Preface

This manual provides a comprehensive introduction on how to correctly use the GESI series inverter. Before use (installation, operation, maintenance, inspection, etc.), please make sure to read this manual carefully. Additionally, it is crucial to fully understand the safety precautions associated with the product prior to its use.

Notes
● To better illustrate the details of the product, some illustrations in this manual may depict the product without its outer cover or safety cover. When using this product, please ensure that the casing or cover are properly installed as required and that you operate the product strictly according to the instructions provided. ● The illustrations in this instruction manual are for illustrative purposes only and may differ from the product you ordered. ● When there are product upgrades or specification changes, the contents of this manual will be updated in a timely manner to ensure accuracy and ease of use. ● If you need to order a new manual due to damage or loss of the original one, please contact our regional agents or our customer service center directly. ● Should you have any questions during use, please do not hesitate to contact our customer service center.

Table of contents

Chapter 1 Safety and Precautions

Definition:
In this manual, safety precautions are divided into the following two categories:
Danger: Danger caused by failure to operate as required, which may lead to serious injury or even death;
Caution: Danger caused by failure to operate as required, which may result in moderate or minor injuries, and equipment damage;

Please read this chapter carefully and follow the safety precautions outlined here when installing, commissioning and repairing this product. In the event of any injury or damage due to non-compliance, our company shall not be held liable.

1.1 Safety matters

1.1.1 Before installation:

 Danger	● Please do not install if there is water present in the control system, or if there are missing parts or damaged parts! ● Please do not install if the packing list does not match the actual product name!
 Caution	● The equipment should be lifted and placed with care during transportation, otherwise it may be damaged! ● Please do not use the equipment if the drive is damaged or if any components are missing, as this may pose a risk of injury! ● Do not touch the components of the control system with your hands; otherwise, there may be a risk of static electricity damage!

1.1.2 During installation:

 Danger	● Please install the equipment on flame-retardant objects such as metal and keep it away from flammable materials. Otherwise, it may cause a fire! ● Do not arbitrarily twist the fixing bolts of equipment components, especially the bolts with red marks!
 Caution	● Avoid letting wire leads or screws fall into the drive. Otherwise, the drive may be damaged! ● Please install the drive in a place with little vibration and out of direct sunlight. ● When placing two or more inverters in the same cabinet, please pay attention to the installation position to ensure proper heat dissipation.

1.1.3 When wiring:

 Danger	● The instructions in this manual must be strictly followed and the work must be performed by professional electrical engineers; otherwise, unexpected dangers may occur! ● The inverter and the power supply must be separated by a circuit breaker, otherwise, a fire may occur!

	● Before wiring, please ensure that the power supply is in a zero-energy state; otherwise, there may be a risk of electric shock! ● Please correctly ground the inverter according to the standards; otherwise, there may be a risk of electric shock!
 Caution	● Never connect input power to the output terminals (U, V, W) of the inverter. Pay close attention to the markings on the wiring terminals and be sure to connect the correct wires! Otherwise, the drive may be damaged! ● Ensure that the wiring meets the local EMC requirements and safety standards. For recommended wire diameters, please refer to the manual. Failure to do so may result in an accident! ● Never connect the braking resistor directly between the (+) and (-) terminals of the DC bus; otherwise, it may cause a fire! ● The encoder must use shielded wire, and the shielding layer must ensure reliable single-end grounding!

1.1.4 Before powering on:

 Danger	● Please confirm whether the voltage level of the input power supply matches the rated voltage level of the inverter; whether the wiring positions on the power input terminals (R, S, T) and output terminals (U, V, W) are correct; check for any short circuits in the peripheral circuit connected to the drive and ensure that all connected lines are secure. Failure to do so may result in damage to the drive! ● Please note that no part of the inverter needs to undergo a withstand voltage test, as the product has already undergone this test before leaving the factory. Attempting to perform such a test by yourself may cause an accident!
 Caution	● The inverter must be covered before it can be powered on. Otherwise, it may cause electric shock! ● All peripheral accessories must be wired in accordance with the instructions provided in this manual and connected correctly as per the specified circuit connection methods. Otherwise, it may cause an accident!

1.1.5 After powering on:

 Danger	● Do not open the cover once the equipment is powered on, as this may pose a risk of electric shock! ● Do not touch the drive and surrounding circuits with wet hands, as this may pose a risk of electric shock! ● Do not touch any input or output terminals of the inverter, as this may pose a risk of electric shock! ● Upon powering on, the inverter will automatically conduct a safety check on the external high-voltage circuit. At this time, it is crucial that you do not touch the U, V, W terminals of the drive or the motor terminals, as this may pose a risk of electric shock!

 Caution	• If parameter identification is necessary, be mindful of the potential risk of injury due to the motor's rotation. Failure to take proper precautions could result in an accident! • Please do not arbitrarily change the manufacturer parameters of the inverter, as doing so may cause damage to the equipment!

1.1.6 During operation:

 Danger	• Do not touch the cooling fan or discharge resistor to test the temperature, as this may result in burns! • Only professional technicians are allowed to perform signal detection during operation. Otherwise, personal injury or equipment damage may occur!
 Caution	• While the inverter is in operation, ensure that no objects fall into the equipment, as this may cause damage to the equipment! • Do not use the contactor on-off method to control the start and stop of the drive, as this may cause damage to the equipment!

1.1.7 During maintenance:

 Danger	• Do not repair or maintain the equipment while it is still powered on, as this may pose a risk of electric shock! • Before proceeding with any maintenance or repair work on the drive, ensure that the inverter voltage has dropped below AC 36V, which should be confirmed two minutes after the power is turned off. Otherwise, the residual charge on the capacitor may be harmful! • Personnel without professional training are not allowed to repair or maintain the inverter. Otherwise, personal injury or equipment damage may occur! • After replacing the inverter, parameters must be set and all pluggable plug-ins must be plugged in and out when the power is off!

1.2 Precautions

1.2.1 Motor insulation testing

Prior to the initial use of the motor, following a prolonged period of storage, and during routine inspections, motor insulation testing should be conducted to prevent damage to the inverter due to insulation failure of the motor windings. During the insulation testing, be sure to separate the motor wires from the inverter. It is recommended to use a 500V mega ohmmeter to ensure that the measured insulation resistance is not less than 5MΩ.

1.2.2 Motor thermal protection

If the selected motor does not match with the inverter in rated capacity, especially when the rated power of the inverter is greater than that of the motor, be sure to adjust the motor protection parameters of the inverter or install a thermal relay upstream of the motor to protect the motor.

1.2.3 Operation above power frequency

The output frequency of the inverter ranges from 0 Hz to 3200 Hz. To use the inverter at above 50 Hz, please consider the bearing capacity of the mechanical device.

1.2.4 Vibration of mechanical device

The inverter may encounter mechanical resonance points of the load device at certain output frequencies, which can be avoided by setting the jump frequency parameters in the inverter.

1.2.5 Motor heat and noise

Because the inverter output voltage is a PWM wave, which contains certain harmonics, there may be a slight increase in the temperature rise, noise and vibration of the motor compared to operation under power frequency.

1.2.6 Varistor or power factor improvement capacitors on the output side

The inverter output voltage is a PWM wave. Do not use the inverter if a power factor improvement capacitor or a lightning varistor is on the output side, as it may easily result in transient overcurrent of the inverter, or even damage the inverter.

1.2.7 Switching devices such as contactors used at the input and output ends of the inverter

If a contactor is installed between the power supply and the inverter's input terminal, it is not allowed to use this contactor to control the start and stop of the inverter. Should it be necessary to use the contactor to control the start and stop of the inverter, there must be an interval of at least one hour. Frequent charging and discharging tend to reduce the service life of the capacitors in the inverter. If there are switching devices such as contactors between the output terminal and the motor, ensure that the inverter is turned on and off when there is no output, otherwise it is easy to cause damage to the module inside the inverter.

1.2.8 Use beyond the rated voltage range

It is not advisable to use the GESI series inverter outside the allowable operating voltage range specified in the manual, as this may easily cause damage to the components inside the inverter. If necessary, use appropriate step-up or step-down transformer to transform the voltage.

1.2.9 Changing three-phase input to two-phase input

It is not advisable to convert a three-phase inverter in the GESI series into a two-phase inverter, as doing so will cause malfunction or inverter damage.

1.2.10 Lightning surge protection

This series of inverters are equipped with a lightning overcurrent protection device, which provides a certain level of self-protection against induced lightning. For areas where lightning occurs frequently, customers should install additional protection devices at the front end of the inverter.

1.2.11 Altitude and derating

In areas with an altitude of more than 1000 m, the heat dissipation effect of the inverter will deteriorate due to the thin air, and it is necessary to derate the inverter. In this case, please consult our company for technical advice.

1.2.12 Some special usages

If the customer needs to use a connection method other than those recommended in the wiring diagram provided in this manual, such as a common DC bus, please consult our company.

1.2.13 Notes on inverter scrapping

The electrolytic capacitors in the main circuit and on the printed circuit board may explode when burned. Toxic gases will be produced when plastic parts are burned. Please dispose of the inverter as industrial waste.

1.2.14 Compatible motor

1) The standard compatible motor is a four-pole squirrel cage asynchronous induction motor. If the motor is not of this type, please ensure to select the inverter according to the rated current of the motor.

2) The cooling fan of the non-variable frequency motor is coaxially connected to the rotor shaft. When the speed decreases, the cooling effect of the fan decreases. Therefore, if the motor overheats, it is advisable to install an additional strong exhaust fan or replace the motor with a variable frequency motor;

3) The inverter has built-in standard parameters for compatible motors. Depending on the actual situation, it may be necessary to identify the motor parameters or modify the default parameters to match the actual values as much as possible; otherwise, the operation effect and protection performance may be affected;

4) A short circuit in the cable or motor may cause the inverter to alarm or even explode. Therefore, it is advisable to perform insulation resistance test and short-circuit test on the initially installed motor and cables, and perform these tests frequently during routine maintenance. Please note that when conducting such tests, be sure to disconnect the inverter from the tested part.

Chapter 2 Product Information

2.1 Product inspection

Upon receiving the product, please confirm the following items:

Confirmation item	Confirmation method
Whether the product matches the model and type of the one ordered	Please check the nameplate on the side of the GESI inverter
Whether there is any broken or damaged parts	Check the overall appearance and see if it is damaged during transportation
Whether there is any loosening of screws or other fastening parts	Check with a screwdriver if necessary
Whether the instructions, certificates and other accessories are present	GESI User Manual and related accessories

2.4 Selection Guide

Model	Compatible motor		Rated input current (A)	Rated output current (A)
	kW	HP		
Single-phase 220 V ± 15%				
GESI-00040S	0.4	0.5	5	2.3
GESI-00075S	0.75	1	9	4
GESI-00150S	1.5	2	17	7
GESI-00220S	2.2	3	23	9.6
Three-phase 380 V ± 15%				
GESI-00075H	0.75	1	3.4	2.1
GESI-00150H	1.5	2	5	3.8
GESI-00220H	2.2	3	6.8	6

2.5 Technical specifications

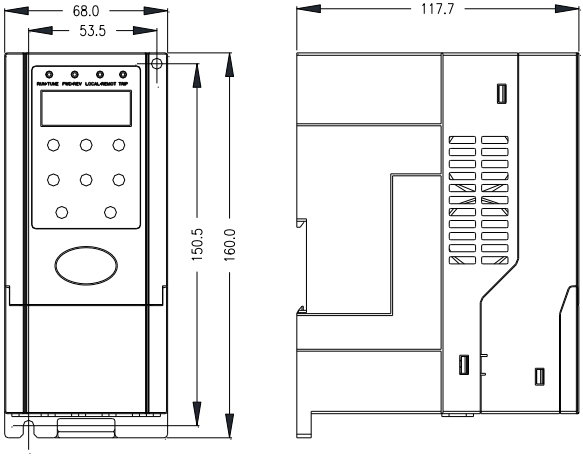
Table 2-2 GESI inverter technical specifications

		Açıklama
Input	Input voltage range	1AC 220 V ± 15%, 3AC 380 V ± 15%
	Input frequency range	47–63 Hz
Output	Output voltage range	0–rated voltage
	Output frequency range	V/f control: 0–3200 Hz SVC (sensorless vector control): 0–320 Hz
Control characteristic	Control mode	V/f control SVC Torque control
	Command execution mode	Panel control Terminal control Serial communication control
	Frequency setting method	Digital setting, analog quantity setting, pulse frequency setting, serial communication setting, multi-speed setting, simple PLC setting, PID setting, etc., enable the combination and mode switching of setting modes.
	Overload capacity	G type: 150% rated current for 60 s, 180% rated current for 10 s, 200% rated current for 3 s
	Starting torque	0.5 Hz/150% (SVC), 1 Hz/150% (V/f)
	Speed range	1:100 (SVC), 1:50 (V/f)
	Speed control accuracy	± 0.5% (SVC)
	Carrier frequency	1.0–16.0 kHz, which can be automatically adjusted according to temperature and load characteristics
	Frequency resolution	Number setting: 0.01 Hz, analog setting: maximum frequency × 0.05%
	Torque boost	Automatic torque boost, manual torque increase range: 0.1%–30.0%
	V/f curve	Three modes: straight line, multi-point, Nth power (1.2, 1.4, 1.6, and 1.8th power, square)
	Acceleration/deceleration method	Straight line/S curve; four acceleration/deceleration time, ranging from 0.1 s to 3600.0 s
	DC braking	DC braking at start and stop DC braking frequency: 0.0 Hz–maximum frequency, braking time: 0.0 s–100.0 s
	Jogging operation	Jogging operation frequency: 0.0 Hz–maximum frequency Jogging acceleration/deceleration time: 0.1 s–3600.0 s
	Simple PLC and multi-stage operation	A maximum of 16-stage speed operation can be achieved through built-in PLC or control terminals.
	Built-in PID	A closed-loop control system that can easily achieve control of process variables (such as pressure, temperature, and flow)
	Automatic voltage regulation	When the grid voltage changes, it can automatically keep the output voltage constant.
	Torque control	Torque control without PG
	Torque limit	It features an excavator-like characteristic, with automatic torque limitation during operation to prevent frequent overcurrent tripping.
Control function	Wobble frequency control	Various triangle wave frequency control, special for textile

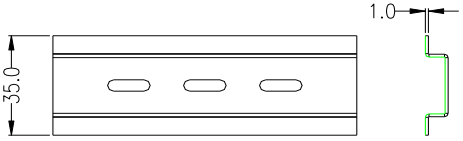
	Time-fixed/length-fixed/count control	Time-fixed/length-fixed/count control function
	Overvoltage and overcurrent stall control	It automatically limits current and voltage during operation to prevent frequent overcurrent and over-voltage tripping.
	Fault protection function	It is equipped with protection function for more than 30 faults such as overcurrent, overvoltage, undervoltage, overheating, phase loss, overload and short circuit. Also, it can record the detailed status of the inverter operation when a fault occurs and is equipped with a fault automatic reset function.
Input/output terminal	Input terminal	Programmable DI: 5-channel switching value input Programmable AI: 1-channel, with an input of voltage 0–10 V or current 0/4–20 mA
	Output terminal	Programmable open collector output: 1 channel (open collector output or high-speed pulse output) Relay output: 1 channel Analog quantity output: 1 channel, 0/4–20 mA or 0–10 V selectable
	Communication terminal	It provides RS485 physical interface and supports MODBUS-RTU communication
HMI	LED display	It can display parameters such as set frequency, output frequency, output voltage, output current, etc.
	Multi-function button	QUICK/JOG button, which can be used as a multi-function button
Environmental conditions	Temperature	The temperature range is -10°C to 40°C. If the temperature exceeds 40°C, derating is required, with a maximum allowable temperature not exceeding 50°C. For every 1°C increase beyond 40°C, derating by 4% is required.
	Humidity	≤ 90, no moisture condensation
	Altitude	≤ 1000 m: output of rated power; >1000 m: output derating
	Storage temperature	-20°C–60°C
	Storage environment	Indoors, no direct sunlight, dust, corrosive gas, flammable gas, oil mist, steam, dripping water, salt, or vibration

2.6 Product appearance and hole size

2.6.1 Product components description



GESI series machine supporting guide rail installation



Guide rail dimension drawing

2.7 Daily care and maintenance of the inverter

2.7.1 Daily care

Due to the influence of environmental temperature, humidity, dust and vibration, the components inside the inverter may age, potentially leading to inverter failure or a reduction in its service life. Therefore, it is essential to ensure daily and regular maintenance and upkeep on the inverter.

Daily inspection items:

1) Check for abnormal sound changes during motor operation
2) Check for vibration during motor operation
3) Check if the inverter installation environment has changed
4) Check if the inverter cooling fan is working properly
5) Check if the inverter is overheating

Daily cleaning:

1) Ensure that the inverter should always be kept clean.
2) Effectively remove dust from the surface of the inverter to prevent it from entering the interior. Especially

metal dust.
3) Effectively remove the oil stains from the inverter cooling fan.

2.7.2 Regular inspection

Please regularly inspect areas that are difficult to conduct inspection during operation. Regular inspection items:
1) Check the air duct and clean it regularly
2) Check if the screws are loose
3) Check if the inverter is corroded
4) Check whether there are any signs of arcing on the connecting terminal
5) Conduct main circuit insulation test
Note: When measuring insulation resistance with a megohmmeter (use a DC 500 V megohmmeter), make sure that the main circuit line is disconnected from the inverter. Do not use an insulation resistance meter to test the control circuit insulation. High voltage testing is not necessary (which has already been done at the factory).

2.7.3 Replacement of inverter wearing parts

The main wearing parts of the inverter include cooling fans and electrolytic capacitors for filtering. Their lifespan is closely related to the operating environment and maintenance conditions. The general service life is:

Device	Service life
Fan	2–3 year
Capacitor	4–5 year

Users can determine time of replacement based on the operating time.
1) Cooling fan
Possible causes of damage: bearing wear and blade aging.
Judging criteria: Check whether there are cracks on the fan blades and whether there is abnormal vibration sound when the machine is turned on.
2) Filter electrolytic capacitor
Possible causes of damage: poor input power quality, high ambient temperature, frequent load changes, and electrolyte aging.
Judging criteria: Check whether there is liquid leakage, whether the safety valve is bulging, measurement of electrostatic capacitance, and measurement of insulation resistance.

2.7.4 Storage of the inverter

After purchasing the inverter, users must pay attention to the following items for temporary storage and long-term storage:
When storing, please pack the products in the Company's packaging boxes according to the original form.
Long-term storage will cause the electrolytic capacitor to deteriorate. Therefore, the inverter must be powered on once within 1 year for at least 5 hours, and the input voltage must be slowly increased to the rated value using a voltage regulator.

Chapter 3 Mechanical and Electrical Installation

3.1 Mechanical installation

3.1.1 Installation environment:

1) Environment temperature: Since the ambient temperature has a great impact on the life of the inverter, the operating temperature of the inverter cannot exceed the allowable temperature range (-10°C–40°C).
2) The inverter should be installed on the surface of a flame-retardant object, leaving enough space around it for heat dissipation. The inverter tends to generate a lot of heat when working. And the inverter should be installed vertically on the mounting bracket with screws.
3) The inverter should be installed in a place that is not prone to vibration. The vibration should not exceed 0.6 G. And it should stay away from equipment such as punching machines.
4) The inverter should be installed in a location that avoids direct sunlight, humidity, and places with water droplets.
5) The inverter should be installed in a location free from corrosive, flammable, or explosive gases.
6) The inverter should be installed in a location free from oil, dust, or metal dust.

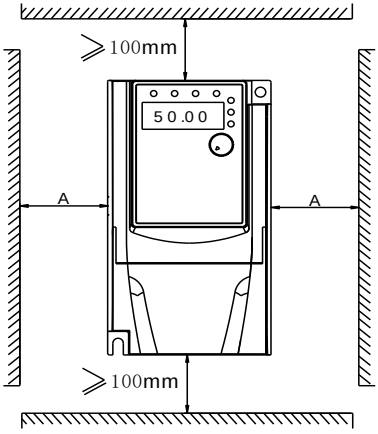


Illustration for single unit installation

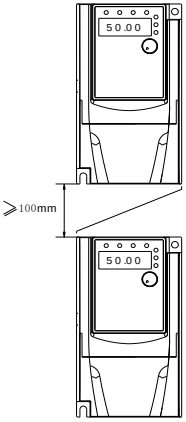


Illustration for vertical installation

Figure 3-1 GESI inverter installation illustration

For single unit installation: no need to consider the A dimension.
For vertical installation: When the inverter is installed vertically, please install the heat insulation guide plate as shown in the figure above.

3.1.2 Mechanical installation needs to focus on heat dissipation, so please pay attention to the following:

1) The inverter should be installed vertically to facilitate heat dissipation upwards, instead of installing upside down. If there are more inverters in the cabinet, it is best to install them side by side. In situations where vertical installation is required, please refer to Figure 3-1 to install the heat insulation guide plate.
2) The installation space should comply with Figure 3-1 to ensure sufficient heat dissipation space for the inverter. However, the heat dissipation of other components in the cabinet should also be considered when arranging.
3) The mounting bracket must be made of flame-retardant material.
4) For applications involving metal dust, it is recommended to install the radiator outside the cabinet. At this time, the space inside the fully sealed cabinet should be as large as possible.

