9-1 shows the terminal wiring. The cables are standard PROFIBUS cables, each consisting of a twisted pair and shield layer. The shield layers of PROFIBUS cables are directly grounded on all nodes. You can select a proper grounding mode based on the actual situation on site.

Wiring precautions:

- **When connecting the nodes, ensure that the data cables are not twisted. For systems to be used in environments with strong electromagnetic radiation, you need to use cables with shield layers to improve electromagnetic compatibility (EMC).**
- **If the shielded braided or shielded foiled cable is used, connect the two ends of it to the protective ground and use the 360-degree reliable grounding to ensure high conductivity. In addition, data cables need to be separated from high-voltage cables.**
- **When the data transmission rate is higher than 500 kbit/s, do not use short stubs, but use the plugs available in the market to connect the data input and output cables. In addition, the DB9 plug to the communication card can be connected or disconnected at any time without interrupting data communication of other nodes.**

9.3.3 System configuration

1. System setup

Master station and VFD should be configured so that the master station can communicate with the communication card after correctly installing EC-TX103 communication card.

Each PROFIBUS subsidiary station on the PROFIBUS bus need to have "device description document" named GSD file which used to describe the characteristics of PROFIBUS-DP devices. GSD file contains all defined parameters, including the supported baud rate, information length, amount of input/output data, meaning of diagnostic data.

You can download the GSD file of EC-TX103 communication card from our website to the corresponding subdirectory on the configuration tool software. For specific operations and PROFIBUS system configuration, please refer to relevant system configuration software instructions.

Parameter number	Parameter name	Optional setting	Default	Remarks
0	Module type	Read only	PROFIBUS-DP	This parameter shows communication module type detected by VFD; users can not adjust this parameter. If this parameter

Parameter number	Parameter name	Optional setting	Default	Remarks
				is not defined, communication between the communication card and VFD cannot be established.
1	Node address	0–99	2	In PROFIBUS network, each device corresponds to a unique node address, you can use the node address selection switch to define node address, but you cannot adjust the parameter by yourself and the parameter is only used to display the node address.
2	Baud rate setting	0: 9.6kbit/s 1: 19.2 kbit/s 2: 45.45 kbit/s 3: 93.75 kbit/s 4: 187.5 kbit/s 5: 500 kbit/s 6: 1.5 Mbit/s 7: 3Mbit/s 8: 6 Mbit/s 9: 9 Mbit/s 10: 12 Mbit/s	6	
3	PZD2	0–65535	0	
4	PZD3	0–65535	0	
...	…	0–65535	0	
10	PZD12	0–65535	0	

Master station and VFD should be configured so that the master station can communicate with the communication card after correctly installing EC-TX103 communication card.

2. Module type

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

3. Node address

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

In PROFIBUS network, each device corresponds to a unique node address, you can use the node address selection switch to define node address, but you cannot adjust the parameter by yourself and the parameter is only used to display the node address.

4. GSD file

Each PROFIBUS subsidiary station on the PROFIBUS bus need to have "device description document" named GSD file which used to describe the characteristics of PROFIBUS-DP devices. GSD file contains all defined parameters, including the supported baud rate, information length, amount of input/output data, meaning of diagnostic data.

A CD-ROM will be offered in which contains GSD file of the EC-TX103 communication card (expansion name is .gsd) for fieldbus adapter. Users can copy GSD file to relevant subdirectory of configuration tools. Please refer to relevant system configuration software instructions to know specific operations and PROFIBUS system configuration.

9.4 PROFIBUS-DP Networking

PROFIBUS-DP is a distributed I/O system, which enables master machine to use a large number of peripheral modules and field devices. Data transmission shows cycle: master machine read input information from subsidiary machine then give feedback signal. EC-TX103 communication card supports PROFIBUS-DP protocol.

9.4.1 Service access point

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

9.4.2 PROFIBUS -DP information frame data structure

PROFIBUS-DP bus mode allows rapid data exchange between master station and VFD. Adopting master-slave mode dealing with VFD access, VFD is always subsidiary station, and each has definite address. PROFIBUS periodic transmission messages use 16 words transmission, the structure shown in Figure 9-7.

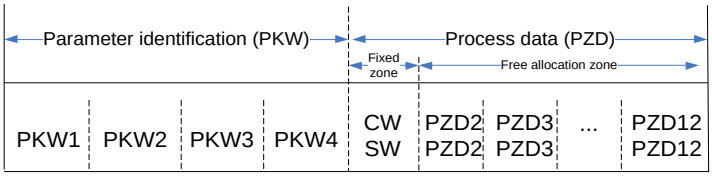


Figure 9-7 PROFIBUS-DP packet structure

Parameter identification (PKW) zone

Parameter identification (PKW): PKW zone describes treatment of parameter identification interface, PKW interface is a mechanism which determine parameters transmission between two communication partners, such as reading and writing parameter values.

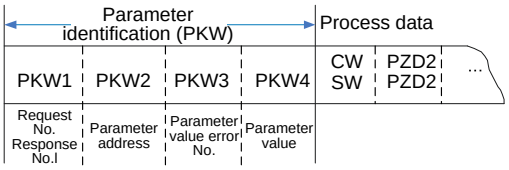


Figure 9-8 Parameter identification zone

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

Bit	Bit	Definition	Range
The first word PKW1 (16 bit)	Bit 15–00	Task or response identification marks	0–7
The second word PKW2 (16 bit)	Bit 15–00	Basic parameter address	0–247
The third word PKW3 (16 bit)	Bit 15–00	Parameter value (MSB) or return error code value	00
The fourth word PKW4 (16 bit)	Bit 15–00	Parameter value (LSB)	0–65535

Note: If the master node requests the value of a parameter, the values in PKW3 and PKW4 of the packet that the master node transmits to the VFD are no longer valid.

Task request and response: When transmitting data to a slave node, the master node uses a request number, and the slave node uses a response number to accept or reject the request. Table 9-3 lists the request/response function.

The definition of task identification flag PKW1 is as follows:

Table 9-3 Task identification flag PKW1

Request No. (from the master to a slave)		Response No. (from a slave to the master)	
Request No.	**Function**	**Acceptance**	**Rejection**
0	No task.	0	–
1	Requesting the value of a parameter	1, 2	3
2	Modifying a parameter value (one word) [modifying the value only on RAM]	1	3 or 4
3	Modifying a parameter value (two words) [modifying the value only on RAM]	2	3 or 4
4	Modifying a parameter value (one word) [modifying the value on both RAM and EEPROM]	1	3 or 4
5	Modifying a parameter value (two words) [modifying the value on both RAM and EEPROM]	2	3 or 4

The definition of response identification flag PKW1 is as follows:

Table 9-4 Response identification flag PKW1

Response No. (from a slave to the master)	
Response No.	**Function**
0	No response
1	Transmitting the value of a parameter (one word)
2	Transmitting the value of a parameter (two words)
3	The task cannot be executed and one of the following error number is returned: 0: Invalid parameter number 1: Parameter values cannot be changed (read-only parameter) 2: Out of set value range 3: Incorrect sub-index number 4: Setting is not allowed (reset only) 5. Invalid data type 6: The task could not be implemented due to operational state 7: Request is not supported 8: Request cannot be completed due to communication error 9: Fault occurs during the write operation to fixed storage zone 10: Request failed due to timeout 11: Parameter cannot be assigned to PZD 12: Control word bit cannot be allocated 13: Other faults
4	No parameter modification rights

PKW examples:

Example 1: Reading the value of a parameter

You can set PKW1 to 1 and PKW2 to 4 to read a frequency set through keypad (the address of the frequency set through keypad is 4), and the value is returned in PKW4.

Request (from the master station to the VFD):

	PKW1		PKW2		PKW3		PKW4		CW		PZD2		PZD3		...	PZD12	
Request	00	01	00	04	00	00	00	00	02	00	xx	xx	xx	xx	...	xx	xx

0004: Parameter address

0001: Request for reading parameter values

Response (from the VFD to the master station):

	PKW1		PKW2		PKW3		PKW4		CW		PZD2		PZD3		...	PZD12	
Response	00	01	00	04	00	00	50	00	02	00	xx	xx	xx	xx	...	xx	xx

5000: Parameter value of address 4

0001: Response (parameter value is refreshed)

Example 2: Modifying the value of a parameter (on RAM only)

You can set PKW1 to 2 and PKW2 to 4 to modify a frequency set through keypad (the address of the present date is 4), and the value to be modified (50.00Hz) is in PKW4.

