AF22 Serisi Hız Kontrol Cihazları

Kullanım Kılavuzu

Preface

Thank you for choosing our inverter.

Our invertr is a high-performance and multipurpose inverter aiming to integrate synchronous motor drive with asynchronous motor drive, and torque control, speed control with position control. It is armed with advanced vector control technology and the latest digital processor dedicated for motor control,thus enhancing product reliability and adaptability to the environment. Inverter adopts customized and industrialized design to realize excellent control performance through optimized functions and flexible applications.

In order to meet diversified customer demands, inverter provides abundant extension cards including programmable extension card, PG card, communication card and I/Oextension card to achieve various functions as needed.

The programmable extension card adopts mainstream CODESYS development environment for customers to carry out secondary development easily, fulfilling varied customized needs and reducing customer cost.

PG card supports a variety of encoders like incremental encoders and resolver-type encoders, in addition, it also supports pulse reference and frequency-division output. PG card adopts digital filter technology to improve EMC performance and to realize stable transmission of the encoder signal over a long distance. It is equipped with encoder offline detection function to contain the impact of system faults.

Inverter supports multiple kinds of popular communication modes to realize complicated system solutions. It can be connected to the internet with optional wireless communication card, by which users can monitor the inverter state anywhere any time via mobile APP.

Inverter uses high power density design. Some power ranges carry built-in reactor and brake unit to save installation space. Through overall EMC design, it can satisfy the low noise and low electromagnetic interference requirements to cope with challenging grid, temperature, humidity and dust conditions, thus greatly improving product reliability.

This operation manual presents installation wiring, parameter setup, fault diagnosis and trouble shooting, and precautions related to daily maintenance. Read through this manual carefully before installation to ensure inverter is installed and operated in a proper manner to give full piay to its performance and powerful functions.

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

Our company reserves the right to update the information of our products.

Contents

Chapter 1 Safety precautions

1.1 What this chapter contains

Read this manual carefully and follow all safety precautions before moving, installing, operating and servicing the inverter. If these safety precautions are ignored, physical injury or death may occur, or damage may occur to the equipment.

If any physical injury or death or damage to the equipment occur due to neglect of the safety precautions in the manual, our company will not be responsible for any damages and we are not legally bound in any manner.

1.2 Safety definition

Danger: Serious physical injury or even death may occur if related requirements are not followed

Warning**:** Physical injury or damage to the equipment may occur if related requirements are not followed

Note: Procedures taken to ensure proper operation.

Qualified electricians**:** People working on the device should take part in professional electrical and safety training, receive the certification and be familiar with all steps and requirements of installing, commissioning, operating and maintaining the device to prevent any emergencies.

1.3 Warning symbols

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

Symbols	Name	Instruction	Abbreviation
 Danger	Danger	Serious physical injury or even death may occur if related requirements are not followed	
 Warning	Warning	Physical injury or damage to the equipment may occur if related requirements are not followed	
 Forbid	Electrostatic discharge	Damage to the PCBA board may occur if related requirements are not followed	
 Hot	Hot sides	The base of the inverter may become hot. Do not touch.	
	Electric shock	As high voltage still presents in the bus capacitor after power off, wait for at least five minutes (or 15 min / 25 min, depending on the warning symbols on the machine) after power	

		off to prevent electric shock	
	Read manual	Read the operation manual before operating on the equipment	
Note	Note	Procedures taken to ensure proper operation	**Note**

1.4 Safety guidelines

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

✧ Do not perform wiring, inspection or component replacement when power supply is applied. Ensure all the input power supplies are disconnected before wiring and inspection, and wait for at least the time designated on the inverter or until the DC bus voltage is less than 36V. The minimum waiting time is listed in the table below.

Inverter model		Minimum waiting time
380V	1.5kW-110kW	5 min
380V	132kW-315kW	15 min
380V	Above 355kW	25 min
660V	22kW-132kW	5 min
660V	160kW-350kW	15 min
660V	400kW-630kW	25 min

✧ Do not refit the inverter unless authorized; otherwise, fire, electric shock or other injuries may occur.

✧ The base of the radiator may become hot during running. Do not touch to avoid hurt.

✧ The electrical parts and components inside the inverter are electrostatic. Take measures to prevent electrostatic discharge during related operation.

1.4.1 Delivery and installation

✧ Install the inverter on fire-retardant material and keep the inverter away from combustible materials.

✧ Connect the optional brake parts (brake resistors, brake units or feedback units) according to the wiring diagram.

✧ Do not operate on a damaged or incomplete inverter.

✧ Do not touch the inverter with wet items or body parts; otherwise, electric shock may occur.

Note:

✧ Select appropriate tools for delivery and installation to ensure a safe and proper running of the inverter and avoid physical injury or death. To ensure physical safety, the installation staff should take mechanical protective measures like wearing exposure shoes and working uniforms;

✧ Ensure to avoid physical shock or vibration during delivery and installation;

- ✧ Do not carry the inverter by its front cover only as the cover may fall off;
- ✧ Installation site should be away from children and other public places;
- ✧ The inverter cannot meet the requirements of low voltage protection in IEC61800-5-1 if the altitude of installation site is above 2000m;
- ✧ The inverter should be used in proper environment (see chapter 4.2.1 Installation environment for details);
- ✧ Prevent the screws, cables and other conductive parts from falling into the inverter;
- ✧ As leakage current of the inverter during running may exceed 3.5mA, ground properly and ensure the grounding resistance is less than 10Ω. The conductivity of PE grounding conductor is the same with that of the phase conductor (with the same cross sectional area).
- ✧ R, S and T are the power input terminals, and U, V and W are output motor terminals. Connect the input power cables and motor cables properly; otherwise, damage to the inverter may occur.

1.4.2 Commissioning and running

- ✧ Disconnect all power sources applied to the inverter before terminal wiring, and wait for at least the time designated on the inverter after disconnecting the power sources.
- ✧ High voltage presents inside the inverter during running. Do not carry out any operation on the inverter during running except for keypad setup.
- ✧ The inverter may start up by itself when P01.21 (restart after power down) is set to 1. Do not get close to the inverter and motor.
- ✧ The inverter cannot be used as "Emergency-stop device".
- ✧ The inverter cannot act as an emergency brake for the motor; it is a must to install mechanical brake device.
- ✧ During driving permanent magnet synchronous motor, besides above-mentioned items, the following work must be done before installation and maintenance.
  1. Disconnect all the input power sources including main power and control power.
  2. Ensure the permanent-magnet synchronous motor has been stopped, and the voltage on output end of the inverter is lower than 36V.
  3. After the permanent-magnet synchronous motor is stopped, wait for at least the time designated on the inverter, and ensure the voltage between "+" and "-" is lower than 36V.
  4. During operation, it is a must to ensure the permanent-magnet synchronous motor cannot run again by the action of external load; it is recommended to install effective external brake device or disconnect the direct electrical connection between permanent-magnet synchronous motor and the inverter.

Note:

- ✧ Do not switch on or switch off input power sources of the inverter frequently;

✧ For inverters that have been stored for a long time, set the capacitance and carry out inspection and pilot run on the inverter before use.

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

1.4.3 Maintenance and component replacement

	✧ Only well-trained and qualified professionals are allowed to perform maintenance, inspection, and component replacement on the inverter. ✧ Disconnect all the power sources applied to the inverter before terminal wiring, and wait for at least the time designated on the inverter after disconnecting the power sources. ✧ Take measures to prevent screws, cables and other conductive matters from falling into the inverter during maintenance and component replacement.

Note:

✧ Use proper torque to tighten the screws.

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

✧ Do not carry out insulation voltage-endurance test on the inverter, or measure the control circuits of the inverter with megameter.

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

1.4.4 Scrap treatment

	✧ The heavy metals inside the inverter should be treated as industrial effluent.
	✧ When the life cycle ends, the product should enter the recycling system. Dispose of it separately at an appropriate collection point instead of placing it in the normal waste stream.

Chapter 2 Product overview

2.1 What this chapter contains

This chapter describes the basic principles that should be paid attention to during the installation and commissioning of the frequency converter, so that customers can quickly install and commission the frequency converter.

2.2 Product specification

Function description		Specification
Power input	Input voltage (V)	AC 3PH 380V (-15%)–440V (+10%) rated voltage: 380V AC 3PH 520V (-15%)–690V (+10%) rated voltage: 660V
	Input current (A)	Refer to *Rated value*
	Input frequency (Hz)	50Hz or 60Hz, allowable range: 47–63Hz
Power output	Output voltage (V)	0–input voltage
	Output current (A)	Refer to Rated value
	Output power (kW)	Refer to Rated value
	Output frequency (Hz)	0–400Hz
Technical control performance	Control mode	SVPWM control, SVC, VC
	Motor type	Asynchronous motor, permanent-magnet synchronous motor
	Speed regulation ratio	Asynchronous motor 1: 200 (SVC); Synchronous motor 1: 20 (SVC) , 1:1000 (VC)
	Speed control precision	±0.2% (SVC), ±0.02% (VC)
	Speed fluctuation	± 0.3% (SVC)
	Torque response	<20ms SVC) , <10ms (VC)
	Torque control precision	10% (SVC) , 5% (VC)
	Starting torque	Asynchronous motor: 0.25Hz/150% (SVC) Synchronous motor: 2.5 Hz/150% (SVC) 0Hz/200% (VC)
	Overload capacity	150% of rated current: 1min; 180% of rated current: 10s; 200% of rated current: 1s;
Running control performance	Frequency setup mode	Digital, analog, pulse frequency, multi-step speed running, simple PLC, PID, MODBUS communication, PROFIBUS communication, etc; Realize switch-over between the set combination and the set channel
	Automatic voltage regulation function	Keep the output voltage constant when grid voltage changes
	Fault protection function	Fault protection function Provide over 30 kinds of fault protection functions: overcurrent, overvoltage, undervoltage, over-temperature, phase loss and overload, etc
	Speed tracking restart function	Realize impact-free starting of the motor in rotating Note: This function is available for 4kW and above models
Peripheral	Terminal analog input	No more than 20mV

Function description		Specification
interface	resolution	
	Terminal digital input resolution	No more than 2ms
	Analog input	2 inputs, AI1: 0–10V/0–20mA; AI2: -10–10V
	Analog output	1 output, AO1: 0–10V /0–20mA
	Digital input	Four regular inputs; max. frequency: 1kHz; internal impedance: 3.3kΩ Two high-speed inputs; max. frequency: 50kHz; supports quadrature encoder input; with speed measurement function
	Digital output	One high-speed pulse output; max. frequency: 50kHz One Y terminal open collector output
	Relay output	Two programmable relay outputs RO1A NO, RO1B NC, RO1C common port RO2A NO, RO2B NC, RO2C common port Contact capacity: 3A/AC250V, 1A/DC30V
	Extension interface	Three extension interfaces: SLOT1, SLOT2, SLOT3 Expandable PG card, programmable extension card, communication card, I/O card, etc
Others	Installation mode	Support wall-mounting, floor-mounting and flange-mounting
	Temperature of running environment	-10–50°C, derating is required if the ambient temperature exceeds 40°C
	Protection level	IP20
	Pollution level	Level 2
	Cooling mode	Air cooling
	Brake unit	Built-in brake unit for 380V 37kW and below models; Optional built-in brake unit for 380V 45kW–110kW (inclusive) models; Optional external brake unit for 660V models;
	EMC filter	380V models fulfill the requirements of IEC61800-3 C3 Optional external filter should meet the requirements of IEC61800-3 C2

2.3 Product nameplate

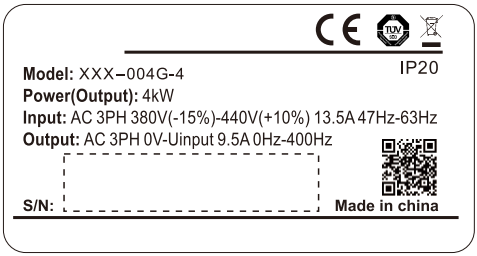


Fig 2.4 Product nameplate

Note:

This is an example of the nameplate of standard products. The CE/TUV/IP20 marking on the top right will be marked according to actual certification conditions.

2. Scan the QR code on the bottom right to download mobile APP and operation manual.

2.4 Type designation key

The type designation key contains product information. Users can find the type designation key on the nameplate and simple nameplate of the inverter.

XXX – 5R5G – 4
① ② ③

Fig 2.5 Type designation key

Field	Sign	Description	Contents
Abbreviation of product series	①	Abbreviation of	XXX: XXX high performance multi-function inverter
Rated power	②	Power range + load type	5R5-5.5kW G—Constant torque load
Voltage level	③	Voltage level	4: AC 3PH 380V (-15%)–440V (+10%) Rated voltage: 380V 6: AC 3PH 520V (-15%)–690V (+10%) Rated voltage: 660V
Note: Built-in brake unit is included in standard configuration of 380V 37kW and below models; Brake unit is not included in standard configuration of 380V 45–110kW models (optional built-in brake unit is available, suffix "-B" indicates optional built-in brake unit, eg XXX-045G-4-B)			

2.5 Rated value

2.5.1 AC 3PH 380V(-15%)–440V(+10%) rated value

Product model	Output power (kW)	Input current (A)	Output current (A)
1R5G- 4	1.5	5.0	3.7
2R2G-4	2.2	5.8	5
004G-4	4	13.5	9.5
5R5G-4	5.5	19.5	14
7R5G-4	7.5	25	18.5
011G-4	11	32	25
015G-4	15	40	32
018G-4	18.5	47	38
022G-4	22	51	45
030G-4	30	70	60
037G-4	37	80	75
045G-4	45	98	92
055G-4	55	128	115
075G-4	75	139	150
090G-4	90	168	180
110G-4	110	201	215
132G-4	132	265	260
160G-4	160	310	305
185G-4	185	345	340
200G-4	200	385	380
220G-4	220	430	425
250G-4	250	460	480
280G-4	280	500	530
315G-4	315	580	600
355G-4	355	625	650
400G-4	400	715	720
450G-4	450	840	820
500G-4	500	890	860

Note:

1. The input current of 1.5–500kW inverter is measured in cases where the input voltage is 380V without additional reactors;
2. The rated output current is the output current when the output voltage is 380V;
3. Within allowable input voltage range, the output current/power cannot exceed rated output current/power.

2.5.2 AC 3PH 520V (-15%)–690V (+10%) rated value

Product model	Output power (kW)	Input current (A)	Output current (A)
022G-6	22	35	27
030G-6	30	40	34
037G-6	37	47	42
045G-6	45	52	54
055G-6	55	65	62
075G-6	75	85	86
090G-6	90	95	95
110G-6	110	118	131
132G-6	132	145	147
160G-6	160	165	163
185G-6	185	190	198
200G-6	200	210	216
220G-6	220	230	240
250G-6	250	255	274
280G-6	280	286	300
315G-6	315	334	328
355G-6	355	360	380
400G-6	400	411	426
450G-6	450	445	465
500G-6	500	518	540
560G-6	560	578	600
630G-6	630	655	680
800G-6	800	822	860
2000G-6	2000	2072	2160

Note:

1. The input current of 22–350kW inverter is measured in cases where the input voltage is 660V without DC reactors and input/output reactors;
2. The input current of 400–630kW inverter is measured in cases where the input voltage is 660V and there is input reactor;
3. Rated output current is the output current when the output voltage is 660V.
4. Within allowable input voltage range, the output current/power cannot exceed rated output current/power.

2.6 Structure diagram

The inverter layout is shown in the figure below (take a 380V 30kW inverter as an example).

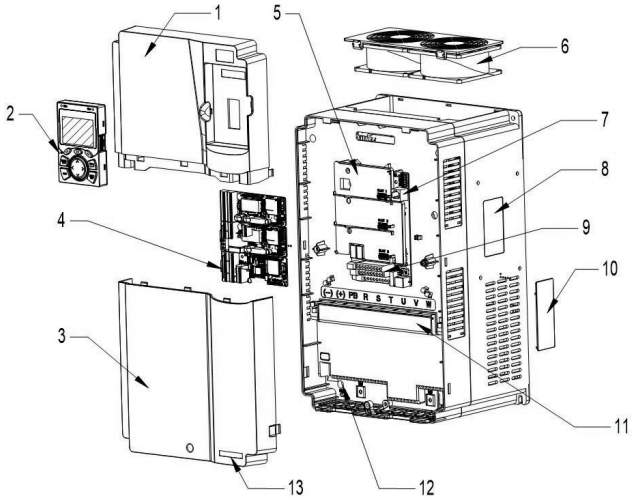


Fig 2.6 Structure diagram

		Instruction
	Upper cover	Protect internal components and parts
	Keypad	See details at chapter 5.4 *Keypad operation*
	Lower cover	Protect internal components and parts
	Extension card	Optional, see details at Appendix A *Extension cards*
	Baffle of control board	Protect the control board and install extension card
	Cooling fan	See details at chapter 9 *Maintenance and hardware fault diagnosis*

No.	Name	Instruction
7	Keypad interface	Connect the keypad
8	Nameplate	See details at chapter 3.4 *Product nameplate*
9	Control terminals	See details at chapter 4 *Installation guide*
10	Cover plate of heat emission hole	Optional. Cover plate can upgrade protection level, however, as it will also increase internal temperature, derated use is required.
11	Main circuit terminal	See details at chapter 4 *Installation guide*
12	POWER indicator	Power indicator
13	Label of product	See details at *Type designation key* of this chapter

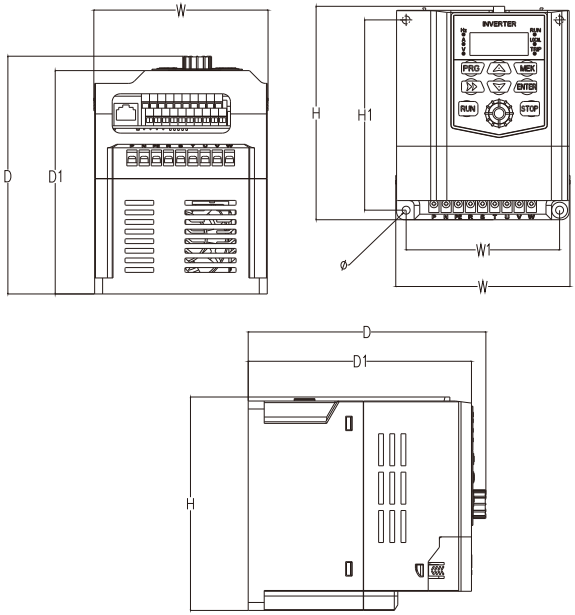
Chapter 3 Installation guide

3.1 What this chapter contains

This chapter introduces the mechanical and electrical installations of the inverter.