3.2 Electrical installation

3.2.1 Peripheral electrical components selection guide

Table 3-1 Selection guide for peripheral electrical components of GESI inverter

Inverter model	Molded case circuit breaker (MCCB) A	Recommended contactor A	Recommended input side main circuit wire mm^2	Recommended output side main circuit wire mm^2	Recommended control circuit wire mm^2
Single-phase 220 V ± 15%					
GESI-00040S	16	10	2.5	2.5	0.5
GESI-00075S	16	10	2.5	2.5	0.5
GESI-00150S	20	16	4.0	2.5	0.5
GESI-00220S	40	32	4.0	2.5	0.5
Three-phase 380 V ± 15%					
GESI-00075H	10	9	0.75	0.75	0.5
GESI-00150H	10	9	1.5	0.75	0.5
GESI-00220H	10	9	2.5	1.5	0.5

3.2.2 Connection with peripheral devices

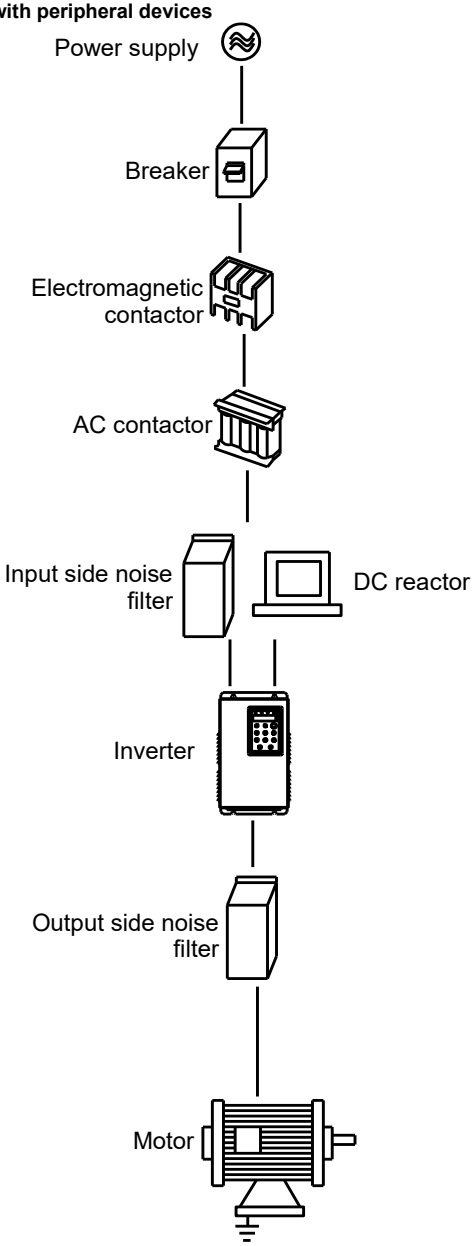


Figure 3-2 Example of connection between GESI inverter and peripheral equipment

- The capacitors or surge suppressors should not be installed on the output side of the inverter, as this

may cause inverter malfunction or damage to the capacitors and surge suppressors.

- The input/output (main circuit) of the inverter contains harmonic components, which may interfere with the communication equipment near the inverter. Therefore, anti-interference filters are installed to minimize interference.
- For details and the selection of components of peripheral devices, refer to the selection manual of the peripheral devices.

3.2.3 Peripheral electrical components instructions

Table 3-2 Instructions for use of peripheral electrical components of GESI inverter

Component name	Installation location	Function description
Molded case circuit breaker	Input circuit front end	Cutting off power supply when downstream equipment is overcurrent
Contactor	Between the MCCB and the inverter input side	Controlling the power on/off operations of the inverter. Frequent power on/off operations (ideally, less than twice per minute) or direct start operations of the inverter through the contactor shall be avoided.
AC input reactor	Inverter input side	Improving the power factor at the input side; Effectively eliminating high-order harmonics at the input side to prevent damage to other equipment due to voltage waveform distortion; Eliminating input current imbalance caused by power phase imbalance.
EMC input filter	Inverter input side	Reducing the external conducted and radiated interference generated by the inverter; Reducing the conducted interference flowing from the power supply to the inverter, and improving the anti-interference ability of the inverter.
AC output reactor	Between the inverter output side and the motor, close to the inverter	At the output side of the inverter, high-order harmonics are typically present in relatively large quantities. When the motor is located at a considerable distance from the inverter, a significant amount of distributed capacitance exists within the line. Under such circumstances, one of these harmonics may cause resonance in the circuit, leading to two notable consequences: Damaging the motor insulation performance, which would cause damage to the motor over time Generating a large leakage current, which would trigger frequent protective actions by the inverter. Generally, if the distance between the inverter and the motor exceeds 100 m, it is recommended to install an output AC reactor.

3.2.4 Wiring illustration

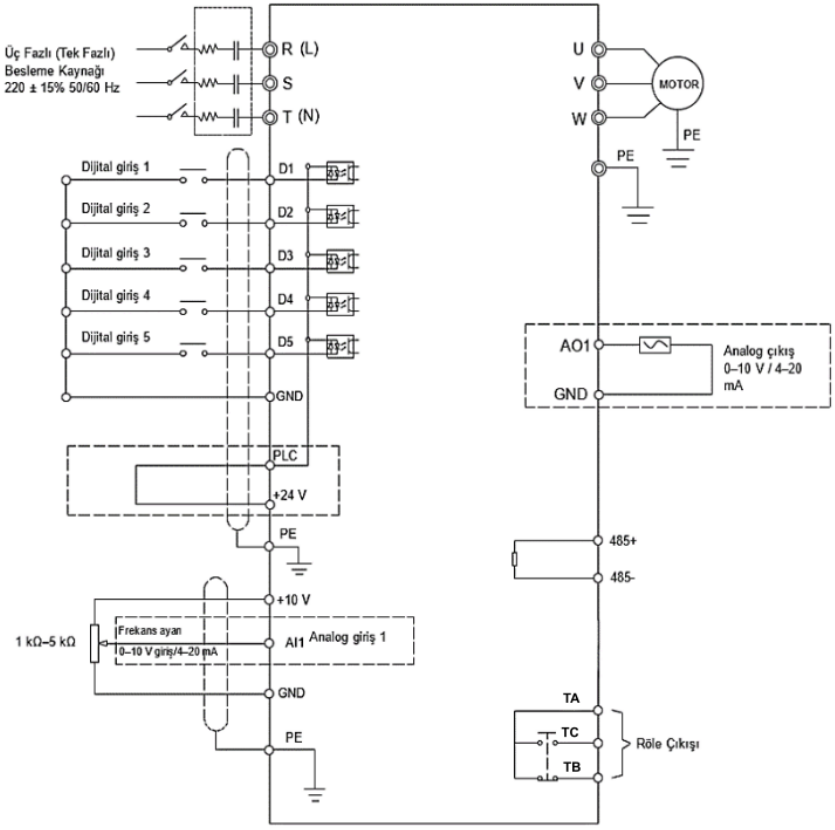


Figure 3-3 GESI inverter series wiring illustration

Note:

1) Terminal ◎ indicates the main circuit terminal, and ○ indicates the control circuit terminal.

2) The braking resistor is selected according to users' needs.

3.2.5 Main circuit terminals and wiring

Danger
● The power switch must be in the off state before wiring, otherwise electric shock accidents may occur! ● Wiring personnel must be professionally trained, otherwise it may cause damage to the equipment and hurt to the personnel! ● It must be grounded reliably, otherwise there is a risk of electric shock or fire!

Caution

- The input power should be consistent with the rated value of the inverter, otherwise the inverter will be damaged!
- The motor and inverter should be compatible, otherwise the motor may be damaged or the inverter protection may be triggered!
- It is strictly forbidden to connect the power supply to the U, V, W terminals, otherwise the inverter will be damaged!
- It is strictly forbidden to connect the braking resistor directly to the DC bus (+) or (-) terminals, otherwise it may cause a fire!

1） The main circuit terminal illustration is shown below:

Figure 3-7 Main circuit terminal illustration (GESI series single-phase 220 V-0.4–2.2 kW)

2） The main circuit terminal illustration is shown below:

Figure 3-7 Main circuit terminal illustration (GESI series, 380 V-0.75-2.2 kW)

3） Main circuit terminal description

Table 3-3 GESI inverter main circuit terminal description

Terminal marking	Name	Description
L, N	Two-phase power input terminal	Current input two-phase power connection point
R, S, T	Three-phase power input terminal	AC input three-phase power connection point
(+), PB	Braking resistor connection terminals	Braking resistor connection terminals
U, V, W	Inverter output terminal	Connecting a three-phase motor
⏚	Ground terminal	Ground terminal

Wiring precautions:

a) Input power R, S, T (L, N);

The input side wiring of the inverter has no phase sequence requirements;

b) Braking resistor connection terminal (+), PB:

The braking resistor connection terminal is valid for this model to confirm that the braking unit has been built-in. The braking resistor selection should refer to the recommended value, and the wiring distance should be less than 5 m. Otherwise, the inverter may be broken.

c) Inverter output side U, V, W:

The capacitors or surge suppressors should not be connected to the inverter output side, otherwise the inverter will be frequently protected or even damaged. When the motor cable is too long, electrical resonance is likely to occur due to the influence of distributed capacitance, which may damage the motor insulation or generate a large leakage current causing the inverter to trigger overcurrent protection.

When the motor cable length is greater than 100 m, an AC output reactor must be installed.

d) Ground terminal ⏚ PE:

The terminal must be reliably grounded, and the grounding wire resistance must be less than 0.1 Ω. Otherwise, the device may malfunction or even be damaged.

The ground terminal ⏚ and the power neutral line N terminal must not be shared.

3.2.6 Control circuit terminals and wiring

1） The control circuit terminal illustration is shown below:

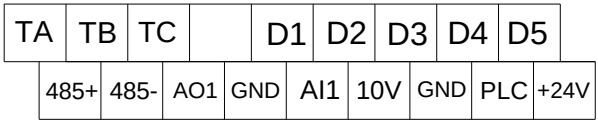


Figure 3-13 Control circuit terminal illustration (GESI series)

2) Control terminal function description

Table 3-4 GESI inverter control terminal function description

Category	Terminal symbol	Terminal name	Function description
Power supply	+10 V–GND	External +10 V power supply	+10 V power supply to the outside, maximum output current: 10 mA Generally used as an external potentiometer working power supply, and the potentiometer resistance range is: 1 kΩ–5 kΩ
	+24 V–GND	External +24 V power supply	It provides +24 V power to the outside, generally used as the working power supply for digital input/output terminal and external sensor power supply Maximum output current: 200 mA
	PLC	External power input terminal	Factory default connection to +24 V When using external signals to drive D1–D6, HDI, the PLC needs to be connected to an external power supply, and the +24 V and PLC short-circuit jumper must be removed.
Analog input	AI1–GND	Analog quantity input terminal 1	1. Input range: DC 0 V–10 V/4 mA–20 mA, determined by the J1 jumper selection on the control board. 2. Input impedance: 22 kΩ for voltage input, 500 Ω for current input.
Digital input	D1	Digital input 1	1. Optical coupler isolation, compatible with bipolar input 2. Input impedance: 4.7 kΩ 3. Voltage range for level input: 9 V–30 V
	D2	Digital input 2	
	D3	Digital input 3	
	D4	Digital input 4	
	D5	Digital input 5	
Analog output	AO1–GND	Analog output 1	The voltage or current output is determined by the J3 wire jumper selection on the control board.

			Output voltage range: 0 V–10 V, output current range: 0 mA–20 mA
Relay output 1	TB-TA	Normally closed terminal	Contact drive capability: AC 250 V, 3 A; DC 30 V, 1 A
	TC-TA	Normally open terminal	
communication	485+	RS485 communication positive	Half-duplex RS485 communication and maximum baud rate 57600 bps, which supports up to 64 nodes.
	485-	RS485 communication negative	

3) Control terminal wiring description

a) Analog input terminal

Due to the susceptibility of weak analog voltage signals to external interference, shielded cables are typically required. Additionally, the wiring distance should be kept as short as possible and must not exceed 20 meters, as illustrated in Figure 3-6. In scenarios where analog signals are severely interfered with, a filter capacitor or ferrite core must be added on the analog signal source side, as shown in Figure 3-7.

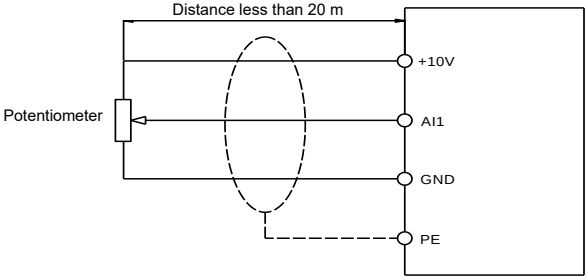


Figure 3-15 Analog quantity input terminal wiring illustration

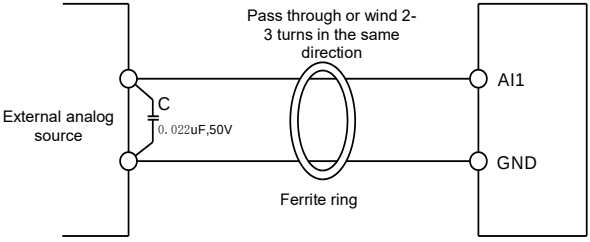


Figure 3-16 Analog quantity input terminal processing wiring illustration

b) Digital input terminal

Generally, shielded cables are required, and the wiring distance should be as short as possible, not exceeding 20 m. When active driving is selected, necessary filtering measures must be taken to address power supply crosstalk. It is recommended to use contact control mode.

D1–D5 terminal wiring

Sinking input method

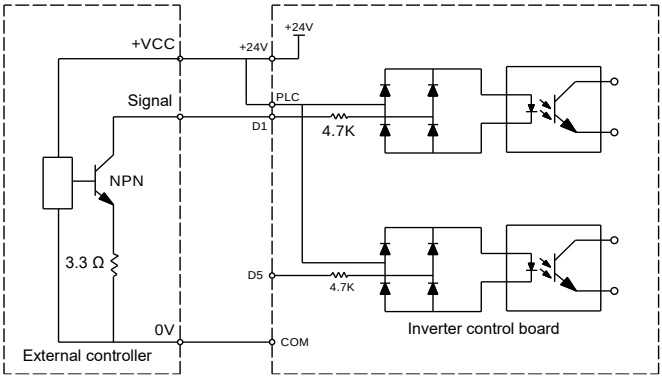


Figure 3-17 Sinking input method This is the most commonly used wiring method. If an external power supply is used, the short circuit piece between +24 V and PLC must be removed, the positive terminal of the external power supply must be connected to the PLC, and the negative terminal of the external power supply must be connected to COM.

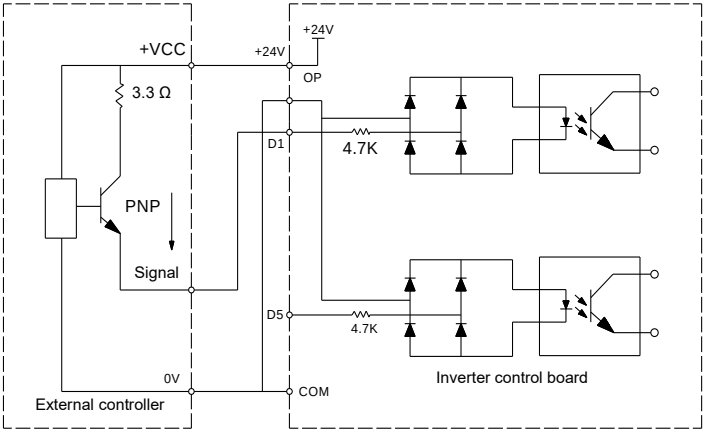


Figure 3-18 Sinking input wiring method

For this wiring method, the short circuit plate between +24 V and PLC must be removed. Additionally, +24 V and the common terminal of the external controller must be connected together, and PLC and COM must be connected together.

Chapter 4 Operation and Display

4.1 Operation and display interface introduction

The operation panel can be used to modify the inverter's function parameters, monitor the inverter's working status, and control the inverter's operation (start, stop). Its appearance and function areas are shown in the figure below:

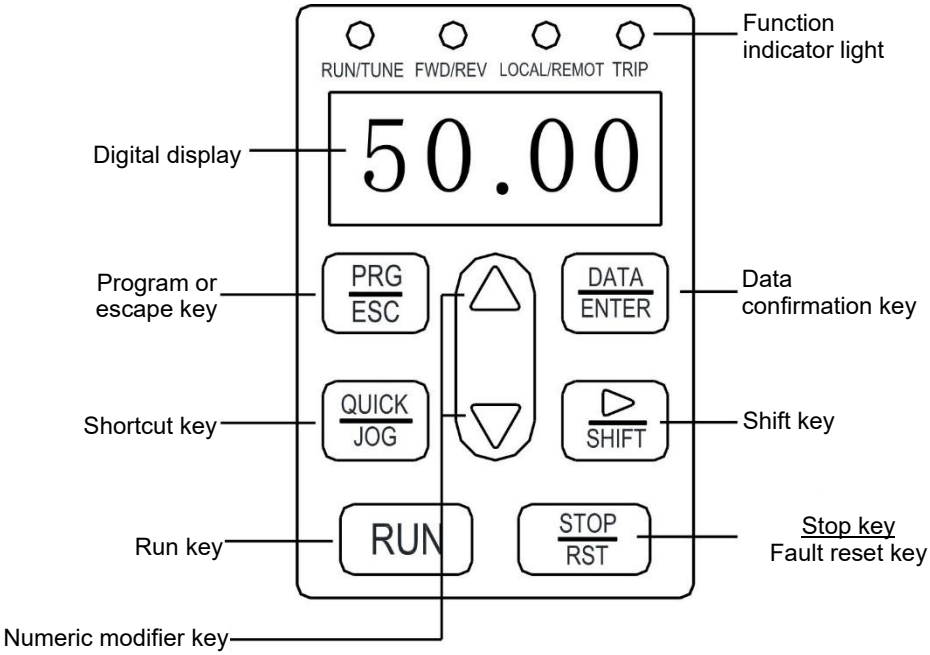


Figure 4-1 Schematic diagram of the operation panel

1) Function indicator light description

Indicator light name	Indicator light description
RUN	Running status indicator light: The light is off when the inverter is in stopped state, and the light is on when the inverter is in running status.
FWD/REV	Forward and reverse indicator light: The light is off when it is in forward rotation, and the light is on when it is in reverse rotation.

LOCAL/REMOT	Control mode indicator light: The light is off when it is in keyboard control state, the light is on when it is in terminal control state, and the light flashes when it is in remote communication control state.
TUNE/TRIP	Overload pre-warning indicator: The light is on when it is in torque control mode, the light flashes slowly when it is in self-learning state, and the light flashes quickly when it is in fault state.

2) Unit indicator light description

Indicator light name	Indicator light description
Hz	Frequency unit
A	Current unit
V	Voltage unit
RPM	Speed unit
%	percentage

3) Digital display area

5-digit LED display can show various monitoring data such as set frequency, output frequency and alarm code.

4) Keyboard key description table

Button	Name	Function
PRG/ESC	Programming key	First level menu entry or exit
DATA/ENTER	Confirm key	Enter the menu screen step by step, set parameters and confirm
△	Incremental key	Incrementing of data or function code
▽	Descending key	Decrement of data or function code
▷	Shift key	Under the stop display interface and the operation display interface, display parameters can be cyclically selected; when modifying parameters, the specific digit position to be modified can be chosen.
RUN	Run key	In keyboard operation mode, it is used to run the operation
STOP/RST	Stop/Reset	During the running state, pressing this key can be used to stop the running operation; in the fault alarm state, it can be used to reset the operation. The characteristics of this key are restricted by function code P7-02.
QUICK/JOG	Multi-function selection key	Select function switch according to P7-01

4.2 Explanation of how to view and modify function codes

The operation panel of the GESI inverter adopts a three-level menu structure for parameter setting and other operations. The three levels of menus are: function parameter group (first level menu) → function

code (second level menu) → function code set value (third level menu). The operation process is shown in Figure 4-2.

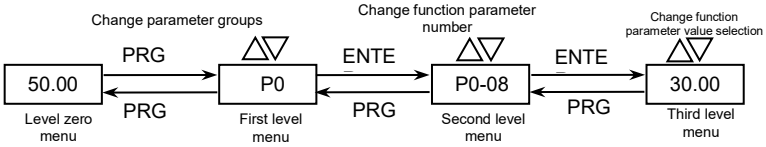
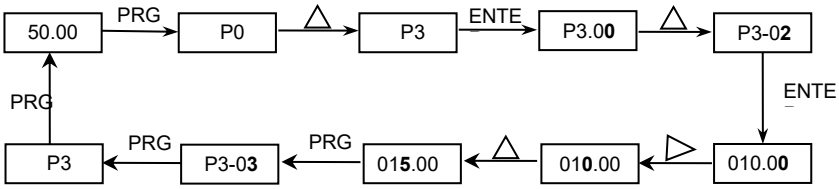


Figure 4-2 Three-level menu operation flow chart

Note: When operating in the third level menu, you can press the PRG key or the ENTER key to return to the second level menu. The difference between the two is that pressing the ENTER key will save the set parameters and then return to the second level menu and automatically transfer to the next function code; while pressing the PRG key will directly return to the second level menu without storing the parameters and return to the current function code.

Example: Change the function code P3-02 from 10.00Hz to 15.00Hz. (Bold characters indicate flicker bit)



In the third level menu state, if the parameter has no flicker bit, it means that the function code cannot be modified, and the possible reasons are:

1) This function code is a parameter that cannot be modified. Such as actual test parameters, operation record parameters, etc.

2) This function code cannot be modified in the running state and can only be modified after stopping the machine.

4.3 Power-on initialization

During the inverter power-on process, the system is first initialized, and the LED displays "**8.8.8.8.8.**". After waiting for the inverter to be powered on, if there is a fault, it will be in fault protection state, otherwise it will be in standby state.

4.4 Fault protection

After a fault occurs in the inverter, the inverter will display the fault code and record output current, output voltage and other parameters of the frequency converter at the time of the fault. For details, please refer to the P9 (Fault and protection) parameter group. The user can reset the fault through the STOP/RST key on

the keyboard or the external terminal.