Request (from the master station to the VFD):

	PKW1		PKW2		PKW3		PKW4		CW		PZD2		PZD3		...	PZD12	
Request	00	02	00	04	00	00	50	00	02	00	xx	xx	xx	xx	...	xx	xx

5000: Parameter value of address 4

0002: Modifying the value of a parameter

Response (from the VFD to the master station):

	PKW1		PKW2		PKW3		PKW4		CW		PZD2		PZD3		...	PZD12	
Response	00	02	00	04	00	00	12	30	02	00	xx	xx	xx	xx	...	xx	xx

0001: Response (parameter value is refreshed)

Example 3: Modifying the value of a parameter (both RAM and EEPROM)

You can set PKW1 to 2 and PKW2 to 4 to modify a frequency set through keypad (the address of the present date is 4), and the value to be modified (50.00Hz) is in PKW4.

Request (from the master station to the VFD):

	PKW1		PKW2		PKW3		PKW4		CW		PZD2		PZD3		...	PZD12	
Request	00	04	04	04	00	00	50	04	02	00	xx	xx	xx	xx	...	xx	xx

5000: Parameter value of address 4

0004: Modifying the value of a parameter

Response (from the VFD to the master station):

	PKW1		PKW2		PKW3		PKW4		CW		PZD2		PZD3		...	PZD12	
Response	00	01	00	04	00	00	50	00	02	00	xx	xx	xx	xx	...	xx	xx

0001: Response (parameter value is refreshed)

9.4.3 Process data (PZD) zone

The PZD zone in a communication packet is designed for controlling and monitoring a VFD. The master and slave stations always process the received PZD with the highest priority. The processing of PZD takes priority over that of PKW, and the master and slave nodes always transmit the latest valid data on the interfaces.

CW - control word (from the master to a slave, see Table 9-6): Using CWs is the basic method of the fieldbus system to control the VFD. A CW is transmitted by the fieldbus master node to the VFD. In this case, the EC-TX103 communication card functions as a gateway.

SW - status word (from a slave to the master, see Table 9-10): The VFD responds to the bit code information of the CW and feeds state information back to the master through an SW.

PZD2–PZD12 - process data (user defined)

Note: A PZD contains the output (that is, reference value) sent from the master node to the slave node and the input (that is, actual value) sent from the slave node to the master node.

Reference value (see Table 9-8**):** The VFD may receive control information in multiple channels, including analog and digital input terminals, VFD control panel, and EC-TX103 communication card. To enable the control over the VFD through PROFINET, you need to set the EC-TX103 communication card as the controller of the VFD.

Actual value (see Table 9-12**):** An actual value is a 16-bit word that includes information about VFD operation. The monitoring function is defined through VFD parameters. The conversion scale of an integer transmitted as an actual value from the VFD to the master depends on the set function.

Note: The VFD always checks the bytes of a CW and reference value.

Mission message (from the master station to the rectifier unit)

Table 9-5 Control word (CW) of the rectifier unit

Bit	Name	Value	Status/description
0–7	COMMAND BYTE Communication-based control command	1	Run
		2	
		3	
		4	
		5	Normal stop
		6	
		7	Fault reset
		8	
		9	Power-on buffering
8	WIRTE ENABLE	1	Write enabling (mainly PKW1-PKW4)
9–10	Reserved		
11	Reserved		
14	Reserved		
15	HEARTBEAT REF	1	Heartbeat enable
		0	Heartbeat disable

Mission message (from the master station to the VFD)

The first word of PZD is control word (CW) of VFD. The CW definition is described as following:

Table 9-6 Control word (CW) of the VFD

Bit	VFD CW		
	Name	Value	Status/description
00	HEARTBEAT REF	1	Heartbeat enable

Bit	VFD CW		
	Name	Value	Status/description
		0	Heartbeat disable
01	EXTERNAL RESET	1	Perform fault reset if the fault persists.
		0	Run normally.
02	FORWARD COMMAND	1	Forward running
		0	Decelerate to stop
03	REVERSE COMMAND	1	Reverse running
		0	Decelerate to stop
04	EXCITING COMMAND	1	Exciting enable
		0	Exciting disable
05	TORQUE CONTROL SELECTION	1	Enabling torque control
		0	Disable torque control
06	EXTERNAL SAFE SWITCH	1	Enable external safety switching
		0	Coast to stop
07	QUICK STOP COMMAND	1	Run normally.
		0	Cut off in an emergency manner and stop at the fastest speed.
08	GROUP B SELECTION	1	Switch to motor B.
		0	Run normally.
09	WIRTE ENABLE	1	Enable writing (mainly PKW1-PKW4)
		0	Disable writing
10–15	Reserved	1	Reserved
		0	Reserved

Reference **value (REF**): The second to twelfth words (PZD2–PZD12) in a PZD task packet are the main reference values. The following table shows the reference values of the VFD:

Table 9-7 Reference value of the rectifier unit

Bit	Name	function selection
Received PZD2	0: Disable 1: DC voltage setting (0–40000; Unit: 0.1V) 2–4: Reserved 5: AO output setting 1 (-1000–+1000, in which 1000 corresponds to 100.0%) 6: AO output setting 2 (-1000–+1000, in which 1000 corresponds to 100.0%) 7–13: Reserved	0
Received PZD3		0
Received PZD4		0
Received PZD5		0
Received PZD6		0
Received PZD7		0
Received PZD8		0
Received PZD9		0
Received PZD10		0
Received PZD11		0
Received PZD12		0

Table 9-8 Reference value of the VFD

Bit	Name	Value sent from master to slave
PZD2	SPEED REF	Master depended
PZD3	TENSION REF	Master depended
PZD4	CURRENT LIMIT CLAMP	Master depended
PZD5－PZD12	Reserved	Reserved

Response message (from the VFD to the master station)

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

Table 9-9 SW of the rectifier unit

Bit	Name	Value	Status/description
0–7	RUN STATUS BYTE	1	Running
		2	
		3	Stopped
		4	Faulty
		5	POFF
8	DC VOLTAGE ESTABLISH	1	Ready for running
		0	Not ready for running
9–11	Reserved	1	
		0	
12	OVERLOAD ALARM	1	Pre-alarm upon overload
		0	No pre-alarm upon overload
13–14	Reserved	1	
		0	
15	HEARTBEAT FEEDBACK	1	Enable
		0	Disable

Table 9-10 SW of the VFD

		VFD SW	
Bit	Value	Name	Status/description
00	1	HEARTBEAT FEEDBACK	Enable
	0		Disable
01	1	FAULT Faulty.	
	0		No fault.
02	1	DC VOLTAGE ESTABLISH	Bus voltage established.
	0		Bus voltage not established.
03	1	MOTO GROUP FEEDBACK-1	Bit 3 and Bit 14 determine which motor is selected. 00: Basic motor parameter group 01: Extended motor group 1 10: Extended motor group 2 12: Extended motor group 3
	0		
04	1	QUICK STOP FEEDBACK	Stop command is invalid.
	0		Stop at the fastest speed in an emergency manner.
05	1	DRIVE CURRENT LIMIT FEEDBACK	Enable drive current limit feedback.
	0		Disable drive current limit feedback.
06	1	DRIVE FLUX ENABLED	Enable drive.
	0		Disable drive.
07	1	RUNNING FORWARD	Running forward.
	0		Not running forward.
08	1	RUNNING REVERSE	Running reversely.
	0		Not running reversely.
09	1	MOTOR TEMPERATURE	Enable motor overtemperature alarm.
	0		Disable motor overtemperature alarm.
10	1	FLUX IN EXCITING	Exciting.
	0		Magnetic flux established.

		VFD SW	
Bit	**Value**	**Name**	**Status/description**
11	1	MASTER MODE	Master mode in master/slave control.
	0		Not master mode.
12	1	SLAVE MODE	Slave mode in master/slave control.
	0		Not slave mode.
13	1	TORQUE CONTROL	Torque control mode
	0		Speed control mode
14	1	MOTO GROUP FEEDBACK-2	Bit 3 and Bit 14 determine which motor is selected.
	0		
15		Reserved	

Actual value (ACT): The second to twelfth words (PZD2–PZD12) in a PZD task packet from the rectifier unit are the main actual values.