	✧ Only well trained and qualified professionals are allowed to carry out the operations mentioned in this chapter. Please carry out operations according to instructions presented in Safety precautions. Ignoring these safety precautions may lead to physical injury or death, or device damage. ✧ Ensure the inverter power is disconnected before installation. If the inverter has been powered on, disconnect the inverter and wait for at least the time designated on the inverter, and ensure the POWER indicator is off. Users are recommended to use a multimeter to check and ensure the inverter DC bus voltage is below 36V. ✧ Installation must be designed and done according to applicable local laws and regulations. INVT does not assume any liability whatsoever for any installation which breaches local laws and regulations. If recommendations given by INVT are not followed, the inverter may experience problems that the warranty does not cover.

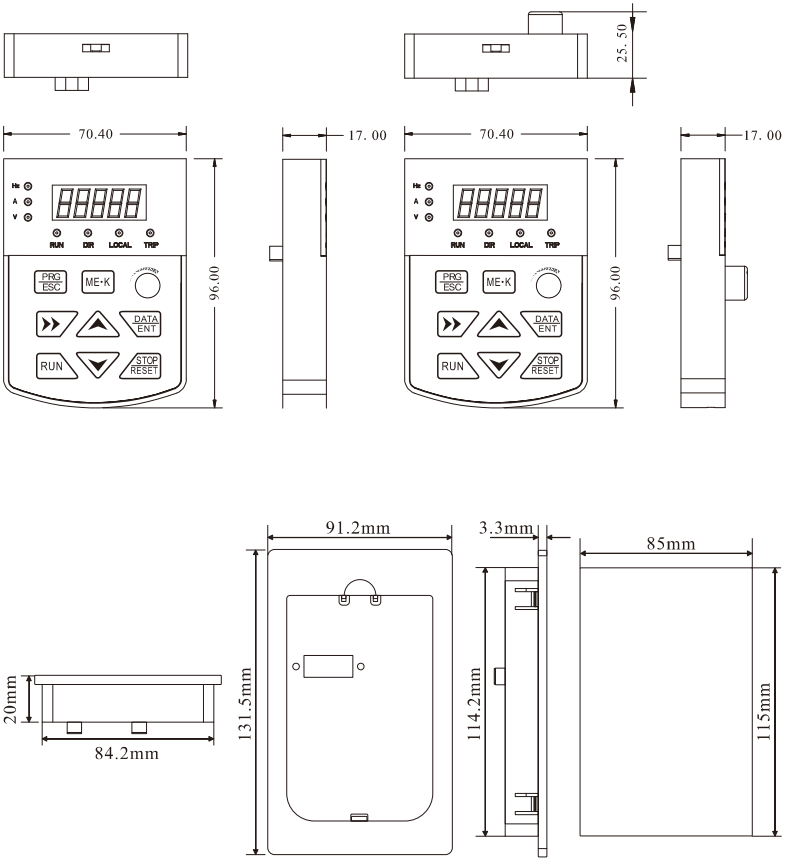
3.2 Product mountuing hole dimensions



Specification and model	Form factor and mounting size (mm)						
	W	W1	H	H1	D	D1	Φ
5D5/P3-7D5	180	167	240	228	214	205	5.5
7D5/P3-011							
011/P3-015							
015/P3-018	225	200	354	330	211	205	6
018/P3-022							
022/P3-030							
030/P3-037	240	165	450	433	236	230	7
037/P3-045							
045/P3-055	240	160	560	545	331	321	7
055/P3-075							
075/P3-090	270	195	640	617	378	368	10
090/P3-110							
110/P3-132							
132/P3-160	352	220	800	777	418	408	10
160/P3-185							
185/P3-200	360	200	940	912	494.5	484.5	17.5
200/P3-220							
220/P3-250							
250/P3-280	370	200	1140	1112	575.5	565.5	17.5
280/P3 315							
315/P3-350	400	240	1250	1222	560	550	17.5
350/P3-400							
400/P3 450							

Note: The above dimensions are subject to change without prior notice.

3.2.1 Keyboard size and keyboard tray size



The shape and mounting hole size of the single nixie external keypad (keyboard holder) above 4kW

3.2.2 Installation environment

Installation environment is essential for the inverter to operate at its best in the long run. The installation environment of the inverter should meet the following requirements.

Environment	Condition
Installation site	Indoors
Ambient temperature	✧ -10–+50°C; ✧ When the ambient temperature exceeds 40°C, derate 1% for every additional 1°C; ✧ It is not recommended to use the inverter when the ambient temperature is above 50°C; ✧ In order to improve reliability, do not use the inverter in cases where the temperature changes rapidly; ✧ When the inverter is used in a closed space eg control cabinet, use cooling fan or air conditioner to prevent internal temperature from exceeding the temperature required; ✧ When the temperature is too low, if restart an inverter which has been idled for a long time, it is required to install external heating device before use to eliminate the freeze inside the inverter, failing to do so may cause damage to the inverter.
Humidity	✧ The relative humidity (RH) of the air is less than 90%;
	✧ Condensation is not allowed; ✧ The max RH cannot exceed 60% in the environment where there are corrosive gases.
Storage temperature	-30–+60°C
Running environment	The installation site should meet the following requirements. ✧ Away from electromagnetic radiation sources; ✧ Away from oil mist, corrosive gases and combustible gases; ✧ Ensure foreign object like metal powder, dust, oil and water will not fall into the inverter (do not install the inverter onto combustible object like wood); ✧ Away from radioactive substance and combustible objects; ✧ Away from harmful gases and liquids; ✧ Low salt content; ✧ No direct sunlight
Altitude	✧ Below 1000m; ✧ When the altitude exceeds 1000m, derate 1% for every additional 100m; ✧ When the altitude exceeds 2000m, configure isolation transformer on the input end of the inverter. It is recommended to keep the altitude below 5000m.
Vibration	The max. amplitude of vibration should not exceed 5.8m/s^2 (0.6g)
Installation direction	Install the inverter vertically to ensure good heat dissipation effect

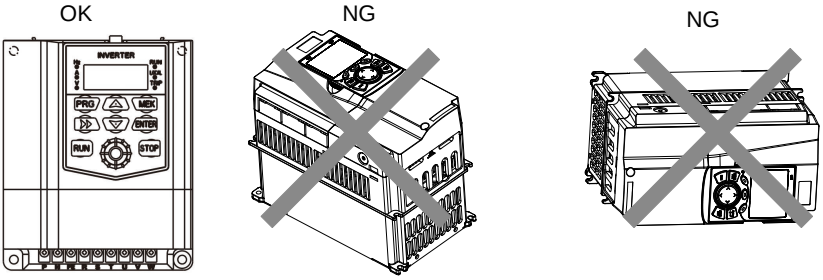
Note:

1. **Inverter should be installed in a clean and well-ventilated environment based on the IP level.**
2. **The cooling air must be clean enough and free from corrosive gases and conductive dust.**

3.2.2 Installation direction

The inverter can be installed on the wall or in a cabinet.

The inverter must be installed vertically. Check the installation position according to following requirements. See appendix C *Dimension drawings* for detailed outline dimensions.



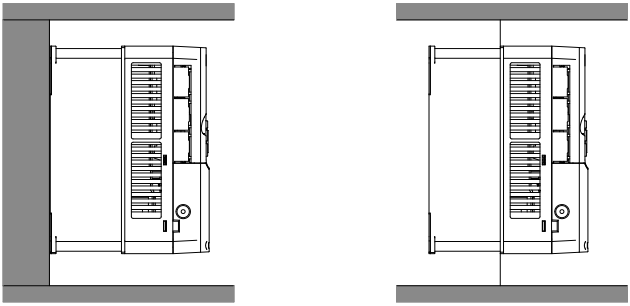
Vertical installation B. Horizontal installation C. Transverse installation

Fig 3.1 Installation direction of the inverter

3.2.3 Installation mode

There are three kinds of installation modes based on different inverter dimensions.

1. Wall-mounting: suitable for 380V 315kW and below inverters, and 660V 355kW and below inverters;
2. Flange-mounting: suitable for 380V 200kW and below inverters, and 660V 220kW and below inverters;
3. Floor-mounting: suitable for 380V 220–500kW inverters, and 660V 250–630kW inverters.



Wall-mounting Flange-mounting

Fig 3.2 Installation mode

(1) Mark the position of the installation hole. See appendix for the position of installation hole;

(2) Mount the screws or bolts onto the designated position;

(3) Put the inverter on the wall;

(4) Tighten the fixing screws on the wall.

Note:

1. Flange-mounting plate is a must for 380V 1.5–75kW inverters that adopt flange-mounting mode; while 380V 90–200kW and 660V 22–220kW models need no flange-mounting plate.
2. Optional installation base is available for 380V 220–315kW and 660V 250–355kW inverters. The base can hold an input AC reactor (or DC reactor) and an output AC reactor.

3.2.4 Single-unit installation

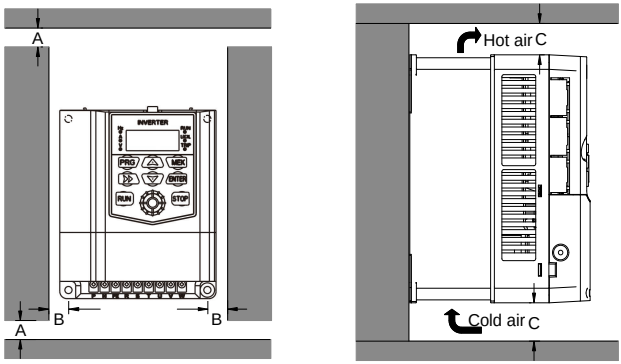


Fig 3.3 Single-unit installation

Note: The min. dimension of B and C is 100mm.

3.2.5 Multiple-unit installation

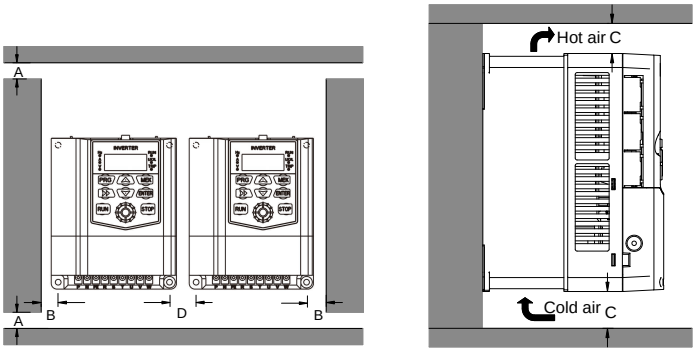


Fig 3.4 Parallel installation

Note:

1. When users install inverters in different sizes, align the top of each inverter before installation for the convenience of future maintenance.
2. The min. dimension of B, D and C is 100mm.

3.2.6 Vertical installation

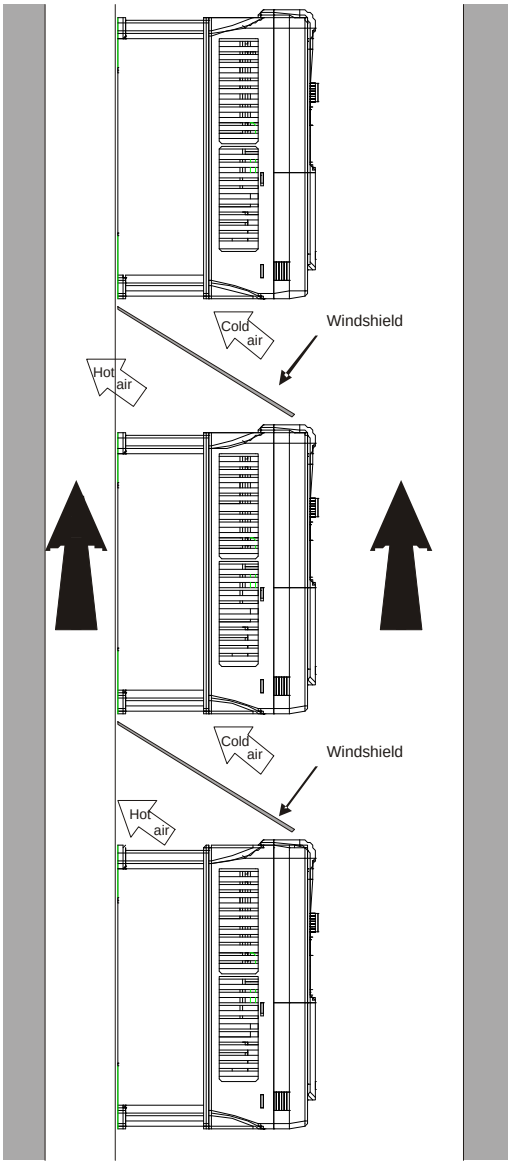


Fig 3.5 Vertical installation

Note: During vertical installation, users must install windshield, otherwise, the inverter will experience mutual interference, and the heat dissipation effect will be degraded.

3.2.7 Tilted installation

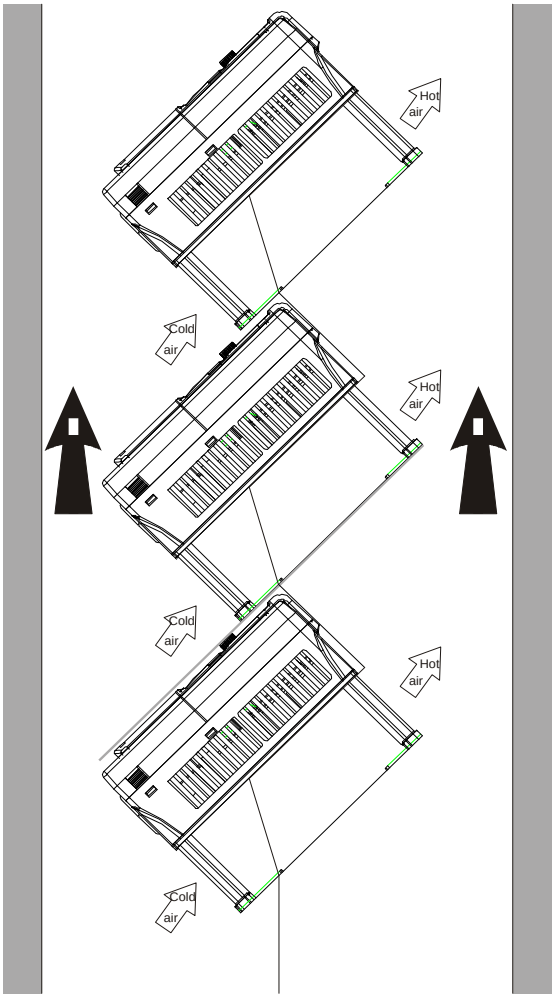


Fig 3.6 Tilted installation

Note: During tilted installation, it is a must to ensure the air inlet duct and air outlet duct are separated from each other to avoid mutual interference.

3.3 Standard wiring of main circuit

3.3.1 Wiring diagram of main circuit

3.3.1.1 AC 3PH 380V(-15%)–440V(+10%) main circuit wiring diagram

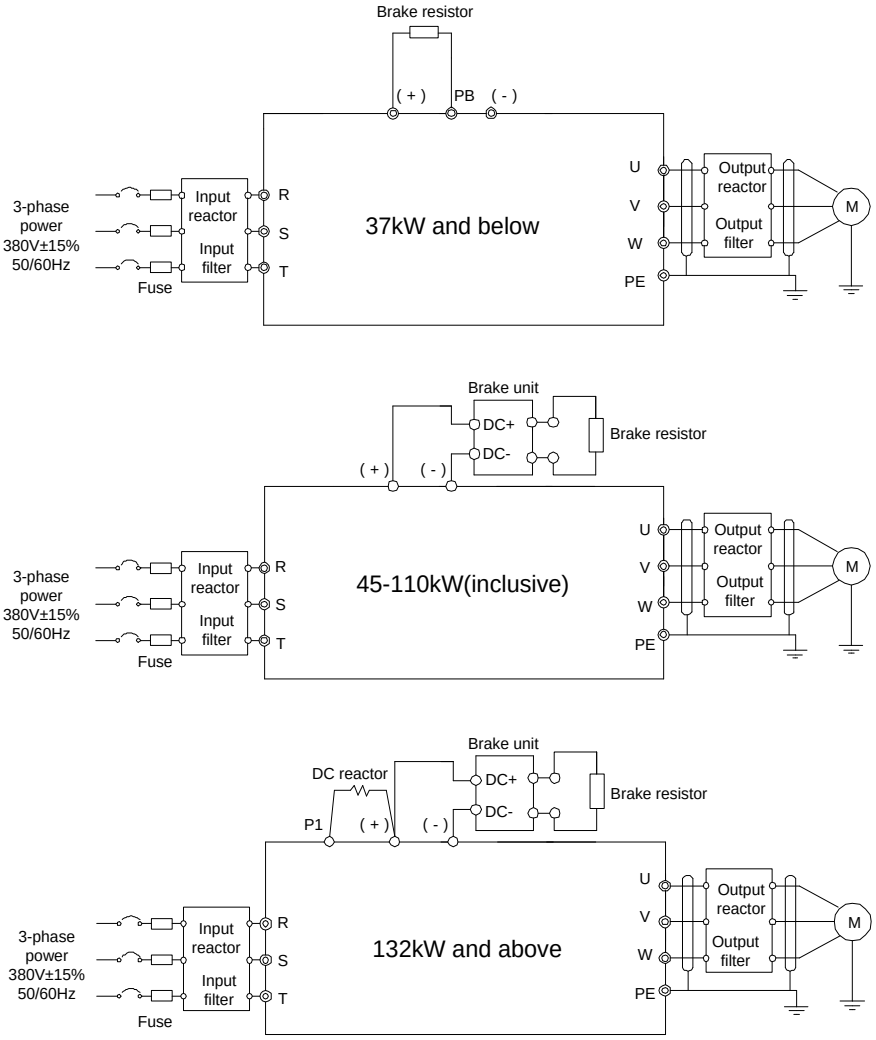


Fig 3.7 Main circuit wiring diagram for AC 3PH 380V(-15%)–440V(+10%)

Note:

1. The fuse, DC reactor, brake unit, brake resistor, input reactor, input filter, output reactor and output filter are optional parts.
2. P1 and (+) have been short connected by default for 380V 132kW and above inverters. If users need to connect to external DC reactor, take off the short-contact tag of P1 and (+).
3. When connecting the brake resistor, take off the yellow warning sign marked with PB, (+) and (-) on the terminal block before connecting the brake resistor wire, otherwise, poor contact may occur.

3.3.1.2 AC 3PH 520V(-15%)–690V(+10%) main circuit wiring diagram

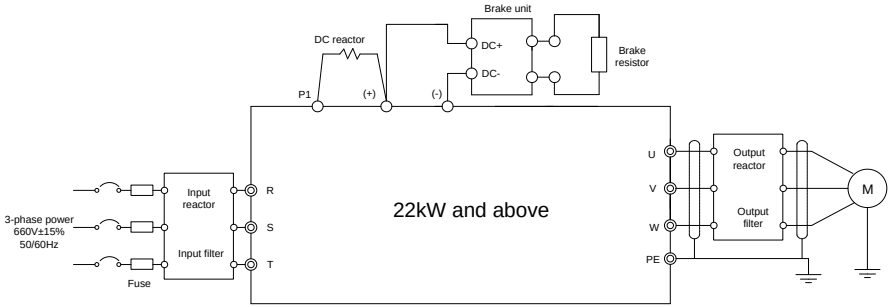


Fig 3.8 660V main circuit wiring diagram

Note:

1. The fuse, DC reactor, brake resistor, input reactor, input filter, output reactor and output filter are optional parts.
2. P1 and (+) have been short connected by default. If users need to connect to external DC reactor, take off the short-contact tag of P1 and (+).
3. When connecting the brake resistor, take off the yellow warning sign marked with (+) and (-) on the terminal block before connecting the brake resistor wire, otherwise, poor contact may occur.