4.5 Standby

In the stopped and standby states, various status parameters can be displayed respectively. Function code P7-05 (stopped status display parameter) can be used to select whether the parameter is displayed according to the binary bit.

In the stopped state, there are thirteen stopped state parameters that can be selected to be displayed or not, namely: set frequency, bus voltage, DI terminal input state, DO output state, analog input AI1 voltage, analog input AI2 voltage, radiator temperature, count value, actual length value, PLC operation stage, load speed display, PID setting, HDI input pulse frequency. Press the " ▷ " key to switch the display of the selected parameters in sequence.

When the inverter is powered off and then powered on again, the displayed parameters are defaulted to the parameters selected before the inverter was powered off.

4.6 Running

There are 32 status parameters that can be displayed in the running state. The function codes P7-03 (running state display parameter 1) and P7-04 (running state display parameter 2) can select whether to display the parameters according to the binary bit. They are: operating frequency, set frequency, bus voltage, output voltage, output current, output power, output torque, DI input state, DO output state, analog input AI1 voltage, analog input AI2 voltage, radiator temperature, actual count value, actual length value, linear velocity, PID setting, PID feedback, etc. Press the " ▷ " key to switch the display of the selected parameters in sequence.

4.7 Password setting

The inverter provides a user password protection function. When PP-00 is set to non-zero, it is the user password. The password protection takes effect when exiting the function code editing state. Press the PRG key again and "-----" will be displayed. The user password must be entered correctly to enter the normal menu, otherwise it cannot be entered.

To cancel the password protection function, you can only enter with the password and set PP-00 to 0.

4.8 Self-learning of motor parameter

Select the vector control mode. Before the inverter is running, the nameplate parameters of the motor must be accurately entered. The GESI inverter matches the standard motor parameters based on the nameplate parameters. The vector control mode is highly dependent on the motor parameters. To obtain good control performance, the accurate parameters of the controlled motor must be obtained.

The steps for automatic tuning of motor parameters are as follows:

Firstly, select the command source (P0-02) as the operation panel command channel. Then please enter the following parameters according to the motor nameplate parameters:

P1-00: Motor type selection

P1-01: Motor rated power

P1-02: Motor rated voltage

P1-03: Motor rated current

P1-04: Motor rated frequency

P1-05: Motor rated speed

If the motor can be completely disconnected from the load, select 12 (comprehensive self-learning of motor parameters) for P1-37, and then press the RUN key on the keyboard panel. The inverter will automatically calculate the following parameters of the motor:

P1-06: Motor stator resistance

P1-07: Motor rotor resistance

P1-08: Motor leakage inductance

P1-09: Motor mutual inductance

P1-10: Motor no-load current

Complete the automatic tuning of motor parameters.

If the motor cannot be completely disconnected from the load, select 11 (motor parameter static self-learning) for P1-37, and then press the RUN key on the keyboard panel. The inverter will automatically calculate the following parameters of the motor:

P1-06: Motor stator resistance

P1-07: Motor rotor resistance

P1-08: Motor leakage inductance

Chapter 5 Function Parameter Table

The function parameters of GESI series inverters are divided into 19 groups according to their functions, namely P0–PP, A0, and U0. Each function group contains several function codes. For example, "P1-10" means the 10th parameter in the 1st group. P0–PE are basic function parameter groups; PF is the manufacturer parameter group, and users have no right to view this group of parameters; A0 is the torque control function parameter group; U0 is the monitoring function parameter group.

PP-00 is set to a non-zero value, which means that a parameter protection password is set. In the function parameter mode and the user parameter change mode, the parameter menu can only be entered after entering the correct password. To cancel the password, PP-00 must be set to 0.

A0 and U0 are hidden parameter groups by default. The display properties of A0 and U0 parameter groups can be set by modifying parameter PP-02.

The symbols in the function table are explained as follows:
"○": Indicates that the set value of this parameter can be changed when the inverter is in the stopped or running state;
"◎": Indicates that the sett value of this parameter cannot be changed when the inverter is in the running state;
"●": Indicates that the value of this parameter is the actual detection record value and cannot be changed.

5.1 Basic parameter summary table

Function code	Name	Setting range	Factory default	Change
P0 group Basic functions				
P0-01	Control mode	0: Sensorless vector control Sensorless vector control, that is, open-loop vector control, is suitable for common high-performance control occasions where one inverter can only drive one motor. Such as machine tools, centrifuges, wire drawing machines, injection molding machines and other loads. 2: V/F control V/F control is suitable for occasions where the load requirements are not high, or where one inverter drives multiple motors, such as fans and pump loads. It can be used in situations where one inverter drives multiple motors.	2	◎
P0-02	Run instruction channel	0: Operation panel command channel (LED off) 1: Terminal command channel (LED on) 2: Communication command channel (LED flashes)	1	◎
P0-03	Main frequency source selection	0: Keyboard set frequency The initial value of set frequency is the value of P0-08 (preset frequency). The inverter's set frequency value can be changed by pressing the	2	◎

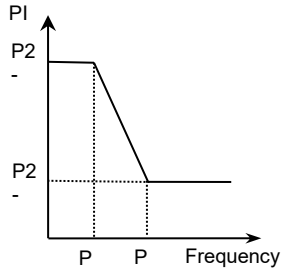
		▲ and ▼ keys on the keyboard (or the UP and DOWN keys on the multi-function input terminal). When the inverter is powered off and then powered on again, the set frequency value is restored to the P0-08 (digital set preset frequency) value. 1: Keyboard set frequency The initial value of set frequency is the value of P0-08 (preset frequency). The inverter's set frequency value can be changed by pressing the ▲ and ▼ keys on the keyboard (or the UP and DOWN keys on the multi-function input terminal). When the inverter is powered off and then powered on again, the set frequency is the set frequency at the time of the last power failure, which is memorized by the keyboard ▲ and ▼ keys or the correction amount of the terminals UP and DOWN. It should be noted that P0-23 is the "digital set frequency stop memory selection". P0-23 is used to select whether the frequency correction amount is memorized or cleared when the inverter stops. P0-23 is related to shutdown, not to power-off memory, so please pay attention to it in application. 2: Analog quantity AI1 setting 3: Reserved 4: Panel potentiometer setting The frequency is set by the potentiometer on the operation panel. 5: High speed pulse HDI setting The frequency is given through terminal pulses. Pulse given signal specifications: voltage range 9V–30V, frequency range 0kHz–100kHz. The pulse command can only be input from the multi-function input terminal HDI. The relationship between the HDI terminal input pulse frequency and the corresponding setting is set through P4-28–P4-31, which is a straight line correspondence between 2 points. The 100.0% setting corresponding to the pulse input refers to the percentage relative to P0-10 (maximum frequency). 6: Multi-speed operation setting When selecting the multi-segment instruction operation mode, different state combinations of the digital input D terminal are required to correspond to different set frequency values. It is possible to set up 4 multi-segment command terminals and 16 states of the 4 terminals, which can correspond to any 16 multi-segment commands through the PC group function code.		

		The multi-segment command is a percentage relative to P0-10 (maximum frequency). When the digital input D terminal functions as a multi-segment command terminal, corresponding settings need to be made in P4 Group. For details, please refer to the description of relevant function parameters in P4 Group. 7: Simple PLC program setting When the frequency source is a simple PLC, the inverter's operating frequency source can be switched between 1 to 16 arbitrary frequency commands. The holding time of 1 to 16 frequency commands and their respective acceleration and deceleration times can also be set by the user. For specific details, refer to the relevant instructions of the PC group. 8: PID control setting Select the output of the process PID control as the operating frequency. It is generally used for on-site process closed-loop control, such as constant pressure closed-loop control, constant tension closed-loop control, etc. When using PID as the frequency source, you need to set the relevant parameters of the PA (PID function) group. 9: Remote communication settings It means that the main frequency source is given by the host computer through communication.		
P0-04	Auxiliary frequency source B selection	Same as P0-03	0	◎
P0-05	Auxiliary frequency source B reference object selection	0: relative to the maximum frequency 1: relative to the main frequency source A	0	○
P0-06	Auxiliary frequency source B range	0%–150%	100%	○
P0-07	Frequency source superposition method	Units digit: Frequency source selection 0: Main frequency source A 1: Primary and secondary results (The operation relationship is determined by tens) 2: Switch between main frequency source A and auxiliary frequency source B 3: Switch between main frequency source A and main and auxiliary operation results 4: Switch between auxiliary frequency source B and main and auxiliary operation results Tens digit: main auxiliary operation relationship of frequency source 0: A + B 1: A - B 2: Max (A, B) 3: Min (A, B)	00	○
P0-08	Keyboard set frequency	0.00 Hz–P0-10 (maximum frequency)	50.00 Hz	○
P0-09	Running direction	0: Same direction 1: Opposite direction	0	○
P0-10	Maximum output frequency	50.00 Hz–300.00 Hz	50.00 Hz	◎

P0-11	Upper frequency source	0: P0-12 setting 1: AI1 2: Reserved 3: Panel potentiometer setting 4: HDI high speed pulse setting 5: Communication given	0	◎
P0-12	Upper limit of frequency	P0-14 (lower limit of frequency)–P0-10 (maximum frequency)	50.00 Hz	○
P0-13	Upper frequency offset	0.00 Hz–P0-10 (maximum frequency)	0.00 Hz	○
P0-14	Lower limit of frequency	0.00 Hz–P0-12 (upper limit of frequency)	0.30 Hz	○
P0-15	Carrier frequency	1.0 kHz–16.0 kHz	Model determination	○
P0-16	Carrier frequency changes with temperature	0: No 1: Yes	0	○
P0-17	Acceleration time 1	0.01 s–36000 s	Model determination	○
P0-18	Deceleration time 1	0.01 s–36000 s	Model determination	○
P0-19	Acceleration and deceleration time unit	0: 1 s 1: 0.1 s 2: 0.01 s	1	◎
P0-21	Auxiliary frequency source bias frequency during stacking	0.00 Hz–P0-10 (maximum frequency)	0.00 Hz	○
P0-22	Frequency command resolution	1: 0.1 Hz 2: 0.01 H:	2	◎
P0-23	Digital set frequency stop memory selection	0: No memory No memory means that after the inverter stops, the frequency value set by the keyboard is restored to the value of P0-08 (preset frequency), and the frequency correction performed by the keyboard ▲, ▼ keys or terminals UP, DOWN is cleared to zero. 1: Memory Memory means that after the inverter stops, the keyboard set frequency is retained as the set frequency at the last stop time, and the frequency correction performed by the keyboard ▲, ▼ keys or terminals UP, DOWN remains valid.	1	○
P0-24	Reserved			●
P0-25	Acceleration and deceleration time reference frequency	0: P0-10 (maximum frequency) 1: set frequency 2.100 Hz	0	◎
P0-26	Runtime frequency instruction UP/DN benchmark	0: operating frequency 1: set frequency	0	◎
P0-27	Command source bundled with frequency source	Units digit: Operation panel command binding frequency source selection 0: No binding 1: Keyboard set frequency 2: AI1 3: Reserved 4: Panel potentiometer 5: High speed pulse HDI setting 6: Multi-speed 7: Simple PLC 8: PID Tens digit: Terminal command binding frequency	0000	○

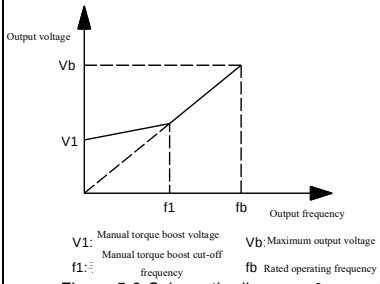
		source selection Hundreds digit: Communication command binding frequency source selection Thousands digit: Automatically run binding frequency source selection		
P0-29	Application macro	Setting range: 0-65535 10000: Function code restore factory settings macro 1: Frequency conversion single pump constant pressure water supply macro 2: One-to-three constant pressure water supply macro (1 variable frequency pump and 2 power frequency pumps) 3: One-to-five constant pressure water supply macro (1 variable frequency pump 4 power frequency pumps) 7: Fire inspection water supply macro 11: CNC machine tool 100Hz macro 1 12: CNC machine tool 100Hz macro 2 17: Spindle engraving 300Hz macro 1 (straight line with multi-segment) 18: Spindle engraving 300Hz macro 2 (multi-point and multi-segment) 19: Spindle engraving 300Hz macro 3 (17+sleep) 20: Spindle engraving 300Hz macro 4 (18+sleep) 21: Spindle engraving 400Hz macro 1 (straight line with multi-segment) 22: Spindle engraving 400Hz macro 2 (multi-point and multi-segment) 23: Spindle engraving 400Hz macro 3 (21+sleep) 23: Spindle engraving 400Hz macro 4 (22+sleep) 30: Spindle engraving 600Hz macro 4 (multi-point + sleep) *Note 1: Before selecting a macro number, first restore P0-29 to factory default, then select a macro number.* *Note 2: One-to-multiple water supply detailed inspection b0 parameter group*	0	◎
P1 Group Motor parameters				
P1-00	Motor type selection	0: Ordinary asynchronous machine 1: Variable frequency asynchronous machine	0	◎
P1-01	Rated power of motor	0.1–1000 KW	Model determination	◎
P1-02	Rated voltage of motor	1–380 V	Model determination	◎
P1-03	Rated current of motor	0.01 A–655.35 A (Inverter power <= 55Kw) 0.1 A–6553.5 A (Inverter power > 55Kw)	Model determination	◎
P1-04	Rated frequency of motor	0.01 Hz–P0-10 (maximum frequency)	Model determination	◎
P1-05	Rated speed of motor	1 rpm–36000 rpm	Model determination	◎
P1-06	Motor stator resistance	0.001 Ω–65.535 Ω (Inverter power <= 55Kw) 0.0001 Ω–6.5535 Ω (Inverter power > 55Kw)	Motor parameters	◎
P1-07	Motor rotor resistance	0.001 Ω–65.535 Ω (Inverter power <= 55Kw) 0.0001 Ω–6.5535 Ω (Inverter power > 55Kw)	Motor parameters	◎

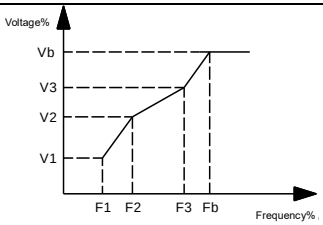
P1-08	Motor leakage inductance	0.01 Mh–655.35 Mh (Inverter power <= 55Kw) 0.001 Mh–65.535 Mh (Inverter power > 55Kw)	Motor parameters	◎
P1-09	Motor mutual inductance	0.1 Mh–6553.5 Mh (Inverter power <= 55Kw) 0.01 Mh–655.35 Mh (Inverter power > 55Kw)	Motor parameters	◎
P1-10	Motor no-load current	0.01 A–P1-03 (rated current of motor) (Inverter power <= 55Kw) 0.1 A–P1-03 (rated current of motor) (Inverter power > 55Kw)	Motor parameters	◎
P1-37	Self-learning of motor parameter	0: No operation No operation means that the self-learning of motor parameter is prohibited. 1: Static self-learning of motor parameter The static self-learning of motor parameters is suitable for situations where the asynchronous machine and the load are not easy to be disconnected and complete self-learning cannot be performed. Before performing static self-learning of an asynchronous machine, the motor type and motor nameplate parameters (P1-00–P1-05) must be set correctly. The asynchronous machine is in static self-learning mode, and the inverter can obtain the three parameters from P1-06 to P1-08. Action description: Set the function code to 1, the keyboard displays TUNE, and then press the RUN key, the inverter will perform static self-learning. 2: Comprehensive self-learning of motor parameters To ensure the dynamic control performance of the inverter, please select comprehensive self-learning of motor parameters. At this time, the motor must be disconnected from the load to keep the motor in a no-load state. During the comprehensive self-learning process, the inverter first performs static self-learning, then accelerates to 80% of the motor rated frequency according to the acceleration time P0-17, and maintains it for a period of time, and then decelerates and stops according to the deceleration time P0-18 and ends the self-learning. Before performing comprehensive motor self-learning, you need to set the motor type and motor nameplate parameters P1-00–P1-05. Through comprehensive motor self-learning, the inverter can obtain the five motor parameters P1-06–P1-10 and the vector control current loop PI parameters P2-13–P2-16. Action description: Set the function code to 2, the keyboard displays TUNE, and then press the	0	◎

		RUN key, the inverter will perform rotation self-learning. 3: Static Tuning 2 11: Synchronous motor load tuning (static self-learning) 12: Synchronous motor no-load tuning (comprehensive self-learning)		
P2 Group Vector control parameters				
P2-00	Speed loop proportional gain 1	1–100	30	○
P2-01	Speed loop integral time 1	0.01 s–10.00 s	0.50s	○
P2-02	Switch low point frequency	0.00-P2-05	5.00 Hz	○
P2-03	Speed loop proportional gain 2	1–100	20	○
P2-04	Speed loop integral time 2	0.01 s–10.00 s	1.00 s	○
P2-05	Switch high point frequency	P2-02–P0-10 (maximum frequency) The inverter runs at different frequencies and different speed loop PI parameters can be selected. When the operating frequency is less than P2-02 (switching frequency 1), PI adjustment parameters of speed loop are P2-00 and P2-01. When the operating frequency is greater than P2-05 (switching frequency 2), PI adjustment parameters of speed loop are P2-03 and P3-04. The speed loop PI parameters between switching frequency 1 and switching frequency 2 are calculated linearly according to two sets of PI parameters as shown in Fig.6-2  Figure 5-2 PI parameter diagram By setting the proportional coefficient and integral time of the speed regulator, the speed dynamic response characteristics of the vector control can be adjusted. Increasing the proportional gain and reducing the integral time can speed up the dynamic response of the speed loop. However, if the proportional gain is too large or the integral time is too small, the system may oscillate. The recommended adjustment method is: If the factory default cannot meet the	10.00 Hz	○

		requirements, it can make fine adjustments based on the factory value parameters, first increase the proportional gain to ensure that the system does not oscillate; and then reduce the integral time so that the system has both faster response characteristics and smaller overshoot. Note: Improper PI parameter settings may cause excessive speed overshoot or even overvoltage fault when the overshoot falls back.		
P2-06	Vector control slip gain	50%–200%	120%	○
P2-07	Speed loop filter time constant	0.000 s–0.100 s In vector control mode, the output of the speed loop regulator is the torque current command. This parameter is used to filter the torque command. This parameter generally does not need to be adjusted. When the speed fluctuates greatly, the filter time can be appropriately increased; if the motor oscillates, this parameter should be appropriately reduced. The filter time constant of the speed loop is small, the inverter output torque may fluctuate greatly, but the speed response is fast.	0.015s	○
P2-08	Vector control over excitation gain	0–200 During deceleration process of the inverter, over excitation control can suppress the rise of bus voltage and avoid over-voltage faults. The larger the over excitation gain, the stronger the suppression effect. In situations where the inverter is prone to over voltage alarm during deceleration, it is necessary to increase the over excitation gain. However, if the over excitation gain is too large, it will easily lead to an increase in output current, which needs to be weighed in the application. For situations where the inertia is very small, there will be no voltage rise during motor deceleration, so it is recommended to set the over excitation gain to 0. For situations with braking resistors, it is also recommended to set the over excitation gain to 0.	64	○
P2-09	Torque upper limit source in speed control mode	0: Function code P2-10 setting 1: AI1 2: Reserved 3: Panel potentiometer setting 4: High speed pulse HDI setting 5: Communication given 6: Reserved 7: Reserved The full scale of options 1-5 corresponds to P2-10	0	○
P2-10	Digital setting of upper torque limit	0.0%–200.0% P2-09 is used to select the setting source of the torque upper limit. When it is set by analog quantity, high-speed pulse HDI setting, or	150.0%	○

		communication, 100% of the corresponding setting corresponds to P2-10, and 100% of P2-10 is the rated torque of the inverter.		
P2-13	Excitation adjustment proportional gain	0–60000	2000	○
P2-14	Excitation regulation integral gain	0–60000	1300	○
P2-15	Torque adjustment proportional gain	0–60000	2000	○
P2-16	Torque regulation integral gain	0–60000	1300	○
P2-17	Speed loop integral properties	Units digit: Integral separation 0: Invalid 1: Valid	0	○
P2-18	Synchronous motor field-weakening mode	0–2	0	◎
P2-19	Synchronous motor field-weakening coefficient	0–50	0	○
P2-20	Synchronous motor maximum field-weakening current	0–300	0	○
P2-21	Synchronous motor automatic field-weakening tuning coefficient	10–500	0	○
P2-22	Synchronous motor field-weakening integral multiple	0–1	0	◎
P2-23	Synchronous motor field-weakening depth	1–200%	20%	○
P3 Group V/F Control Parameters				
P3-00	VF curve setting	0: Straight line V/F 1: Multipoint V/F 2: Square V/F 3: 1.2 power V/F 4: 1.4 power V/F 6: 1.6 power V/F 8: 1.8 power V/F 9: Reserved 10: VF completely separated 11: VF semi-separated 0: Straight line V/F. Suitable for normal constant torque loads. 1: Multipoint V/F. Suitable for special loads such as dehydrators and centrifuges. At this time, by setting the P3-03–P3-08 parameters, you can get any VF relationship curve. 2: Square V/F. Suitable for centrifugal loads such as fans and pumps. 3–8: VF relationship curve between straight line VF and square VF.	0	◎
P3-01	Torque boost	0.0%: (Automatic torque boost) 0.1%–30.0%	Model determination	○
P3-02	Torque boost cut-off frequency	0.00 Hz–P0-10 (maximum frequency) In order to compensate for the low-frequency torque characteristics of V/F control, some boost compensation is made to increase the output voltage of the inverter at low frequency. However, if the torque boost is set too large, the motor is prone to overheating and the inverter is	50.00 Hz	◎