Table 9-11 Actual value of the rectifier unit

Bit	Name	function selection
Sent PZD2	0: Disable	0
Sent PZD3	1: DC voltage (* 10, V)	0
Sent PZD4	2: DC voltage feedback (* 10, V)	0
Sent PZD5	3: Input voltage valid value (* 10, V)	0
Sent PZD6	4: Input current valid value (* 10, A)	0
Sent PZD7	5: Input power (* 10, kW)	0
Sent PZD8	6: Input power factor (*100)	0
Sent PZD9	7: Grid frequency (* 10, Hz)	0
Sent PZD10	8: Active current feedback (100% corresponds to the rectifier rated current.)	0
Sent PZD11		0
Sent PZD12	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: Reserved 14: Terminal input status 15: Terminal output status 16: Running status word 17–20: Reserved	0

Table 9-12 Actual value of the VFD

Bit	Name	Value sent from slave to master
PZD2	FAULT CODE	Fault code, 0–N
PZD3	SPEED FEEDBACK	Actual value of speed
PZD4	PG POS COUNTER	PG card position
PZD5	DRIVE TORQUE FEEDBACK	Actual value of torque
PZD6	Motor Running Freq.	Actual value of motor running frequency
PZD7	DRIVE CURRENTFEEDBACK	Actual value of drive current
PZD8	DRIVE VOLTAGEFEEDBACK	Actual value of drive voltage
PZD9	Reserved	Reserved

Bit	Name	Value sent from slave to master
PZD10	Reserved	Reserved
PZD11	Reserved	Reserved
PZD12	Reserved	Reserved

PZD examples:

Transmission of PZD area is achieved through inverter function code.

Example 1: Reading process data of the VFD

In this example, PZD3 is set to "8: Rotating speed during running" through the VFD parameter P15.14. This operation sets the parameter forcibly. The setting remains until the parameter is set to another option.

Response (from the VFD to the master station):

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

Example 2: Writing process data into the VFD

In this example, PZD3 is set to "2: same as reference" through the VFD parameter P15.03. The parameter specified in each request frame is updated with the information contained in PZD3 until another parameter is specified.

Request (from the master station to the VFD):

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

Then the content of PZD3 is traction reference within each request frame until a parameter is reselected.

9.5 Fault Information

An EC-TX103 communication card is equipped with two fault indicators. The following figure and table show the indicator details.

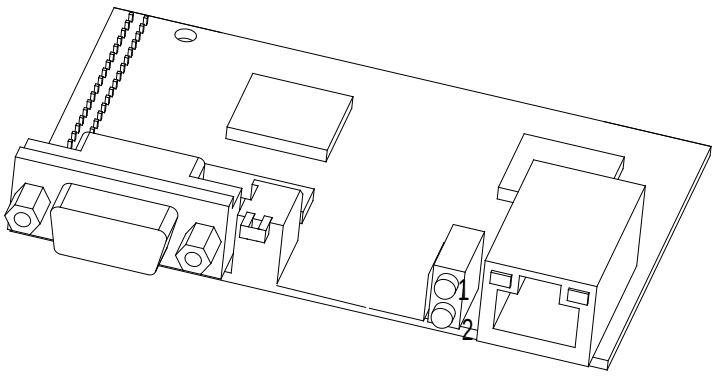


Figure 9-9 Fault indicators

Table 9-13 Fault indicators

LED No.	Name	Color	Function
1	Online	Green	On--The module is online and data exchange can be performed. Off--The module is not in the online state.
2	Offline/Fault	Red	On--The module is offline and data exchange cannot be performed. Off--The module is not in the offline state. It blinks at the frequency of 1 Hz when a configuration error occurs:

LED No.	Name	Color	Function
			The length of the user parameter data set during the module initialization is different from that during the network configuration. It blinks at the frequency of 2 Hz when user parameter data is incorrect: The length or content of the user parameter data set during the module initialization is different from that during the network configuration. It blinks at the frequency of 4 Hz when an error occurs in the ASIC initialization of communication.

9.6 Related function codes

Related function codes for rectifier unit

Function code	Name	Description	Setting range	Default
P12.00	Module type	0: PROFIBUS	0	0
P12.01	Module address	0–127	0–127	2
P12.02	Received PZD2	0: Disable 1: DC voltage setting (0–40000; Unit: 0.1V) 2–4: Reserved 5: AO setting 1 (-1000–1000, 1000 corresponding to 100.0%) 6: AO setting 2 (-1000–1000, 1000 corresponding to 100.0%) 7–13: Reserved	0–13	0
P12.03	Received PZD3		0–13	0
P12.04	Received PZD4		0–13	0
P12.05	Received PZD5		0–13	0
P12.06	Received PZD6		0–13	0
P12.07	Received PZD7		0–13	0
P12.08	Received PZD8		0–13	0
P12.09	Received PZD9		0–13	0
P12.10	Received PZD10		0–13	0
P12.11	Received PZD11		0–13	0
P12.12	Received PZD12		0–13	0
P12.13	Sent PZD2	0: Disable 1: DC voltage (* 10, V) 2: DC voltage feedback (* 10, V) 3: Input voltage valid value (* 10, 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
P12.14	Sent PZD3		0–20	0
P12.15	Sent PZD4		0–20	0
P12.16	Sent PZD5		0–20	0
P12.17	Sent PZD6		0–20	0
P12.18	Sent PZD7		0–20	0
P12.19	Sent PZD8		0–20	0
P12.20	Sent PZD9		0–20	0
P12.21	Sent PZD10		0–20	0
P12.22	Sent PZD11		0–20	0
P12.23	Sent PZD12		0–20	0
P12.24	Temporary variable 1 for PZD sending	0–65535	0–65535	0

Function code	Name	Description	Setting range	Default
P12.25	DP communication timeout time	0.0 (invalid), 0.1–60.0s	0.0–60.0s	0.0s

Related function codes for inverter unit

Function code	Name	Description	Setting range	Default
P15.00	Module type	0: PROFIBUS	0–1	0
P15.01	PROFIBUS/CANopen module address	0–127	0–127	2
P15.02	Received PZD2	0: Disable	0–20	0
P15.03	Received PZD3	1: Set frequency (0–Fmax (Unit: 0.01Hz))	0–20	0
P15.04	Received PZD4	2: PID reference (0–1000, in which 1000 corresponds to 100.0%)	0–20	0
P15.05	Received PZD5		0–20	0
P15.06	Received PZD6	3: PID feedback (0–1000, in which 1000 corresponds to 100.0%)	0–20	0
P15.07	Received PZD7		0–20	0
P15.08	Received PZD8	4: Torque setting (-3000–+3000, in which 1000 corresponds to 100.0% of the motor rated current)	0–20	0
P15.09	Received PZD9		0–20	0
P15.10	Received PZD10	5: Setting of the upper limit of forward running frequency (0–Fmax, unit: 0.01 Hz)	0–20	0
P15.11	Received PZD11		0–20	0
P15.12	Received PZD12	6: Setting of the upper limit of reverse running frequency (0–Fmax, unit: 0.01 Hz) 7: Upper limit of the electromotive torque (0–3000, in which 1000 corresponds to 100.0% of the motor rated current) 8: Upper limit of braking torque (0–2000, in which 1000 corresponds to 100% of the motor rated current) 9: Virtual input terminal command. Range: 0x000–0x1FF 10: Virtual output terminal command. Range: 0x00–0x0F 11: Voltage setting (special for V/F separation) (0–1000, in which 1000 corresponds to 100% of the motor rated voltage) 12: AO output setting 1 (-1000–+1000, in which 1000 corresponds to 100.0%) 13: AO output setting 2 (-1000–+1000, in which 1000 corresponds to 100.0%)	0–20	0
P15.13	Sent PZD2	0: Invalid 1: Running frequency (*100, Hz) 2: Set frequency (*100, Hz) 3: Bus voltage (*10, V) 4: Output voltage (*1, V) 5: Output current (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)	0–20	0
P15.14	Sent PZD3		0–20	0
P15.15	Sent PZD4		0–20	0
P15.16	Sent PZD5		0–20	0
P15.17	Sent PZD6		0–20	0
P15.18	Sent PZD7		0–20	0
P15.19	Sent PZD8		0–20	0
P15.20	Sent PZD9		0–20	0
P15.21	Sent PZD10		0–20	0
P15.22	Sent PZD11		0–20	0

Function code	Name	Description	Setting range	Default
P15.23	Sent PZD12	10: Ramp reference frequency 11: Fault code 12: AI1 input (*100, V) 13: AI2 input (*100, V) 14: AI3 input (* 100, V) 15: PULSE frequency value (x100, kHz) 16: Terminal input status 17: Terminal output status 18: PID reference (x100, %) 19: PID feedback (x100, %) 20: Motor rated torque	0–20	0
P15.24	Temporary variable 1 for PZD sending	0–65535	0–65535	0
P15.25	DP communication timeout time	0.0 (invalid), 0.1–60.0s	0.0–60.0	0.0s
P15.26	CAN communication timeout time	0.0 (invalid), 0.1–60.0s	0.0–60.0	0.0s
P15.27	CANopen communication baud rate	0: 1000k 1: 800k 2: 500k 3: 250k 4: 125k 5: 100k 6: 50k 7: 20k	0–7	0
P15.28	CAN communication address	0–127 0 indicates a broadcast address	0–127	1
P15.29	CAN communication baud rate	0: 1000k 1: 500k 2: 250k 3: 125k 4: 100k	0–4	1

10 Ethernet communication

The VFD has been integrated with Ethernet communication function. Ethernet communication can be implemented by connecting the VFD to the upper computer that hosts the Ethernet upper computer monitoring software (available at www.invt.com) with a standard Ethernet RJ45 cable.