3.3.2 Main loop terminal description

<table>
<tr><th rowspan="2">Terminal sign</th><th colspan="3">Terminal name</th><th rowspan="2">Function description</th></tr>
<tr><th>380V 37kW and below</th><th>380V 45-110kW (inclusive)</th><th>380V 132kW and above
660V</th></tr>
<tr><td>R, S, T</td><td colspan="3">Main circuit power input</td><td>3PH AC input terminal, connect to the grid</td></tr>
<tr><td>U, V, W</td><td colspan="3">Inverter output</td><td>3PH AC output terminal, connect to the motor</td></tr>
<tr><td>P1</td><td>Null</td><td>Null</td><td>DC reactor terminal 1</td><td rowspan="5">P1 and (+) connect to external DC reactor terminal
(+) and (-) connect to external brake unit terminal
PB and (+) connect to external brake resistor terminal</td></tr>
<tr><td>(+)</td><td>Brake resistor terminal 1</td><td>Brake unit terminal 1</td><td>DC reactor terminal 2, Brake unit terminal 1</td></tr>
<tr><td>(-)</td><td>/</td><td colspan="2">Brake unit terminal 2</td></tr>
<tr><td>PB</td><td>Brake resistor</td><td colspan="2">Null</td></tr>
<tr><td></td><td>terminal 2</td><td colspan="2"></td></tr>
<tr><td>PE</td><td colspan="3">Grounding resistor is less than 10 ohm</td><td>Grounding terminal for safe protection; each machine must carry two PE terminals and proper grounding is required</td></tr>
</table>

Note:

1. Do not use asymmetrical motor cable. If there is a symmetrical grounding conductor in the motor cable besides the conductive shielded layer, ground the grounding conductor on the inverter end and motor end.
2. Brake resistor, brake unit and DC reactor are optional parts.
3. Route the motor cable, input power cable and control cables separately.
4. "Null" means this terminal is not for external connection.

3.3.3 Wiring process of the main circuit terminals

1. Connect the grounding line of the input power cable to the grounding terminal (PE) of the inverter, and connect the 3PH input cable to R, S and T terminals and tighten up.
2. Connect the grounding line of the motor cable to the grounding terminal of the inverter, and connect 3PH motor cable to U, V and W terminals and tighten up.
3. Connect the brake resistor which carries cables to the designated position.

4. Fix all the cables outside the inverter mechanically if allowed.

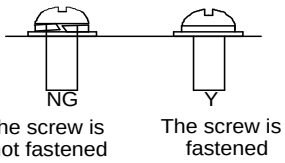


Fig 3.17 Screw installation diagram

3.4 Standard wiring of control circuit

3.4.1 Wiring diagram of basic control circuit

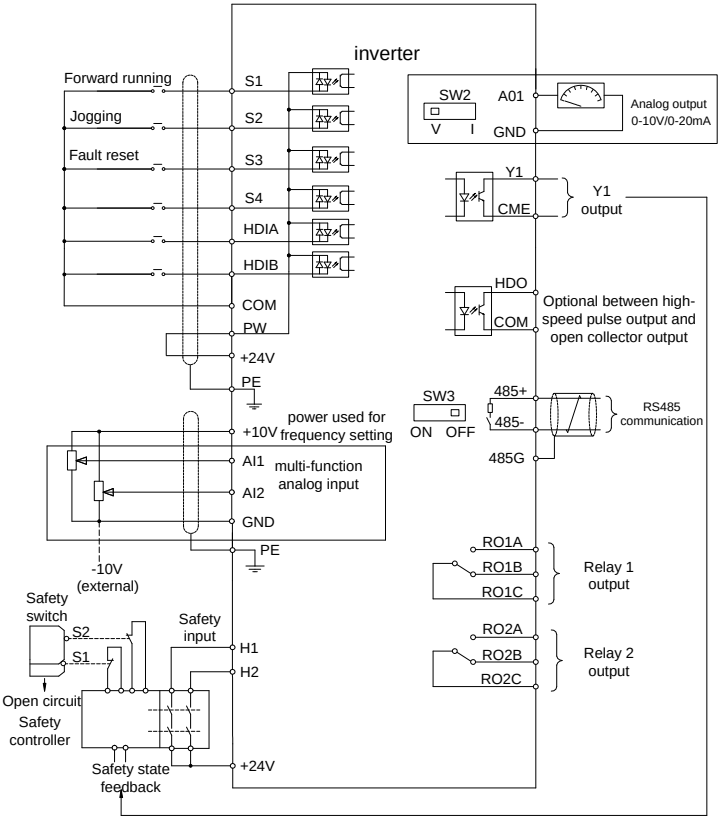


Fig 3.18 Wiring diagram of control circuit

Terminal name	Instruction
+10V	The inverter provides +10.5V power
AI1 AI2	1. Input range: AI1 voltage/current can choose 0–10/ 0–20mA; AI2: -10V–+10V voltage; 2. Input impedance: 20kΩ during voltage input; 250Ω during current input; 3. AI1 voltage or current input is set by P05.50; 4. Resolution ratio: When 10V corresponds to 50Hz, the min. resolution ratio is 5mV; 5. 25°C, When input above 5V or 10mA, the error is ±0.5%
GND	+10.5V reference zero potential
AO1	1. Output range: 0–10V voltage or 0–20mA current 2. Voltage or current output is set by toggle switch SW2; 3. 25°C, when input above 5V or 10mA, the error is ±0.5%.
RO1A RO1B RO1C	RO1 relay output; RO1A is NO, RO1B is NC, RO1C is common port Contact capacity: 3A/AC250V, 1A/DC30V
RO2A RO2B RO2C	RO2 relay output; RO2A is NO, RO2B is NC, RO2C is common port Contact capacity: 3A/AC250V, 1A/DC30V
HDO	1. Switch capacity: 200mA/30V; 2. Range of output frequency: 0–50kHz 3. Duty ratio: 50%
COM	Common port of +24V
CME	Common port of open collector output; short connected to COM by default
Y1	1. Switch capacity: 200mA/30V; 2. Range of output frequency: 0–1kHz
485+ 485-	485 communication port, 485 differential signal port and standard 485 communication interface should use twisted shielded pair; the 120ohm terminal matching resistor of 485 communication is connected by toggle switch SW3.
PE	Grounding terminal
PW	Provide input digital working power from external to internal; Voltage range: 12–24V
24V	The inverter provides user power; the max. output current is 200mA
COM	Common port of +24V

Terminal name	Instruction	
S1	Digital input 1	1. Internal impedance: 3.3kΩ 2. Accept 12–30V voltage input 3. This terminal is bi-directional input terminal and supports NPN/PNP connection modes 4. Max. input frequency: 1kHz 5. All are programmable digital input terminals, users can set the terminal function via function codes
S2	Digital input 2	
S3	Digital input 3	
S4	Digital input 4	
HDIA	Besides S1–S4 functions, it can also act as high frequency pulse input channel Max. input frequency: 50kHz; Duty ratio: 30%–70%; Supports quadrature encoder input; equipped with speed-measurement function	
HDIB		
+24V—H1	STO input 1	1. Safe torque off (STO) redundant input, connect to external NC contact, STO acts when the contact opens, and the inverter stops output; 2. Safety input signal wires use shielded wire whose length is within 25m; 3. H1 and H2 terminals are short connected to +24V by default; it is required to remove the short-contact tag on the terminal before using STO function.
+24V—H2	STO input 2	

3.4.2 Input/output signal connection diagram

Set NPN /PNP mode and internal/external power via U-type short-contact tag. NPN internal mode is adopted by default.

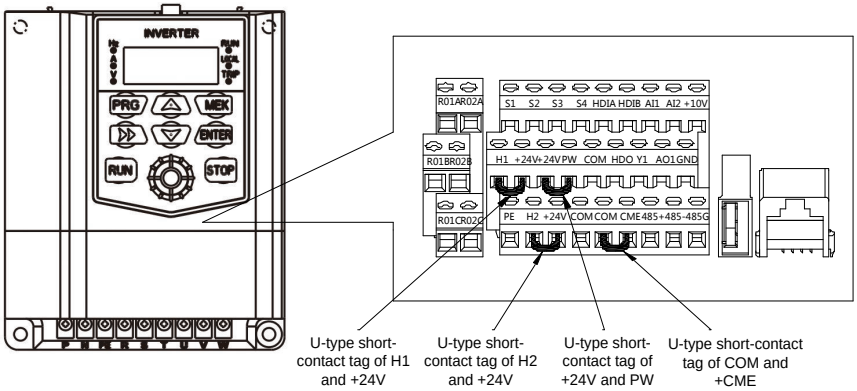
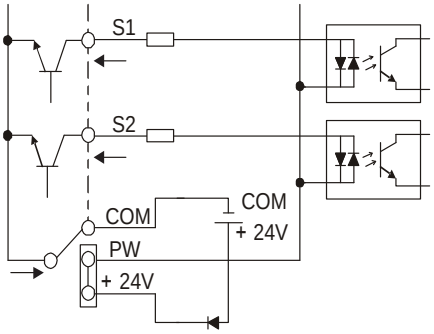
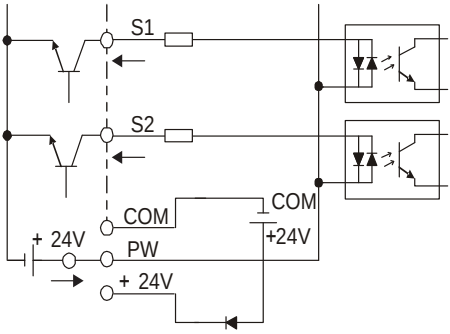


Fig 3.19 Position of U-type short-contact tag

If input signal comes from NPN transistors, set the U-type short-contact tag between +24V and PW based on the power used according to the figure below.



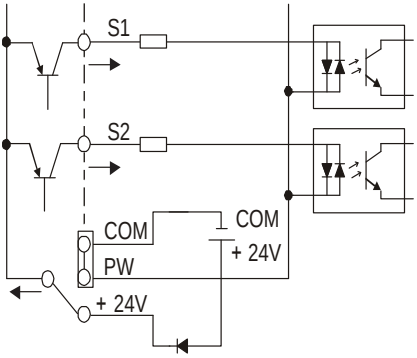
Internal power (NPN mode)



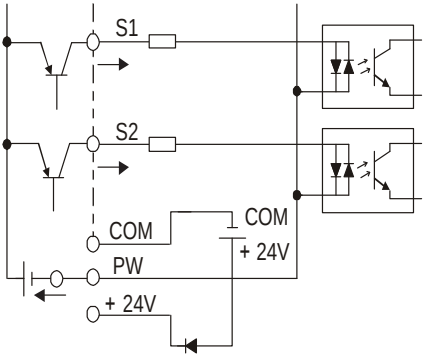
External power (NPN mode)

Fig 3.20 NPN mode

If input signal comes from PNP transistor, set the U-type short-contact tag based on the power used according to the figure below.



Internal power (PNP mode)



External power (PNP mode)

Fig 3.21 PNP mode

3.5 Wiring protection

3.5.1 Protect the inverter and input power cable in short-circuit

Protect the inverter and input power cable during short-circuit to avoid thermal overload.

Carry out protective measures according to the following requirements.

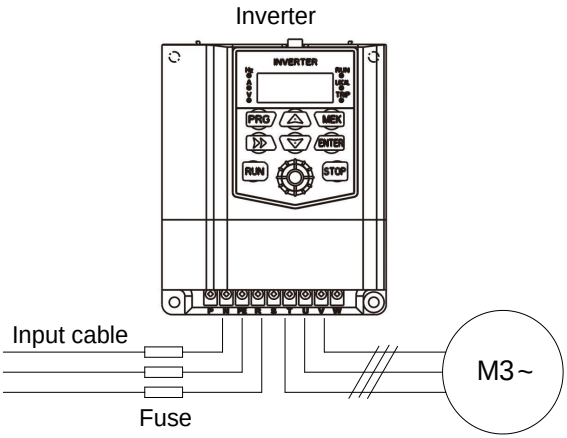


Fig 3.22 Fuse configuration

Note: Select the fuse according to operation manual. During short-circuit, the fuse will protect input power cables to avoid damage to the inverter; when internal short-circuit occurred to the inverter, it can protect neighboring equipment from being damaged.

3.5.2 Protect the motor and motor cable in short circuit

If the motor cable is selected based on rated inverter current, the inverter will be able to protect the motor cable and motor during short circuit without other protective devices.

	✧ If the inverter is connected to multiple motors, it is a must to use a separated thermal overload switch or breaker to protect the cable and motor, which may require the fuse to cut off the short circuit current.

3.5.3 Protect motor and prevent thermal overload

According to the requirements, the motor must be protected to prevent thermal overload. Once overload is detected, users must cut off the current. The inverter is equipped with motor thermal overload protection function, which will block output and cut off the current (if necessary) to protect the motor.

3.5.4 Bypass connection

In some critical occasions, industrial frequency conversion circuit is necessary to ensure proper operation of the system when inverter fault occurs.

In some special cases, eg, only soft startup is needed, it will converts to power-frequency operation directly after soft startup, corresponding bypass link is also needed.

	✧ Do not connect any power source to inverter output terminals U, V and W. The voltage applied to motor cable may cause permanent damage to the inverter.

If frequent switch-over is needed, users can use the switch which carries mechanical interlock or a contactor to ensure motor terminals will not be connected to input power cables and inverter output ends simultaneously.

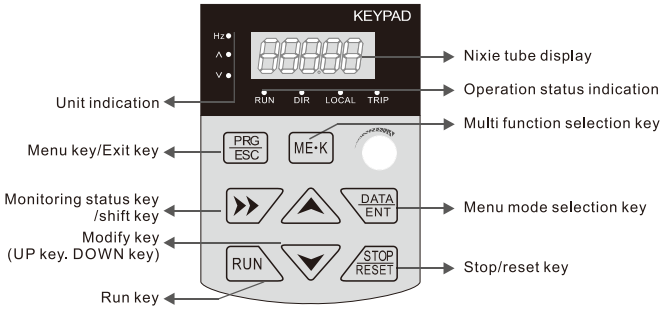
Chapter 4 Basic operation instructions

4.1 What this chapter contains

This chapter tells users how to use the inverter keypad and the commissioning procedures for common functions of the inverter.

4.2 Keypad introduction

LCD keypad is included in the standard configuration of GD350 series inverter. Users can control the inverter start/stop, read state data and set parameters via keypad.



Schematic diagram of operation panel of frequency converter above

Note:

1. LCD keypad is armed with real-time clock, which can run properly after power off when installed with batteries. The clock battery (type: CR2032) should be purchased by the user separately;
2. LCD keypad support parameter-copy;
3. When extending keypad lines to install the keypad, M3 screws can be used to fix the keypad onto the door plate, or optional keypad installation bracket can be used for this purpose.

Key	Name	Function
PRG/ESC or PRG	Programming key	Entering or exiting the primary menu
DATA/ENT or ENTER	Confirm key	Step by step to enter the menu screen and confirm the setting parameters
△	Incremental key	Increment of data or function code
▽	Decrement key	Decrement of data or function code
▷▷	Shift key	Under the shutdown display interface and operation display interface, display parameters can be selected circularly; When modifying a parameter, you can select the modification bit of the parameter.
RUN	Run key	In keyboard operation mode, it is used to run operations.
STOP/RESET or STOP	Stop/Reset	In the running state, press this key to stop the running operation; In case of fault alarm, it can be used for reset operation. The characteristics of this key are restricted by function code EO7.04.
ME.K	Multi function selection key	Function switching selection according to EO7.02

Chapter 5 Function parameter list

5.1 What this chapter contains

This chapter lists all the function codes and corresponding description of each function code.

5.2 Function parameter list

Function parameters of GD350 series inverter are categorized according to functions. Among the function groups, P98 is analog input/output calibration group, and P99 is factory function group which cannot be accessed by users. The function code adopts three-level menu, eg, "P08.08" indicates it is the no. 8 function code in P8 group.

The function group no. corresponds to the first-level menu; function code no. corresponds to the second-level menu; function code parameter corresponds to the third-level menu.

1. The function list is divided into the following columns.

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

Colum 2 "Name": complete name of the function parameter;

Colum 3 "Detailed parameter description": detailed description of this function parameter;

Colum 4 "Default value": The original set value of the function parameter by default;

Colum 5: "Modify": The modification attribute of the function parameter, namely whether the function parameter can be modified and the condition for modification, as shown below.

"○": the set value of this parameter can be modified when the inverter is in stop or running state;

"◎": the set value of this parameter cannot be modified when the inverter is in running state;

"●": the parameter value is the measured value which cannot be modified.

(The inverter has assigned the modification attribute of each parameter automatically to avoid inadvertent modification by users.)

2. "System of numeration for parameters" is decimalism; if the parameter is presented in hexadecimal numbers, the data of each bit will be independent of each other during parameter edit, and the value range of partial bits can be 0–F in hexadecimal system.

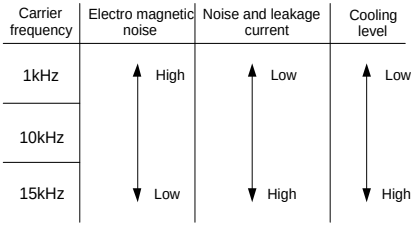
3. "Default value" is value restored after parameter refresh during restoring to default value; however, the measured value or recorded value will not be refreshed.

4. In order to enhance parameter protection, the inverter provides password protection for the function codes. After setting user password (namely user password P07.00 is not zero), when users press PRG/ESC key to enter function code edit state, the system will first enter user password verification state which displays "0.0.0.0.0.", requiring operators to input the correct user password. For factory parameters, besides user password, it is also required to input the correct factory password (users should not attempt to modify factory parameters as improper setup may easily lead to mal-operation or damage the inverter). When password protection is unlocked, the user password

can be modified at any time; user password is subject to the last input. User password can be cancelled by setting P07.00 to 0; if P01.00 is set to a non-zero value, the parameter will be protected by password. When modifying function parameters through serial communication, the function of user password also follows above rules.