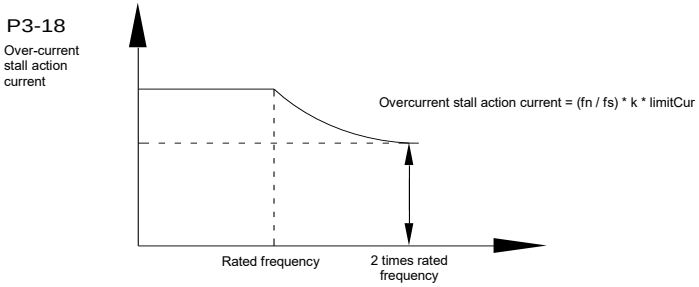
		prone to overcurrent. When the load is heavy and the starting torque of motor is not enough, it is recommended to increase this parameter. When the load is light, torque boost can be reduced. When the torque boost is set to 0.0, the inverter is an automatic torque boost. At this time, the inverter automatically calculates the required torque boost value according to the motor stator resistance and other parameters. Torque boost torque cut-off frequency: Below this frequency, the torque boost is effective, and above this set frequency, the torque boost is invalid. For details, see Figure 6-3.  Figure 5-3 Schematic diagram of manual torque boost		
P3-03	Multi-point VF frequency point 1	0.00 Hz-P3-05	1.30Hz	◎
P3-04	Multi-point VF voltage point 1	0.0%–100.0%	15%	◎
P3-05	Multi-point VF frequency point 2	P3-03–P3-07	5.00 Hz	◎
P3-06	Multi-point VF voltage point 2	0.0%–100.0%	20%	◎
P3-07	Multi-point VF frequency point 3	P3-05–P1-04 (rated frequency of motor)	50.00 Hz	◎
P3-08	Multi-point VF voltage point 3	0.0%–100.0% The six parameters P3-03 to P3-08 define multiple V/F curves. The multi-point V/F curve should be set according to the load characteristics of the motor. It should be noted that the relationship between the three voltage points and frequency points must satisfy: V1 < V2 < V3, F1 < F2 < F3. Figure 6-4 is a schematic diagram of the setting of the multi-point VF curve. If the voltage is set too high at low frequency, the motor may overheat or even burn out, and the inverter may lose speed or overcurrent protection.	0.0%	◎

		 V1-V3: Multi-speed V/F the 1st-3rd voltage percentage F1-F3: Multi-speed V/F the 1st-3rd frequency percentage Vb: Rated voltage of motor Fb: rated operating frequency of the motor Figure 5-4 Schematic diagram of multi-point V/F curve setting		
P3-09	VF slip compensation gain	0.0%–200.0%	0.0%	○
P3-10	VF over excitation gain	0–200 During deceleration process of the inverter, over excitation control can suppress the rise of bus voltage and avoid over-voltage faults. The larger the over excitation gain, the stronger the suppression effect. In situations where the inverter is prone to over voltage alarm during deceleration, it is necessary to increase the over excitation gain. However, if the over excitation gain is too large, it will easily lead to an increase in output current, which needs to be weighed in the application. For situations where the inertia is very small, there will be no voltage rise during motor deceleration, so it is recommended to set the over excitation gain to 0. For situations with braking resistors, it is also recommended to set the over excitation gain to 0.	64	○
P3-11	VF oscillation suppression gain	0–100 The method for selecting this gain is to make it as small as possible while effectively suppressing oscillation to avoid adverse effects on VF operation. When the motor has no oscillation, please select this gain as 0. Only when the motor oscillates obviously, it is necessary to increase the gain appropriately. The larger the gain, the more obvious the suppression of oscillation. When using the oscillation suppression function, the motor rated current and no-load current parameters must be accurate, otherwise the VF oscillation suppression effect will be poor.	Model determination	○
(P3-18)	Over-current stall action current	50–200%	150%	○
(P3-19)	Overcurrent stall suppression enable	0: Invalid 1: Valid	1	○

(P3-20)	Overcurrent stall suppression gain	0–100	20	○
(P3-21)	Current compensation coefficient of double-speed overcurrent stall action	50–200%	50%	○

In the high-frequency area, the motor driving current is small. Compared with the rated frequency, the motor speed drops greatly with the same stall current. In order to improve the operating characteristics of the motor, the stall action current above the rated frequency can be reduced. This method has a good effect on the acceleration performance in some centrifuges and other situations with high operating frequencies, requiring several times field weakening and large load inertia. Overcurrent stall action current exceeding rated frequency = (fs / fn) * k * LimitCur;

Fs is the operating frequency, fn is the rated frequency of the motor, k is P3-21 "double speed overcurrent stall action current compensation coefficient", and LimitCur is P3-18 "overcurrent stall action current"



Schematic diagram of the loss speed action of the double speed overcurrent

Remark:

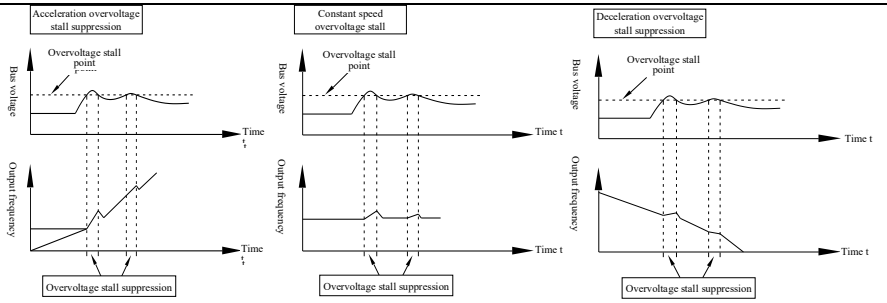
150% of the overcurrent stall action current means 1.5 times the rated current of the inverter;

For high-power motors with carrier frequencies below 2kHz, the increase in pulsating current causes the wave-by-wave current limiting response to be initiated before the overcurrent stall prevention action, resulting in insufficient torque. In this case, please reduce the overcurrent stall prevention action current.

(P3-22)	Overvoltage stall action voltage	330.0 V – 800.0 V	Single phase: 390.0 V Three-phase: 760.0 V	○
(P3-23)	Overvoltage stall enable	0: Invalid, 1: Valid	1	○
(P3-24)	Overvoltage stall suppression frequency gain	0–100	30	○
(P3-25)	Overvoltage stall suppression voltage gain	0–100	30	○
(P3-26)	Overvoltage stall maximum rising frequency limit	0–50 Hz	5 Hz	○

Inverter bus voltage limit (the above braking resistors turn-on voltage setting)

If the bus voltage exceeds the overvoltage stall point of 390V, it means that the electromechanical system is already in the power generation state (motor speed > output frequency), and the overvoltage stall will take effect to adjust the output frequency (consume the excess feedback power). The actual deceleration time will be automatically extended to avoid trip protection. If the actual deceleration time cannot meet the requirements, the over excitation gain can be appropriately increased.



Remark:

When using a braking resistor or adding a braking unit or using an energy feedback unit, please be careful: Please set the value of P3-23 "Overvoltage Stall Enable" to "0", which may cause the deceleration time to be extended.

P3-34	AVR Function Selection	**0**: Turn off AVR **1**: AVR enabled	1	○
P4 Group Input terminal				
P4-00	D1 terminal function selection	0: No function Unused terminals can be set to "No Function" to prevent malfunctions. 1: Forward running 2: Reverse running The forward and reverse rotation of the inverter is controlled through external terminals. 3: Three-wire operation control This terminal is used to determine whether the inverter is running in three-wire control mode. For details, please refer to the description of function code P4-11 (terminal command mode). 4: Forward jogging 5: Reverse jogging FJOG is jogging forward operation, and RJOG is jogging reverse operation. For the jogging operation frequency and jogging acceleration/deceleration time, please refer to the description of function code P8-00, P8-01 and P8-02. 6: Terminal UP 7: Terminal DN Modify the frequency increment and decrement instructions when the frequency is given by external terminals. When the frequency source is set to a digital, the set frequency can be adjusted up and down. 8: Free stop The inverter blocks the output, at which point the motor's parking process is not controlled by the inverter. This method has the same meaning as free stop described in P6-10. 9: Fault reset (RESET) The function of fault reset is realized by using the terminals. It has the same function as the RESET key on the keyboard. This function can be used to achieve remote fault reset. 10: Operation paused The inverter decelerates to stop, but all operating parameters are memorized such as PLC parameters, swing frequency parameters, PID parameters. After the signal from this terminal disappears, the inverter returns to the	1	◎
P4-01	D2 terminal function selection		2	◎
P4-02	D3 terminal function selection		12	◎
P4-03	D4 terminal function selection		13	◎
P4-04	D5 terminal function selection		18	◎
P4-05	Reserved		0	◎
P4-06	HDI/D6 terminal function selection		9	◎

running state before stopping.
11: External fault normally open input
When the signal is sent to the inverter, the inverter reports fault E-15 and performs fault processing according to the fault protection action mode (for details, refer to function code P9-47).
12: Multi-segment command terminal 1
13: Multi-segment command terminal 2
14: Multi-segment command terminal 3
15: Multi-segment command terminal 4
The 16 states of these four terminals can be used to set 16 speed segments or 16 other commands. For details, please see Attached Table 1.

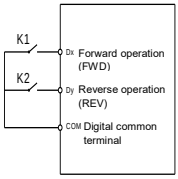
K4	K3	K2	K1	Instruction settings	Corresponding parameter
OFF	OFF	OFF	OFF	Multi-segment instruction 0	PC-00
OFF	OFF	OFF	ON	Multi-segment instruction 1	PC-01
OFF	OFF	ON	OFF	Multi-segment instruction 2	PC-02
OFF	OFF	ON	ON	Multi-segment instruction 3	PC-03
OFF	ON	OFF	OFF	Multi-segment instruction 4	PC-04
OFF	ON	OFF	ON	Multi-segment instruction 5	PC-05
OFF	ON	ON	OFF	Multi-segment instruction 6	PC-06
OFF	ON	ON	ON	Multi-segment instruction 7	PC-07
ON	OFF	OFF	OFF	Multi-segment instruction 8	PC-08
ON	OFF	OFF	ON	Multi-segment instruction 9	PC-09
ON	OFF	ON	OFF	Multi-segment instruction 10	PC-10
ON	OFF	ON	ON	Multi-segment instruction 11	PC-11
ON	ON	OFF	OFF	Multi-segment instruction 12	PC-12
ON	ON	OFF	ON	Multi-segment instruction 13	PC-13
ON	ON	ON	OFF	Multi-segment instruction 14	PC-14
ON	ON	ON	ON	Multi-segment instruction 15	PC-15

16: Acceleration and deceleration time selection terminal 1
17: Acceleration and deceleration time selection terminal 2
18: Frequency source switching
Used to switch to select different frequency sources.
According to the setting of the frequency source selection function code (P0-07), when a certain two frequency sources are set to switch as the frequency source, this terminal is used to switch between the two frequency sources.
19: UP/DN setting reset
(Terminal, keyboard)
When the frequency is set to digital frequency, this terminal can clear the frequency value changed by terminal UP/DOWN or keyboard UP/DOWN, so that the given frequency returns to the value set by P0-08.
20: Run command switching terminal
When the command source is set to terminal control (P0-02=1), this terminal can be used to switch between terminal control and keyboard control.
When the command source is set to communication control (P0-02=2), this terminal can be used to switch between communication control and keyboard control.
21: Acceleration and deceleration prohibited

		Ensure that the inverter is not affected by external signals (except for stop commands) and maintains the current output frequency. 22: PID pause PID is temporarily invalid, the inverter maintains the current output frequency, and no longer performs PID adjustment of the frequency source. 23: PLC status reset When the PLC is paused during execution and runs again, this terminal can be used to restore the inverter to the initial state of the simple PLC. 24: Swing frequency pause The inverter outputs at the center frequency. The swing frequency function is paused. 25: Counter input Input terminal for counting pulses. 26: Counter reset Reset the counter status. 27: Length count input Input terminal for length counting. 28: Length reset Length cleared 29: Torque control prohibited The inverter is prohibited from torque control and enters speed control mode. 30: PULSE frequency input (Only valid for HDI) HDI functions as a pulse input terminal. 31: Reserved 32: Immediate DC braking When this terminal is valid, the inverter directly switches to the DC braking state. 33: External fault normally closed input When the external fault normally closed signal is sent to the inverter, the inverter reports fault E-15 and shuts down. 34: Frequency modification enable If this function is set to be valid, when the frequency changes, the inverter will not respond to the frequency change until the terminal status is invalid. 35: PID action direction is reversed When this terminal is valid, the PID action direction is opposite to the direction set by PA-03. 36: External parking terminal 1 When controlled by keyboard, this terminal can be used to stop the inverter, which is equivalent to the function of the STOP key on the keyboard. 37: Control command switching terminal 2 For switching between terminal control and communication control. If the command source is selected as terminal control, the system switches to communication control when the terminal is valid, and vice versa. 38: PID integral pause When this terminal is valid, the integral adjustment function of PID is suspended, but the proportional and differential adjustment functions of PID are still valid. 39: Switch between frequency source A and preset frequency 40: Switch between frequency source B and		

		preset frequency 42: Reserved 43: PID parameter switching When the PID parameter switching condition is DI terminal (PA-18=1), if the terminal is invalid, PID parameters PA-05–PA-07 are used; if the terminal is valid, PA-15–PA-17 are used; 44: User-defined fault 1 45: User-defined fault 2 When user-defined faults 1 and 2 are valid, the inverter alarms E-27 and E-28 respectively, and the inverter will process according to the action mode selected by fault protection action selection P9-49. 46: Speed control/torque control switch Enables the inverter to switch between torque control and speed control mode. When this terminal is invalid, the inverter runs in the mode defined by A0-00 (speed/torque control mode). When this terminal is valid, it switches to another mode. 47: Emergency Stop When this terminal is valid, the inverter stops at the fastest speed, and the current is at the set current upper limit during the stopping process. This function is used to meet the requirement that the inverter needs to stop as quickly as possible when the system is in an emergency state. 48: External parking terminal 2 In any control mode (panel control, terminal control, communication control), this terminal can be used to decelerate the inverter to stop. At this time, the deceleration time is fixed to deceleration time 4. 49: Deceleration DC braking When this terminal is valid, the inverter first decelerates to the shutdown DC braking starting frequency, and then switches to the DC braking state. 50: This operating time is reset When this terminal is valid, the timing time of the inverter's current operation is cleared. This function needs to be used in conjunction with the timing operation (P8-42) and the current operating time arrival (P8-53). 51: Two-wire/three-wire switching 52: Reverse frequency prohibition 53: Single terminal UP/DOWN enable, source switching (same as function 18) 54: Terminal activation UP, inactivation DOWN 55: Fire Mode		
P4-07–P4-09	Reserved			●
P4-10	Terminal filter time	0.000 s–1.000 s	0.010s	○
P4-11	Terminal command mode	Units digit: Two-wire and three-wire selections **0**: Two-wire 1 Two-wire mode 1: This is the most commonly used two-wire mode. The forward and reverse running of the motor is determined by terminals Dx and Dy.	00	◎

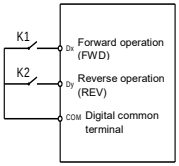
K1	K2	Run Comman
0	0	stop
0	1	Reversal rotation
1	0	Forward rotation
1	1	stop



1: Two-wire 2

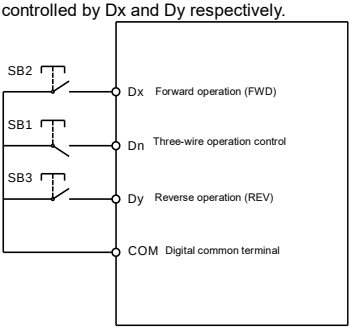
Two-wire mode 2: In this mode, the Dx terminal functions as the run enable terminal, and the Dy terminal functions to determine the run direction.

K1	K2	Run Command
0	0	stop
0	1	stop
1	0	Forward rotation
1	1	Reversal rotation



2: Three-wire 1

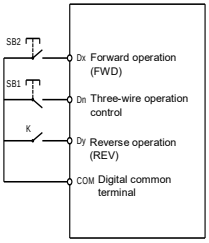
Three-wire control mode 1: In this mode, Dn is the enable terminal, and the direction is controlled by Dx and Dy respectively.



3: Three-wire 2

Three-wire control mode 2: The enable terminal of this mode is Dn, the running command is given by Dx, and the direction is determined by the state of Dy.

K	Running direction
0	Forward rotation
1	Reversal rotation



Tens digit: Multi-speed terminal start enable

0: Invalid

1: Enable

P4-12	Terminal UP/DN change rate	0.001Hz/s–65.535Hz/s	1.00Hz/s	○
P4-13	AI curve 1 minimum input	0.00 V–P4-15	0.00 V	○
P4-14	AI curve 1 minimum input corresponding setting	-100.0%–+100.0%	0.0%	○
P4-15	AI curve 1 maximum input	P4-13–+10.00V	10.00 V	○
P4-16	AI curve 1 maximum input corresponding setting	-100.0%–+100.0%	100.0%	○
P4-17	AI1 filter time	0.00 s–10.00 s	0.10s	○
P4-18	AI curve 2 minimum input	0.00 V–P4-20	0.00 V	○
P4-19	AI curve 2 minimum input corresponding setting	-100.0%–+100.0%	0.0%	○
P4-20	AI curve 2 maximum input	P4-18–+10.00V	10.00 V	○
P4-21	AI curve 2 maximum input corresponding setting	-100.0%–+100.0%	100.0%	○
P4-22	Reserved			○
P4-23	AI curve 3 minimum input	-10.00 V–P4-25	1.5V	○
P4-24	AI curve 3 minimum input corresponding setting	-100.0%–+100.0%	0.0%	○
P4-25	AI curve 3 maximum input	P4-23–+10.00V	10.00 V	○
P4-26	AI curve 3 maximum input corresponding setting	-100.0%–+100.0%	100.0%	○
P4-27	AI3 filter time	0.00 s–10.00 s	0.10s	○
P4-28	HDI minimum input	0.00 kHz-P4-30	0.00 kHz	○
P4-29	HDI minimum input corresponding setting	-100.0%–100.0%	0.0%	○
P4-30	HDI maximum input	P4-28–100.00 kHz	50.00 kHz	○
P4-31	HDI maximum input setting	-100.0%–100.0%	100.0%	○
P4-32	HDI filter time	0.00 s–10.00 s	0.10s	○
P4-33	AI curve selection	Units digit: AI1 curve selection 1: Curve 1 (see P4-13 to P4-16) 2: Curve 2 (see P4-18 to P4-21) 3: Curve 3 (see P4-23 to P4-26) Tens digit: Reserved	321	○
P4-34	AI below minimum input setting selection	Units digit: AI1 below the minimum input setting selection 0: corresponding minimum input setting 1:0.0% Tens digit: Reserved	00	○
P4-35	Terminal effective mode selection	0: High level effective 1: Low level effective Units digit: D1 Tens digit: D2 Hundreds digit: D3 Thousands digit: D4 Ten-thousands digit: D5	00000	◎

P4-37	AI input voltage/current selection	Units digit: AI1 Tens digit: Reserved 0: Voltage input 1: Current input	10	◎
P4-38	D1 conduction delay time	0.0s～6553.5s	0.0s	◎
P4-39	D2 conduction delay time	0.0s～6553.5s	0.0s	◎
P4-40	D3 conduction delay time	0.0s～6553.5s	0.0s	◎
P4-41	D4 conduction delay time	0.0s～6553.5s	0.0s	◎
P4-42	D5 conduction delay time	0.0s～6553.5s	0.0s	◎
P4-43	D6 conduction delay time	0.0s～6553.5s	0.0s	◎
P4-44	D7 conduction delay time	0.0s～6553.5s	0.0s	◎
P4-48	D1 disconnection delay time	0.0s～6553.5s	0.0s	◎
P4-49	D2 disconnection delay time	0.0s～6553.5s	0.0s	◎
P4-50	D3 disconnection delay time	0.0s～6553.5s	0.0s	◎
P4-51	D4 disconnection delay time	0.0s～6553.5s	0.0s	◎
P4-52	D5 disconnection delay time	0.0s～6553.5s	0.0s	◎
P4-53	D6 disconnection delay time	0.0s～6553.5s	0.0s	◎
P4-54	D7 disconnection delay time	0.0s～6553.5s	0.0s	◎
P4-58	Frequency UP/DOWN automatic reset mode	0: No automatic reset function 1: Clear when jogging 2: Clear to zero when a fault occurs 3: Clear when reverse rotation	0	◎
P5 Group Output terminal				
P5-00	HDO terminal output mode selection	0: High-speed pulse output 1: Open collector output	0	○
P5-01	HDO open collector output selection	0: No output Output terminal has no function 1: The inverter is running Indicates that the inverter is in operation and has an output frequency (which can be zero), at which time the ON signal is output. 2: Fault output (fault shutdown) When the inverter fails and stops, the ON signal is output. 3: Frequency level detection FDT1 output Please refer to the description of function code P8-19 and P8-20. 4: Frequency arrival Please refer to the description of function code P8-21. 5: In zero speed operation (no output when stopped) When the inverter is running and the output frequency is 0, the ON signal is output. When the inverter is in stopped state, this signal is OFF. 6: Motor overload pre-alarm Before the motor overload protection is activated, a judgment is made based on the overload pre-alarm threshold, and an ON signal is output after exceeding the pre-alarm	0	○
P5-02	Relay T1 output selection		2	○
P5-03	Reserved		0	○

		threshold. For motor overload parameter settings, refer to function codes P9-00 to P9-02. 7: Inverter overload pre-alarm The ON signal is output 10s before the inverter overload protection occurs. 8: Set the record value to arrive When the count value reaches the value set by PB-08, an ON signal is output. 9: The specified record value has been reached When the count value reaches the value set by PB-09, an ON signal is output. For the counting function, refer to the PB group function description. 11: PLC cycle completed When the simple PLC completes a cycle, it outputs a pulse signal with a width of 250ms. 12: Cumulative operating time reached When the inverter's cumulative operating time exceeds the time set in P8-17, it will output an ON signal. 13: Frequency limited When the set frequency exceeds the upper or lower frequency limit, and the inverter output frequency also reaches the upper or lower frequency limit, an ON signal is output. 14: Torque limited When the output torque reaches the torque limit value under the speed control mode, the inverter is in stall protection state and outputs an ON signal at the same time. 15: Ready to run When the power supply of the inverter main circuit and control circuit has been stabilized, and the inverter has not detected any fault information, and the inverter is in an operational state, it outputs an ON signal. 16: AI1 > AI2 17: Upper frequency limit reached When the operating frequency reaches the upper limit frequency, an ON signal is output. 18: Lower frequency limit reached (operation related) When the operating frequency reaches the lower limit frequency, an ON signal is output. This signal is OFF in the stopped state. 19: Undervoltage status output When the inverter is in undervoltage state, it outputs ON signal. 20: Communication settings Please refer to communication protocol. 21: Positioning completed (reserved) 22: Positioning proximity (reserved) 23: Zero speed running 2 (also output when stopped) When the inverter output frequency is 0, it outputs an ON signal. This signal is also ON in the stopped state. 24: Accumulated power-on time reached When the inverter's cumulative power-on time (P7-13) exceeds the time set by P8-16, the ON signal is output. 25: Frequency level detection FDT2 output Please refer to the description of function code P8-28 and P8-29.		