With the host computer, all parameters in the VFD can be easily set, uploaded, downloaded, while the waveforms of up to 100+ messages can be easily monitored in real time.

10.1 Operation procedure

See the operating manual of INVT Workshop upper computer monitoring system.

Goodrive3000 series VFD can save the waveform information of 0.2 seconds before the last stop failure, which can be extracted by the software of the host computer for fault cause analysis.

10.2 Related function codes

Related function codes for rectifier unit

Function code	Name	Description	Setting range	Default
P13.00	Ethernet communication rate	0: Self adaptive 1: 100M full duplex 2: 100M half duplex 3: 10M full duplex 4: 10M half duplex	0–4	0
P13.01	IP address 1	0–255	0–255	192
P13.02	IP address 2	0–255	0–255	168
P13.03	IP address 3	0–255	0–255	0
P13.04	IP address 4	0–255	0–255	1
P13.05	Subnet mask 1	0–255	0–255	255
P13.06	Subnet mask 2	0–255	0–255	255
P13.07	Subnet mask 3	0–255	0–255	255
P13.08	Subnet mask 4	0–255	0–255	0
P13.09	Gateway 1	0–255	0–255	192
P13.10	Gateway 2	0–255	0–255	168
P13.11	Gateway 3	0–255	0–255	1
P13.12	Gateway 4	0–255	0–255	1

Related function codes for inverter unit

Function code	Name	Description	Setting range	Default
P16.00	Ethernet communication rate	0: Self adaptive 1: 100M full duplex 2: 100M half duplex 3: 10M full duplex 4: 10M half duplex	0–4	0
P16.01	IP address 1	0–255	0–255	192
P16.02	IP address 2	0–255	0–255	168
P16.03	IP address 3	0–255	0–255	0

Function code	Name	Description	Setting range	Default
P16.04	IP address 4	0–255	0–255	1
P16.05	Subnet mask 1	0–255	0–255	255
P16.06	Subnet mask 2	0–255	0–255	255
P16.07	Subnet mask 3	0–255	0–255	255
P16.08	Subnet mask 4	0–255	0–255	0
P16.09	Gateway 1	0–255	0–255	192
P16.10	Gateway 2	0–255	0–255	168
P16.11	Gateway 3	0–255	0–255	1
P16.12	Gateway 4	0–255	0–255	1

11 Optional peripheral accessories

11.1 Expansion card

The following table lists the expansion card supported by Goodrive 3000.

Table 11-1 Expansion cards

Name	Model	Description	Remarks
Master/slave expansion card	ASY01_PB12301_TF6	CAN communication card special for master/slave	Cannot be used at the same time
Comprehensive extension card	ASY01_PB12301_TF4	Expandable analog input/output, digital input/output, and CAN master-slave communication	See 11.1.1
5V incremental encoder PG card	EC-PG101-05	5V incremental ABZ encoder, supporting differential input, with max. frequency 200kHz	For encoder selection, please confirm with the manufacturer's professionals.
12V encoder PG card	EC-PG101-12	12V incremental ABZ encoder, supporting differential, OC and push-pull input, with max. frequency 100kHz	
24V encoder PG card	EC-PG101-24	24V incremental ABZ encoder, supporting differential, OC, and push-pull input, with max. frequency 100kHz	
Resolver encoder PG card	EC-PG104-00	Resolver transformer encoder, supporting pulse/direction differential input, and 5V differential frequency division output, with max. frequency 500kHz	
Communication expansion card	EC-TX103	PROFIBUS communication interface	
	EC-TX105	CANopen communication interface	
	EC-TX109	PROFINET communication interface	

11.1.1 Comprehensive expansion card

11.1.1.1 Terminals

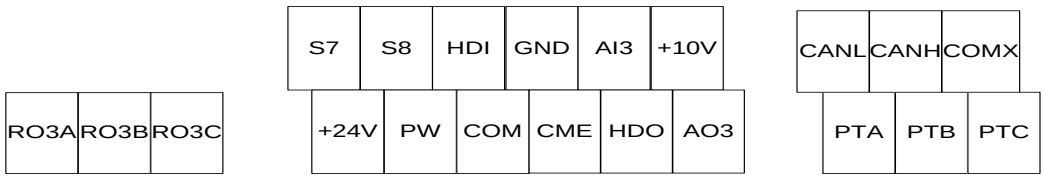


Figure 11-1 Wiring terminals

Table 11-2 Terminal description

Category	Terminal symbol	Terminal name	Description
Power supply	+10V	+10V reference power supply	GND reference; Set point of 10.5V, Max. output current of 100mA, with output shortcircuit protection, accuracy of 1%
	24V	24V power supply	COM reference; Used to provide working power to the internal
	PW	External power	COM reference; Provide the working power supply for switch

Category	Terminal symbol	Terminal name	Description
			input/output from external to internal Input voltage range: DC12–30V
Analog input	AI3	Analog input 3	GND reference; 1. Input range: 0–10V or 0–20mA, 12bit resolution, error±1%, 25°C 2. Voltage or current input is determined by J13
Analog output	AO3	Analog output 1	GND reference; 1. Output range: -10V–10V or -20mA–20mA, error±1%, 25°C 2. Whether the output type is voltage or current is determined by J14 and J2
Digital input/output	S7	Digital input 7	COM reference; 1. Internal impedance: 3.3kΩ 2. Bi-direction input terminal, supporting both NPN and PNP 3. 12–30V voltage input is acceptable 4. Max. input frequency: 1kHz 5. HDI is high-speed pulse input, max. input frequency: 50kHz
	S8	Digital input 8	
	HDI	High-speed pulse input	
	HDO	High-speed pulse output	CME reference; 1. Output voltage amplitude: 24V 2. Output frequency: 50kHz
Relay output	RO3A	NO contact of relay 3	1. Contact capacity: AC250V/3A, DC30V/1A 2. Cannot be used as high frequency digital output
	RO3B	NC contact of relay 3	
	RO3C	Common contact of relay 3	
CAN communication	CANL CANH COMX	CAN communication	CAN communication for master/slave control
Motor temperature detection	PTA PTB PTC	Analog input	PT100/PT1000 detection

Note: The terminal resistor is connected through the DIP switch when CAN communication is used. To connect the terminal resistor, the DIP switch is switched to ON (11); To disconnect it, the switch is switched to OFF (00).