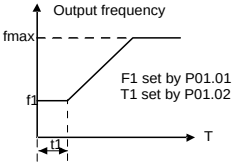
Function code	Name	Detailed parameter description	Default value	Modify
P00 group Basic functions				
P00.00	Speed control mode	0:SVC 0 1:SVC 1 2:SVPWM 3:VC **Note:** If 0, 1 or 3 is selected, it is required to carry out motor parameter autotuning first.	2	◎
P00.01	Running command channel	0: Keypad 1: Terminal 2: Communication	0	○
P00.02	Communication running command channel	0: MODBUS 1: PROFIBUS/CANopen/Devicenet 2: Ethernet 3: EtherCat/Profinet 4: PLC programmable card 5: Wireless communication card **Note:** 1, 2, 3, 4 and 5 are extended functions which are applicable with corresponding cards.	0	○
P00.03	Max. output frequency	Used to set the max. output frequency of the inverter. It is the basis of frequency setup and the acceleration/deceleration. Setting range: Max (P00.04, 10.00) –630.00Hz	50.00Hz	◎
P00.04	Upper limit of running frequency	The upper limit of running frequency is upper limit value of inverter output frequency. This value should be no more than the max. output frequency. When the set frequency is higher than the upper limit frequency, the inverter runs at the upper limit frequency. Setting range: P00.05–P00.03 (max. output frequency)	50.00Hz	◎
P00.05	Lower limit of running frequency	The lower limit of running frequency is the lower limit value of inverter output frequency. When the set frequency is lower than the lower limit frequency, the inverter runs at the lower limit	0.00Hz	◎

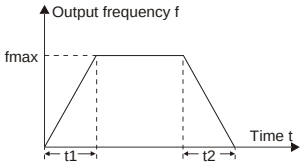
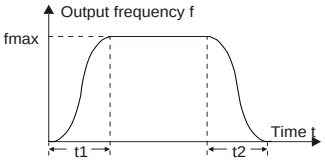
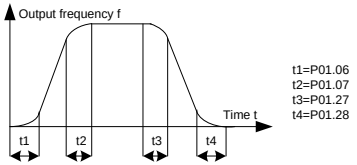
Function code	Name	Detailed parameter description	Default value	Modify
		frequency. **Note: Max. output frequency ≥ upper limit frequency ≥ lower limit frequency.** Setting range: 0.00Hz–P00.04 (upper limit of running frequency)		
P00.06	A frequency command selection	0: Set via keypad 1: Set via AI1 2: Set via AI2	0	○
P00.07	B frequency command selection	3: Set via AI3 4: Set via high speed pulse HDIA 5: Set via simple PLC program 6: Set via multi-step speed running 7: Set via PID control 8: Set via MODBUS communication 9: Set via PROFIBUS / CANopen / DeviceNet communication 10: Set via Ethernet communication 11: Set via high speed pulse HDIB 12: Set via pulse string AB 13: Set via EtherCat/Profinet communication 14: Set via PLC card 15: Reserved	15	○
P00.08	Reference object of B frequency command	0: Max. output frequency 1: A frequency command	0	○
P00.09	Combination mode of setting source	0: A 1: B 2: (A+B) 3: (A-B) 4: Max. (A, B) 5: Min. (A, B)	0	○
P00.10	Set frequency via keypad	When A and B frequency commands are set by keypad, the value is the initial digital set value of the inverter frequency. Setting range: 0.00 Hz–P00.03 (max. output frequency)	50.00Hz	○
P00.11	Acceleration time 1	Acceleration time is the time needed for accelerating	Depend on model	○

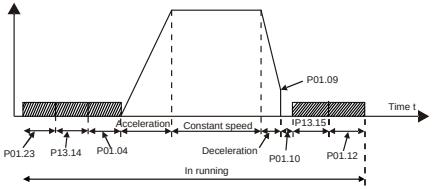
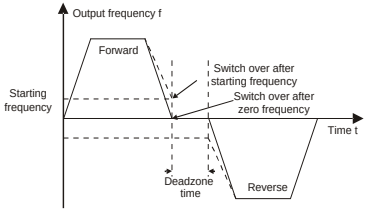
<table>
<tr><th>Function code</th><th>Name</th><th>Detailed parameter description</th><th>Default value</th><th>Modify</th></tr>
<tr><td rowspan="2">P00.12</td><td rowspan="2">Deceleration time 1</td><td>from 0Hz to max. output frequency (P00.03).</td><td rowspan="2">Depend on model</td><td rowspan="2">○</td></tr>
<tr><td>Deceleration time is the time needed from decelerating from max. output frequency (P00.03) to 0Hz.
Goodrive350 series inverter defines four groups of acceleration and deceleration time, which can be selected via multi-function digital input terminals (P05 group). The acceleration/deceleration time of the inverter is the first group by default.
Setting range of P00.11 and P00.12: 0.0–3600.0s</td></tr>
<tr><td>P00.13</td><td>Running direction</td><td>0: Run in default direction
1: Run in reverse direction
2: Reverse running is prohibited</td><td>0</td><td>○</td></tr>
<tr><td>P00.14</td><td>Carrier frequency setup</td><td> 

The relation between the model and carrier frequency is shown below.
<table>
<tr><th colspan="2">Model</th><th>Default value of carrier frequency</th></tr>
<tr><td rowspan="3">380V</td><td>1.5–11kW</td><td>8kHz</td></tr>
<tr><td>15–55kW</td><td>4kHz</td></tr>
<tr><td>Above 75kW</td><td>2kHz</td></tr>
<tr><td rowspan="2">660V</td><td>22–55kW</td><td>4kHz</td></tr>
<tr><td>Above 75kW</td><td>2kHz</td></tr>
</table>
Advantages of high carrier frequency are as follows: ideal current waveform, few current harmonics and small motor noise.
Disadvantages of high carrier frequency are as follows: growing switch consumption, enlarged temperature rise, impacted output capacity; under high carrier frequency, the inverter needs to be derated for use, meanwhile, the leakage current will</td><td>Depend on model</td><td>○</td></tr>
</table>

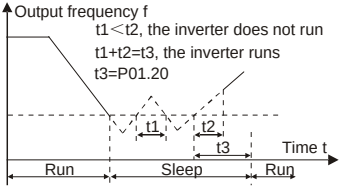
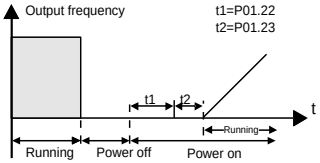
Function code	Name	Detailed parameter description	Default value	Modify
		increase, which increases electromagnetic interference to the surroundings. While low carrier frequency is the contrary. Low carrier frequency will cause unstable operation at low frequency, decrease the torque, or even lead to oscillation. The carrier frequency of inverter is set properly by default, and it should not be changed by users at will. If the default carrier frequency is exceeded during use, derating is required, derate by 10% for every additional 1k carrier frequency. Setting range: 1.2–15.0kHz		
P00.15	Motor parameter autotuning	0: No operation 1: Rotary autotuning; carry out comprehensive motor parameter autotuning; rotary autotuning is used in cases where high control precision is required; 2: Static autotuning 1 (comprehensive autotuning); static autotuning 1 is used in cases where the motor cannot be disconnected from load; 3: Static autotuning 2 (partial autotuning) ; when current motor is motor 1, only P02.06, P02.07 and P02.08 will be autotuned; when current motor is motor 2, only P12.06, P12.07 and P12.08 will be autotuned.	0	◎
P00.16	AVR function	0: Invalid 1: Valid during the whole process Automatic voltage regulation function is used to eliminate the impact on the output voltage of inverter when bus voltage fluctuates.	1	○
P00.17	Reserved	Reserved		
P00.18	Function parameter restoration	0: No operation 1: Restore to default value 2: Clear fault history Note: After the selected function operations are done, this function code will be restored to 0 automatically. Restoration to default value will clear the user password, this function should be used with caution.	0	◎

Function code	Name	Detailed parameter description	Default value	Modify
P01 group Start/stop control				
P01.00	Running mode of start	0: Direct start 1: Start after DC brake 2: Start after speed-tracking 1 3: Start after speed-tracking 2	0	◎
P01.01	Starting frequency of direct start	Starting frequency of direct startup is the initial frequency when the inverter starts. See P01.02 (hold time of starting frequency) for details. Setting range: 0.00–50.00Hz	0.50Hz	◎
P01.02	Hold time of starting frequency	 A proper starting frequency can increase the torque during startup. Within the hold time of starting frequency, the output frequency of inverter is the starting frequency, and then it runs from the starting frequency to the target frequency, if the target frequency (frequency command) is below the starting frequency, the inverter will be standby rather than running. The starting frequency value is unlimited by the lower limit frequency. Setting range: 0.0–50.0s	0.0s	◎
P01.03	DC brake current before start	During starting, the inverter will first perform DC brake based on the set DC brake current before startup, and then it will accelerate after the set DC brake time before startup elapses. If the set DC brake time is 0, DC brake will be invalid. The larger the DC brake current, the stronger the brake force. The DC brake current before startup refers to the percentage relative to rated inverter current. Setting range of P01.03: 0.0–100.0% Setting range of P01.04: 0.00–50.00s	0.0%	◎
P01.04	DC brake time before start		0.00s	◎
P01.05	Acceleration/deceleration mode	This function code is used to select the frequency variation mode during starting and running. 0: Straight line; the output frequency increases or	0	◎

Function code	Name	Detailed parameter description	Default value	Modify
		decreases in straight line;  1: S curve; the output frequency increases or decreases in S curve; S curve is generally used in cases where smooth start/stop is required, eg, elevator, conveyer belt, etc.  **Note: When set to 1, it is required to set P01.06, P01.07, P01.27 and P01.28 accordingly.**		
P01.06	Time of starting section of acceleration S curve	The curvature of S curve is determined by acceleration range and acceleration and deceleration time.  Setting range: 0.0–50.0s	0.1s	◎
P01.07	Time of ending section of acceleration S curve		0.1s	◎
P01.08	Stop mode	0: Decelerate to stop; after stop command is valid, the inverter lowers output frequency based on the deceleration mode and the defined deceleration time, after the frequency drops to the stop speed (P01.15), the inverter stops. 1: Coast to stop; after stop command is valid, the inverter stops output immediately, and the load coasts to stop as per mechanical inertia.	0	○
P01.09	Starting frequency of DC brake after stop	Starting frequency of DC brake after stop; during decelerating to stop, when this frequency is reached, DC brake will be performed after stop.	0.00Hz	○

Function code	Name	Detailed parameter description	Default value	Modify
P01.10	Waiting time of DC brake after stop	Demagnetization time (waiting time of DC brake after stop): Before the DC brake, the inverter will block output, and after the demagnetization time elapses, DC brake will start. This function is used to prevent overcurrent fault caused by DC brake during high speed. DC brake current after stop: it means the DC brake force applied, the larger the current, the stronger the DC brake effect.  Setting range of P01.09: 0.00Hz–P00.03 (max. output frequency) Setting range of P01.10: 0.00–30.00s Setting range of P01.11: 0.0–100.0% Setting range of P01.12: 0.0–50.0s	0.00s	○
P01.11	DC brake current of stop		0.0%	○
P01.12	DC brake time of stop		0.00s	○
P01.13	Deadzone time of forward/reverse rotation	This function code refers to the transition time of the threshold set by P01.14 during setting forward/reverse rotation of the inverter, as shown below.  Setting range: 0.0–3600.0s	0.0s	○
P01.14	Forward/reverse rotation switch-over mode	0: Switch over after zero frequency 1: Switch over after starting frequency 2: Switch over after passing stop speed and delay	0	◎
P01.15	Stop speed	0.00–100.00Hz	0.50Hz	◎
P01.16	Stop speed detection mode	0: Set value of speed (the only detection mode valid in SVPWM mode) 1: Detection value of speed	0	◎

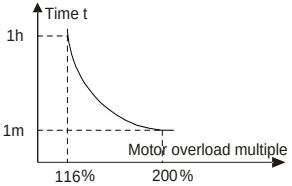
Function code	Name	Detailed parameter description	Default value	Modify
P01.17	Stop speed detection time	0.00–100.00s	0.50s	◎
P01.18	Running protection of power-on terminal	When the running command channel is controlled by terminals, the system will detect running terminal state automatically during power up. 0: Terminal running command is invalid during power up. The inverter will not run during power up even if the running command terminal is detected to be valid, and the system is in running protection state. The inverter will run only after this terminal is cancelled and enabled again. 1: Terminal running command is valid during power up. The system will start the inverter automatically after initialization is done if the running command terminal is detected to be valid during power up. Note: This function must be set with caution, otherwise, serious consequences may occur.	0	○
P01.19	Action selection when the running frequency is below lower limit (lower limit should be larger than 0)	This function code is used to set the running state of inverter when the set frequency is below lower limit frequency. 0: Run in lower limit of the frequency 1: Stop 2: Sleep When the set frequency is below lower limit frequency, the inverter coasts to stop; when the set frequency is above lower limit again and continues to be so after the time set by P01.20 elapses, the inverter will be restored to running state automatically.	0	◎
P01.20	Wake-up-from-sleep delay	This function code is used to set the sleep delay. When the running frequency of inverter is below the lower limit frequency, the inverter enters sleep state; when the set frequency is above the lower limit again and continues to be so after the time set by P01.20 elapses, the inverter will run automatically.	0.0s	○

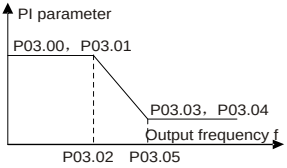
Function code	Name	Detailed parameter description	Default value	Modify
		 Setting range: 0.0–3600.0s (valid when P.01.19 is 2)		
P01.21	Restart after power cut	This function code sets the automatic running of the inverter at next power-on after power down. 0: Disabled restart 1: Enable restart, namely the inverter will run automatically after the time set by P01.22 elapses if the starting conditions are met.	0	○
P01.22	Waiting time of restart after power cut	This function code sets the waiting time before automatically running at next power-on after power down.  Setting range: 0.0–3600.0s (valid when P01.21 is 1)	1.0s	○
P01.23	Start delay	This function code sets the delay of the inverter's wake-up-from-sleep after running command is given, the inverter will start to run and output after the time set by P01.23 elapses to realize brake release. Setting range: 0.0–600.0s	0.0s	○
P01.24	Stop speed delay	0.0–600.0s	0.0s	○
P01.25	Open-loop 0Hz output selection	0: No voltage output 1: With voltage output 2: Output as per DC brake current of stop	0	○
P01.26	Deceleration time of emergency-stop	0.0–60.0s	2.0s	○
P01.27	Time of starting section of deceleration S curve	0.0–50.0s	0.1s	◎

Function code	Name	Detailed parameter description	Default value	Modify
P01.28	Time of ending section of deceleration S curve	0.0–50.0s	0.1s	◎
P01.29	Short-circuit brake current	When the inverter starts in direct start mode (P01.00=0), set P01.30 to a non-zero value to enter short-circuit brake. During stop, if the running frequency of inverter is below the starting frequency of brake after stop, set P01.31 to a non-zero value to enter short-circuit brake after stop, and then carry out DC brake in the time set by P01.12 (refer to P01.09–P01.12). Setting range of P01.29: 0.0–150.0% (inverter) Setting range of P01.30: 0.0–50.0s Setting range of P01.31: 0.0–50.0s	0.0%	○
P01.30	Hold time of short-circuit brake at startup		0.00s	○
P01.31	Hold time of short-circuit brake at stop		0.00s	○
P01.32–P01.34	Reserved variables	0–65535	0	●
P02 group Parameters of motor 1				
P02.00	Type of motor 1	0: Asynchronous motor 1: Synchronous motor	0	◎
P02.01	Rated power of asynchronous motor 1	0.1–3000.0kW	Depend on model	◎
P02.02	Rated frequency of asynchronous motor 1	0.01Hz–P00.03 (max. output frequency)	50.00Hz	◎
P02.03	Rated speed of asynchronous motor 1	1–36000rpm	Depend on model	◎
P02.04	Rated voltage of asynchronous motor 1	0–1200V	Depend on model	◎
P02.05	Rated current of asynchronous motor 1	0.8–6000.0A	Depend on model	◎
P02.06	Stator resistance of asynchronous motor 1	0.001–65.535Ω	Depend on model	○

Function code	Name	Detailed parameter description	Default value	Modify
P02.07	Rotor resistance of asynchronous motor 1	0.001–65.535Ω	Depend on model	○
P02.08	Leakage inductance of asynchronous motor 1	0.1–6553.5Mh	Depend on model	○
P02.09	Mutual inductance of asynchronous motor 1	0.1–6553.5Mh	Depend on model	○
P02.10	No-load current of asynchronous motor 1	0.1–6553.5A	Depend on model	○
P02.11	Magnetic saturation coefficient 1 of iron core of asynchronous motor 1	0.0–100.0%	80.0%	○
P02.12	Magnetic saturation coefficient 2 of iron core of asynchronous motor 1	0.0–100.0%	68.0%	○
P02.13	Magnetic saturation coefficient 3 of iron core of asynchronous motor 1	0.0–100.0%	57.0%	○
P02.14	Magnetic saturation coefficient 4 of iron core of asynchronous motor 1	0.0–100.0%	40.0%	○

Function code	Name	Detailed parameter description	Default value	Modify
P02.15	Rated power of synchronous motor 1	0.1–3000.0KW	Depend on model	◎
P02.16	Rated frequency of synchronous motor 1	0.01Hz–P00.03 (max. output frequency)	50.00Hz	◎
P02.17	Number of pole pairs of synchronous motor 1	1–128	2	◎
P02.18	Rated voltage of synchronous motor 1	0–1200V	Depend on model	◎
P02.19	Rated current of synchronous motor 1	0.8–6000.0A	Depend on model	◎
P02.20	Stator resistance of synchronous motor 1	0.001–65.535Ω	Depend on model	○
P02.21	Direct-axis inductance of synchronous motor 1	0.01–655.35Mh	Depend on model	○
P02.22	Quadrature-axis inductance of synchronous motor 1	0.01–655.35Mh	Depend on model	○
P02.23	Counter-emf constant of synchronous motor 1	0–10000	300	○
P02.24	Initial pole position of synchronous motor 1 (reserved)	0x0000–0xFFFF	0	●
P02.25	Identification current of	0%–50% (rated motor current)	10%	●

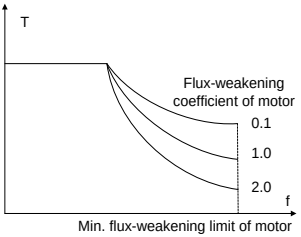
Function code	Name	Detailed parameter description	Default value	Modify
	synchronous motor 1 (reserved)			
P02.26	Overload protection of motor 1	0: No protection 1: Common motor (with low-speed compensation). As the cooling effect of common motor will be degraded in low speed, the corresponding electronic thermal protection value should also be adjusted properly, the low compensation here means to lower the overload protection threshold of the motor whose running frequency is below 30Hz. 2: Frequency-variable motor (without low speed compensation). As the cooling effect of frequency-variable motor is not affected by the rotating speed, there is no need to adjust the protection value during low speed running.	2	◎
P02.27	Overload protection coefficient of motor 1	Motor overload multiples M=Iout/(In×K) In is rated motor current, Iout is inverter output current, K is motor overload protection coefficient. The smaller the K, the larger the value of M, and the easier the protection. M=116%: protection will be applied when motor overloads for 1h; M=200%: protection will be applied when motor overloads for 60s; M>=400%: protection will be applied immediately.  Setting range: 20.0%–120.0%	100.0%	○
P02.28	Power display calibration coefficient of motor 1	This function adjusts the power display value of motor 1 only, and it does not affect the control performance of the inverter. Setting range: 0.00–3.00	1.00	○
P02.29	Parameter display of motor 1	0: Display as per motor type; under this mode, only parameters related to current motor type will be displayed.	0	○