		26: Frequency 1 reaches output Please refer to the description of function code P8-30 and P8-31. 27: Frequency 2 reaches output Please refer to the description of function code P8-32 and P8-33. 28: Current 1 reaches output Please refer to the description of function code P8-38 and P8-39. 29: Current 2 reaches output Please refer to the description of function code P8-40 and P8-41. 30: Timing arrival output When the timing function selection (P8-42) is valid, the inverter outputs an ON signal after the current operating time of the inverter reaches the set timing time. 31: AI1 input exceeds limit When the analog quantity input AI1 value is greater than P8-46 (AI1 input protection upper limit) or less than P8-45 (AI1 input protection lower limit), an ON signal is output. 32: Load loss When the inverter is in the load loss state, it outputs ON signal. 33: Reverse running When the inverter is in reverse operation, it outputs an ON signal 34: Zero current state Please refer to the description of function code P8-34 and P8-35. 35: Module temperature reaches When the inverter module heat sink temperature (P7-07) reaches the set module temperature reaching value (P8-47), the output is ON signal 36: Output current exceeds limit Please refer to the description of function code P8-36 and P8-37. 37: Lower limit frequency has been reached (output also occurs during shutdown) When the operating frequency reaches the lower limit frequency, an ON signal is output. This signal is also ON in the stopped state. 38: Alarm output (continue running) When a fault occurs in the inverter and the fault handling mode is to continue running, the inverter will output an alarm. 39: Motor over-temperature pre-warning When the motor temperature reaches P9-58 (motor overheat pre-alarm threshold), an ON signal is output. (The motor temperature can be viewed via U0-34) 40: This operating time has arrived When the inverter starts operating for more than the time set in P8-53, it will output an ON signal. 41: Fault output (free stop fault and no output for undervoltage) 42: Frequency 1 <= Operating frequency <= frequency 2 43: Frequency 1 >= Operating frequency >= Frequency 2 44: Frequency 1 <= set frequency <= frequency 2 45: Frequency 1 >= set frequency >= frequency 2		

		(Note: Frequency 1, 2 refers to P8-30, P8-32) 46: Linkage D1 terminal output 47: Linkage D2 terminal output 48: Linkage D3 terminal output 49: Linkage D4 terminal output 50: Auxiliary motor water pump 1 51: Auxiliary motor water pump 2 52: Auxiliary motor water pump 3 53: Auxiliary motor water pump 4 54: Sleeping		
P5-04 – P5-05	Reserved			●
P5-06	HDO high-speed pulse output function selection	0: Operating frequency 0–Maximum output frequency 1: set frequency 0–Maximum output frequency 2: Output current 0–2 times the rated current of the motor 3: Output torque 0–2 times the rated torque of the motor 4: Output power 0–2 times rated power 5: Output voltage 0–1.2 times the rated voltage of the inverter 6: HDI high-speed pulse input (100.% corresponds to 100.0kHz) 0.01 kHz–100.00 kHz 7: AI1 0 V–10 V 8: Reserved 9: Reserved 10: Length 0–Maximum set length 11: Record (count) value 0–Maximum count 12: Communication settings 0.0%–100.0% 13: Motor speed The corresponding rotational speed from 0 to the maximum output frequency 14: Output current (100.0% corresponds to 1000.0A) 0.0 A–1000.0 A 15: Output voltage (100.0% corresponds to 1000.0V) 0.0 V – 1000.0 V 16: Reserved	0	○
P5-07	AO1 output function selection		0	○
P5-08	Reserved		0	○
P5-09	HDO output maximum frequency	0.01 kHz–100.00 kHz	50.00 kHz	○
P5-10	AO1 zero bias coefficient	-100.0%–+100.0%	0.0%	○
P5-11	AO1 gain	-10.00–+10.00 The above function codes are generally used to correct the zero drift of analog output and the deviation of output amplitude. It can also be used to customize the required AO output curve. If the zero bias is represented by "b", the gain is represented by k, the actual output is represented by Y, and the standard output is represented by X, then the actual output is: Y = Kx＋b.	1.00	○

		Among them, the zero bias coefficient of AO1 is 100% corresponding to 10V (or 20Ma), and the standard output refers to the quantity indicated by the analog output corresponding to 0V to 10V (or 4Ma to 20Ma) output without zero bias and gain correction.		
P5-12 P5-13	Reserved			○
P5-17	HDO open collector output delay time	0.0s～6553.5s	0.0s	○
P5-18	Relay 1 output delay time	0.0s～6553.5s	0.0s	○
P5-19	Reserved			○
P5-20 P5-21	Reserved			●
P5-22	Output terminal active state selection	0: Positive logic Positive logic, the digital output terminal is in active state when connected to the corresponding common terminal, and becomes invalid when disconnected. 1: Negative logic Negative logic, the digital output terminal is in inactive state when connected to the corresponding common terminal, and becomes valid when disconnected. Units digit: HDO Tens digit: Relay 1 Hundreds digit: Reserved	000	○
P5-23	AO current output selection	Units digit: AO1 Tens digit: Reserved 0: 0–20 Ma 1: 4–20 Ma	00	◎
P5-24	HDO delay-off time	0.0 s–6553.5 s	0.0s	◎
P5-25	T1 delay-off time	0.0 s–6553.5 s	0.0s	◎
P5-26	T1 delay-off time	0.0 s–6553.5 s	0.0s	◎
P5-26	Reserved			
P6 Group Start/Stop control				
P6-03	Starting frequency	0.00 Hz–50.00 Hz	0.00 Hz	○
P6-04	Starting frequency holding time	0.0 s–100.0 s	0.0 s	◎
P6-05	Starting DC braking current/ Pre-excitation current	0%–100%	50%	◎
P6-06	Starting DC braking time/ Pre-excitation time	0.0 s–100.0 s	0.0s	◎
P6-07	Acceleration/deceleration method	0: Straight line acceleration/deceleration Straight line acceleration/deceleration output frequency increases or decreases linearly. 1: S-curve acceleration/deceleration A The output frequency increases or decreases according to the S-curve. Suitable for applications requiring gentle staring/stopping (e.g., elevators, conveyors, etc.). Function codes P6-08 and P6-09 respectively define the	0	◎

		time ratios for the initial segment and final segment of the S-curve acceleration/deceleration 2: S-curve acceleration and deceleration B In this mode, the motor's rated frequency f b always serves as the inflection point of the S-curve. As shown in Figure 6-11. Typically used for high-speed regions (above rated frequency) requiring rapid acceleration/deceleration.		
P6-08	Initial S-Curve segment time ratio	0.0%–(100.0%–P6-09)	30.0%	◎
P6-09	Final S-curve segment time ratio	0.0%–(100.0%–P6-08)	30.0%	◎
P6-10	Stopping mode	0: Decelerate stop After the stop command is enabled, the inverter reduces the output frequency according to the deceleration time and stops when the frequency drops to 0 Hz. 1: Free stop After the stop command is enabled, the inverter terminates output immediately, and the motor stops freely based on mechanical inertia.	0	○
P6-11	DC braking start frequency at stop	0.00 Hz–P0-10 (maximum frequency)	0.00 Hz	○
P6-12	DC braking delay time at stop	0.0 s–100.0 s	0.0s	○
P6-13	DC braking current at stop	0%–100%	50%	○
P6-14	DC braking time at stop	0.0 s–100.0 s	0.2s	○
P6-15	Braking duty cycle	0%–100%	100%	○
P6-21	Demagnetization time	0.00 s–5.00 s	0.5 s	○
P6-22	Minimum output frequency	0.00 Hz–P6-11 (DC braking start frequency at stop)	0.00 Hz	○
P7 Group Human machine interface				
P7-00	Display function extension 1	Units digit: Power supply voltage monitoring mode 0: DC bus voltage 1: AC Input voltage (prefixed with "U")	00000	◎
P7-01	QUICK/JOG key function selection	0: QUICK/JOG key is invalid The key has no function. 1: Toggle between the operation panel command channel and remote command channels (terminal command channel or communication command channel) Toggle between keyboard command and remote operation. Refers to the switching of command sources, that is, the toggling between the current command source and keyboard control (local operation). If the current command source is keyboard control, the key function is invalid. 2: Forward/reverse rotation toggle The forward/reverse rotation toggle switches the frequency command direction via the QUICK/JOG key. This function is only enabled when the command source is set to the operation panel command channel.	0	◎

		3: Forward jogging Forward jogging is activated by pressing the QUICK/JOG key on the keyboard. 4: Reverse jogging Reverse jogging is activated by pressing the QUICK/JOG key on the keyboard. 5: Display mode toggle (normal display mode and modified parameter display mode) The display mode toggle switches between the normal display mode and modified parameter display mode through the QUICK/JOG key on the keyboard.		
P7-02	STOP/RST key function	0: Only in keyboard operation mode, The STOP/RST key stop function is effective 1: In any operation mode, The STOP/RST key stop function is effective	1	○
P7-03	Running status display parameter 1	0000–FFFF Bit00: Operating frequency 1 (Hz) Bit01: Set frequency (Hz) Bit02: Bus voltage (V) Bit03: Output voltage (V) Bit04: Output current (A) Bit05: Output power (kW) Bit06: Output torque (%) Bit07: DI input status Bit08: DO output status Bit09: AI1 voltage (V) Bit10: Reserved) Bit11: Radiator temperature Bit12: Count value Bit13: length value Bit14: Load speed display Bit15: PID setting	GESI: 01F	○
P7-04	Running status display parameter 2	0000–FFFF Bit00: PID feedback Bit01: PLC stage Bit02: HDI input pulse frequency (kHz) Bit03: Operating frequency 2 (Hz) Bit04: Remaining operating time Bit05: AI1 pre-calibration voltage (V) Bit06: Reserved Bit07: Reserved Bit08: Linear velocity Bit09: Current power-on time (Hour) Bit10: Current operating time (Min) Bit11: HDI input pulse frequency (Hz) Bit12: Communication preset value Bit13: Reserved Bit14: Main frequency A display (Hz) Bit15: Auxiliary frequency B display (Hz)	0	○
P7-05	Stop status display parameters	0000–FFFF Bit00: Set frequency (Hz) Bit01: Bus voltage (V) Bit02: DI terminal input status Bit03: DO output status Bit04: AI1 voltage (V) Bit05: Reserved Bit06: Radiator temperature Bit07: Count value Bit08: length value Bit09: PLC stage Bit10: Load speed Bit11: PID setting Bit12: HDI input pulse frequency (kHz)	33	○

P7-06	Load speed display coefficient	0.0001–6.5000	1.000	○
P7-07	Radiator temperature of inverter module	0.0°C–100.0°C		●
P7-08	Rated voltage of inverter	1 V–2000 V	Model determination	●
P7-09	Cumulative operating time	0 h–65535 h	-	●
P7-10	Product Number	-	-	●
P7-11	Software version No.	-	-	●
P7-12	Decimal places for load speed display	0: 0 decimal places 1: 1 decimal places 2: 2 decimal places 3: 3 decimal places	21	○
P7-13	Total cumulative power-on time	0 h–65535 h	-	●
P7-14	Cumulative power consumption	0 kW–65535 kW	-	●
P8 Group Enhanced functions				
P8-00	Jogging operation frequency	0.00Hz–P0-10 (maximum frequency)	2.00 Hz	○
P8-01	Jogging acceleration time	0.1s～6500.0s	20.0s	○
P8-02	Jogging deceleration time	0.1s～6500.0s	20.0s	○
P8-03	Acceleration time 2	0.1s～6500.0s	Model determination	○
P8-04	Deceleration time 2	0.1s～6500.0s	Model determination	○
P8-05	Acceleration time 3	0.1s～6500.0s	Model determination	○
P8-06	Deceleration time 3	0.1s～6500.0s	Model determination	○
P8-07	Acceleration time 4	0.1s～6500.0s	Model determination	○
P8-08	Deceleration time 4	0.1s～6500.0s	Model determination	○
P8-09	Jump frequency 1	0.00 Hz–P0-10 (maximum frequency)	0.00 Hz	○
P8-10	Jump frequency 2	0.00 Hz–P0-10 (maximum frequency)	0.00 Hz	○
P8-11	Jump frequency amplitude	0.00 Hz–P0-10 (maximum frequency)	0.00 Hz	○
P8-12	Forward/reverse dead zone time	0.0 s–3000.0 s	0.0s	○
P8-13	Reverse rotation control enable	0: Allowed 1: Prohibited	0	○
P8-14	Operation mode when set frequency below lower limit	0: Run at lower frequency limit 1: Stop 2: Zero-speed operation	1	○
P8-15	Droop control	0.00 Hz–10.00 Hz	0.00 Hz	○
P8-16	Set cumulative power-on time arrival	0.1h～65000h	0h	○
P8-17	Set cumulative operation time arrival	0.1h～65000h	0h	○
P8-18	Power-on operation command effective protection selection	0: Unprotected 1: Protected	0	○
P8-19	Frequency detection value (FDT1)	0.00 Hz–P0-10 (maximum frequency)	50.00 Hz	○

P8-20	Frequency detection hysteresis (FDT1)	0.0%–100.0% (FDT1 level)	5.0%	○
P8-21	Frequency arrival detection window	0.0%–100.0% (maximum frequency)	0.0%	○
P8-25	Acceleration time 1 and acceleration time 2 Switching frequency point	0.00 Hz–P0-10 (maximum frequency)	0.00 Hz	○
P8-26	Deceleration time 1 and deceleration time 2 Switching frequency point	0.00 Hz–P0-10 (maximum frequency)	0.00 Hz	○
P8-27	Terminal jogging priority	0: Invalid 1: Valid	0	○
P8-28	Frequency detection value (FDT2)	0.00 Hz–P0-10 (maximum frequency)	50.00 Hz	○
P8-29	Frequency detection hysteresis (FDT2)	0.0%–100.0% (FDT2 level)	5.0%	○
P8-30	Arbitrary arrival frequency detection value 1	0.00 Hz–P0-10 (maximum frequency)	50.00 Hz	○
P8-31	Arbitrary arrival frequency detection window 1	0.0%–100.0% (maximum frequency)	0.0%	○
P8-32	Arbitrary arrival frequency detection value 2	0.00 Hz–P0-10 (maximum frequency)	50.00 Hz	○
P8-33	Arbitrary arrival frequency detection window 2	0.0%–100.0% (maximum frequency)	0.0%	○
P8-34	Zero current detection level	0.0%–300.0% 100.0% corresponds to motor rated current	5.0%	○
P8-35	Zero current detection delay time	0.01 s–600.00 s	0.10s	○
P8-36	Output current overlimit threshold	0.0% (not detected) 0.1%–300.0% (motor rated current)	200.0%	○
P8-37	Output current overlimit detection delay time	0.00 s–600.00 s	0.00s	○
P8-38	Arbitrary current arrival 1	0.0%–300.0% (motor rated current)	100.0%	○
P8-39	Arbitrary current arrival 1 window	0.0%–300.0% (motor rated current)	0.0%	○
P8-40	Arbitrary current arrival 2	0.0%–300.0% (motor rated current)	100.0%	○
P8-41	Arbitrary current arrival 2 window	0.0%–300.0% (motor rated current)	0.0%	○
P8-42	Timer function selection	0: Invalid 1: Valid	0	○
P8-43	Timer operating time selection	0: P8-44 setting 1: AI1 2: Reserved 3: Panel potentiometer Analog input range corresponds to P8-44	0	○
P8-44	Timer operating time	0.0 Min–6500.0 Min	0.0 Min	○
P8-45	AI1 input voltage protection value lower limit	0.00 V–P8-46	3.10 V	○
P8-46	AI1 input voltage protection value upper limit	P8-45–11.00V	6.80 V	○
P8-47	Module temperature reached	0°C–100°C	75°C	○
P8-48	Cooling fan control	0: Fan operates during running 1: Fan runs continuously	0	○

		2: Fan operates upon reaching temperature threshold		
P8-49	Wake-up frequency	Sleep frequency (P8-51)–maximum frequency (P0-10)	0.00 Hz	○
P8-50	Wake-up delay time	0.0 s–3600.0 s	0.0s	○
P8-51	Sleep frequency	0.00 Hz–Wake-up frequency （P8-49）	0.00 Hz	○
P8-52	Sleep delay time	0.0 s–6500.0 s	0.0s	○
P8-53	Current operation time arrival setting	0.0 Min–6500.0 Min	0.0 Min	○
P8-55	Fire mode selection	0: No function 1: Fire Mode 1 2: Fire Mode 2 3: Fire Mode 3	0	◎
P8-56	Forced operating frequency	0.00 Hz–P0-10 (maximum frequency)	50.00 Hz	◎
P8-57	Set temperature to start the fan	0°C–999°C	30°C	○

Fire function application:
P8-55=0 has no function, the fire mode trigger terminal (55) in the P4 group will be disabled even when triggered.

P8-55=1 (fire mode 1), the start/stop control of the inverter is determined by the selection of P0-02, and the frequency source is determined by the selection of P0-03. Fire mode enable is activated through fire mode trigger terminal (55). Terminal (55) does not start the inverter. After fire mode enable terminal (55) is removed, the inverter can be stopped by command source. Mainly used for fire mode debugging.

P8-55=2 (fire mode 2), the fire mode enable is activated by pulse edge trigger of fire mode trigger terminal (55), but does not start the inverter. The inverter must be started through the startup method selected by command source (P0-03). Once the inverter is running with fire mode enabled, removal of both startup terminal and fire mode trigger terminal will not stop operation.

P8-55=3 (fire mode 3), the fire mode trigger terminal (55) initiates startup via pulse edge triggering and operates at forced frequency (P8-56). No stop command will be effective until power loss or equipment damage occurs.

Notice:
1. In mode 1, when the fire mode trigger terminal becomes inoperative, the inverter will stop upon receiving a stop command. Any detected faults will generate corresponding fault codes. This mode is mainly used for fire mode function debugging and is not suitable for standard fire mode.
2. When the fire mode operation is activated, the inverter will not stop until the power loss or catastrophic equipment failure (e.g., explosion) occurs.
3. Even if the inverter is in a fault state, as long as the inverter is not damaged, triggering the fire mode will forcibly clear the fault and restart the inverter.
4. The fire mode trigger defaults to forward rotation operation. If other terminals are configured for reverse rotation operation or reverse jogging, the inverter will execute reverse rotation operation or reverse jogging accordingly. If the fire mode needs to prohibit reverse rotation operation or reverse jogging, set all unused terminal functions in the P4 function group to "0: No function.".
Warning: The user shall be solely responsible for any property damage or personal injury resulting from the activation of fire mode.