11.1.1.2 Wiring diagram

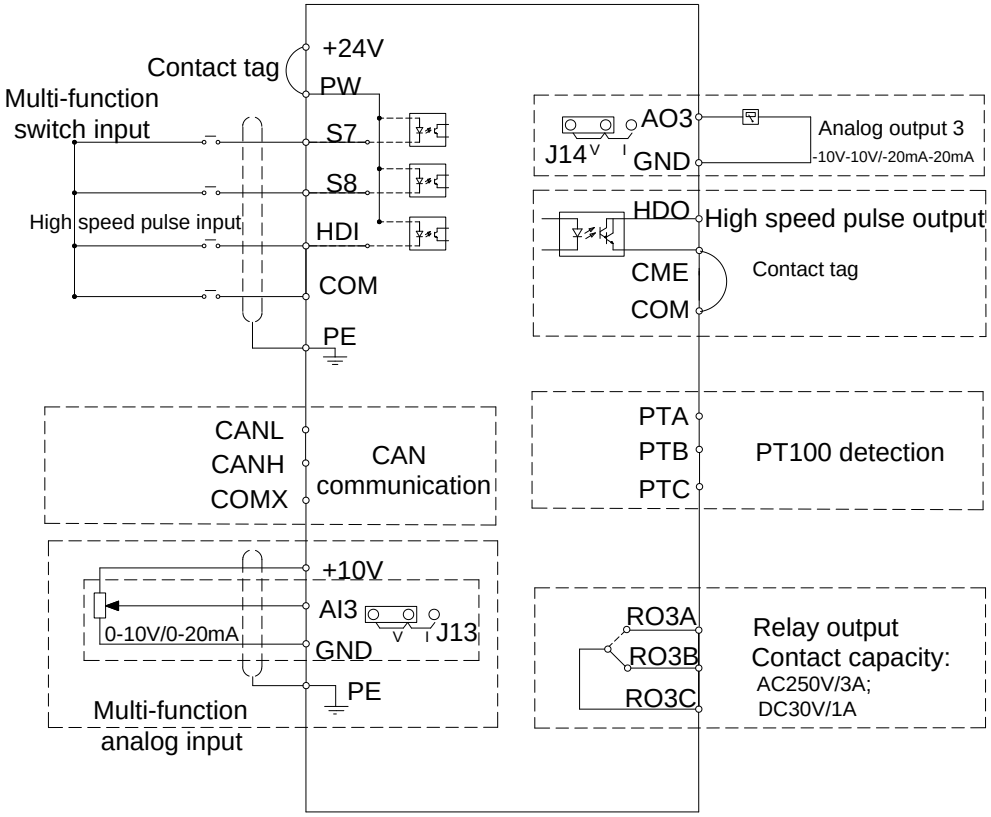


Figure 11-2 Wiring diagram

11.1.2 Incremental encoder card

Note: The lower pins of CN3 are valid if incremental encoder PG card is used on Goodrive3000 series products.

11.1.2.1 Introduction

A PG card is a must for PG vector control. The PG card functions include processing circuits for two quadrature encoder signals and supporting spindle positioning Z signal inputs, and receiving signals of differential, open collector and push-pull encoder. Frequency-divided output can be performed for the input encoder signals. The output quantity includes two channels of differential signals. You can choose to output push-pull signals or open collector signals through jumper J1 or J2 according to your actual use.

11.1.2.2 Terminal and DIP switch

The incremental encoder PG card has two 2*4P user wiring terminals. See the figure.

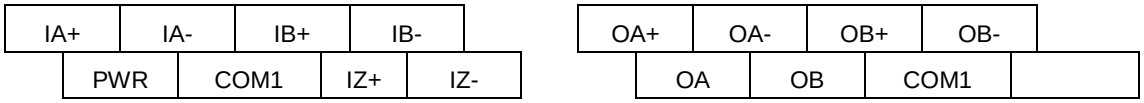


Figure 11-3 Wiring terminals

PWR and COM1 are for encoder working power output; IA+, IA-, IB+, IB-, IZ+, and IZ- are encoder signal input terminals; OA+, OA-, OB+, OB- are differential crossover signal output terminals, while OA, OB, and COM1 are frequency-divided push-pull signal and open collector signal output terminals (the output signal type is selected by jumper J1 or J2); the PG card does not connect PE to the earth internally, you can ground it during use.

The frequency division coefficient of the incremental encoder PG card is determined by the dip switch on the card. The dip switch have 8 bits, and the frequency division coefficient is determined by adding 1 to the binary number that the dip switch represents. The place labeled with "1" is the low binary bit, and the one labeled with "8" is the high binary bit. When the dip switch is turned to ON, the bit is valid, indicating "1"; otherwise, the bit indicates "0". See the following table for frequency division coefficients.

Decimal	Binary	Frequency division coefficient
0	00000000	1
1	00000001	2
2	00000010	3
...	…	…
m	...	m+1
255	11111111	256

11.1.2.3 Wiring diagram

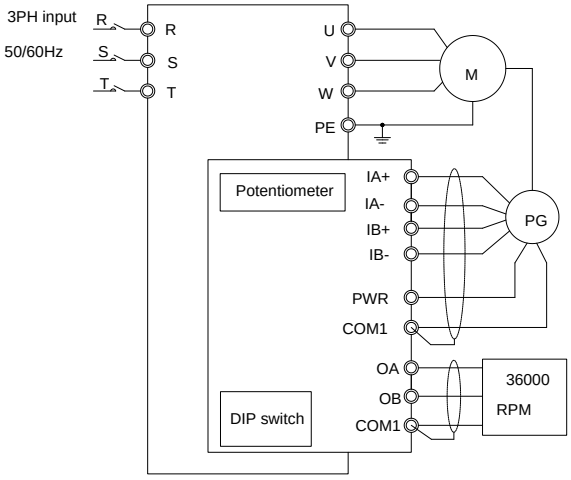


Figure 11-4 Wiring diagram

Wiring precautions:

1. A PG card signal line and a power line must be routed separately and disallow parallel routing;

2. To avoid interference from encoder signals, use a shielded cable for the PG card signal line;

3. The shield layer of the encoder shield cable should be connected to the earth (such as the PE of VFD), and it must be connected to earth only at one end to avoid signal interference;

4. If the PG card uses frequency-divided output when connecting to an external power supply, the voltage should be less than 24V; otherwise the PG card will be damaged;

5. You can set the output voltage by adjusting the 12–15V incremental encoder PG card potentiometer (clockwise for voltage increases) according to actual needs, and the force should not be too great when rotating the potentiometer.

11.1.2.4 Input application connection

① Differential output encoder connection

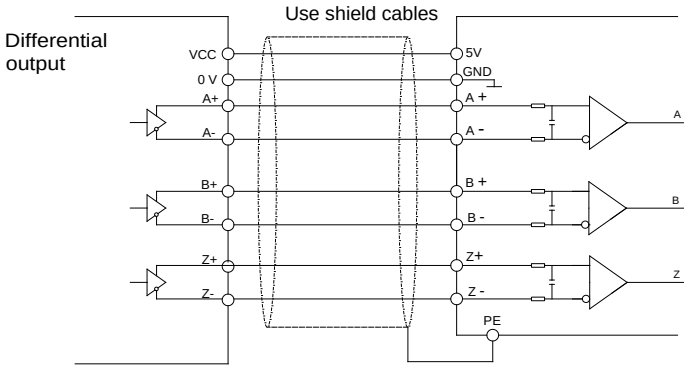


Figure 11-5 Wiring diagram of differential output encoder

② Open collector output encoder connection

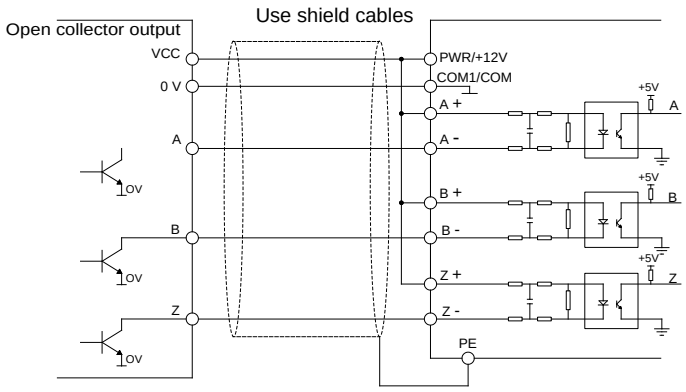


Figure 11-6 Wiring diagram of open collector output encoder

③ Push-pull output encoder connection

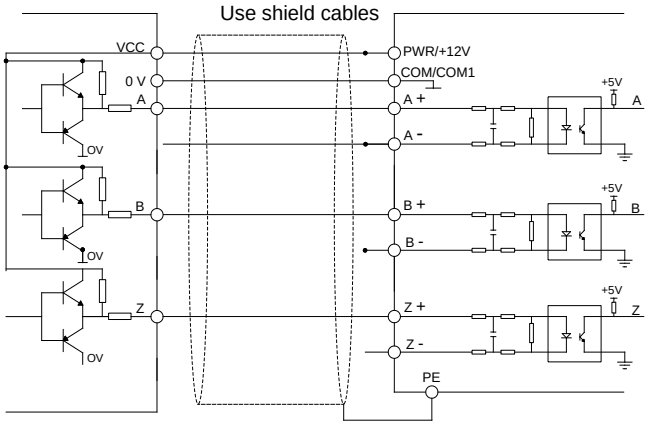


Figure 11-7 Wiring diagram of push-pull output encoder

Note: When the spindle positioning VFD is supported, the Z signal needs to be connected, of which the wiring method is similar to that for the A and B signals.