Function code	Name	Detailed parameter description	Default value	Modify
		1: Display all; under this mode, all the motor parameters will be displayed.		
P02.30	System inertia of motor 1	0–30.000kgm2	0	○
P02.31–P02.32	Reserved variables	0–65535	0	○
P03 group Vector control of motor 1				
P03.00	Speed loop proportional gain 1	Parameters of P03.00–P03.05 fit for vector control mode only. Below P03.02, speed loop PI parameter is P03.00 and P03.01; above P03.06, speed loop PI parameter is P03.03 and P03.04; in between, PI parameter is obtained by linear variation between two groups of parameters, as shown below.  	20.0	○
P03.01	Speed loop integral time 1		0.200s	○
P03.02	Switch low point frequency		5.00Hz	○
P03.03	Speed loop proportional gain 2		20.0	○
P03.04	Speed loop integral time 2		0.200s	○
P03.05	Switch over high point frequency	The speed loop dynamic response characteristics of vector control can be adjusted by setting the proportional coefficient and integral time of speed regulator. Increase proportional gain or decrease integral time can accelerate dynamic response of speed loop, however, if the proportional gain is too large or integral time is too small, system oscillation and overshoot may occur; if proportional gain is too small, stable oscillation or speed offset may occur. Speed loop PI parameter is closely related to the system inertial, users should make adjustment based on default PI parameter according to different load characteristics to fulfill different needs. Setting range of P03.00:0.0–200.0; Setting range of P03.01: 0.000–10.000s Setting range of P03.02: 0.00Hz–P03.05 Setting range of P03.03: 0.0–200.0 Setting range of P03.04: 0.000–10.000s Setting range of P03.05: P03.02–P00.03 (max. output frequency)	10.00Hz	○

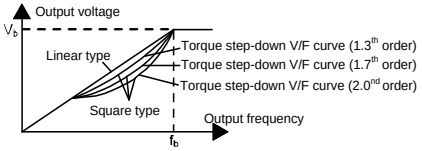
Function code	Name	Detailed parameter description	Default value	Modify
P03.06	Speed loop output filter	0–8 (corresponds to 0–2^8/10ms)	0	○
P03.07	Vector control slip compensation coefficient (motoring)	Slip compensation coefficient is used to adjust the slip frequency of vector control to improve speed control precision. This parameter can be used to control speed offset. Setting range: 50–200%	100%	○
P03.08	Vector control slip compensation coefficient (generating)		100%	○
P03.09	Current loop proportional coefficient P	**Note:** 1. These two parameters are used to adjust PI parameters of current loop; it affects dynamic response speed and control precision of the system directly. The default value needs no adjustment under common conditions; 2. Fit for SVC mode 0 (P00.00=0) and VC mode (P00.00=3); 3. The value of this function code will be updated automatically after parameter autotuning of synchronous motor is done. Setting range: 0–65535	1000	○
P03.10	Current loop integral coefficient I		1000	○
P03.11	Torque setup mode selection	0–1: Set via keypad (P03.12) 2: Set via AI1 (100% corresponds to three times of rated motor current) 3: Set via AI2 (the same as above) 4: Set via AI3 (the same as above) 5: Set via pulse frequency HDIA (the same as above) 6: Set via multi-step torque (the same as above) 7: Set via MODBUS communication (the same as above) 8: Set via PROFIBUS/CANopen/DeviceNet communication (the same as above) 9: Set via Ethernet communication (the same as above) 10: Set via pulse frequency HDIB (the same as	0	○

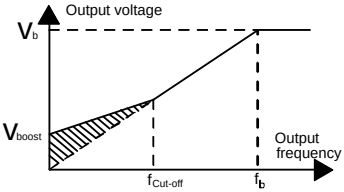
Function code	Name	Detailed parameter description	Default value	Modify
		above) 11: Set via EtherCat/Profinet communication 12: Set via PLC		
P03.12	Torque set by keypad	-300.0%–300.0% (rated motor current)	20.0%	○
P03.13	Torque reference filter time	0.000–10.000s	0.010s	○
P03.14	Source of upper limit frequency setup of forward rotation in torque control	0: Keypad (P03.16) 1: AI1 (100% corresponds to max. frequency) 2: AI2 (the same as above) 3: AI3 (the same as above) 4: Pulse frequency HDIA (the same as above) 5: Multi-step (the same as above) 6: MODBUS communication (the same as above) 7: PROFIBUS /CANopen/ DeviceNet communication (the same as above) 8: Ethernet communication (the same as above) 9: Pulse frequency HDIB (the same as above) 10: EtherCat/Profinet communication 11: PLC 12: Reserved	0	○
P03.15	Source of upper limit frequency setup of reverse rotation in torque control	0: Keypad (P03.17) 1: AI1 (100% corresponds to max. frequency) 2: AI2 (the same as above) 3: AI3 (the same as above) 4: Pulse frequency HDIA (the same as above) 5: Multi-step (the same as above) 6: MODBUS communication (the same as above) 7: PROFIBUS /CANopen/ DeviceNet communication (the same as above) 8: Ethernet communication (the same as above) 9: Pulse frequency HDIB (the same as above) 10: EtherCat/Profinet communication 11: PLC 12: Reserved **Note:** Source 1-11, 100% relative to the max. frequency	0	○
P03.16	Keypad limit value of upper	This function code is used to set frequency limit. 100% corresponds to the max. frequency. P03.16	50.00Hz	○

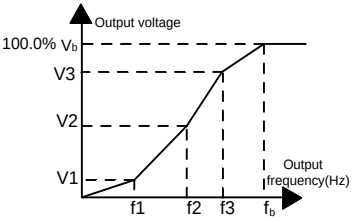
Function code	Name	Detailed parameter description	Default value	Modify
	limit frequency of forward rotation in torque control	sets the value when P03.14=1; P03.17 sets the value when P03.15=1. Setting range: 0.00Hz–P00.03 (max. output frequency)		
P03.17	Max. output frequency		50.00Hz	○
P03.18	Source of upper limit setup of the torque during motoring	0: Keypad (P03.20) 1: AI1 (100% relative to three times of motor current) 2: AI2 (the same as above) 3: AI3 (the same as above) 4: Pulse frequency HDIA (the same as above) 5: MODBUS communication (the same as above) 6: PROFIBUS/CANopen/DeviceNet communication (the same as above) 7: Ethernet communication (the same as above) 8: Pulse frequency HDIB (the same as above) 9: EtherCat/Profinet communication 10: PLC 11: Reserved	0	○
P03.19	Source of upper limit setup of brake torque	0: Keypad (P03.21) 1: AI1 (100% relative to three times of motor current) 2: AI2 (the same as above) 3: AI3 (the same as above) 4: Pulse frequency HDIA (the same as above) 5: MODBUS communication (the same as above) 6: PROFIBUS/CANopen/DeviceNet communication (the same as above) 7: Ethernet communication (the same as above) 8: Pulse frequency HDIB (the same as above) 9: EtherCat/Profinet communication 10: PLC 11: Reserved	0	○
P03.20	Set upper limit of the torque when motoring via keypad	This function code is used to set torque limit. Setting range: 0.0–300.0% (rated motor current)	180.0%	○
P03.21	Set upper limit of brake torque via keypad		180.0%	○

Function code	Name	Detailed parameter description	Default value	Modify
P03.22	Flux-weakening coefficient of constant-power zone	Used when asynchronous motor is in flux-weakening control.  P03.22 and P03.23 are valid during constant power. When motor speed is above rated speed, motor enters flux-weakening running state. The flux-weakening control coefficient can change the flux-weakening curvature, the larger the coefficient, the steeper the curve, the smaller the coefficient, the smoother the curve. Setting range of P03.22: 0.1–2.0 Setting range of P03.23: 10%–100%	0.3	○
P03.23	Min. flux-weakening point of constant-power zone		20%	○
P03.24	Max. voltage limit	P03.24 sets the max. output voltage of the inverter, which is the percentage of rated motor voltage. This value should be set according to field conditions. Setting range:0.0–120.0%	100.0%	○
P03.25	Pre-exciting time	Carry out motor pre-exciting during starting to build a magnetic field inside the motor to improve the torque characteristics of motor during starting. Setting range: 0.000–10.000s	0.300s	○
P03.26	Flux-weakening proportional gain	0–8000	1000	○
P03.27	Vector control speed display	0: Display as per actual value 1: Display as per the set value	0	○
P03.28	Static friction compensation coefficient	0.0–100.0%	0.0%	○
P03.29	Corresponding frequency point of static friction	0.50– P03.31	1.00Hz	○
P03.30	High speed friction	0.0–100.0%	0.0%	○

Function code	Name	Detailed parameter description	Default value	Modify
	compensation coefficient			
P03.31	Corresponding frequency of high speed friction torque	P03.29–400.00Hz	50.00Hz	○
P03.32	Torque control enable	0:Disable 1:Enable	0	◎
P03.33–P03.35	Reserved variables	0–65535	0	●
P03.36	Speed loop differential gain	0.00–10.00s	0.00s	○
P03.37	High-frequency current loop proportional coefficient	Under closed-loop vector control mode (P00.00=3) and P03.39, the current loop PI parameters are P03.09 and P03.10; above P03.39, the PI parameters are P03.37 and P03.38. Setting range of P03.37: 0–20000 Setting range of P03.38: 0–20000 Setting range of P03.39: 0.0–100.0% (relative to max. frequency)	1000	○
P03.38	High-frequency current loop integral coefficient		1000	○
P03.39	Current loop high-frequency switch-over point		100.0%	○
P03.40	Inertia compensation enable	0: Disable 1: Enable	0	○
P03.41	Upper limit of inertia compensation torque	Limit the max. inertia compensation torque to prevent inertia compensation torque from being too large. Setting range: 0.0–150.0% (rated motor torque)	10.0%	○
P03.42	Inertia compensation filter times	Filter times of inertia compensation torque, used to smooth inertia compensation torque. Setting range: 0–10	7	○
P03.43	Inertia identification torque value	Due to friction force, it is required to set certain identification torque for the inertia identification to be performed properly. 0.0–100.0% (rated motor torque)	10.0%	○
P03.44	Enable inertia	0: No operation	0	◎

Function code	Name	Detailed parameter description	Default value	Modify
	identification	1: Start identification		
P03.45–P03.46	Reserved variables	0–65535	0	●
P04 group V/F control				
P04.00	V/F curve setup of motor 1	This group of function code defines the V/F curve of motor 1 to satisfy different load characteristics needs. 0: Straight V/F curve; fit for constant-torque load 1: Multi-point V/F curve 2: Torque down V/F curve (1.3^{th} order) 3: Torque down V/F curve (1.7^{th} order) 4: Torque down V/F curve (2.0^{nd} order) Curve 2–4 are suitable for torque-variable load of fan pump and similar equipment. Users can make adjustment based on load characteristics to achieve optimal energy-saving effect. 5: Customized V/F (V/F separation); under this mode, V is separated from f. Users can adjust f through the frequency reference channel set by P00.06 to change the curve characteristic, or adjust V through the voltage reference channel set by P04.27 to change the curve characteristics. **Note: The V_b** in the figure below corresponds to rated motor voltage, and **f_b** corresponds to rated motor frequency. 	0	◎
P04.01	Torque boost of motor 1	In order to compensate for low-frequency torque characteristics, users can make some boost compensation to the output voltage. P04.01 is relative to the max. output voltage V_b. P04.02 defines the percentage of cut-off frequency of manual torque boost to the rated motor frequency f_b. Torque boost can improve the low-frequency torque characteristics of V/F.	0.0%	○
P04.02	Motor 1 torque boost cut-off		20.0%	○

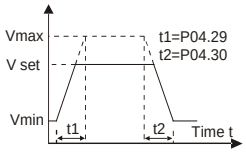
<table>
<tr><th>Function code</th><th>Name</th><th>Detailed parameter description</th><th>Default value</th><th>Modify</th></tr>
<tr><td></td><td></td><td>Users should select torque boost based on the load, eg, larger load requires larger torque boost, however, if the torque boost is too large, the motor will run at over-excitation, which will cause increased output current and motor heat-up, thus degrading the efficiency.
When torque boost is set to 0.0%, the inverter is automatic torque boost.
Torque boost cut-off threshold: Below this frequency threshold, the torque boost is valid, exceeding this threshold will nullify torque boost.
 

Setting range of P04.01: 0.0%: (automatic) 0.1%–10.0%
Setting range of P04.02: 0.0%–50.0%</td><td></td><td></td></tr>
<tr><td>P04.03</td><td>V/F frequency point 1 of motor 1</td><td rowspan="5">When P04.00 =1 (multi-point V/F curve), users can set V/F curve via P04.03–P04.08.
V/F curve is usually set according to the characteristics of motor load.
Note: V1<V2<V3, f1<f2<f3. If low-frequency voltage is set too high, motor overheat or burnt-down may occur, and overcurrent stall or overcurrent protection may occur to the inverter.
 

Setting range of P04.03: 0.00Hz–P04.05
Setting range of P04.04: 0.0%–110.0% (rated voltage of motor 1)</td><td>0.00Hz</td><td>○</td></tr>
<tr><td>P04.04</td><td>V/F voltage point 1 of motor 1</td><td>00.0%</td><td>○</td></tr>
<tr><td>P04.05</td><td>V/F frequency point 2 of motor 1</td><td>0.00Hz</td><td>○</td></tr>
<tr><td>P04.06</td><td>V/F voltage point 2 of motor 1</td><td>0.0%</td><td>○</td></tr>
<tr><td>P04.07</td><td>V/F frequency point 3 of motor 1</td><td>0.00Hz</td><td>○</td></tr>
<tr><td>P04.08</td><td>V/F voltage point 3 of motor 1</td><td>00.0%</td><td>○</td></tr>
</table>

Function code	Name	Detailed parameter description	Default value	Modify
		Setting range of P04.05: P04.03–P04.07 Setting range of P04.06: 0.0%–110.0% (rated voltage of motor 1) Setting range of P04.07: P04.05–P02.02 (rated frequency of motor 1) or P04.05– P02.16 (rated frequency of motor 1) Setting range of P04.08: 0.0%–110.0% (rated voltage of motor 1)		
P04.09	V/F slip compensation gain of motor 1	This function code is used to compensate for the motor speed changes occurred during load variation in SVPWM control mode, thus improving the rigidity of mechanical characteristics of motor. Rated slip frequency of the motor should be calculated. △f=fb-n×p/60 of which: fb is rated motor frequency, corresponds to P02.02; n is rated motor speed, corresponds to P02.03; p is the number of motor pole pairs. 100% corresponds to the rated slip frequency of motor △f. Setting range: 0.0–200.0%	0.0%	○
P04.10	Low-frequency oscillation control factor of motor 1	Under SVPWM control mode, the motor, especially the large-power motor may experience current oscillation during certain frequencies, which may lead to unstable motor operation, or even inverter overcurrent, users can adjust these two parameters properly to eliminate such phenomenon. Setting range of P04.10: 0–100 Setting range of P04.11: 0–100 Setting range of P04.12: 0.00Hz–P00.03 (max. output frequency)	10	○
P04.11	High-frequency oscillation control factor of motor 1		10	○
P04.12	Oscillation control threshold of motor 1		30.00Hz	○
P04.13	V/F curve setup of motor 2	0: Straight V/F curve; 1: Multi-point V/F curve 2: Torque-down V/F curve (1.3^{th} order) 3: Torque-down V/F curve (1.7^{th} order) 4: Torque-down V/F curve (2.0^{nd} order) 5: Customize V/F (V/F separation)	0	◎
P04.14	Torque boost of motor 2	0.0%: (automatic) 0.1%–10.0%	0.0%	○
P04.15	Motor 2 torque boost cut-off	0.0%–50.0% (relative to rated frequency of motor 2)	20.0%	○

Function code	Name	Detailed parameter description	Default value	Modify
P04.16	V/F frequency point 1 of motor 2	0.00Hz– P04.18	0.00Hz	○
P04.17	V/F voltage point 1 of motor 2	0.0%–110.0% (rated voltage of motor 2)	00.0%	○
P04.18	V/F frequency point 2 of motor 2	P04.16– P04.20	0.00Hz	○
P04.19	V/F voltage point 2 of motor 2	0.0%–110.0% (rated voltage of motor 2)	00.0%	○
P04.20	V/F frequency point 3 of motor 2	P04.18– P12.02 (rated frequency of asynchronous motor 2) Or P04.18– P12.16 (rated frequency of synchronous motor 2)	0.00Hz	○
P04.21	V/F voltage point 3 of motor 2	0.0%–110.0% (rated motor voltage)	00.0%	○
P04.22	V/F slip compensation gain of motor 2	0.0–200.0%	0.0%	○
P04.23	Low-frequency oscillation control factor of motor 2	0–100	10	○
P04.24	High-frequency oscillation control factor of motor 2	0–100	10	○
P04.25	Oscillation control threshold of motor 2	0.00Hz–P00.03 (max. output frequency)	30.00Hz	○
P04.26	Energy-saving run	0: No action 1: Automatic energy-saving operation Under light-load state, the motor can adjust the output voltage automatically to achieve energy-saving purpose	0	◎
P04.27	Channel of voltage setup	0: Keypad; output voltage is determined by P04.28 1: AI1 2: AI2 3: AI3 4: HDIA 5: Multi-step (the set value is determined by P10 group)	0	○

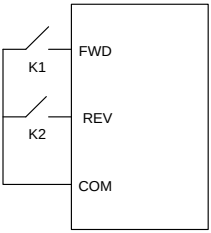
Function code	Name	Detailed parameter description	Default value	Modify
		6: PID 7: MODBUS communication 8: PROFIBUS/CANopen/DeviceNet communication 9: Ethernet communication 10: HDIB 11: EtherCat/Profinet communication 12: PLC programmable card 13: Reserved		
P04.28	Set voltage value via keypad	When the channel for voltage setup is set to "keypad", the value of this function code is digital voltage set value. Setting range: 0.0%–100.0%	100.0%	○
P04.29	Voltage increase time	Voltage increase time means the time needed from outputting the min. voltage to accelerating to output the max. voltage. Voltage decrease time means the time needed from outputting max. voltage to outputting the min. voltage Setting range: 0.0–3600.0s	5.0s	○
P04.30	Voltage decrease time		5.0s	○
P04.31	Output max. voltage	Set the upper/lower limit value of output voltage.  Setting range of P04.31: P04.32–100.0% (rated motor voltage) Setting range of P04.32: 0.0%–P04.31	100.0%	◎
P04.32	Output min. voltage		0.0%	◎
P04.33	Flux-weakening coefficient of constant-power zone	1.00–1.30	1.00	○
P04.34	VF pull-in current 1 of synchronous motor	-100.0%–100.0% (rated motor current)	20.0%	○
P04.35	VF pull-in current 2 of synchronous motor	-100.0%–100.0% (rated motor current)	10.0%	○
P04.36	VF pull-in current frequency	0.00Hz–P00.03 (max. output frequency)	50.00Hz	○