P9 Group Faults and protection				
P9-00	Motor overload protection selection	0: Prohibited 1: Allowed	1	○
P9-01	Motor overload protection gain	0.20–10.00	1.00	○
P9-02	Motor overload warning coefficient	50%–100%	80%	○
P9-03	Overvoltage stall voltage gain	0–100: During the inverter deceleration process, if the DC bus voltage exceeds the overvoltage stall protection voltage, the inverter will stop deceleration and maintain the current operating frequency until the bus voltage drops, then resume deceleration.	30	○

		Overvoltage stall gain is used to adjust the inverter's ability to suppress overvoltage during deceleration. A higher value provides stronger overvoltage suppression capability. The gain should be set as small as possible without causing overvoltage conditions. For low-inertia loads, the overvoltage stall gain should be reduced; otherwise, it may slow down the system's dynamic response. For high-inertia loads, this value should be increased; otherwise, insufficient suppression may lead to overvoltage faults. Setting the overvoltage stall gain to 0 disables the overvoltage stall function.		
P9-04	Overvoltage stall protection voltage	200.0 V – 2000.0 V	Single phase: 390.0 V Three-phase: 760.0 V	○
P9-05	Overcurrent stall gain	1–100 During the inverter acceleration/deceleration process, if the output current exceeds the overcurrent stall protection current, the inverter will stop the acceleration/deceleration process and maintain the current operating frequency until the output current decreases, then resume acceleration/deceleration. Overcurrent stall gain is used to adjust the inverter's ability to suppress overcurrent during acceleration and deceleration. A higher value provides stronger overcurrent suppression capability. The gain should be set as small as possible without causing overcurrent conditions. For low-inertia loads, the overcurrent stall gain should be reduced; otherwise, it may slow down the system's dynamic response. For high-inertia loads, this value should be increased; otherwise, insufficient suppression may lead to overcurrent faults. Setting the overcurrent stall gain to 0 disables the overcurrent stall function.	1	○
P9-06	Overcurrent stall protection current	100%–200%	150%	○
P9-07	Ground short circuit protection selection at power-on	0: Invalid 1: Valid	1	○
P9-08	Dynamic braking activation voltage	200.0-2000.0 V	Single phase: 360.0 V Three-phase: 690.0 V	○
P9-09	Fault auto-reset count	0–65535	0	○
P9-10	Fault DO action selection during fault auto-reset	0: No action 1: Action	0	○
P9-11	Fault auto-reset interval	0.1 s–100.0 s	1.0 s	○
P9-12	Reserved	Reserved	0	○

P9-13	Output phase loss protection selection	0: Prohibited 1: Allowed	1	○
P9-14	Type of first fault	0: No fault 1: Reserved 2: Overcurrent during acceleration 3: Overcurrent during deceleration 4: Overcurrent at constant speed 5: Overvoltage during acceleration 6: Overvoltage during deceleration 7: Overvoltage at constant speed 8: Buffer resistor overload 9: Undervoltage 10: Inverter overload 11: Motor overload 12: Input phase loss 13: Output phase loss 14: Module overheating 15: External fault 16: Communication abnormality 17: Contactor abnormality 18: Current detection abnormality 19: Abnormal tuning of motor 20: Reserved 21: Parameter read/write abnormality 22: Inverter hardware abnormality 23: Motor ground short circuit 24: Reserved 25: Reserved 26: Operating time reached 27: User-defined fault 1 28: User-defined fault 2 29: Power-on time reached 30: Load loss 31: PID feedback loss during operation 40: Fast current limit timeout 41: Reserved 42: Excessive speed deviation 43: Motor overspeed 45: Motor overtemperature fault 51: Initial position error	-	●
P9-15	Type of second fault		-	●
P9-16	Type of third (most recent) fault		-	●
P9-17	The third (most recent) fault frequency	-	-	●
P9-18	The third (most recent) fault current	-	-	●
P9-19	The third (most recent) fault bus voltage	-	-	●
P9-20	The third (most recent) fault input terminal status	-	-	●
P9-21	The third (most recent) fault output terminal status	-	-	●
P9-22	The third (most recent) fault inverter status	-	-	●
P9-23	The third (most recent) fault power-on time	-	-	●
P9-24	The third (most recent) fault operating time	-	-	●
P9-27	Frequency at second fault	-	-	●
P9-28	Current at second fault	-	-	●

P9-29	Bus voltage at second fault	-	-	●
P9-30	The second fault input terminal status	-	-	●
P9-31	The second fault output terminal status	-	-	●
P9-32	The second fault inverter status	-	-	●
P9-33	The second fault power-on time	-	-	●
P9-34	The second fault operating time	-	-	●
P9-37	Frequency at first fault	-	-	●
P9-38	Current at first fault	-	-	●
P9-39	Bus voltage at first fault	-	-	●
P9-40	The first fault input terminal status	-	-	●
P9-41	The first fault output terminal status	-	-	●
P9-42	The first fault inverter status	-	-	●
P9-43	The first fault power-on time	-	-	●
P9-44	The first fault operating time	-	-	●
P9-47	Fault protection action selection 1	Units digit: Motor overload (11) 0: Free stop 1: Stop according to the stopping mode 2: Continue operation Tens digit: Input phase loss (12) Hundreds digit: Output phase loss (13) Thousands digit: External fault (15) Ten-thousands digit: Abnormal communication (16)	00000	○
P9-54	Selection of continued operating frequency in case of fault	0: Operate at the current operating frequency 1: Operate at the set frequency 2: Operate at the upper limit frequency 3: Run at lower frequency limit 4: Operate at the abnormal backup frequency	0	○
P9-55	Abnormal backup frequency	00.0%–100.0% (100.0% corresponds to the maximum frequency P0-10)	100.0%	○
P9-56 – P9-58	Reserved			●
P9-59	Momentary power loss action selection	0: Invalid 1: Decelerate 2: Decelerate to stop	0	○
P9-60	Voltage recovery detection threshold for momentary power loss	80%–100% (standard bus voltage)	85.0%	○
P9-61	Voltage recovery detection time for momentary power loss	0.00 s–100.00 s	0.50s	○
P9-62	Action threshold voltage for momentary power loss detection	60.0%–P9-60 (standard bus voltage)	80.0%	○
P9-63	Load loss protection selection	0: Invalid 1: Valid	0	○
P9-64	Load loss detection level	0.0–100.0%	10.0%	○

P9-65	Load loss detection time	0.0-60.0 s	1.0 s	○
PA Group PID function				
PA-00	PID setting source	0: PA-01 setting 1: Analog quantity AI1 setting 2: Reserved 3: Panel potentiometer setting 4: High speed pulse HDI setting 5: Communication given 6: Multi-step command setting 7: Pressure setting from water supply group b0-01	0	○
PA-01	Given by PID keyboard	0.0–PA-04 (PID feedback range setting) This value is an actual physical quantity and shall match the range. For example, if the given pressure is 3.0 kg by the keyboard, set PA-01 to 3.0.	50%	○
PA-02	PID feedback source	0: AI1 1: Reserved 2: Panel potentiometer setting 3: Reserved 4: High-speed pulse HDI input setting 5: Communication given 6: AI1+AI2 7: MAX (|AI1|, |AI2|) 8: MIN (|AI1|, |AI2|)	0	○
PA-03	PID action direction	0: Direct action 1: Reverse action	0	○
PA-04	PID feedback range setting	PA-01 (given by PID keyboard)–65535 Given feedback range of PID is a dimensionless unit and shall correspond to the actual range. For example, if the range of pressure gauge is 10.0 kg, set this parameter to 10.0.	1000	○
PA-05	Proportional gain Kp1	0.0–999.9 determines the strength of the proportional action in the PID controller. A higher Kp1 value results in stronger control action. This parameter 100.0 indicates that when the deviation between the PID feedback and set value reaches 100.0%, the adjustment range of the PID controller's output frequency command reaches the maximum frequency.	20.0	○
PA-06	Integral time Ti1	0.01 s–10.00 s This parameter defines the strength of the integral action of the PID controller. A shorter integral time results in stronger integral control. The integral time indicates that when the deviation between the PID feedback and set value reaches 100.0%, the integral controller continuously adjusts over this period of time, then the adjustment amount reaches its maximum frequency.	2.00 s	○
PA-07	Derivative time Td1	0.000 s–10.000 s This parameter determines the strength of the derivative action of PID controller based on the rate of change of the deviation. A longer derivative time increases the derivative control effect. The derivative time indicates that when the feedback quantity changes by 100.0% within this time, the adjustment amount of the	0.000 s	○

		derivative controller reaches its maximum frequency.		
PA-08	PID reverse rotation cut-off frequency	0.00–P0-10 (maximum frequency)	0.00 Hz	○
PA-09	PID deviation limit	0.0%–100.0% When the deviation between the PID set and feedback value is less than PA-09, the PID stops its regulation action. In this way, when the deviation between the set and feedback is small, the output frequency remains stable, which is highly effective for certain closed-loop control applications.	0.0%	○
PA-10	PID derivative limiting	0.00%–100.00% In the PID controllers, the derivative action exhibits relatively sensitive and may easily induce system oscillation. To mitigate this, the derivative action is generally constrained within a narrow operational range. PA-10 is used to set the output range for PID derivative action.	0.10%	○
PA-11	PID set filter time	0.00-650.00s PID set filter time refers to the time required for the PID set value to change from 0.0% to 100.0%. When the PID set value changes, the PID set value changes linearly according to the set filter time, thereby reducing the adverse impacts on the system cause by the sudden changes of the set value.	0.00 s	○
PA-12	PID feedback filter time	0.00-60.00s It is used to filter the PID feedback value, which mitigate the interference effects of the feedback value, but it will affect the response performance of the process closed-loop system.	0.00 s	○
PA-13	PID output filter time	0.00-60.00s It is used to filter the PID output frequency, which weaken the sudden change of the inverter's output frequency, but it will also affect the response performance of the process closed-loop system.	0.00 s	○
PA-14	Reserved			○
PA-15	Proportional gain Kp2	0.0–999.9	20.0	○
PA-16	Integral time Ti2	0.01 s–10.00 s	2.00 s	○
PA-17	Derivative time Td2	0.000 s–10.000 s	0.000 s	○
PA-18	PID parameter switching conditions	0: No switching 1: Switch via terminal 2: Auto-switch based on deviation	0	○
PA-19	PID parameter switching deviation 1	0.0%–PA-20	20.0%	○
PA-20	PID parameter switching deviation 2	PA-19–100.0%	80.0%	○
PA-21	PID initial value	0.0%–100.0%	0.0%	○
PA-22	PID initial value holding time	0.00–650.00 s	0.00s	○
PA-23	Maximum positive deviation between two outputs	0.00%–100.00%	20%	○

PA-24	Maximum negative deviation between two outputs	0.00%–100.00%	80%	○
PA-25	PID integral attributes	Units digit: Integral separation 0: Invalid 1: Valid Tens digit: whether to stop integration after the output reaches the limit 0: Continue integration 1: Stop integration	00	○
PA-26	PID feedback loss detection value	0.0%: Feedback loss not detected 0.1%–100.0%	0.0%	○
PA-27	PID feedback loss detection time	0.0 s–20.0 s	0.0 s	○
PA-28	PID stop calculation	0: Do not calculate at stop 1: Calculate at stop It is used to select whether the PID continues to calculate in stop state. In general applications, PID should stop calculating in stop state.	1	○
Pb Group Swing frequency and length counting				
Pb-00	Swing frequency mode	0: Relative to center frequency 1: relative to the maximum frequency	0	○
Pb-01	Swing frequency amplitude	0.0%–100.0%	0.0%	○
Pb-02	Jump frequency amplitude	0.0%–50.0%	0.0%	○
Pb-03	Swing frequency period	0.1 s–3000.0 s	10.0 s	○
Pb-04	Triangle wave rise time of the swing frequency	0.1%–100.0%	50.0%	○
Pb-05	Set length	0 m–65535 m	1000 m	○
Pb-06	Actual length	0 m–65535 m	0 m	○
Pb-07	Pulses per meter	0.1–6553.5	100.0	○
Pb-08	Preset count value	1–65535	1000	○
Pb-09	Designated count value	1–65535	1000	○
PC Group Multi-step command and simple PLC				
PC-00	Multi-segment instruction 0	-100.0%–100.0%	10.0%	○
PC-01	Multi-segment instruction 1	-100.0%–100.0%	30.0%	○
PC-02	Multi-segment instruction 2	-100.0%–100.0%	50.0%	○
PC-03	Multi-segment instruction 3	-100.0%–100.0%	80.0%	○
PC-04	Multi-segment instruction 4	-100.0%–100.0%	100.0%	○
PC-05	Multi-segment instruction 5	-100.0%–100.0%	0.0%	○
PC-06	Multi-segment instruction 6	-100.0%–100.0%	0.0%	○
PC-07	Multi-segment instruction 7	-100.0%–100.0%	0.0%	○
PC-08	Multi-segment instruction 8	-100.0%–100.0%	0.0%	○
PC-09	Multi-segment instruction 9	-100.0%–100.0%	0.0%	○
PC-10	Multi-segment instruction 10	-100.0%–100.0%	0.0%	○

PC-11	Multi-segment instruction 11	-100.0%–100.0%	0.0%	○
PC-12	Multi-segment instruction 12	-100.0%–100.0%	0.0%	○
PC-13	Multi-segment instruction 13	-100.0%–100.0%	0.0%	○
PC-14	Multi-segment instruction 14	-100.0%–100.0%	0.0%	○
PC-15	Multi-segment instruction 15	-100.0%–100.0%	0.0%	○
PC-16	Simple PLC operation mode	0: Stop after single operation The inverter completes a single cycle then stops automatically, requiring a new run command to restart. 1: Hold final values after single operation The inverter automatically maintains the operating frequency and direction of the final segment after a single cycle completion. 2: Continuous cycling The inverter automatically starts the next cycle until receiving a stop command after one cycle completion.	0	○
PC-17	Simple PLC power-off memory selection	Units digit: Power-off memory selection 0: No memory after power-off 1: Memory after power-off Tens digit: Stop memory selection 0: No memory at stop 1: Memory at stop	00	○
PC-18	Simple PLC segment 0 operating time	0.0 s (h)–6500.0 s (h)	0.0 s (h)	○
PC-19	Simple PLC segment 0 acceleration/deceleration time selection	0–3	0	○
PC-20	Simple PLC segment 1 operating time	0.0 s (h)–6500.0 s (h)	0.0 s (h)	○
PC-21	Simple PLC segment 1 acceleration/deceleration time selection	0–3	0	○
PC-22	Simple PLC segment 2 operating time	0.0 s (h)–6500.0 s (h)	0.0 s (h)	○
PC-23	Simple PLC segment 2 acceleration/deceleration time selection	0–3	0	○
PC-24	Simple PLC segment 3 operating time	0.0 s (h)–6500.0 s (h)	0.0 s (h)	○
PC-25	Simple PLC segment 3 acceleration/deceleration time selection	0–3	0	○
PC-26	Simple PLC segment 4 operating time	0.0 s (h)–6500.0 s (h)	0.0 s (h)	○
PC-27	Simple PLC segment 4 acceleration/deceleration time selection	0–3	0	○
PC-28	Simple PLC segment 5 operating time	0.0 s (h)–6500.0 s (h)	0.0 s (h)	○
PC-29	Simple PLC segment 5 acceleration/deceleration time selection	0–3	0	○
PC-30	Simple PLC segment 6 operating time	0.0 s (h)–6500.0 s (h)	0.0 s (h)	○
PC-31	Simple PLC segment 6 acceleration/deceleration time selection	0–3	0	○

PC-32	Simple PLC segment 7 operating time	0.0 s (h)–6500.0 s (h)	0.0 s (h)	○
PC-33	Simple PLC segment 7 acceleration/deceleration time selection	0–3	0	○
PC-34	Simple PLC segment 8 operating time	0.0 s (h)–6500.0 s (h)	0.0 s (h)	○
PC-35	Simple PLC segment 8 acceleration/deceleration time selection	0–3	0	○
PC-36	Simple PLC segment 9 operating time	0.0 s (h)–6500.0 s (h)	0.0 s (h)	○
PC-37	Simple PLC segment 9 acceleration/deceleration time selection	0–3	0	○
PC-38	Simple PLC segment 10 operating time	0.0 s (h)–6500.0 s (h)	0.0 s (h)	○
PC-39	Simple PLC segment 10 acceleration/deceleration time selection	0–3	0	○
PC-40	Simple PLC segment 11 operating time	0.0 s (h)–6500.0 s (h)	0.0 s (h)	○
PC-41	Simple PLC segment 11 acceleration/deceleration time selection	0–3	0	○
PC-42	Simple PLC segment 12 operating time	0.0 s (h)–6500.0 s (h)	0.0 s (h)	○
PC-43	Simple PLC segment 12 acceleration/deceleration time selection	0–3	0	○
PC-44	Simple PLC segment 13 operating time	0.0 s (h)–6500.0 s (h)	0.0 s (h)	○
PC-45	Simple PLC segment 13 acceleration/deceleration time selection	0–3	0	○
PC-46	Simple PLC segment 14 operating time	0.0 s (h)–6500.0 s (h)	0.0 s (h)	○
PC-47	Simple PLC segment 14 acceleration/deceleration time selection	0–3	0	○
PC-48	Simple PLC segment 15 operating time	0.0 s (h)–6500.0 s (h)	0.0 s (h)	○
PC-49	Simple PLC segment 15 acceleration/deceleration time selection	0–3	0	○
PC-50	Simple PLC operating time unit	0: s (second) 1: h (hour)	0	○
PC-51	Multi-step command 0 setting method	0: Function code PC-00 setting 1: Analog quantity AI1 setting 2: Reserved 3: Panel potentiometer setting 4: High-speed pulse HDI input setting 5: PID control setting 6: Keyboard set frequency (P0-08) setting, modifiable via UP/DN.	0	○
Pd Group Communication parameters				
Pd-00	Baud rate	2: 1200BPS 3: 2400BPS 4: 4800BPS 5: 9600BPS 6: 19200BPS 7: 38400BPS	5	○

Pd-01	Data format	0: No parity (8-N-2) 1: Even parity (8-E-1) 2: Odd parity (8-O-1) 3: No parity (8-N-1)	3	○
Pd-02	Inverter address	1–247, 0 as broadcast address	1	○
Pd-03	Response delay	0 ms–20 ms	2	○
Pd-04	Communication timeout	0.0 (invalid), 0.1 s–60.0 s	0.0	○
Pd-05	Communication protocol selection	0: Non-standard MODBUS communication protocol 1: Standard MODBUS protocol	1	○
Pd-06	Communication reading current resolution	0: 0.01 A 1: 0.1 A	0	○
PE Group Reserved group				
PE-00	Reserved			○
PP Group Function code management				
PP-00	User password	0–65535	0	○
PP-01	Parameter initialization	0: No operation 1: Restore default parameters, excluding motor parameters Setting PP-01 to 1 resets most inverter parameters to factory defaults, except motor parameters, frequency command decimal point (P0-22), fault records, cumulative operating time (P7-09), cumulative power-on time (P7-13), cumulative power consumption (P7-14). 2: Clear record information Clear the inverter fault record information, cumulative operating time (P7-09), cumulative power-on time (P7-13), and cumulative power consumption (P7-14). 3: Restore default parameters, including motor parameters 10: Switch to 60 Hz mode	0	◎
PP-02	Function parameter group display selection	Units digit: U0 group display selection 0: Do not displayed 1: Displayed Tens digit: A0 group display selection 0: Do not displayed 1: Displayed Hundreds digit: b0 group display selection 0: Do not displayed 1: Displayed	10111	◎
PP-03	Reserved			●
PP-04	Function code modification attributes	0: Modified 1: Unmodified	0	○
A0 Group Torque control parameters				
A0-00	Speed/torque control mode selection	0: Speed control 1: Torque control (when using torque control, set P0-01 to vector control mode;)	0	◎
A0-01	Torque setting source selection in torque control mode	0: Keyboard setting 1: Analog quantity AI1 setting 2: Reserved 3: Panel potentiometer setting 4: High speed pulse HDI setting	0	◎

		5: Communication given 7: MAX (AI1, AI2) *Note: Full ranges of 1-7 corresponds to A0-03 digital setting*		
A0-03	Torque keyboard setting in torque control mode	-200.0%–200.0%	150.0%	○
A0-04	Torque filter time	0.00 s–10.00 s	0.00s	○
A0-05	Forward maximum frequency in torque control	0.00 Hz–P0-10 (maximum frequency)	50.00 Hz	○
A0-06	Reverse maximum frequency in torque control	0.00 Hz–P0-10 (maximum frequency)	50.00 Hz	○
A0-07	Torque control acceleration time	0.00 s–65535 s	0.00 s	○
A0-08	Torque control deceleration time	0.00 s–36000 s	0.00 s	○
A5 Group Control optimization parameters				
A5-00	DPWM switching upper limit frequency	0.00 Hz–50.00 Hz	0	○
A5-01	PWM modulation method	0: Asynchronous modulation 1: Synchronous modulation	0	○
A5-02	Dead zone compensation mode selection	0: No compensation 1: Compensation mode 1	1	○
A5-03	Random PWM depth	0: Random PWM is invalid 1–10: PWM carrier frequency randomization depth	0	○
A5-04	Fast current limit enable	0: Disabled 1: Enabled	1	○
A5-05	Current detection compensation	0–110	105	○
A5-06	Undervoltage point setting	200.0–2000.0 V	Determined by model	○
A5-08	Dead zone time adjustment	100–200%	150%	○
A5-09	Overvoltage point setting	200.0-2200.0 V	Model determination	◎
b0 Group Control optimization parameters				
b0-00	Pressure sensor range	0–99.99 Bar (kg)	10.00	○
b0-01	Target pressure digital setting *Note: Target pressure is selected by PA-01*	0–99.99 Bar (kg)	5.00	○
b0-02	Sleep pressure	0–150.0% (linked in proportion to the target pressure) Note: The maximum value is limited by (b0-00/b0-01)*100%	100.0%	○
b0-03	Wake-up pressure	0–100.0% (linked in proportion to the target pressure)	95.0%	○
b0-04	Pressure deviation	0–100.0% (linked in proportion to the target pressure)	2.0%	○
b0-05	Sleep delay time	0–6553.5 s (0: Sleep function disabled)	20.0s	○
b0-06	Wake-up delay time	0–6553.5 s	0.0s	○
b0-07	Pressure upper limit protection value	0–200.0% (linked in proportion to the target pressure)	120.0%	○
b0-08	Pressure upper limit protection stop delay time	0–6553.5 s (0: Detection disabled)	0.0s	○

b0-09	Constant pressure forced sleep delay time	0–6553.5 s (0: Detection disabled)	0.0s	○
b0-10	Auxiliary pump quantity setting	0–4 (0: One-to-multiple pumps control disabled)	0	○
b0-11	Pressure tolerance for adding auxiliary pumps	0–100.0% (linked in proportion to the target pressure)	5.0%	○
b0-12	Delay for adding auxiliary pumps	0–6553.5 s	30.0s	○
b0-13	Pressure tolerance for reducing auxiliary pumps	0–100.0% (linked in proportion to the target pressure)	5.0%	○
b0-14	Delay for reducing auxiliary pumps	0–6553.5 s	30.0s	○
b0-15	Delay for emergency reduction of auxiliary pumps at the upper pressure limit (Occupy the normal pump reduction time of b0-14)	0–6553.5 s	3.0s	○
b0-16	Water shortage protection pressure	0–100.0% (linked in proportion to the target pressure) Note: Detection starts when the upper frequency limit is exceeded	20.0%	○
b0-17	Water shortage protection delay	0–6553.5 s (0: Detection disabled)	0.0s	○
b0-18	Sleep mode selection	0: Disable sleep mode 1: Pressure-based sleep (feedback pressure ≥ b0-02) 2: Frequency-based sleep (output frequency ≤ b0-19) 3: Sleep pressure (b0-02) + sleep frequency (b0-19)	1	◎
b0-19	Sleep detection frequency	0.00 Hz–maximum frequency (P0-10) Note: Only valid when b0-18=2	20.00Hz	○
b0-20	Pressure protection fault selection	00–11 Units digit: Overpressure upper limit protection (b0-07) Tens digit: Water shortage and underpressure protection (b0-16) 0: No fault report 1: Report the fault Note: Underpressure fault Err70, overpressure fault Err71	00	◎
b0-21	Sleep shutdown mode	0: Decelerate to stop 1: Free stop	0	◎