11.1.2.5 Output application connection

① PG card frequency-divided differential output connection

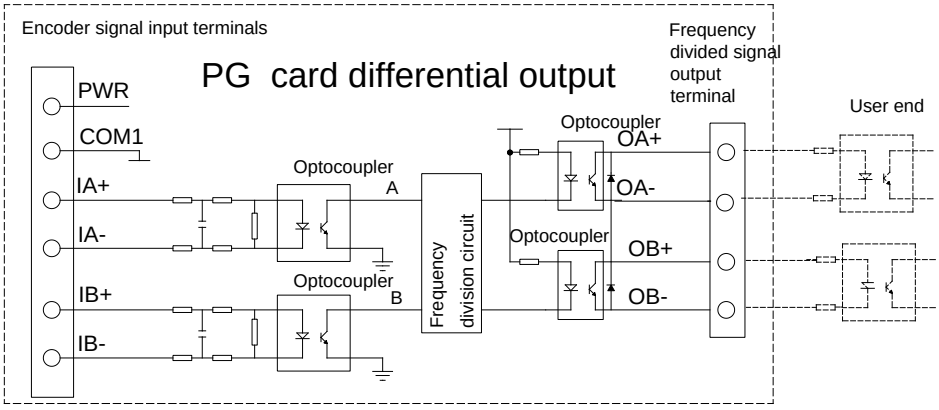


Figure 11-8 Wiring diagram of PG card frequency-divided differential output

② PG card frequency-divided open collector output connection

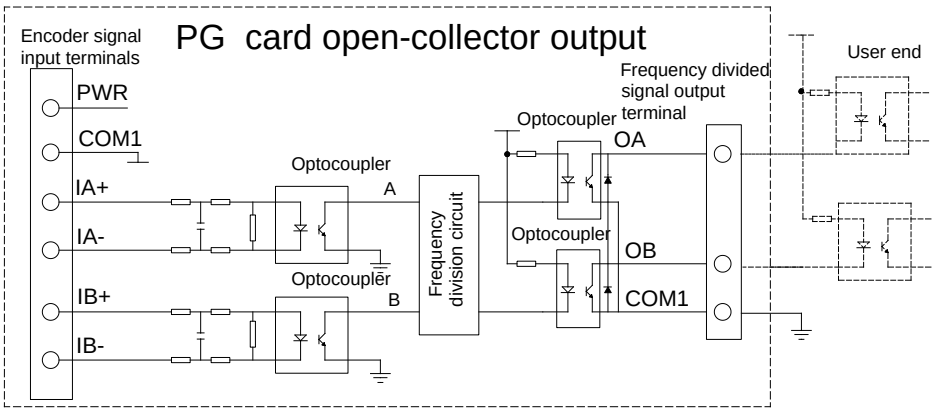


Figure 11-9 Wiring diagram of PG card frequency-divided open collector output

Note: During open collector output, PWR at J1 and that at J2 are short connected to COA and COB.

③ PG card frequency-divided push-pull output connection

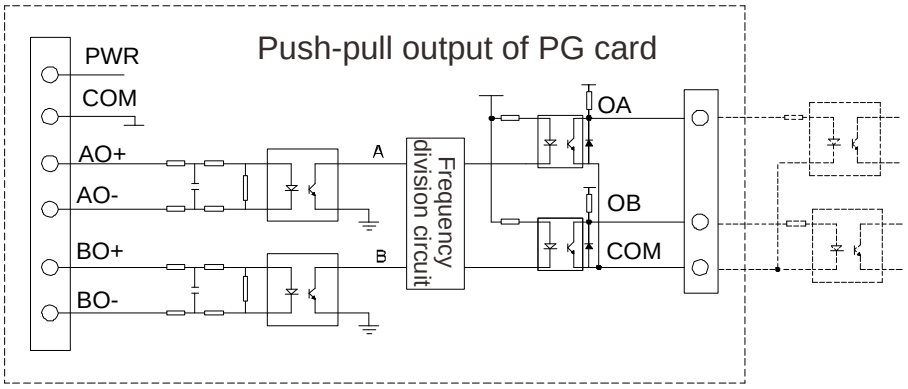


Figure 11-10 Wiring diagram of PG card frequency-divided push-pull output

Note:

1. **Note: During push-pull output, PWR at J1 and that at J2 are short connected to HOA and HOB.**
2. **Incremental encoder PG cards are mainly used to closed-loop vector control on asynchronous motors.**

11.1.3 Resolver encoder PG card

11.1.3.1 Terminal and description

The resolver encoder card has one signal line interface and three user terminals, as the following figure:

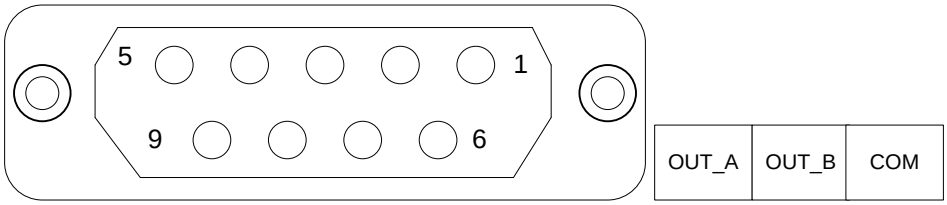


Figure 11-11 Terminal diagram

Input terminal:

Terminal symbol	Terminal name	Description
1	SIN+	Encoder signal input
2	SIN-	
3	COS+	
4	GND	
5	Empty	

Terminal symbol	Terminal name	Description
6	EXC+	Encoder excitation signal
7	EXC-	
8	COS-	Encoder signal input
9	Empty	

Output terminals:

Terminal name	Description
OUT_A, OUT_B	Encoder signal frequency-divided output

11.1.3.2 Wiring diagram

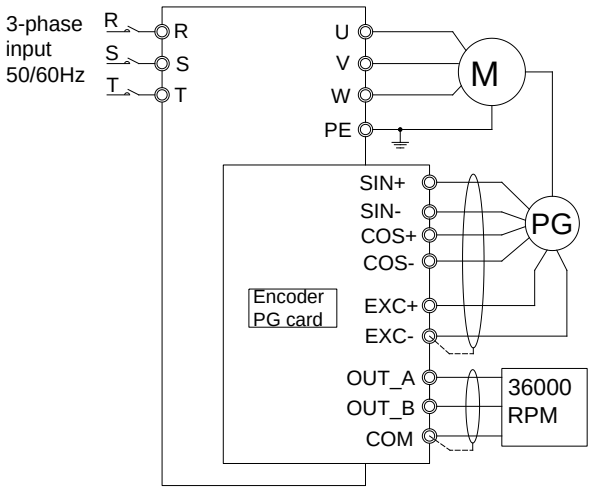


Figure 11-12 Wiring diagram

11.1.4 Communication expansion card

Model	Description	Protocol	Baud rate	Transmission distance (in theory)
EC-TX103	PROFIBUS+Ethernet communication card	DP Ethernet	9.6kbit/s-12Mbit/s 10Mbit/s /100Mbit/s	Max.: 1200m Max.: 100m
EC-TX105	CANOPEN+Ethernet communication card	CANOPEN Ethernet	50kbit/s-1Mbit/s 10Mbit/s /100Mbit/s	Max.: 2500m Max.: 100m
EC-TX109	PROFINET communication card	Ethernet	9.6kbit/s-12Mbit/s 10Mbit/s/100Mbit/s	Max.: 1200m Max.: 100m

Note: For PROFIBUS, PROFINET, and CANopen protocols, see Operation Manual of INVT Communication Cards.

11.2 Reactor

We offer reactors for selection, among which four-quadrant input reactors are standard.

The following table shows the reactor selection for 1140V voltage grade (for other voltage grades, the selection is determined according to the specific model).