Function code	Name	Detailed parameter description	Default value	Modify
	switch-over threshold of synchronous motor			
P04.37	VF reactive closed-loop proportional coefficient of synchronous motor	0–3000	50	○
P04.38	VF reactive closed-loop integral time of synchronous motor	0–3000	30	○
P04.39	VF reactive closed-loop output limit of synchronous motor	0–16000	8000	○
P04.40	Enable/disable IF mode of asynchronous motor 1	0–1	0	◎
P04.41	IF current setting of asynchronous motor 1	0.0–200.0%	120.0%	○
P04.42	IF proportional coefficient of asynchronous motor 1	0–5000	650	○
P04.43	IF integral coefficient of asynchronous motor 1	0–5000	350	○
P04.44	IF mode cut-off frequency threshold of	0.00–20.00Hz	10.00Hz	○

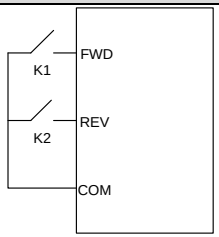
Function code	Name	Detailed parameter description	Default value	Modify
	asynchronous motor 1			
P04.45	Enable/disable IF mode of asynchronous motor 2	0–1	0	◎
P04.46	IF current setting of asynchronous motor 2	0.0–200.0%	120.0%	○
P04.47	IF proportional coefficient of asynchronous motor 2	0–5000	650	○
P04.48	IF integral coefficient of asynchronous motor 2	0–5000	350	○
P04.49	IF mode cut-off frequency threshold of asynchronous motor 2	0.00–20.00Hz	10.00Hz	○
P04.50	Reserved variables	0–65535	0	●
P04.51	Reserved variables	0–65535	0	●
P05 group Input terminals				
P05.00	HDI input type	0x00–0x11 Ones: HDIA input type 0: HDIA is high-speed pulse input 1: HDIA is digital input Tens: HDIB input type 0: HDIB is high-speed pulse input 1: HDIB is digital input	0	◎
P05.01	Function of S1 terminal	0: No function 1: Forward running	1	◎
P05.02	Function of S2 terminal	2: Reverse running 3: 3-Wire control/Sin	4	◎

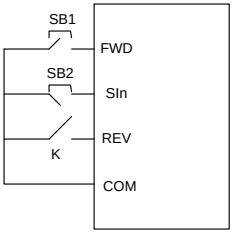
Function code	Name	Detailed parameter description	Default value	Modify
P05.03	Function of S3 terminal	4: Forward jogging 5: Reverse jogging	7	◎
P05.04	Function of S4 terminal	6: Coast to stop 7: Fault reset	0	◎
P05.05	Function of HDIA terminal	8: Running pause 9: External fault input	0	◎
P05.06	Function of HDIB terminal	10: Frequency increase (UP) 11: Frequency decrease (DOWN) 12: Clear frequency increase/decrease setting 13: Switch-over between setup A and setup B 14: Switch-over between combination setup and setup A 15: Switch-over between combination setup and setup B 16: Multi-step speed terminal 1 17: Multi-step speed terminal 2 18: Multi-step speed terminal 3 19: Multi-step speed terminal 4 20: Multi-step speed pause 21: Acceleration/deceleration time selection 1 22: Acceleration/deceleration time selection 2 23: Simple PLC stop reset 24: Simple PLC pause 25: PID control pause 26: Wobbling frequency pause 27: Wobbling frequency reset 28: Counter reset 29: Switch-over between speed control and torque control 30: Acceleration/deceleration disabled 31: Counter trigger 32: Reserved 33: Clear frequency increase/decrease setting temporarily 34: DC brake 35: Switch-over between motor 1 and motor 2 36: Command switches to keypad 37: Command switches to terminal 38: Command switches to communication	0	◎

Function code	Name	Detailed parameter description	Default value	Modify
		39: Pre-exciting command 40: Zero out power consumption quantity 41: Maintain power consumption quantity 42: Source of upper torque limit switches to keypad 43: Position reference point input (only S6, S7 and S8 are valid) 44: Spindle orientation disabled 45: Spindle zeroing/local positioning zeroing 46: Spindle zero position selection 1 47: Spindle zero position selection 2 48: Spindle scale division selection 1 49: Spindle scale division selection 2 50: Spindle scale division selection 3 51: Position control and speed control switch-over terminal 52: Pulse input disabled 53: Clear position deviation cleared 54: Switch over position proportional gain 55: Enable cyclic positioning of digital position positioning 56: Emergency stop 57: Motor over-temperature fault input 58: Enable rigid tapping 59: Switches to V/F control 60: Switches to FVC control 61: PID polarity switch-over 62: Reserved 63: Enable servo 64: Limit of forward run 65: Limit of reverse run 66: Zero out encoder counting 67: Pulse increase 68: Enable pulse superimposition 69: Pulse decrease 70: Electronic gear selection 71–79: Reserved		
P05.07	Reserved variables	0–65535	0	●
P05.08	Polarity of input	This function code is used to set the polarity of input	0x000	○

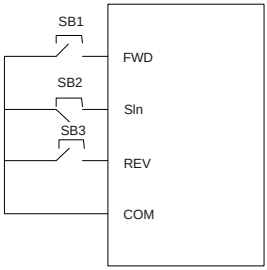
<table>
<tr><th>Function code</th><th>Name</th><th>Detailed parameter description</th><th>Default value</th><th>Modify</th></tr>
<tr><td></td><td>terminal</td><td>terminals.
When the bit is set to 0, input terminal polarity is positive;
When the bit is set to 1, input terminal polarity is negative;
0x000–0x3F</td><td></td><td></td></tr>
<tr><td>P05.09</td><td>Digital filter time</td><td>Set S1–S4, filter time of HDI terminal sampling. In cases where interference is strong, increase the value of this parameter to avoid mal-operation.
0.000–1.000s</td><td>0.010s</td><td>○</td></tr>
<tr><td>P05.10</td><td>Virtual terminal setting</td><td>0x000–0x3F (0: disable, 1: enable)
BIT0: S1 virtual terminal
BIT1: S2 virtual terminal
BIT2: S3 virtual terminal
BIT3: S4 virtual terminal
BIT4: HDIA virtual terminal
BIT5: HDIB virtual terminal</td><td>0x00</td><td>◎</td></tr>
<tr><td>P05.11</td><td>2/3 Wire control mode</td><td>This function code is used to set the 2/3 Wire control mode.
0: 2-Wire control 1; integrate enabling function with direction. This mode is the most popular dual-line mode. Direction of motor rotation is determined by the defined FWD/REV terminal command.
 

<table>
<tr><th>FWD</th><th>REV</th><th>Running command</th></tr>
<tr><td>OFF</td><td>OFF</td><td>Stop</td></tr>
<tr><td>ON</td><td>OFF</td><td>Forward running</td></tr>
<tr><td>OFF</td><td>ON</td><td>Reverse running</td></tr>
<tr><td>ON</td><td>ON</td><td>Hold</td></tr>
</table>
1: 2-Wire control 2; separate enabling function with direction. In this mode, the defined FWD is enabling terminal, and the direction is determined by the state of REV.</td><td>0</td><td>◎</td></tr>
</table>

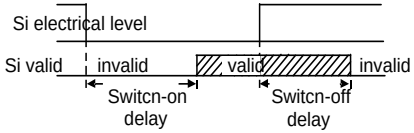
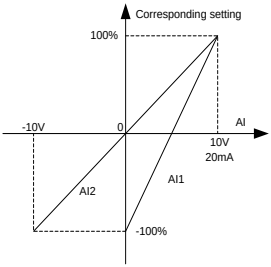
<table>
<tr><th>Function code</th><th>Name</th><th>Detailed parameter description</th><th>Default value</th><th>Modify</th></tr>
<tr><td></td><td></td><td>


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


The direction control during running is shown below.
<table>
<tr><th>SIn</th><th>REV</th><th>Previous running direction</th><th>Current running direction</th></tr>
<tr><td rowspan="2">ON</td><td rowspan="2">OFF→ON</td><td>Forward</td><td>Reverse</td></tr>
<tr><td>Reverse</td><td>Forward</td></tr>
<tr><td rowspan="2">ON</td><td rowspan="2">ON→OFF</td><td>Reverse</td><td>Forward</td></tr>
<tr><td>Forward</td><td>Reverse</td></tr>
<tr><td rowspan="2">ON→OFF</td><td>ON</td><td colspan="2" rowspan="2">Decelerate to stop</td></tr>
<tr><td>OFF</td></tr>
</table>
SIn: 3-Wire control/Sin, FWD: Forward running, REV: Reverse running
3: 3-Wire control 2; This mode defines Sin as enabling terminal. The running command is generated by FWD or REV, and they control the
</td><td></td><td></td></tr>
</table>

<table>
<tr><th>Function code</th><th>Name</th><th>Detailed parameter description</th><th>Default value</th><th>Modify</th></tr>
<tr><td></td><td></td><td>running direction. During running, the terminal Sin should be closed, and terminal FWD or REV generates a rising edge signal to control the running and direction of inverter; the inverter should be stopped by disconnecting terminal Sin.
 

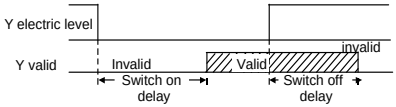
<table>
<tr><th>Sln</th><th>FWD</th><th>REV</th><th>Running direction</th></tr>
<tr><td rowspan="2">ON</td><td rowspan="2">OFF→ON</td><td>ON</td><td>Forward</td></tr>
<tr><td>OFF</td><td>Forward</td></tr>
<tr><td rowspan="2">ON</td><td>ON</td><td rowspan="2">OFF→ON</td><td>Reverse</td></tr>
<tr><td>OFF</td><td>Reverse</td></tr>
<tr><td rowspan="2">ON→OFF</td><td></td><td></td><td rowspan="2">Decelerate to stop</td></tr>
<tr><td></td><td></td></tr>
</table>
Sln: 3-Wire control/Sin, FWD: Forward running, REV: Reverse running
Note: For dual-line running mode, when FWD/REV terminal is valid, if the inverter stops due to stop command given by other sources, it will not run again after the stop command disappears even if the control terminals FWD/REV are still valid. To make the inverter run again, users need to trigger FWD/REV again, eg, PLC single-cycle stop, fixed-length stop, and valid STOP/RST stop during terminal control. (see P07.04)</td><td></td><td></td></tr>
<tr><td>P05.12</td><td>S1 terminal switch-on delay</td><td rowspan="2">These function codes define corresponding delay of the programmable input terminals during level variation from switch-on to switch-off .</td><td>0.000s</td><td>○</td></tr>
<tr><td>P05.13</td><td>S1 terminal switch-off delay</td><td>0.000s</td><td>○</td></tr>
</table>

Function code	Name	Detailed parameter description	Default value	Modify
P05.14	S2 terminal switch-on delay		0.000s	○
P05.15	S2 terminal switch-off delay		0.000s	○
P05.16	S3 terminal switch-on delay	Setting range: 0.000–50.000s	0.000s	○
P05.17	S3 terminal switch-off delay		0.000s	○
P05.18	S4 terminal switch-on delay		0.000s	○
P05.19	S4 terminal switch-off delay		0.000s	○
P05.20	HDIA terminal switch-on delay		0.000s	○
P05.21	HDIA terminal switch-off delay		0.000s	○
P05.22	HDIB terminal switch-on delay		0.000s	○
P05.23	HDIB terminal switch-off delay		0.000s	○
P05.24	Lower limit value of AI1	These function codes define the relation between analog input voltage and corresponding set value of analog input. When the analog input voltage exceeds the range of max./min. input, the max. input or min. input will be adopted during calculation. When analog input is current input, 0–20mA current corresponds to 0–10V voltage. In different applications, 100% of analog setting corresponds to different nominal values. The figure below illustrates several settings. 	0.00V	○
P05.25	Corresponding setting of lower limit of AI1		0.0%	○
P05.26	Upper limit value of AI1		10.00V	○
P05.27	Corresponding setting of upper limit of AI1		100.0%	○
P05.28	Input filter time of AI1		0.030s	○
P05.29	Lower limit value of AI2		-10.00V	○
P05.30	Corresponding setting of lower limit of AI2		-100.0%	○
P05.31	Intermediate		0.00V	○

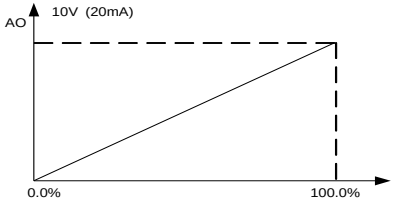
Function code	Name	Detailed parameter description	Default value	Modify
	value 1 of AI2	Input filter time: Adjust the sensitivity of analog input, increase this value properly can enhance the anti-interference capacity of analog variables; however, it will also degrade the sensitivity of analog input. **Note:** AI1 can support 0–10V/0–20mA input, when AI1 selects 0–20mA input; the corresponding voltage of 20mA is 10V; AI2 supports -10V–+10V input. Setting range of P05.24: 0.00V–P05.26 Setting range of P05.25: -100.0%–100.0% Setting range of P05.26: P05.24–10.00V Setting range of P05.27: -100.0%–100.0% Setting range of P05.28: 0.000s–10.000s Setting range of P05.29: -10.00V–P05.31 Setting range of P05.30: -100.0%–100.0% Setting range of P05.31: P05.29–P05.33 Setting range of P05.32: -100.0%–100.0% Setting range of P05.33: P05.31–P05.35 Setting range of P05.34: -100.0%–100.0% Setting range of P05.35: P05.33–10.00V Setting range of P05.36: -100.0%–100.0% Setting range of P05.37: 0.000s–10.000s		
P05.32	Corresponding setting of intermediate value 1 of AI2		0.0%	○
P05.33	Intermediate value 2 of AI2		0.00V	○
P05.34	Corresponding setting of intermediate value 2 of AI2		0.0%	○
P05.35	Upper limit value of AI2		10.00V	○
P05.36	Corresponding setting of upper limit of AI2		100.0%	○
P05.37	Input filter time of AI2		0.030s	○
P05.38	HDIA high-speed pulse input function	0: Set input via frequency 1: Reserved 2: Input via encoder, used in combination with HDIB	0	◎
P05.39	Lower limit frequency of HDIA	0.000 KHz – P05.41	0.000 KHz	○
P05.40	Corresponding setting of lower limit frequency of HDIA	-100.0%–100.0%	0.0%	○
P05.41	Upper limit frequency of HDIA	P05.39 –50.000KHz	50.000 KHz	○
P05.42	Corresponding setting of upper limit frequency of HDIA	-100.0%–100.0%	100.0%	○

Function code	Name	Detailed parameter description	Default value	Modify
P05.43	HDIA frequency input filter time	0.000s–10.000s	0.030s	○
P05.44	HDIB high-speed pulse input function selection	0: Set input via frequency 1: Reserved 2: Encoder input, it should be used in combination with HDIA	0	◎
P05.45	Lower limit frequency of HDIB	0.000 KHz – P05.47	0.000 KHz	○
P05.46	Corresponding setting of lower limit frequency of HDIB	-100.0%–100.0%	0.0%	○
P05.47	Upper limit frequency of HDIB	P05.45 –50.000KHz	50.000 KHz	○
P05.48	Corresponding setting of upper limit frequency of HDIB	-100.0%–100.0%	100.0%	○
P05.49	HDIB frequency input filter time	0.000s–10.000s	0.030s	○
P05.50	AI1 input signal type	0–1 0: Voltage type 1: Current type	0	◎
P05.51–P05.52	Reserved variables	0–65535	0	●
P06 group Output terminals				
P06.00	HDO output type	0: Open collector high-speed pulse output: Max. frequency of the pulse is 50.00kHz. For details about the related functions, see P06.27–P06.31. 1: Open collector output: For details about the related functions, see P06.02.	0	◎
P06.01	Y output selection	0: Invalid 1: In running 2: In forward running 3: In reverse running 4: In jogging	0	○
P06.02	HDO output selection		0	○
P06.03	Relay RO1		1	○

Function code	Name	Detailed parameter description	Default value	Modify
	output selection	5: Inverter fault		
P06.04	Relay RO2 output selection	6: Frequency level detection FDT1 7: Frequency level detection FDT2 8: Frequency reached 9: Running in zero speed 10: Reach upper limit frequency 11: Reach lower limit frequency 12: Ready to run 13: In pre-exciting 14: Overload pre-alarm 15: Underload pre-alarm 16: Simple PLC stage completed 17: Simple PLC cycle completed 18: Reach set counting value 19: Reach designated counting value 20: External fault is valid 21: Reserved 22: Reach running time 23: Virtual terminal output of MODBUS communication 24: Virtual terminal output of POROFIBUS /CANopen communication 25: Virtual terminal output of Ethernet communication 26: DC bus voltage established 27: z pulse output 28: During pulse superposition 29: STO act 30: Positioning completed 31: Spindle zeroing completed 32: Spindle scale-division completed 33: In speed limit 34–35: Reserved 36: Speed/position control switch-over completed 37–40: Reserved 41: C_Y1 from CODESYS (set P27.00 to 1) 42: C_Y2 from CODESYS (set P27.00 to1) 43: C_HDO from CODESYS (set P27.00 to 1) 44: C_RO1 from CODESYS (set P27.00 to 1)	5	○

<table>
<tr><th>Function code</th><th>Name</th><th>Detailed parameter description</th><th>Default value</th><th>Modify</th></tr>
<tr><td></td><td></td><td>45: C_RO2 from CODESYS (set P27.00 to 1)
46: C_RO3 from CODESYS3 (set P27.00 to 1)
47: C_RO4 from CODESYS (set P27.00 to 1)
48–63: Reserved
29: STO action
48–63: Reserved</td><td></td><td></td></tr>
<tr><td>P06.05</td><td>Output terminal polarity selection</td><td>This function code is used to set the polarity of output terminals.
When the bit is set to 0, input terminal polarity is positive;
When the bit is set to 1 input terminal polarity is negative.
<table><tr><td>BIT3</td><td>BIT2</td><td>BIT1</td><td>BIT0</td></tr><tr><td>RO2</td><td>RO1</td><td>HDO</td><td>Y</td></tr></table>Setting range: 0x0–0xF</td><td>00</td><td>○</td></tr>
<tr><td>P06.06</td><td>Y switch-on delay</td><td rowspan="8">This function code defines the corresponding delay of the level variation from switch-on to switch-off.
 