5.2 Monitoring parameters summary

Function code	Name	Minimum unit
U0 Group Basic monitoring parameters		
U0-00	Operating frequency (Hz)	0.01 Hz
U0-01	Set frequency (Hz)	0.01 Hz
U0-02	Bus voltage	0.1 V
U0-03	Output voltage (V)	1 V
U0-04	Output current (A)	0.01 A
U0-05	Output power (kW)	0.1 kW

Function code	Name	Minimum unit
U0-06	Output torque (%)	0.1%
U0-07	DI input status	1
U0-09	AI1 voltage (V)	0.01 V
U0-10	Reserved	0.01 V
U0-11	Radiator temperature	1°C
U0-12	Count value	1
U0-13	Length value	1
U0-14	Load speed display	1
U0-15	PID setting	1
U0-16	PID feedback	1
U0-17	PLC stage	1
U0-18	HDI input pulse frequency (Hz)	0.01 kHz
U0-19	Feedback speed (unit: 0.1Hz)	0.1 Hz
U0-20	Remaining operating time	0.1 Min
U0-21	AI1 pre-calibration voltage	0.001 V
U0-22	Reserved	0.001 V
U0-23	Panel potentiometer pre-calibration voltage	0.001 V
U0-24	Linear velocity	1 m/Min
U0-25	Current power-on time	1 Min
U0-26	Current operating time	0.1 Min
U0-27	HDI input pulse frequency	1 Hz
U0-28	Communication preset value	0.01%
U0-29	Reserved	0.01 Hz
U0-30	Main frequency A display	0.01 Hz
U0-31	Auxiliary frequency B display	0.01 Hz
U0-32	Reserved	1
U0-33	Reserved	0.1°
U0-34	Motor temperature value	1°C
U0-35	Target torque (%)	0.1%
U0-36	Current number of auxiliary pumps in operation	1
U0-37	Power factor angle	0.1°
U0-38	Reserved	1
U0-39	Reserved	1 V
U0-40	Reserved	1 V
U0-41	DI input status visual display	1
U0-42	DO input status visual display	1
U0-43	DI function status visual display 1 (function 01-function 40)	1
U0-44	DI function status visual display 2 (function 41-function 80)	1
U0-59	Set frequency (%)	0.01%
U0-60	Operating frequency (%)	0.01%
U0-61	Inverter status	1

Function code	Name	Minimum unit
U0-62	Current fault code	--
U0-65	Torque upper limit	--
U0-66	U-phase current display (A)	--
U0-67	V-phase current display (A)	--
U0-68	W-phase current display (A)	--

5.3 Industry application macro instructions

P0-29 Industry Application Macro Instructions

---Applicable for version P7-16=0.15 and above---

When using macro parameters, please note that the macro function of this machine is designated to reduce the amount of function code parameters configured by the customer, but not all parameters are considered 100% complete. If y there are some problems encountered during on-site use, specific issues should be analyzed specifically, and one's own experience should be utilized and adjust some helpful parameters to achieve the best use effect.

When switching from a currently macro to another, it is strongly recommended to first execute P0-29=10000 (factory default) before configuring the new macro.

1. Restore factory default parameter macro (P0-29=0 exclude motor parameter group)

P0-29=10000 achieves the same factory default restoration effect as PP-01=1. Before applying any industry application macro, please execute P0-29=10000 first.

2. Constant pressure water supply macro: (Tip: 1 bar = 1 kg = 0.1 MPa = 10 m water column)

The features of this constant pressure water supply are: directly select the water supply macro, then input the range of sensor and the target pressure, and other parameters remain basically no adjustment to achieve high-efficiency constant pressure water supply control. It delivers powerful pressure regulation with rapid, sensitive response, therefore, compared with the traditional PID frequency control methods, it has more advantages such as more stable pressure and higher energy efficiency. At the same time, it also provides superior constant pressure maintenance at sites equipped with pressure tanks. The mainboard's dual relays directly enable one-to-three pump control, or when combined with external relays connected to T1 and HDO terminals, the system can expand to one-to-five pump water supply control. It has independent pump addition/reduction pressure and delay time control, along with dedicated emergency pump reduction control during overpressure events. By appropriately decreasing the [b0-15 Overpressure Emergency Auxiliary Pump Reduction Delay] time value, the system can rapidly reduce auxiliary pumps and stop, effectively mitigating excessive pressure buildup. In addition, the keyboard allows directly switching between monitoring the pressure setting target value or the pressure feedback value by using the shift key. After power-off and subsequent restart, the monitoring content remains unchanged. At the same time, the machine also directly supports dual display keyboard to monitor pressure preset value and feedback value.

1. Single pump variable frequency constant pressure water supply macro: When P0-29=1, the system automatically initializes relevant parameters.

Note 1. For versions below P7-15=V106, the default is PA-00=3 for the panel potentiometer to set the target pressure value; for versions after P7-15=V107, the default is PA-00=7 for the panel UP/DOWN to adjust the target pressure value (b0-01), with power-loss memory retention.

Note 2. When any water supply macro is selected via P0-29, pressing the shift key will make the upper

digital tube (first digital tube) show the set pressure value (default: 5.00 KG, with the AV unit indicator light on the first digital tube simultaneously illuminated); while the lower digital tube (second digital tube) monitors the feedback pressure value with its corresponding AV unit indicator light also illuminated.

Note 3: Over-water-pressure protection: immediate stop method: P6-10=1 (free stop)

Note 4: To disable sleep mode: set b0-05=0.0 (sleep delay time) to deactivate sleep function, and set b0-09=0.0 (limit frequency over-target-pressure protection delay) to turn off the lower limit frequency overpressure protection to achieve the desired effect. However, please note that the overpressure stop parameters b0-07 and b0-08 are still in effect and can be decided whether to stop or not based on the on-site requirements.

Note 5, Dry-run protection: When a dry-run condition (b0-16 and b0-17) is detected, the system will operate to the upper limit frequency until the dry-run protection delay arrives, then stop and trigger a dry-run fault (Err70). (Version P7-15= 1.08 or above)

Note 6: b0-20 can be used to enable/disable specific fault conditions, including dry-run fault (Err70) or overpressure fault (Err71).

P0-01=2, P0-02=1, P0-03=8, P0-14=20.00Hz, p4-18=2.00, P7-03=8015, P7-04=0001, P7-05=3003, P7-17=15, P7-18=16, PA-00=3, PA-05=50.0, PA-06=0.10, PA-28=0 (To increase response speed, raise PA-05 and lower PA-06. To decrease response speed, adjust these parameters inversely.). AI1 defaults to 0–10 V input as PID pressure feedback. If it is necessary to change to 4–20 MA input, please provide the additional parameters: P4-13=2.00V, P4-37=11 (set units digit to 1 for current input mode). The inverter is factory-configured with AI2 defaulting to 0–20mA input. To use AI2 as the PID pressure feedback source, supplement the corresponding parameters: P4-18=2.00V and P4-37=10. When modified AI1 and AI2 to current input, it is necessary to connect the terminal 24V in series to power the sensors.
Notice: If the water supply macro function is selected and the default feedback source AI1 needs to be changed to AI2 as the voltage feedback source, it is necessary to manually adjust P4-18 from 2.00V to 0.00V and modified the tens digit value of P4-37 from 1 to 0, and set PA-02=1 to enable AI2 as the voltage feedback source.
Group B0 is a constant pressure water supply parameter group, where B0-00 must be set according to the range of pressure sensor. For example: if the maximum value of the sensor is marked as 1.6MP, then B0-00 = 16.00 kg.
PA-00 is used to select the target pressure setting source, with a default value of 7 (keyboard UP/DOWN keys to adjust the target pressure). The default target pressure value of b0-01 is 5.00 kg, which can be modified as required. The sleep and wake-up pressure, along with the related delay time, can be adjusted. The sleep, wake-up and various pressure deviations are automatically are automatically adjusted based on a percentage-based linkage of the target pressure, ensuring stable operation without adjustment basically.
* b0-07=110% (if the target pressure is 5.0 kg, the overpressure protection is 5.5 kg) is the upper limit protection value of the over-water pressure. When the water pressure is exceeded, the timing protection will start. When emergency protection is required, please set P06-10=1 (that is, set the inverter to free stop mode) to activate overpressure emergency protection.
Notice: For wiring related to constant pressure water supply inverters, please resolve it independently, as it is not be described here.
2. One-to-three constant pressure water supply macro: set P0-29=2 to activate the 1 variable frequency pump + 2 power frequency pumps constant pressure water supply mode:

This mode is based on the initialization default parameter conditions of the above [Single Pump Variable Frequency Constant Pressure Water Supply Macro], with the following default parameters:

P5-02=50 (T1 is auxiliary pump 1), P5-03=51 (T2 is auxiliary pump 2), P5-25=0.3S, P5-26=0.3S, b0-11=2 (two auxiliary pumps), for more control parameters, please see constant pressure water supply parameter

B0 group.

3. One-to-five constant pressure water supply macro: set P0-29=3 to activate the 1 variable frequency pump + 4 power frequency pumps constant pressure water supply mode:

This mode is based on the initialization default parameter conditions of the above [One-to-three constant pressure water supply macro], with the following default parameters: P5-04=52 (T1 is auxiliary pump 3), P5-01=53 (HDO is auxiliary pump 4), P5-00=1, P5-24=0.3S, P5-27=0.3S, b0-10=4 (four auxiliary pumps), for more control parameters, please see constant pressure water supply parameter B0 group.

4. Dedicated macro for fire protection water inspection cabinet:

P0-29=7, P0-02=1, P0-03=0, P0-08=10.00HZ, P0-12=15.00HZ, P4-00=1, P4-03=9, P6-10=1

5. Machine tool macro 100 HZ: AI1 input provides a 0–10 V speed setting, D1 terminal controls forward start/stop. A braking resistor must be connected to the brake resistor. If overvoltage occurs during braking, attention should be paid to reducing the overvoltage stall gain value in Parameter P9 group. If this value is set too low, it may cause excessive impact on the IGBT.

6. Engraving machine 400 HZ macro 1 (P0-29=21 multi- speed step of straight line): 24000 rpm

D1 forward start and stop, D2 multi-speed step terminal 1, D3 multi-speed step terminal 2, D4 multi-speed step terminal 3. The three-terminal combinations are as follows:

Speed step	Speed value	Corresponding frequency	Multi-speed step terminal 1	Multi-speed step terminal 2	Multi-speed step terminal 3
0	0.0%	0 HZ	OFF	OFF	OFF
1	25.0%	100 HZ	ON	OFF	OFF
2	37.5%	150 HZ	OFF	ON	OFF
3	50.0%	200 HZ	ON	ON	OFF
4	62.5%	250 HZ	OFF	OFF	ON
5	75.0%	300 HZ	ON	OFF	ON
6	87.5%	350 HZ	OFF	ON	ON
7	100.0%	400 HZ	ON	ON	ON

For other similar macros, the terminal usage follows the same logic and will not be given as examples.

Chapter 6 EMC (Electromagnetic Compatibility)

6.1 Definition

Electromagnetic compatibility refers to the ability of electrical equipment to operate in an electromagnetic interference environment without causing disturbances to the electromagnetic environment while maintaining its intended function.

6.2 EMC standards introduction

According to the requirements of national standard GB/T12668.3, the inverter must comply with the requirements of electromagnetic interference and anti-electromagnetic interference.
Our current products adhere to the latest international standards: IEC/EN61800-3:2004 (Adjustable speed electrical power drive systems part 3: EMC requirements and specific test methods), which is equivalent to the national standard GB/T12668.3.
IEC/EN61800-3 mainly examines the inverter from two aspects: electromagnetic interference and anti-electromagnetic interference. Electromagnetic interference mainly tests the inverter's radiated interference, conducted interference and harmonic interference (required for inverters used in civilian applications). The anti-electromagnetic interference mainly tests the inverter's conducted immunity, radiated immunity, surge immunity, fast transient burst immunity, ESD immunity and low-frequency power supply immunity (specific test items include: 1. input voltage dips, interruptions, and variations immunity; 2. commutation notches immunity; 3. harmonic input immunity; 4. input frequency variation; 5. input voltage unbalance; 6. input voltage fluctuations). By strictly following IEC/EN 61800-3 and installing the product as specified in Section 7.3, our inverters demonstrate excellent electromagnetic compatibility in typical industrial environments.

6.3 EMC guidelines

6.3.1 Impact of harmonics

High-order harmonics in the power supply can damage the inverter. Therefore, in areas with poor power quality, it is recommended to install an AC input reactor.

6.3.2 Electromagnetic interference and installation precautions

There are two types of electromagnetic interference. One is the interference of electromagnetic noise from the surrounding environment to the inverter, and the other is the interference generated by the inverter, affecting nearby equipment.
Installation precautions:
1) The grounding wires of the inverter and other electrical products should be well grounded;
2) The power input/output lines and low-voltage signal cables (such as control wiring) of the inverter should not be arranged in parallel as much as possible, and should be arranged vertically if conditions permit;
3) It is recommended to use shielded cables for the output power lines of the inverter, or route them through steel conduits with reliable grounded shielding layers. For the leads of the interfered equipment, it is recommended to use twisted-pair shielded control cables with reliably grounded shielding layers;
4) If the motor cables length exceeds 100 m, an output filter or reactor is required.

6.3.3 Solutions for electromagnetic interference from peripheral equipment to inverter

The general reason of electromagnetic inference affecting inverter is typically the installation of numerous relays, contactors, or electromagnetic brakes in close proximity. If the inverter malfunctions due to such interference, the following solutions are recommended:

1) Install a surge suppressor on the interfering device;

2) Add an input filter to the inverter. Refer to Section 7.3.6 for detailed;

3) Use shielded cables for inverter's control and signal wiring, with the shielding layer properly grounded.

6.3.4 Solutions for interference generated by inverter affecting peripheral equipment

This part of noise is divided into two types: one is radiated interference from the inverter, and the other is conducted interference from the inverter. These two types of interference cause electromagnetic or electrostatic induction in nearby electrical equipment. This caused the equipment to malfunction. The following solutions are recommended based on several different interference situations:

1) For measurement instruments, receivers, sensors and other devices processing weak signals, proximity to inverter or installation within the same control cabinet may cause interference-induced malfunctions. The following solutions are recommended: first, maximize physical separation from interference sources; second, strictly avoid parallel routing and especially bundled arrangements of signal lines with power cables; third, utilize properly grounded shielded wires for both signal and power wiring; fourth, install ferrite cores with 30-1000 MHz suppression range on the inverter's output side by winding cables 2-3 turns in the same direction; and finally, for severe interference cases, choose to install EMC output filter.

2) When the interfered equipment and the inverter use the same power supply, it will cause conducted interference. If the above methods fail to eliminate the interference, an EMC filter should be installed between the inverter and the power supply (refer to Section 7.3.6 for selection operations);

3) The peripheral equipment is grounded separately to eliminate the interference caused by leakage current in the inverter grounding wire during common grounding scenarios.

6.3.5 Leakage current and solutions

There are two forms of leakage current when using an inverter: one is the ground leakage current; the other is the line-to-line leakage current.

1) Factors affecting ground leakage current and its solutions:

There is distributed capacitance between the conductor and the earth. Greater capacitance results in higher leakage; Effectively reduce the distance between the inverter and the motor to decrease the distributed capacitance. Leakage current increases proportionally with carrier frequency. The carrier frequency can be lowered to reduce leakage current. However, reducing the carrier frequency will increase the motor noise. Please note that installing a reactor serves as an effective alternative solution for leakage current.

Leakage current increases proportionally with circuit current magnitude, consequently resulting in higher leakage levels in high-power motor applications.

2) Factors causing line-to-line leakage current and its solutions:

There is distributed capacitance between the inverter output wiring. When high-order harmonics are present in the line current, resonant conditions may induce leakage currents. If a thermal relay is used at this time, it may cause malfunction.

The solution is to lower the carrier frequency or install an output reactor. When using a inverter, it is recommended not to install a thermal relay between the inverter and the motor, utilizing instead the inverter's electronic overcurrent protection function.

6.3.6 Precautions for installing EMC input filter at the power input terminal

1) Notice: The filter must be operated strictly within its rated value. As the filter qualifies as a Class I electrical appliance, its metallic enclosure grounding terminal must establish full-area contact with the grounded metal panel of the installation cabinet while maintaining uninterrupted electrical continuity. Non-compliance may result in electric shock hazards and significant degradation of EMC performance.
2) Through EMC testing, the filter's grounding terminal must be connected to the same common ground point as the inverter's PE terminal. Non-compliance will be seriously affected EMC performance.
3) The filter shall be installed in immediate proximity to the inverter's power input terminal.

Chapter 7 Fault Diagnosis and Countermeasures

7.1 Fault alarms and countermeasures

The inverter has multiple warning information and protective functions. Once a fault occurs, the protection function is activated, the inverter stops output, the inverter fault relay contacts are activated, and the corresponding fault code is displayed on the inverter's display panel. Prior to requesting service support, users can first perform self-inspection according to the tips in this section to analyze the cause of the problem and find a solution. For faults listed in the dashed boxes, please seek services by contacting the agent of your purchased inverter or our company's technical support directly.

Fault name	Inverter short circuit protection
Operation panel display	E-01
Fault diagnosis	1. Short circuit in the inverter output circuit 2. Excessive wiring length between motor and inverter 3. Module overheating 4. Loose internal wiring connections in the inverter 5. Abnormal main control board 6. Abnormal driver board 7. Abnormal inverter module
Countermeasures	1. Eliminate external faults 2. Install a reactor or output filter 3. Check for blocked air ducts and ensure proper fan operation 4. Reconnect all connection cables securely 5–7. Contact technical support

Fault name	Overcurrent during acceleration
Operation panel display	E-02
Fault diagnosis	1. Ground fault/short circuit in output circuit of inverter 2. Vector control activated without motor parameter identification 3. Insufficient Acceleration Time 4. Improper manual torque boost or V/F curve 5. Low voltage 6. Start the rotating motor 7. Sudden load during acceleration 8. Undersized Inverter Selection
Countermeasures	1. Eliminate external faults 2. Perform motor parameter identification 3. Increase acceleration time 4. Adjust manual boost torque or V/F curve 5. Adjust the voltage to the normal range 6. Select speed tracking start or wait until the motor stops before starting 7. Eliminate sudden load 8. Choose inverter with a higher power rating

Fault name	Overcurrent during deceleration

Operation panel display	E-03
Fault diagnosis	1. Ground fault/short circuit in output circuit of inverter 2. Vector control activated without motor parameter identification 3. Insufficient deceleration time 4. Low voltage 5. Sudden load during deceleration 6. Braking unit and braking resistor without installation
Countermeasures	1. Eliminate external faults 2. Perform motor parameter identification 3. Increase deceleration time 4. Adjust the voltage to the normal range 5. Eliminate sudden load 6. Install braking unit and braking resistor

Fault name	Overcurrent at constant speed
Operation panel display	E-04
Fault diagnosis	1. Ground fault/short circuit in output circuit of inverter 2. Vector control activated without motor parameter identification 3. Low voltage 4. Check for sudden load during operation 5. Undersized Inverter Selection
Countermeasures	1. Eliminate external faults 2. Perform motor parameter identification 3. Adjust the voltage to the normal range 4. Eliminate sudden load 5. Choose inverter with a higher power rating

Fault name	Overvoltage during acceleration
Operation panel display	E-05
Fault diagnosis	1. Excessive input voltage 2. External force driving motor during acceleration 3. Insufficient acceleration time 4. Braking unit and braking resistor without installation
Countermeasures	1. Adjust the voltage to the normal range 2. Remove external force or install braking resistor 3. Increase acceleration time 4. Install braking unit and braking resistor

Fault name	Overvoltage during deceleration
Operation panel display	E-06
Fault diagnosis	1. Excessive input voltage 2. External force driving motor during deceleration 3. Insufficient deceleration time 4. Braking unit and braking resistor without installation
Countermeasures	1. Adjust the voltage to the normal range 2. Remove external force or install braking resistor

	3. Increase deceleration time 4. Install braking unit and braking resistor

Fault name	Overvoltage at constant speed
Operation panel display	E-07
Fault diagnosis	1. Excessive input voltage 2. External force driving motor during operation
Countermeasures	1. Adjust the voltage to the normal range 2. Remove external force or install braking resistor

Fault name	Control power fault
Operation panel display	E-08
Fault diagnosis	1. Input voltage outside specification
Countermeasures	1. Adjust voltage to within the range required by the specification

Fault name	Undervoltage fault
Operation panel display	E-09
Fault diagnosis	1. Momentary power loss 2. Input voltage of inverter outside specification 3. Abnormal bus voltage 4. Abnormal rectifier bridge and buffer resistor 5. Abnormal driver board 6. Abnormal control panel
Countermeasures	1. Reset fault 2. Adjust voltage to normal range 3–6. Contact technical support