Model	Input reactor	Output reactor
GD3000-01-055G-12 GD3000-11-055G-12	25006-00298	25006-00395
GD3000-01-075G-12 GD3000-11-075G-12	25006-00298	25006-00395
GD3000-01-090G-12 GD3000-11-090G-12	25006-00298	25006-00395

Model	Input reactor	Output reactor
GD3000-01-110G-12 GD3000-11-110G-12	25006-00298	25006-00395
GD3000-01-132G-12 GD3000-11-132G-12	25006-00438	25006-00072
GD3000-01-160G-12 GD3000-11-160G-12	25006-00438	25006-00072
GD3000-01-200G-12 GD3000-11-200G-12	25006-00438	25006-00072
GD3000-01-250G-12 GD3000-11-250G-12	25006-00210	25006-00431
GD3000-01-315G-12 GD3000-11-315G-12	25006-00210	25006-00431
GD3000-01-400G-12 GD3000-11-400G-12	25006-00210	25006-00431
GD3000-01-500G-12 GD3000-11-500G-12	25006-00441	25006-00440
GD3000-01-630G-12 GD3000-11-630G-12	25006-00441	25006-00440
GD3000-01-800G-12 GD3000-11-800G-12	25006-00435	25006-00434
GD3000-01-1000G-12 GD3000-11-1000G-12	25006-00435	25006-00434

11.3 Filters

We offer high-performance filters for selection.

The following table shows the filter selection for 1140V voltage grade (for other voltage grades, the selection is determined according to the specific model).

Model	Input filter	Output filter
GD3000-01-055G-12 GD3000-11-055G-12	FLT-P1250H-B	FLT-L1250H-B
GD3000-01-075G-12 GD3000-11-075G-12	FLT-P1250H-B	FLT-L1250H-B
GD3000-01-090G-12 GD3000-11-090G-12	FLT-P12100H-B	FLT-L12100H-B
GD3000-01-110G-12 GD3000-11-110G-12	FLT-P12100H-B	FLT-L12100H-B
GD3000-01-132G-12 GD3000-11-132G-12	FLT-P12100H-B	FLT-L12100H-B
GD3000-01-160G-12 GD3000-11-160G-12	FLT-P12100H-B	FLT-L12200H-B
GD3000-01-200G-12 GD3000-11-200G-12	FLT-P12200H-B	FLT-L12200H-B

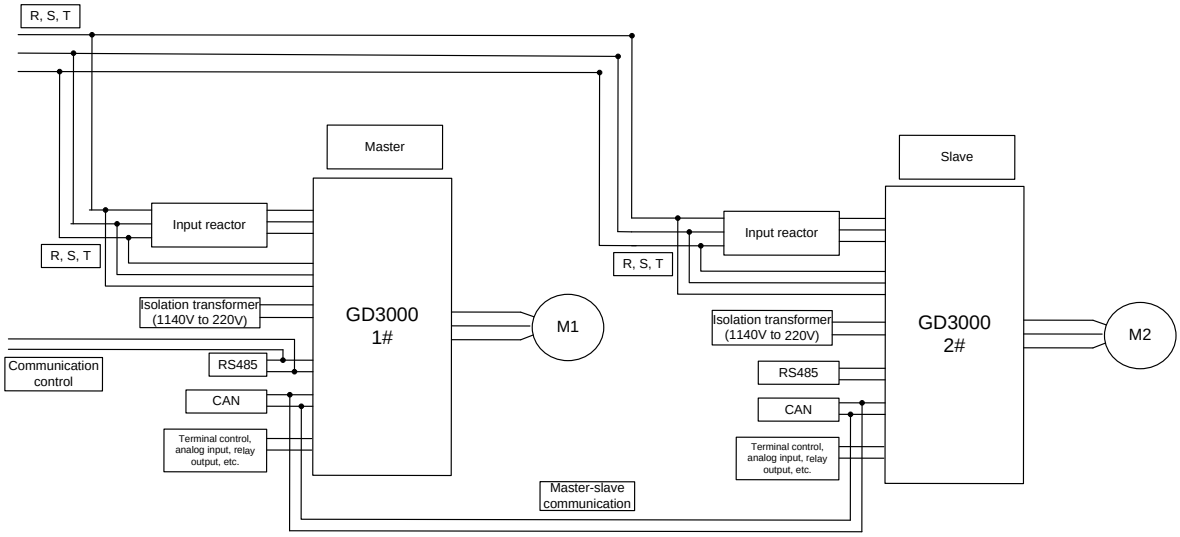
Model	Input filter	Output filter
GD3000-01-250G-12 GD3000-11-250G-12	FLT-P12200H-B	FLT-L12200H-B
GD3000-01-315G-12 GD3000-11-315G-12	FLT-P12200H-B	FLT-L12200H-B
GD3000-01-400G-12 GD3000-11-400G-12	FLT-P12300H-B	FLT-L12300H-B
GD3000-01-500G-12 GD3000-11-500G-12	FLT-P12400H-B	FLT-L12400H-B
GD3000-01-630G-12 GD3000-11-630G-12	FLT-P12400H-B	FLT-L12400H-B
GD3000-01-800G-12 GD3000-11-800G-12	FLT-P12600H-B	FLT-L12600H-B
GD3000-01-1000G-12 GD3000-11-1000G-12	FLT-P12800H-B	FLT-L12800H-B

Note:

- If no corresponding products for selection, replace with the model at larger current degree.
- The filters are selected according to the corresponding model or rated current. For the VFDs of other manufacturers, need fine tuning according to the rated current.
- Two-quadrant and four-quadrant models at the same power share one type of filters.

Appendix A Debugging of master/slave control

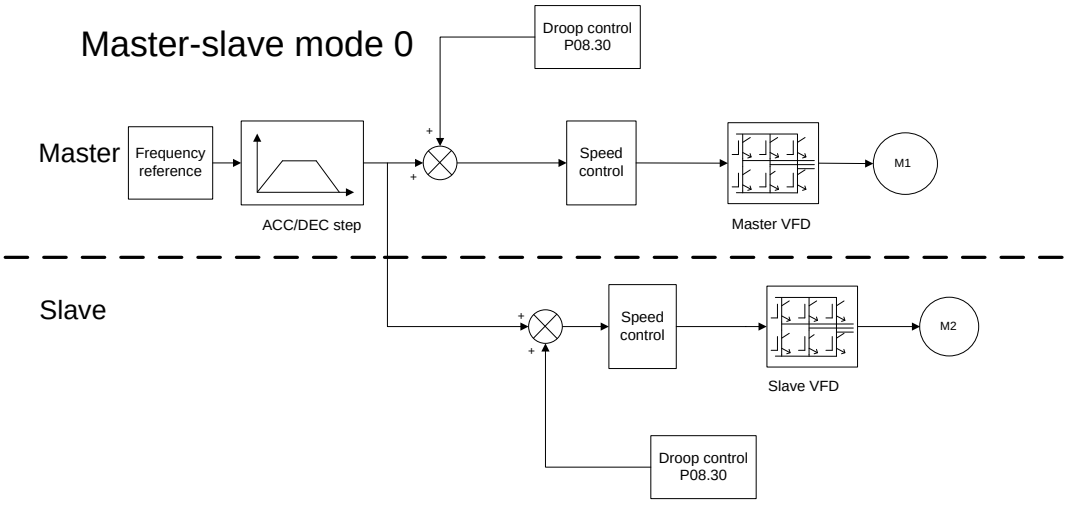
A.1 Wiring of master/slave control



A.2 Debugging procedure

Goodrive3000 VFD has special function group of master-slave control. Only by simple parameter settings can users realize master-slave operation and power balance among multiple motors. There are two modes of master-slave control set by P21.02.

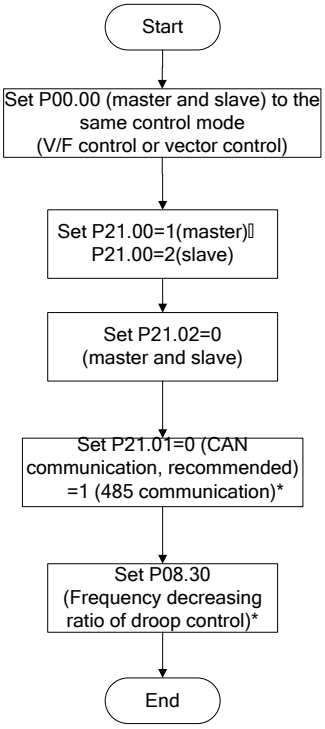
When P21.02=0, master-slave mode 0, set the master (1) and slave(s) in speed control mode and adopt droop control to realize power balance. The flow is shown as follows:



Note:

- Both the master and slave use speed control, and power balancing is performed by droop control.
- The master-slave mode is applicable to both rigid connection and flexible connection. It is generally recommended in flexible connection.