Setting range: 0.000–50.000s
Note: P06.08 and P06.09 are valid only when P06.00=1.</td><td>0.000s</td><td>○</td></tr>
<tr><td>P06.07</td><td>Y switch-off delay</td><td>0.000s</td><td>○</td></tr>
<tr><td>P06.08</td><td>HDO switch-on delay</td><td>0.000s</td><td>○</td></tr>
<tr><td>P06.09</td><td>HDO switch-off delay</td><td>0.000s</td><td>○</td></tr>
<tr><td>P06.10</td><td>Relay RO1 switch-on delay</td><td>0.000s</td><td>○</td></tr>
<tr><td>P06.11</td><td>Relay RO1 switch-off delay</td><td>0.000s</td><td>○</td></tr>
<tr><td>P06.12</td><td>Relay RO2 switch-on delay</td><td>0.000s</td><td>○</td></tr>
<tr><td>P06.13</td><td>Relay RO2 switch-off delay</td><td>0.000s</td><td>○</td></tr>
<tr><td>P06.14</td><td>AO1 output selection</td><td rowspan="3">0: Running frequency
1: Set frequency
2: Ramps reference frequency
3: Running speed
4: Output current (relative to inverter)
5: Output current (relative to motor)
6: Output voltage
7: Output power
8: Set torque value</td><td>0</td><td>○</td></tr>
<tr><td>P06.15</td><td>Reserved variables</td><td>0</td><td>○</td></tr>
<tr><td>P06.16</td><td>HDO high-speed pulse output</td><td>0</td><td>○</td></tr>
</table>

Function code	Name	Detailed parameter description	Default value	Modify
		9: Output torque 10: AI1 input value 11: AI2input value 12: AI3 input value 13: Input value of high-speed pulse HDIA 14: Set value 1 of MODBUS communication 15: Set value 2 of MODBUS communication 16: Set value 1 of PROFIBUS\CANopen communication 17: Set value 2 of PROFIBUS\CANopen communication 18: Set value 1 of Ethernet communication 19: Set value 2 of Ethernet communication 20: Input value of high-speed pulse HDIB 21: Reserved 22: Torque current (bipolar, 100% corresponds to 10V) 23: Exciting current (100% corresponds to 10V) 24: Set frequency (bipolar) 25: Ramps reference frequency (bipolar) 26: Running speed (bipolar) 27: Set value 2 of EtherCat/Profinet communication 28: C_AO1 from CODESYS (set P27.00 to 1) 29: C_AO2 from CODESYS (set P27.00 to 1) 30: Running speed 31–47: Reserved		
P06.17	Lower limit of AO1 output	Above function codes define the relation between output value and analog output. When the output value exceeds the set max./min. output range, the upper/low limit of output will be adopted during calculation. When analog output is current output, 1mA corresponds to 0.5V voltage. In different applications, 100% of output value corresponds to different analog outputs.	0.0%	○
P06.18	Corresponding AO1 output of lower limit		0.00V	○
P06.19	Upper limit of AO1 output		100.0%	○
P06.20	Corresponding AO1 output of upper limit		10.00V	○
P06.21	AO1 output filter time		0.000s	○

Function code	Name	Detailed parameter description	Default value	Modify
		 Setting range of P06.17: -100.0%–P06.19 Setting range of P06.18: 0.00V–10.00V Setting range of P06.19: P06.17–100.0% Setting range of P06.20: 0.00V–10.00V Setting range of P06.21: 0.000s–10.000s		
P06.22–P06.26	Reserved variables	0–65535	0	●
P06.27	Lower limit of HDO output	-100.0%–P06.29	0.00%	○
P06.28	Corresponding HDO output of lower limit	0.00–50.00kHz	0.00kHz	○
P06.29	Upper limit of HDO output	P06.27–100.0%	100.0%	○
P06.30	Corresponding HDO output of upper limit	0.00–50.00kHz	50.00 kHz	○
P06.31	HDO output filter time	0.000s–10.000s	0.000s	○
P06.32–P06.34	Reserved variable	0–65535	0	●
P07 group HMI				
P07.00	User password	0–65535 Set it to any non-zero value to enable password protection. 00000: Clear previous user password and disable password protection. After user password becomes valid, if wrong password is inputted, users will be denied entry. It is necessary to keep the user password in mind. Password protection will be effective one minute	0	○

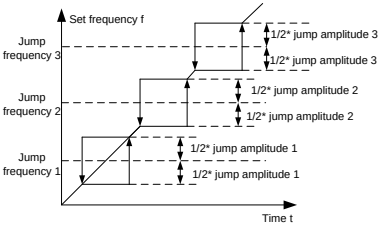
Function code	Name	Detailed parameter description	Default value	Modify
		after exiting function code edit state, and it will display "0.0.0.0.0" if users press PRG/ESC key to enter function code edit state again, users need to input the correct password. **Note: Restoring to default values will clear user password, use this function with caution.**		
P07.01	Reserved variables		/	/
P07.02	Function of keys	Range: 0x00–0x27 Ones: Function selection of QUICK/JOG key 0: No function 1: Jogging 2: Reserved 3: Forward/reverse rotation switch-over 4: Clear UP/DOWN setting 5: Coast to stop 6: Switch over the running command reference mode in sequence 7: Reserved Tens: Reserved	0x01	◎
P07.03	Running command channel switch-over sequence of QUICK key	When P07.02=6, set the switch-over sequence of running command channel. 0: keypad control→terminal control→ communication control 1: keypad control←→terminal control 2: keypad control←→communication control 3: terminal control←→communication control	0	○
P07.04	Stop function selection of STOP/RST key	Validness selection of stop function of STOP/RST. For fault reset, STOP/RST is valid under any situation. 0: valid only for panel control only 1: valid for both panel and terminal control 2: valid for both panel and communication control 3: valid for all control modes	0	○
P07.05–P07.07	Reserved variables		/	/
P07.08	Frequency display coefficient	0.01–10.00 Display frequency=running frequency× P07.08	1.00	○

Function code	Name	Detailed parameter description	Default value	Modify
P07.09	Speed display coefficient	0.1–999.9% Mechanical speed=120×display running frequency×P07.09/number of motor pole pairs	100.0%	○
P07.10	Linear speed display coefficient	0.1–999.9% Linear speed=mechanical speed×P07.10	1.0%	○
P07.11	Temperature of rectifier bridge module	-20.0–120.0°C	/	●
P07.12	Temperature of inverter module	-20.0–120.0°C	/	●
P07.13	Software version of control board	1.00–655.35	/	●
P07.14	Accumulated running time	0–65535h	/	●
P07.15	High bit of inverter power consumption	Display the power consumption of the inverter. Inverter power consumption=P07.15×1000+P07.16 Setting range of P07.15: 0–65535 kWh (×1000) Setting range of P07.16: 0.0–999.9 kWh	/	●
P07.16	Low bit of inverter power consumption		/	●
P07.17	Reserved		/	/
P07.18	Rated power of inverter	0.4–3000.0kW	/	●
P07.19	Rated voltage of inverter	50–1200V	/	●
P07.20	Rated current of inverter	0.1–6000.0A	/	●
P07.21	Factory barcode 1	0x0000–0xFFFF	/	●
P07.22	Factory barcode 2	0x0000–0xFFFF	/	●
P07.23	Factory barcode 3	0x0000–0xFFFF	/	●
P07.24	Factory barcode 4	0x0000–0xFFFF	/	●
P07.25	Factory barcode 5	0x0000–0xFFFF	/	●
P07.26	Factory barcode 6	0x0000–0xFFFF	/	●
P07.27	Type of present fault	0: No fault 1: Inverter unit U phase protection (OUt1)	/	●
P07.28	Type of the last	2: Inverter unit V phase protection (OUt2)	/	●

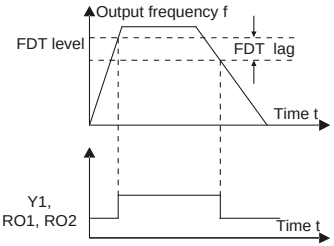
Function code	Name	Detailed parameter description	Default value	Modify
	fault	3: Inverter unit W phase protection (OUt3)		
P07.29	Type of the last but one fault	4: Overcurrent during acceleration (OC1) 5: Overcurrent during deceleration (OC2)	/	●
P07.30	Type of the last but two fault	6: Overcurrent during constant speed (OC3) 7: Overvoltage during acceleration (OV1)	/	●
P07.31	Type of the last but three fault	8: Overvoltage during deceleration (OV2) 9: Overvoltage during constant speed (OV3)	/	●
P07.32	Type of the last but four fault	10: Bus undervoltage fault (UV) 11: Motor overload (OL1) 12: Inverter overload (OL2) 13: Phase loss on input side (SPI) 14: Phase loss on output side (SPO) 15: Rectifier module overheat (OH1) 16: Inverter module overheat (OH2) 17: External fault (EF) 18: 485 communication fault (CE) 19: Current detection fault (ItE) 20: Motor autotuning fault (tE) 21: EEPROM operation fault (EEP) 22: PID feedback offline fault (PIDE) 23: Brake unit fault (bCE) 24: Running time reached (END) 25: Electronic overload (OL3) 26: Keypad communication error (PCE) 27: Parameter upload error (UPE) 28: Parameter download error (DNE) 29: Profibus communication fault (E-DP) 30: Ethernet communication fault (E-NET) 31: CANopen communication fault (E-CAN) 32: To-ground short-circuit fault 1 (ETH1) 33: To-ground short-circuit fault 2 (ETH2) 34: Speed deviation fault (dEu) 35: Mal-adjustment fault (STo) 36: Underload fault (LL) 37: Encoder offline fault (ENC1O) 38: Encoder reversal fault (ENC1D) 39: Encoder Z pulse offline fault (ENC1Z) 40: Safe torque off (STO) 41: Channel H1 safety circuit exception (STL1)	/	●

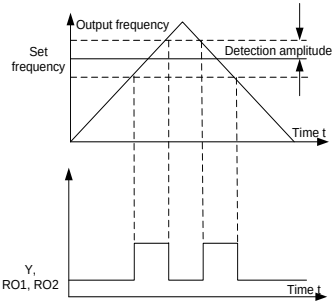
Function code	Name	Detailed parameter description	Default value	Modify
		42: Channel H2 safety circuit exception (STL2) 43: Channel H1 and H2 exception (STL3) 44: Safety code FLASH CRC fault (CrCE) 45: PLC card customized fault 1 (P-E1) 46: PLC card customized fault 2 (P-E2) 47: PLC card customized fault 3 (P-E3) 48: PLC card customized fault 4 (P-E4) 49: PLC card customized fault 5 (P-E5) 50: PLC card customized fault 6 (P-E6) 51: PLC card customized fault 7 (P-E7) 52: PLC card customized fault 8 (P-E8) 53: PLC card customized fault 9 (P-E9) 54: PLC card customized fault 10 (P-E10) 55: Repetitive extension card type fault (E-Err) 56: Encoder UVW loss fault (ENCUV) 57: Profibus communication fault (E-PN) 58: CANopen communication fault (ESCAN) 59: Motor over-temperature fault (OT) 60: Card slot 1 card identification failure (F1-Er) 61: Card slot 2 card identification failure (F2-Er) 62: Card slot 3 card identification failure (F3-Er) 63: Card slot 1 card communication timeout fault (C1-Er) 64: Card slot 2 card communication timeout fault (C2-Er) 65: Card slot 3 card communication timeout fault (C3-Er) 66: EtherCat communication fault (E-CAT) 67: Bacnet communication fault (E-BAC) 68: DeviceNet communication fault (E-DEV) 69: Master-slave synchronous CAN slave fault (S-Err)		
P07.33	Running frequency of present fault		0.00Hz	●
P07.34	Ramps reference frequency of present fault		0.00Hz	●
P07.35	Output voltage of present fault		0V	●
P07.36	Output current of present fault		0.0A	●
P07.37	Bus voltage of present fault		0.0V	●
P07.38	Max. temperature of present fault		0.0°C	●

Function code	Name	Detailed parameter description	Default value	Modify
P07.39	Input terminal state of present fault		0	●
P07.40	Output terminal state of present fault		0	●
P07.41	Running frequency of the last fault		0.00Hz	●
P07.42	Ramps reference frequency of the last fault		0.00Hz	●
P07.43	Output voltage of the last fault		0V	●
P07.44	Output current of the last fault		0.0A	●
P07.45	Bus voltage of the last fault		0.0V	●
P07.46	Max. temperature of the last fault		0.0°C	●
P07.47	Input terminal state of the last fault		0	●
P07.48	Output terminal state of the last fault		0	●
P07.49	Running frequency of the last but one fault		0.00Hz	●
P07.50	Ramps reference frequency of the last but one fault		0.00Hz	●
P07.51	Output voltage of the last but one fault		0V	●
P07.52	Output current of the last but one fault		0.0A	●
P07.53	Bus voltage of the last but one fault		0.0V	●
P07.54	Max. temperature of the last but one fault		0.0°C	●
P07.55	Input terminal state of the last but one fault		0	●
P07.56	Output terminal state of the last but one fault		0	●
P08 group	**Enhanced functions**			
P08.00	Acceleration time 2	See P00.11 and P00.12 for detailed definitions. Goodrive350 series inverter defines four groups of acceleration/deceleration time, which can be selected by multi-function digital input terminal (P05 group). The acceleration/deceleration time of the inverter is the first group by default. Setting range: 0.0–3600.0s	Depend on model	○
P08.01	Deceleration time 2		Depend on model	○
P08.02	Acceleration time 3		Depend on model	○
P08.03	Deceleration time 3		Depend on model	○
P08.04	Acceleration time 4		Depend on model	○
P08.05	Deceleration time 4		Depend on model	○
P08.06	Running frequency of jogging	This function code is used to define the reference frequency of the inverter during jogging. Setting range: 0.00Hz–P00.03 (max. output frequency)	5.00Hz	○

Function code	Name	Detailed parameter description	Default value	Modify
P08.07	Acceleration time of jogging	Jogging acceleration time is the time needed for the inverter to accelerate from 0Hz to max. output frequency (P00.03).	Depend on model	○
P08.08	Deceleration time of jogging	Jogging deceleration time is the time needed from decelerating from the max. output frequency (P00.03) to 0Hz. Setting range: 0.0–3600.0s		○
P08.09	Jump frequency 1	When the set frequency is within the range of jump frequency, the inverter will run at the boundary of jump frequency. The inverter can avoid mechanical resonance point by setting the jump frequency, and three jump frequency points can be set. If the jump frequency points are set to 0, this function will be invalid.	0.00Hz	○
P08.10	Jump frequency amplitude 1		0.00Hz	○
P08.11	Jump frequency 2		0.00Hz	○
P08.12	Jump frequency amplitude 2		0.00Hz	○
P08.13	Jump frequency 3		0.00Hz	○
P08.14	Jump frequency amplitude 3	 Setting range: 0.00Hz–P00.03 (max. output frequency)	0.00Hz	○
P08.15	Amplitude of wobbling frequency	0.0–100.0% (relative to set frequency)	0.0%	○
P08.16	Amplitude of jump frequency	0.0–50.0% (relative to amplitude of wobbling frequency)	0.0%	○
P08.17	Rise time of wobbling frequency	0.1–3600.0s	5.0s	○
P08.18	Descend time of wobbling frequency	0.1–3600.0s	5.0s	○
P08.19	Switching frequency of acceleration/deceleration time	0.00–P00.03 (max. output frequency) 0.00Hz: no switch-over Switch to acceleration/deceleration time 2 if the running frequency is larger than P08.19	0.00Hz	○

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

Function code	Name	Detailed parameter description	Default value	Modify
		Setting range: 0.00–50.00Hz		
P08.31	Switch-over between motor 1 and motor 2	0x00–0x14 Ones: Switch-over channel 0: Switch over by terminal 1: Switch over by MODBUS communication 2: Switch over by PROFIBUS/CANopen/DeviceNet 3: Switch over by Ethernet communication 4: Switch over by EtherCat/Profinet communication Tens: Motor switch over during running 0: Disable switch over during running 1: Enable switch over during running	0x00	◎
P08.32	FDT1 level detection value	When the output frequency exceeds the corresponding frequency of FDT level, multi-function digital output terminal outputs "frequency level detection FDT" signal, this signal will be valid until the output frequency lowers to below the corresponding frequency (FDT level-FDT lag detection value), the waveform is shown in the figure below.  Setting range of P08.32: 0.00Hz–P00.03 (max. output frequency) Setting range of P08.33: 0.0–100.0% (FDT1 level) Setting range of P08.34: 0.00Hz–P00.03 (max. output frequency) Setting range of P08.35: 0.0–100.0% (FDT2 level)	50.00Hz	○
P08.33	FDT1 lag detection value		5.0%	○
P08.34	FDT2 level detection value		50.00Hz	○
P08.35	FDT2 lag detection value		5.0%	○
P08.36	Detection value for frequency arrival	When the output frequency is within the positive /negative detection range of the set frequency, the multi-function digital output terminal outputs "frequency arrival" signal as shown below.	0.00Hz	○

Function code	Name	Detailed parameter description	Default value	Modify
		 Setting range: 0.00Hz–P00.03 (max. output frequency)		
P08.37	Enable/disable energy-consumption brake	0: Disable energy-consumption 1: Enable energy-consumption	1	○
P08.38	Energy-consumption brake threshold voltage	Set the starting bus voltage of energy-consumption brake, adjust this value properly can brake the load effectively. The default value will change with the change of voltage class. Setting range: 200.0–2000.0V	220V voltage: 380.0V; 380V voltage: 700.0V; 660V voltage: 1120.0V	○
P08.39	Running mode of cooling fan	0: Common running mode 1: The fan keeps running after power up	0	○
P08.40	PWM selection	0x0000–0x1121 Ones: PWM mode 0: 3PH modulation and 2-phase modulation 1: 3PH modulation Tens: PWM low-speed carrier limit 0: Limit low-speed carrier to 2K 1: Limit low-speed carrier to 4K 2: No limit on low-speed carrier Hundreds: Reserved Thousands: PWM loading mode 0: PWM loading mode 1 1: PWM loading mode 2	0001	◎