Fault name	Inverter overload
Operation panel display	E-10
Fault diagnosis	1. Verify if overload/motor stall exists 2. Undersized Inverter Selection
Countermeasures	1. Reduce load and inspect motor/mechanical condition 2. Choose inverter with a higher power rating

Fault name	Motor overload
Operation panel display	E-11
Fault diagnosis	1. Verify motor protection parameter P9-01 setting 2. Verify if overload/motor stall exists 3. Undersized Inverter Selection
Countermeasures	1. Correctly set parameter 2. Reduce load and inspect motor/mechanical condition 3. Choose inverter with a higher power rating

Fault name	Output phase loss
Operation panel display	E-13
Fault diagnosis	1. Abnormal wiring between inverter and motor

	2. Unbalanced three-phase output of inverter during motor operation 3. Abnormal driver board 4. Abnormal module
Countermeasures	1. Eliminate external faults 2. Inspect motor three-phase windings for proper operation and troubleshoot any abnormalities 3–4. Contact technical support

Fault name	Module overheating
Operation panel display	E-14
Fault diagnosis	1. High ambient temperature 2. Air duct blockage 3. Damaged fan 4. Damaged module thermistor 5. Damaged inverter module
Countermeasures	1. Reduce ambient temperature 2. Clean air duct 3. Replace fan 4. Replace thermistor 5. Replace inverter module

Fault name	External equipment fault
Operation panel display	E-15
Fault diagnosis	Signal of external fault input via multi-function terminal D
Countermeasures	Reset and resume operation

Fault name	Communication fault
Operation panel display	E-16
Fault diagnosis	1. The host computer is not working properly 2. The communication cable is abnormal 3. The PD group of communication parameters are not set correctly
Countermeasures	1. Check the wiring of host computer 2. Check the communication connection cable 3. Set the communication parameters correctly

Fault name	Current detection fault
Operation panel display	E-18
Fault diagnosis	1. Check if the Hall device is abnormal 2. Abnormal driver board
Countermeasures	1. Replace the Hall device 2. Replace the drive board

Fault name	Motor self-learning fault
Operation panel display	E-19
Fault diagnosis	1. The motor parameters are not set according to the nameplate 2. The parameter identification process times out
Countermeasures	1. Set the motor parameters correctly according to the nameplate 2. Check the wiring from the inverter to the motor

Fault name	EEPROM read-write fault
Operation panel display	E-21
Fault diagnosis	1. The EEPROM chip is damaged
Countermeasures	1. Replace the main control board

Fault name	Inverter hardware fault
Operation panel display	E-22
Fault diagnosis	1. Overvoltage 2. Overcurrent
Countermeasures	1. Address the overvoltage fault 2. Address the overcurrent fault

Fault name	Ground short circuit fault
Operation panel display	E-23
Fault diagnosis	1. The motor has a ground short circuit
Countermeasures	1. Replace the cable or the motor

Fault name	Fault of cumulative operating time due
Operation panel display	E-26
Fault diagnosis	1. The cumulative operating time reaches the set value
Countermeasures	1. Use parameter initialization function to clear the recorded information

Fault name	User-defined fault 1
Operation panel display	E-27
Fault diagnosis	1. Signal of user-defined fault 1 input via multi-function terminal D
Countermeasures	1. Reset and resume operation

Fault name	User-defined fault 2
Operation panel display	E-28
Fault diagnosis	1. Signal of user-defined fault 2 input via multi-function terminal D
Countermeasures	1. Reset and resume operation

Fault name	Fault of cumulative power-on time due
Operation panel display	E-29
Fault diagnosis	1. The cumulative power-on time reaches the set value
Countermeasures	1. Use parameter initialization function to clear the recorded information

Fault name	Load loss fault
Operation panel	E-30

display	
Fault diagnosis	1. The operating current of the inverter is less than P9-64
Countermeasures	1. Confirm whether the load is detached or whether the parameter settings of P9-64 and P9-65 are in accordance with the actual operating conditions.

Fault name	Fault of PID feedback loss during operation
Operation panel display	E-31
Fault diagnosis	1. PID feedback is less than the set value of PA-26
Countermeasures	1. Check the PID feedback signal or set PA-26 to a suitable value

Fault name	Wave-by-wave current limiting fault
Operation panel display	E-40
Fault diagnosis	1. Verify if overload/motor stall exists 2. Undersized Inverter Selection
Countermeasures	1. Reduce load and inspect motor/mechanical condition 2. Choose inverter with a higher power rating

Fault name	Motor overtemperature fault
Operation panel display	E-45
Fault diagnosis	1. The temperature sensor wiring is loose 2. The motor temperature is too high
Countermeasures	1. Check the temperature sensor wiring and troubleshoot 2. Reduce the carrier frequency or take other cooling measures to dissipate heat from the motor.

Fault name	Keyboard communication fault
Operation panel display	E-50
Fault diagnosis	1. Is the keyboard cable firmly plugged in 2. Is the keyboard cable too long
Countermeasures	1. Replug the keyboard cable 2. Shorten the keyboard cable 3. Seek technical support

Fault name	Initial position error
Operation panel display	E-51
Fault diagnosis	1. The deviation between the motor parameters and the actual situation is too large. 2. The motor is not connected during operation.
Countermeasures	1. Reconfirm whether the motor parameters are correct, and pay special attention to whether the rated current is set too low. 2. Connect the motor correctly

Fault name	Water shortage protection
Operation panel display	E-70
Fault diagnosis	1. The on-site water pressure is lower than the set water shortage protection pressure of b0-16
Countermeasures	1. Check whether the set value of b0-16 is reasonable 2. Is the water pipe burst

	3. Is the water pump damaged

Fault name	Overpressure protection
Operation panel display	E-71
Fault diagnosis	1. The on-site water pressure is higher than the set pressure value of b0-07
Countermeasures	1. Check whether the set value of b0-07 is reasonable 2. Is the water outlet valve closed 3. Is the pressure sensor damaged

7.2 Common faults and corresponding solutions

The following faults may occur during the use of the inverter. Please refer to the following methods for simple fault analysis:

Table 7-1 Common faults and corresponding solutions

S/N	Fault description	Possible causes	Solution
1	No display after power on	The grid voltage is not available or is too low; the switching power supply on the inverter drive board is faulty; the rectifier bridge is damaged; the inverter buffer resistor is damaged; the control board or keyboard is faulty; The connection between the control board, drive board and keyboard are broken.	Check the input power supply; check the bus voltage; re-plug the keyboard and 22-core cable; seek service from the manufacturer
2	Display of "E-23" alarm after power on	The motor or the output line has a ground short circuit; the inverter is damaged	Use a megger to measure the insulation of the motor and output line; seek service from the manufacturer
3	Frequent report of fault E-14 (module overheating)	The carrier frequency is set too high; the fan is damaged or the air duct is blocked. The internal components of the inverter are damaged. (thermocouple or others)	Reduce carrier frequency (P0-15); replace fan, clean air duct; seek service from the manufacturer
4	The motor does not rotate after the inverter is running.	Motor and motor cable; inverter parameter setting error (motor parameters); poor contact between the drive board and the control board; drive board fault	Reconfirm the connection between the inverter and the motor; replace the motor or eliminate the mechanical fault; check and reset the motor parameters
5	Terminal D failure	Parameter setting error; external signal error; the jumper between PLC and +24V is loose; control board failure	Check and reset the relevant parameters of P4 group; reconnect the external signal line; reconfirm the jumper between PLC and +24V; seek service from the manufacturer
6	The inverter frequently reports overcurrent and overvoltage faults.	Incorrect motor parameter settings; inappropriate acceleration and deceleration times; load fluctuations	Reset the motor parameters or perform motor self-learning; Set appropriate acceleration and deceleration time; seek service from the manufacturer
7	Display of	1. Inverter initialization fails 2. Related components on the control	1. Check the keyboard and 22-core cable;

	after power on	board are damaged	2. Replace the control board; 3. Seek service from the manufacturer

Chapter 8 MODBUS Communication Protocol

GESI series inverter provides RS485 communication interface and supports MODBUS communication protocol. Users can achieve centralized control through PC/PLC and host computer. Through this communication protocol, users can set inverter operation commands, modify or read function code parameters, read inverter working status and fault information, etc.

8.1 Agreement content

The MODBUS serial communication protocol defines the frame content and usage format for the frames transmitted in serial communication. These include: the formats of the host polling and broadcast frames, and the slave response frames; the host encoding method, which includes the slave address (or broadcast address), commands, transmission data, and error checking, etc. The slave's response also uses the same structure, including: action confirmation, data return, error checking, etc. If an error occurs when the slave receives information, or if the slave cannot complete the action required by the host, the slave will organize a fault frame as a response to the host.

8.2 Application

GESI series inverters can be connected to a "single host and multiple slaves" PC/PLC control network with RS485 bus.

8.3 Bus structure

(1) Interface mode
RS485 hardware interface
(2) Transmission mode
Asynchronous serial, half-duplex transmission mode. At any given moment, only one (either the host or the slave) can send data, while the other can only receive data. During serial asynchronous communication, data is sent frame by frame in the form of messages.
(3) Topological structure
Single-host-multiple-slave system. The setting range of the slave address is 1–247, with 0 as the broadcast communication address. The slave addresses in the network must be unique. This is the basis for MODBUS communication.

8.4 Protocol description

The GESI series inverter communication protocol is an asynchronous serial host-slave MODBUS communication protocol. Only one device (host) in the network can establish a protocol (called "query/command"). Other devices (slaves) can only respond to the host's "query/command" by providing data, or take corresponding actions based on the host's "query/command". The host here refers to a personal computer (PC), industrial control equipment or a programmable logic controller (PLC), etc., and the slave refers to the GESI series inverter or other communication equipment with the same communication protocol. The host can communicate with a slave individually, and can also broadcast information to all

slaves. For the host "query/command" accessed individually, the slave must return a message (called a response). For the broadcast information sent by the host, the slave does not need to give a response to the host.

8.5 Communication frame structure

The MODBUS protocol communication data format of the GESI series inverter is RTU (remote terminal unit) mode. In RTU mode, the format of each byte is as follows:
Coding system: 8-bit binary, each 8-bit frame field contains two hexadecimal characters, hexadecimal 0 to 9, A to F.
Data format: start bit, 8-bit data bits, check bit and stop bit.
In RTU mode, a new data frame always starts with a transmission time silence of at least 3.5 bytes. On a network where the transmission rate is calculated by baud rate, the transmission time of 3.5 bytes can be easily determined. The data fields transmitted subsequently are the slave address, operation command code, data and CRC check word. The transmission bytes of each field are hexadecimal, 0 to 9, A to F. Network devices continuously monitor the network bus activity, including during the pause intervals. When the first field (address information) is received, each network device acknowledges the byte. After the last transmitted character, there is another similar interval of at least 3.5 bytes of transmission time to mark the end of this frame. After this, the transmission of a new frame will begin.
The information of a frame must be transmitted in a continuous data stream. If there is an interval of more than 1.5 bytes before the end of the entire frame transmission, the receiving device will clear these incomplete messages and assume that the next byte is the address field part of a new frame. Likewise, if the time interval between the start of a new frame and the previous frame is less than 3.5 bytes, the receiving device will consider it to be a continuation of the previous frame. The misalignment of the frame will lead to incorrect final CRC check value, resulting in communication failure.
RTU frame format:

<table>
<tr><td>Frame START</td><td>Transmission time of 3.5 bytes</td></tr>
<tr><td>Slave address ADRR</td><td>Communication address: 0–247 (0 as the broadcast address)</td></tr>
<tr><td>Command code CMD</td><td>03H: Read slave parameters;
06H: Write slave parameters</td></tr>
<tr><td>Data content DATA (N-1)</td><td rowspan="4">Data content: function code parameter address, number of function code parameters, function code parameter value, etc.</td></tr>
<tr><td>Data content DATA (N-2)</td></tr>
<tr><td>…</td></tr>
<tr><td>Data content DATA0</td></tr>
<tr><td>CRC CHK low byte</td><td rowspan="2">Detection value: CRC check value.</td></tr>
<tr><td>CRC CHK high byte</td></tr>
<tr><td>Frame END</td><td>Time of 3.5 bytes</td></tr>
</table>

8.6 Command code and communication data description

8.6.1 Command code: 03H, read N words (up to 12 words can be read)
For example: From the start address F002 of the inverter with slave address 01, two consecutive parameter values are read consecutively

Host command information

ADR	01H
CMD	03H
Start address high byte	F0H
Start address low byte	02H
Register number high byte	00H
Register number low byte	02H
CRC CHK low byte	56H
CRC CHK high byte	CBH

Slave response information

ADR	01H
CMD	03H
Number of bytes	04H
Data F002H high byte	00H
Data F002H low byte	00H
Data F003H high byte	00H
Data F003H low byte	01H
CRC CHK low byte	3BH
CRC CHK high byte	F3H

8.6.2 Command code: 06H, write a word

For example: Write 5000 (1388H) to the F00AH address of the inverter with slave address 02H.

Host command information

ADR	02H
CMD	06H
Data address high byte	F0H
Data address low byte	0AH
Data content high byte	13H
Data content low byte	88H
CRC CHK low byte	97H
CRC CHK high byte	ADH

Slave response information

ADR	02H
CMD	06H
Data address high byte	F0H
Data address low byte	0AH
Data content high byte	13H

Data content low byte	88H
CRC CHK low byte	97H
CRC CHK high byte	ADH

8.6.3 Communication error checking method

Verification method - CRC: CRC (Cyclical Redundancy Check) uses the RTU frame format, and the frame includes an error detection field based on the CRC method. The CRC field checks the contents of the entire frame. The CRC field consists of two bytes and contains a 16-bit binary value. It is calculated by the transmission device and added to the frame. The receiving device recalculates the CRC of the received frame and compares it with the value in the received CRC field. If the two CRC values are not equal, it indicates that there is an error in the transmission.

CRC is initialized by loading 0xFFFF first, and then a procedure is called to process the consecutive 8-bit bytes in the message with the value in the current register. Only the 8-bit data in each character is valid for CRC. The start bit, stop bit and parity bit are invalid.

During the CRC generation process, each 8-bit character is XO Red with the register contents individually, the result is shifted toward the least significant bit, and the most significant bit is filled with 0. The LSB is extracted and tested. If the LSB is 1, the register is XO Red with the preset value. If the LSB is 0, no operation is performed. The whole process is repeated 8 times. After the last bit (the 8th bit) is completed, the next 8-bit byte is XORed with the current value of the register. The final value in the register is the CRC value after all bytes in the frame have been processed.

When the CRC is added to the frame, the low byte is added first, followed by the high byte. Here is a simple CRC calculation function for user reference (programmed in C language):

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

8.6.4 Communication parameter address definition

This section defines the address of communication data, which is used to control the operation of the inverter, the inverter status and related parameter settings.

(1) Function code parameter address representation rules

For parameters in the P0–PF group, the high byte of the address is F0–FF, and the parameter number is the low byte of the address;

For parameters in the A0 group, the high byte of the address is A0, and the parameter number is the low

byte of the address;
For parameters in the U0 group, the high byte of the address is 70H, and the parameter number is the low byte of the address;
For example: For P3-12, the address is F30C;
For PC-05, the address is FC05
For A0-01, the address is A001
For U0-03, the address is 7003

Notice:
1. PF group: Parameters cannot be read or changed;
2. U0 group: Parameters can only be read but not changed.
3. Some parameters cannot be changed when the inverter is in operation; some parameters cannot be changed regardless of the inverter state; when changing function code parameters, attention also needs to be paid to the parameter range, unit, and related instructions.

In addition, since EEPROM is frequently stored, the service life of EEPROM will be reduced. Therefore, some function codes do not need to be stored in the communication mode; it is sufficient to just change the value in RAM.
The address representation rules for only changing RAM without modifying EEPROM are as follows:
For parameters in the P0–PF group, the high byte of the address is 00–0F, and the parameter number is the low byte of the address;
For parameters in the A0 group, the high byte of the address is 40, and the parameter number is the low byte of the address;
For parameters in the U0 group, the high byte of the address is 70H, and the parameter number is the low byte of the address;
For example: For P3-12, the address is 030C;
For PC-05, the address is 0C05
For A0-01, the address is 4001

(2) Stop/run parameter address:

Parameter address	Parameter description
1000	*Communication set value (-10000–10000) (decimal)
1001	Operating frequency
1002	Bus voltage
1003	Output voltage
1004	Output current
1005	Output power
1006	Output torque
1007	Running speed
1008	DI input status
1009	DO output status
100A	AI1 voltage
100B	Reserved
100C	Radiator temperature

Parameter address	Parameter description
100D	Count value input
100E	Length value input
100F	Load speed
1010	PID settings
1011	PID feedback
1012	PLC operation stage
1013	HDI input pulse frequency (unit: 0.01 kHz)
1014	Feedback speed (unit: 0.1 Hz)
1015	Remaining operating time
1016	AI1 pre-calibration voltage
1017	Reserved
1018	Reserved
1019	Linear velocity
101A	Current power-on time
101B	Current operating time
101C	HDI input pulse frequency (unit: 1 Hz)
101D	Communication preset value
101E	Actual feedback speed
101F	Reserved
1020	Reserved

Notice:

The communication set value is a percentage of the relative value, where 10000 corresponds to 100.00%, and -10000 corresponds to -100.00%;

For data of frequency dimension, the percentage is the percentage relative to the maximum frequency (P0-10);

For data of torque dimension, the percentage is P2-10 (torque upper limit digital setting).

(3) Control command input to the inverter: (write only)

Command word address	Command function
2000	0001: Forward running
	0002: Reverse running
	0003: Forward jogging
	0004: Reverse jogging
	0005: Free stop
	0006: Decelerate to stop
	0007: Fault reset

(4) Read inverter status: (read only)

Status word address	Status word function
3000	0001: Forward running
	0002: Reverse running
	0003: Stop

(5) Parameter lock password verification: (If 8888H is returned, password verification is passed)

Password address	Content of input password
1F00	*****

(6) Digital output terminal control: (write only)

Command address	Command content
2001	BIT0: Reserved BIT1: Reserved BIT2: Relay 1 output control BIT3: Reserved BIT4: HDO open collector output control

(7) Analog output AO1 control: (write only)

Command address	Command content
2002	0–7FFF means 0%–100%

(8) Pulse output control: (write only)

Command address	Command content
2004	0–7FFF means 0%–100%

(9) Inverter fault code description:

Fault address of inverter	Inverter fault information
8000	0000: No fault 0001: Reserved 0002: Overcurrent during acceleration 0003: Overcurrent during deceleration 0004: Overcurrent at constant speed 0005: Overvoltage during acceleration 0006: Overvoltage during deceleration 0007: Overvoltage at constant speed 0008: Reserved 0009: Undervoltage fault 000A: Inverter overload 000B: Motor overload 000C: Input phase loss 000D: Output phase loss 000E: Module overheating 000F: External fault 0010: Communication abnormality 0011: Contactor abnormality 0012: Current detection fault 0013: Motor self-learning fault 0014: Reserved 0015: Parameter read/write abnormality 0016: Inverter hardware fault 0017: Motor ground short circuit fault 0018: Reserved 0019: Reserved 001A: Operating time reached 001B: User-defined fault 1 001C: User-defined fault 2 001D: Power-on time reached 001E: Load loss 001F: PID feedback loss during operation 0028: Fast current limit timeout fault 0029: Reserved 002A: Excessive speed deviation 002B: Motor overspeed

8.6.5 Communication abnormality code

	Fault function description
8001	0000: No fault 0001: Password error 0002: Command code error 0003: CRC check error 0004: Invalid address 0005: Invalid parameter 0006: Invalid parameter change 0007: System locked 0008: EEPROM operation in progress

8.7 PD group communication parameter description

Pd-00	Baud rate	Factory default	5
	Setting range	0: 300 BPS 1: 600 BPS 2: 1200 BPS 3: 2400 BPS 4: 4800 BPS 5: 9600 BPS 6: 19200 BPS 7: 38400 BPS	

This parameter is used to set the data transmission rate between the host computer and the inverter. Note that the baud rate set by the host computer and the inverter must be consistent; otherwise, communication cannot be carried out. The higher the baud rate, the faster the communication speed.

Pd-01	Data format	Factory default	0
	Setting range	0: No parity check: Data format <8,N,2> 1: Even parity check: Data format <8,E,1> 2: Odd parity check: data format <8,O,1> 3: No parity check: Data format <8-N-1>	

The data format set by the host computer and the inverter must be consistent; otherwise, communication cannot be carried out.

Pd-02	Inverter address	Factory default	1
	Setting range	1–247, 0 as the broadcast address	

When the inverter address is set to 0, it becomes the broadcast address, enabling the broadcast function of the host computer.

The inverter address is unique (except for the broadcast address), which is the basis for achieving point-to-point communication between the host computer and the inverter.

Pd-03	Response delay	Factory default	2 ms
	Setting range	0–20 ms	

Response delay: Interval between the inverter completing data reception and sending data to the host computer. If the response delay is shorter than the system processing time, the response delay will be based on the system processing time. If the response delay is longer than the system processing time, after the system processes the data, it will wait until the response delay time is up before sending data to the host computer.

Pd-04	Communication timeout	Factory default	0.0 s
	Setting range	0.0 s (invalid) 0.1–60.0 s	

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

When the function code is set to a valid value, if the interval between one communication and the next communication exceeds the communication timeout period, the system will report a communication fault error (E-16). Normally, it is set to invalid. If this parameter is set in a system with continuous communication, the communication status can be monitored.

Pd-05	Communication protocol selection	Factory default	1
	Setting range	0: Non-standard MODBUS protocol 1: Standard MODBUS protocol	

Pd-05=1: Select the standard MODBUS protocol.

Pd-06	Communication reading current resolution	Factory default	0
	Setting range	0: 0.01 A 1: 0.1 A	

Used to determine the output unit of the current value when the communication reads the output current.