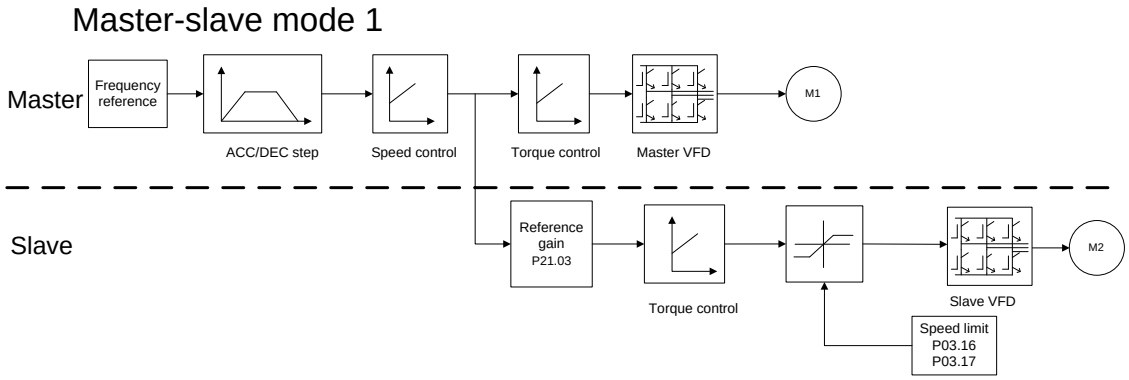
The following figure shows the flow of relevant parameter settings:



Note:

1. The master and slave should be set the same communication mode (CAN communication or RS485 communication);
2. P08.30 is the frequency decreasing velocity of droop control. Generally, the parameter can be set the same for the master and slave in the setting range (0.5–3 times of motor rated slip frequency which can be calculated according to the parameters on the name plate of the motor).

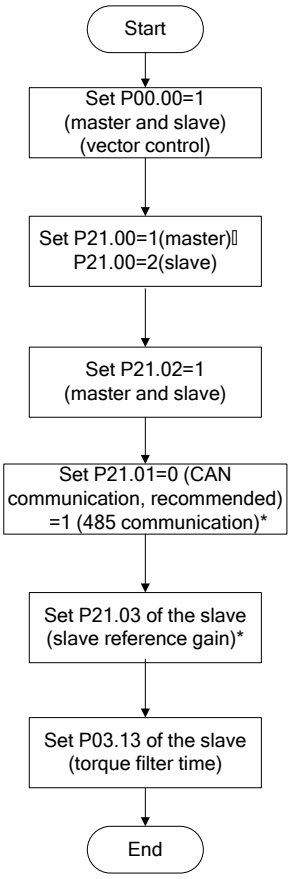
When P21.02=1, master-slave mode 1, set the master (1) and slave(s) in vector control mode, the master in speed control and the slave in torque control, and adopt internal speed loop and torque loop to realize power balance. The flow is shown as follows: The flow is shown as follows:



Note:

1. The master and slave should be in the same type of vector control mode. When the master is in speed control, the slave is automatically set to torque control.
2. The master-slave mode is applicable to both rigid connection and flexible connection.

The following figure shows the flow of relevant parameter settings:



Note:

1. The master and slave should be set the same communication mode (CAN communication or RS485 communication);
2. Set the slave reference gain to 1. When the motor power of the master and that of the slave are different, you need to adjust the gain to keep the actual output power and the rated power of the motor consistent in steady operation.

Appendix B EMC installation guidelines

B.1 Installation guidelines compliant with EMC regulations

B.1.1 General introduction

EMC is short for electromagnetic compatibility, which refers to the ability of a device or system to function properly in its electromagnetic environment and not constitute an unbearable electromagnetic disturbance to anything in that environment. EMC includes two aspects: electromagnetic interference and electromagnetic immunity.

Electromagnetic interference can be divided into two categories according to the transmission paths: conducted interference and radiation interference.

Conducted interference propagates along any conductor. Therefore, any conductor, such as wire, transmission line, inductor, and capacitor, is a transmission channel for conducted interference.

Radiated interference is in the form of electromagnetic waves that propagate with energy that is inversely proportional to the square of the distance.

Electromagnetic interference must have three conditions or three elements at the same time: interference source, transmission channel, and sensitive receiver, each of which is indispensable. The solution of EMC problem mainly focuses the three elements. For users, the solution of EMC problem is mainly in transmission channels because the equipment as interference source or receiver cannot be changed.

Different electric and electronic devices have different EMC capacities because of adopting different EMC standards or classes.

B.1.2 EMC features

Like other electric or electronic devices, the VFD is not only an electromagnetic interference source but also an electromagnetic receiver. The operating principle of the VFD determines that it can produce certain electromagnetic interference noise. And the same time the VFD needs to be designed with certain anti-jamming ability to ensure the smooth working in certain electromagnetic environment. The following describes its EMC features:

- **Input current is non-sine wave. The input current includes large amount of high-harmonic waves that can cause electromagnetic interference, decrease the grid power factor and increase the line loss.**

  Output voltage is high frequency PWM wave, which can increase the temperature rise and shorten the life of motor. And the leakage current will also increase, which can lead to the leakage protection device malfunction and generate strong electromagnetic interference to influence the reliability of other electric devices.

- **As the electromagnetic receiver, too strong interference will damage the VFD and influence the normal using.**
- **In the system, EMS and EMI of the VFD coexist. Decrease the EMI of the VFD can increase its EMS ability.**

B.1.3 EMC installation guidelines

In order to ensure all electric devices in the same VFD to work smoothly, this section, based on EMC features of the VFD, introduces general EMC principles in several aspects including noise control, site wiring and grounding for reference in site installation.

B.1.3.1 Noise control

All the connections to the VFD control terminals must use shielded wires. The shield layer of wire must be grounded near the VFD entrance. The ground mode is 360-degree loop connection formed by cable clips. It is not allowed to connect the twisted shield layer to the ground of the VFD, which greatly decreases or loses the shield 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.

B.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 (such as VFD, filter, PLC, and detection devices) in the same control cabinet, 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 in interlaced state 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.

B.1.3.3 Grounding

The VFD must be grounded safely and reliably in operation. Grounding has the priority in all EMC methods because it does not only ensure the safety of equipment and persons, but also it is the simplest, most effective and lowest-cost solution for EMC problems.

Three categories of grounding: special pole grounding, common pole grounding and series-wound grounding. Different control system needs to use special pole grounding, different devices in the same control system needs to use common pole grounding, and different devices connected by the same power cables needs to use series-wound grounding.

B.1.3.4 Leakage current

Leakage current includes line-to-line leakage current and over-ground leakage current. Its value depends on distributed capacitances and carrier frequency of VFD. The over-ground leakage current, which is the current passing through the common ground wire, 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.

B.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

B.1.4 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).

B.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:

B.2.1 Electromagnetic noise interference

Generally, conduction interference transmits interference via cables. When the interfered devices and the VFD use the same power or electrical connection, conduction interference may easily occur. For such interference, you can adopt the following solutions: install the high-performance power filter of our company at the power input side of the VFD; install the amorphous magnetic ring on the output motor cable and coil 2–3 turns, in the case of severe conditions, you can install the output power filter; install small amorphous magnetic ring on the signal cable and coil 2–3 turns; reduce the carrier frequency appropriately. (Cautions: Too low carrier frequency will increase harmonic and motor noise.)

Radiation interference transmits interference via space and the interfered devices are generally instruments with weak signals, such as sensors and signal controllers. When the interfered devices and the VFD are in the same control cabinet or in a short distance, radiation interference and thus malfunction may easily occur. In this case, we recommend the following solutions: Try not to put the signal devices and the VFD in the same cabinet and keep the signal devices away from the interference source; use shielded twisted pairs for the signal cables and ground the shielded layer 360 degrees reliably.

Near-field induction transmits interference via near-field inductive coupling among cables. Generally, the power cable and the signal cable are too close. In this case, you can adopt the following solutions: Arrange the signal cable and the power cable separately; keep the signal cable away from the power cable; use the shielded cables and ground the shielded layer 360 degrees reliably.

The signal devices should be grounded separately. To avoid common ground interference, do not ground the signal devices with the VFD together.

B.2.2 Harmonic interference

Harmonic interference transmits interference in two ways: interfere the motor through the output port and thus influence the service life of the motor; interfere other devices through the power port. In this case, you can be adopt the following solutions: Install the reactor at the output port of the VFD; install RC absorber at the output port of the VFD; in the case of severe conditions, suggest installing the LC sine filter at the output port; install the reactor at the input power port, for four-quadrant VFD, install the LC sine filter at the input power port; increase the carrier frequency appropriately. (Cautions: Too high carrier frequency will increase temperature rise, electromagnetic noise and leakage current.)

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