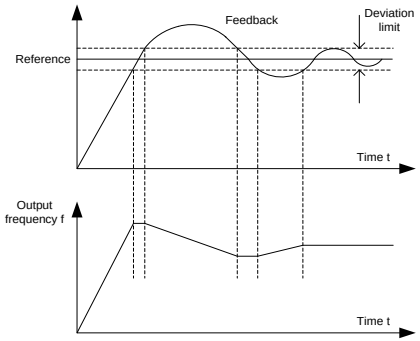
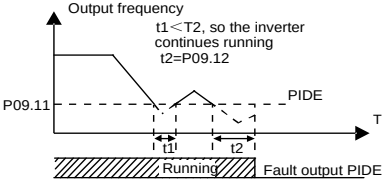
Function code	Name	Detailed parameter description	Default value	Modify
P08.41	Overmodulation selection	0x00–0x11 Ones 0: Overmodulation is invalid 1: Overmodulation is valid Tens 0: Mild overmodulation 1: Deepened overmodulation	01	◎
P08.42	Reserved variables		/	/
P08.43	Reserved variables		/	/
P08.44	UP/DOWN terminal control setup	0x000–0x221 Ones: Frequency control selection 0: UP/DOWN terminal setup is valid 1: UP/DOWN terminal setup is invalid Tens: Frequency control selection 0: Valid only when P00.06=0 or P00.07=0 1: All frequency modes are valid 2: Invalid for multi-step speed when multi-step speed takes priority Hundreds: Action selection during stop 0: Valid 1: Valid during running, clear after stop 2: Valid during running, clear after receiving stop command	0x000	○
P08.45	UP terminal frequency incremental integral rate	0.01–50.00Hz/s	0.50Hz/s	○
P08.46	DOWN terminal frequency decremental change rate	0.01–50.00Hz/s	0.50Hz/s	○
P08.47	Action selection for frequency setup during power down	0x000–0x111 Ones: Action selection for frequency setup (by keypad digits) during power down 0: Save during power down 1: Zero out during power down Tens: Action selection for frequency setup (by MODBUS) during power down	0x000	○

Function code	Name	Detailed parameter description	Default value	Modify
		0: Save during power down 1: Zero out during power down Hundreds: Action selection for frequency setup (by other communication) during power down 0: Save during power down 1: Zero out during power down		
P08.48	High bit of initial value of power consumption	Set the initial value of power consumption. Initial value of power consumption=P08.48×1000+P08.49 Setting range of P08.48: 0–59999 kWh (k) Setting range of P08.49: 0.0–999.9 kWh	0°	○
P08.49	Low bit of initial value of power consumption		0.0°	○
P08.50	Flux braking	This function code is used to enable flux braking function. 0: Invalid 100–150: The larger the coefficient, the stronger the brake intensity The inverter enables motor to decelerate quickly by increasing the motor flux which converts energy generated during braking into thermal energy. The inverter monitors motor state continuously even during flux braking, thus flux braking can be applied in motor stop or used to change motor speed. The flux braking also carries the following advantages. 1) Brake immediately after sending stop command, removing the need to wait for flux to attenuate. 2) Better cooling effect. During flux braking, the stator current of the motor increases, while the rotor current does not change, while the cooling effect of stator is much more effective than that of the rotor.	0	○
P08.51	Current regulation coefficient on input side	This function code is used to adjust the current display value on the AC input side. 0.00–1.00	0.56	○
P08.52	STO lock	0: STO alarm lock Alarm-lock means STO alarm must be reset after state restoration when STO occurs. 1: STO alarm unlock Alarm-unlock means when STO occurs, after state	0	○

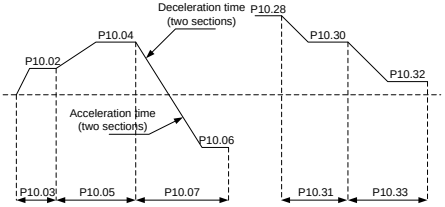
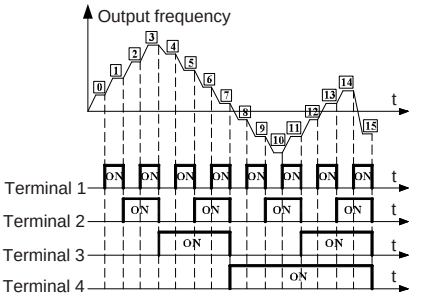
Function code	Name	Detailed parameter description	Default value	Modify
		restoration, STO alarm will disappear automatically.		
P08.53	Bias value of upper limit frequency of torque control	0.00 Hz–P00.03 (max. output frequency)	0.00Hz	○
P08.54	Acceleration/deceleration selection of upper limit frequency of torque control	0: No limit on acceleration or deceleration 1: Acceleration/deceleration time 1 2: Acceleration/deceleration time 2 3: Acceleration/deceleration time 3 4: Acceleration/deceleration time 4	0	○
P09 group PID control				
P09.00	PID reference source	When frequency command (P00.06, P00. 07) is set to 7, or channel of voltage setup (P04.27) is set to 6, the inverter running mode is process PID control. This parameter determines the target reference channel of process PID. 0: Keypad (P09.01) 1: AI1 2: AI2 3: AI3 4: High-speed pulse HDIA 5: Multi-step 6: MODBUS communication 7: PROFIBUS/CANopen/DeviceNet communication 8: Ethernet communication 9: High-speed pulse HDIB 10: EtherCat/Profinet communication 11: Programmable extension card 12: Reserved The set target value of process PID is relative value, the set 100% corresponds to 100% of the feedback signal of controlled system. The system operates based on the relative value (0–100.0%)	0	○
P09.01	Pre-set PID reference of keypad	Users need to set this parameter when P09.00 is set to 0, the reference value of this parameter is the feedback variable of the system.	0.0%	○

Function code	Name	Detailed parameter description	Default value	Modify
		Setting range: -100.0%–100.0%		
P09.02	PID feedback source	This parameter is used to select PID feedback channel. 0: AI1 1: AI2 2: AI3 3: High-speed pulse HDIA 4: MODBUS communication 5: PROFIBUS/CANopen/DeviceNet communication 6: Ethernet communication 7: High-speed pulse HDIB 8: EtherCat/Profinet communication 9: Programmable extension card 10: Reserved **Note: The reference channel and feedback channel cannot overlap; otherwise, PID cannot be controlled effectively.**	0	○
P09.03	PID output characteristics	0: PID output is positive characteristic: namely, the feedback signal is larger than the PID reference, which requires the inverter output frequency to decrease for PID to reach balance, eg, tension PID control of winding 1: PID output is negative characteristics: namely the feedback signal is less than PID reference, which requires inverter output frequency to increase for PID to reach balance, eg, tension PID control of unwinding.	0	○
P09.04	Proportional gain (Kp)	This function code is suitable for proportional gain P of PID input. It determines the regulation intensity of the whole PID regulator, the larger the value of P, the stronger the regulation intensity. If this parameter is 100, it means when the deviation between PID feedback and reference is 100%, the regulation amplitude of PID regulator (ignoring integral and differential effect) on output frequency command is the max. frequency (ignoring integral and differential actions). Setting range: 0.00–100.00	1.80	○

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

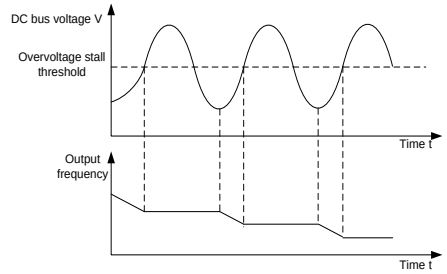
Function code	Name	Detailed parameter description	Default value	Modify
				
P09.09	Upper limit value of PID output	These two function codes are used to set the upper/lower limit value of PID regulator.	100.0%	○
P09.10	Lower limit value of PID output	100.0% corresponds to max. output frequency (P00.03)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

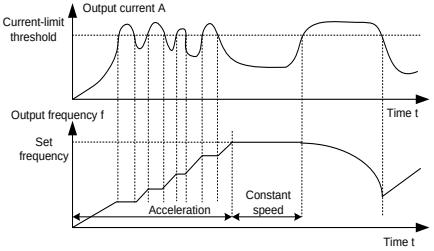
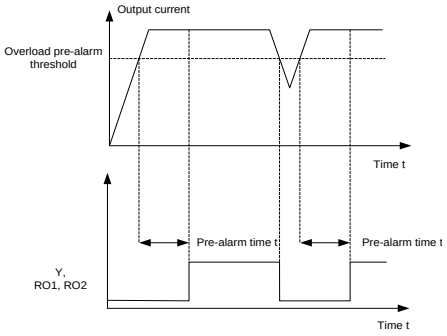
Function code	Name	Detailed parameter description	Default value	Modify
		Hundreds: 0: Limit based on the max. frequency 1: Limit based on A frequency Thousands: 0: A+B frequency, acceleration /deceleration of main reference A frequency source buffering is invalid 1: A+B frequency, acceleration/ deceleration of main reference A frequency source buffering is valid, acceleration and deceleration are determined by P08.04 (acceleration time 4).		
P09.14	Low-frequency proportional gain (Kp)	0.00–100.00 Low-frequency switching point: 5.00Hz, high-frequency switching point: 10.00Hz (P09.04 corresponds to high-frequency parameter), and the middle is the linear interpolation between these two points	1.00	○
P09.15	Acceleration/ deceleration time of PID command	0.0–1000.0s	0.0s	○
P09.16	Filter time of PID output	0.000–10.000s	0.000s	○
P09.17–P09.28	Reserved variables	0–65536	0	○
P10 group Simple PLC and multi-step speed control				
P10.00	Simple PLC mode	0: Stop after running once; the inverter stops automatically after running for one cycle, and it can be started only after receiving running command. 1: Keep running in the final value after running once; The inverter keeps the running frequency and direction of the last section after a single cycle. 2: Cyclic running; the inverter enters the next cycle after completing one cycle until receiving stop command and stops.	0	○
P10.01	Simple PLC memory selection	0: No memory after power down 1: Memory after power down; PLC memories its running stage and running frequency before power down.	0	○
P10.02	Multi-step speed 0	Setting range of the frequency in 0^{th} –15^{th} sections	0.0%	○

Function code	Name	Detailed parameter description	Default value	Modify
P10.03	Running time of 0th step	are -100.0–100.0%, 100% corresponds to max. output frequency P00.03.	0.0s(min)	○
P10.04	Multi-step speed 1	Setting range of the running time in 0th –15th sections are 0.0–6553.5s (min), the time unit is determined by P10.37.	0.0%	○
P10.05	Running time of 1st step	When simple PLC operation is selected, it is required to set P10.02–P10.33 to determine the running frequency and running time of each section.	0.0s(min)	○
P10.06	Multi-step speed 2	**Note: The symbol of multi-step speed determines the running direction of simple PLC, and the negative value means reverse running.**	0.0%	○
P10.07	Running time of 2nd step		0.0s(min)	○
P10.08	Multi-step speed 3		0.0%	○
P10.09	Running time of 3rd step		0.0s(min)	○
P10.10	Multi-step speed 4		0.0%	○
P10.11	Running time of 4th step		0.0s(min)	○
P10.12	Multi-step speed 5		0.0%	○
P10.13	Running time of 5th step	When selecting multi-step speed running, the multi-step speed is within the range of -fmax–fmax, and it can be set continuously. The start/stop of multi-step stop is also determined by P00.01.	0.0s(min)	○
P10.14	Multi-step speed 6	Goodrive350 series inverter can set 16-step speed, which are set by combined codes of multi-step terminals 1–4 (set by S terminal, correspond to function code P05.01–P05.06) and correspond to multi-step speed 0 to multi-step speed 15.	0.0%	○
P10.15	Running time of 6th step		0.0s(min)	○
P10.16	Multi-step speed 7		0.0%	○
P10.17	Running time of 7th step		0.0s(min)	○
P10.18	Multi-step speed 8		0.0%	○
P10.19	Running time of 8th step		0.0s(min)	○
P10.20	Multi-step speed 9		0.0%	○
P10.21	Running time of 9th step		0.0s(min)	○
P10.22	Multi-step speed 10		0.0%	○
P10.23	Running time of 10th step		0.0s(min)	○
P10.24	Multi-step speed 11	When terminal 1, terminal 2, terminal 3 and terminal 4 are OFF, the frequency input mode is set by	0.0%	○
P10.25	Running time of		0.0s(min)	○

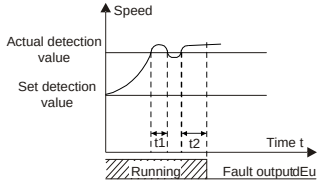
<table>
<tr><th>Function code</th><th>Name</th><th>Detailed parameter description</th><th>Default value</th><th>Modify</th></tr>
<tr><td></td><td>11th step</td><td rowspan="8">P00.06 or P00.07. When terminal 1, terminal 2, terminal 3 and terminal 4 are not all OFF, the frequency set by multi-step speed will prevail, and the priority of multi-step setting is higher than that of the keypad, analog, high-speed pulse, PID, and communication settings.
The relation between terminal 1, terminal 2, terminal 3 and terminal 4 are shown in the table below.
<table>
<tr><td>Terminal 1</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td></tr>
<tr><td>Terminal 2</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td></tr>
<tr><td>Terminal 3</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td></tr>
<tr><td>Terminal 4</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td></tr>
<tr><td>Step</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr>
<tr><td>Terminal 1</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td></tr>
<tr><td>Terminal 2</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td></tr>
<tr><td>Terminal 3</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td></tr>
<tr><td>Terminal 4</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td></tr>
<tr><td>Step</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td></tr>
</table></td><td></td><td></td></tr>
<tr><td>P10.26</td><td>Multi-step speed 12</td><td>0.0%</td><td>○</td></tr>
<tr><td>P10.27</td><td>Running time of 12th step</td><td>0.0s(min)</td><td>○</td></tr>
<tr><td>P10.28</td><td>Multi-step speed 13</td><td>0.0%</td><td>○</td></tr>
<tr><td>P10.29</td><td>Running time of 13th step</td><td>0.0s(min)</td><td>○</td></tr>
<tr><td>P10.30</td><td>Multi-step speed 14</td><td>0.0%</td><td>○</td></tr>
<tr><td>P10.31</td><td>Running time of 14th step</td><td>0.0s(min)</td><td>○</td></tr>
<tr><td>P10.32</td><td>Multi-step speed 15</td><td>0.0%</td><td>○</td></tr>
<tr><td>P10.33</td><td>Running time of 15th step</td><td>0.0s(min)</td><td>○</td></tr>
<tr><td>P10.34</td><td>Acceleration/deceleration time of 0th –7th step of simple PLC</td><td>Detailed illustration is shown in the table below.
<table>
<tr><th>Function code</th><th colspan="2">Binary</th><th>Step number</th><th>ACC/DEC time 1</th><th>ACC/DEC time 2</th><th>ACC/DEC time 3</th><th>ACC/DEC time 4</th></tr>
<tr><td rowspan="8">P10.34</td><td>BIT1</td><td>BIT0</td><td>0</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT3</td><td>BIT2</td><td>1</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT5</td><td>BIT4</td><td>2</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT7</td><td>BIT6</td><td>3</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT9</td><td>BIT8</td><td>4</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT11</td><td>BIT10</td><td>5</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT13</td><td>BIT12</td><td>6</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT15</td><td>BIT14</td><td>7</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
</table></td><td>0x0000</td><td>○</td></tr>
<tr><td>P10.35</td><td>Acceleration/deceleration time of 8th – 15th step of simple PLC</td><td>
<table>
<tr><td rowspan="8">P10.35</td><td>BIT1</td><td>BIT0</td><td>8</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT3</td><td>BIT2</td><td>9</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT5</td><td>BIT4</td><td>10</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT7</td><td>BIT6</td><td>11</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT9</td><td>BIT8</td><td>12</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT11</td><td>BIT10</td><td>13</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT13</td><td>BIT12</td><td>14</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT15</td><td>BIT14</td><td>15</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
</table></td><td>0x0000</td><td>○</td></tr>
</table>

Function code	Name	Detailed parameter description	Default value	Modify
		Select corresponding acceleration/deceleration time, and then convert 16-bit binary number into hexadecimal number, finally, set corresponding function code. Acceleration/deceleration time 1 is set by P00.11 and P00.12; Acceleration/deceleration time 2 is set by P08.00 and P08.01; Acceleration/deceleration time 3 is set by P08.02 and P08.03; Acceleration /deceleration time 4 is set by P08.04 and P08.05. Setting range: 0x0000–0xFFFF		
P10.36	PLC restart mode	0: Restart from the first step, namely if the inverter stops during running (caused by stop command, fault or power down), it will run from the first step after restart. 1: Continue running from the step frequency when interruption occurred, namely if the inverter stops during running (caused by stop command or fault), it will record the running time of current step, and enters this step automatically after restart, then continue running at the frequency defined by this step in the remaining time.	0	◎
P10.37	Multi-step time unit	0: s; the running time of each step is counted in seconds; 1: min; the running time of each step is counted in minutes;	0	◎
P11 group Protection parameters				
P11.00	Phase-loss protection	0x000–0x111 Ones: 0: Disable software input phase loss protection 1: Enable software input phase loss protection Tens: 0: Disable output phase loss protection 1: Enable output phase loss protection Hundreds: 0: Disable hardware input phase loss protection 1: Enable hardware input phase loss protection	0x110	○
P11.01	Frequency-drop at transient	0: Disable 1: Enable	0	○

Function code	Name	Detailed parameter description	Default value	Modify
	power down			
P11.02	Reserved variables	0–65535	0	○
P11.03	Overvoltage stall protection	0: Disable 1: Enable 	1	○
P11.04	Overvoltage stall protection voltage	120–150% (standard bus voltage) (380V)	136%	○
		120–150% (standard bus voltage) (220V)	120%	
P11.05	Current-limit selection	During accelerated running, as the load is too large, the actual acceleration rate of motor is lower than that of output frequency, if no measures are taken, the inverter may trip due to overcurrent during acceleration. 0x00–0x11 Ones: Current-limit action selection 0: Invalid 1: Always valid Tens: Hardware current-limit overload alarm selection 0: Valid 1: Invalid	01	◎
P11.06	Automatic current-limit level	Current-limit protection function detects output current during running, and compares it with the current-limit level defined by P11.06, if it exceeds the current-limit level, the inverter will run at stable frequency during accelerated running, or run in decreased frequency during constant-speed running; if it exceeds the current-limit level continuously, the inverter output frequency will drop continuously until reaching lower limit frequency.	G model: 160.0% P model: 120.0%	◎
P11.07	Frequency-drop rate during current limit		10.00 Hz/s	◎

Function code	Name	Detailed parameter description	Default value	Modify
		When the output current is detected to be lower than the current-limit level again, it will continue accelerated running.  Setting range of P11.06: 50.0–200.0% Setting range of P11.07: 0.00–50.00Hz/s		
P11.08	Inverter or motor overload/underload pre-alarm	If the inverter or motor output current is larger than the overload pre-alarm detection level (P11.09), and the duration exceeds the overload pre-alarm detection time (P11.10), overload pre-alarm signal will be outputted.  Setting range of P11.08: Enable and define overload pre-alarm function of the inverter and motor Setting range: 0x000–0x131 Ones: 0: Motor overload/underload pre-alarm, relative to rated motor current; 1: Inverter overload/underload pre-alarm, relative to rated inverter current. Tens:	0x000	○
P11.09	Overload pre-alarm detection level		G model: 150% P model: 120%	○
P11.10	Overload pre-alarm detection time		1.0s	○

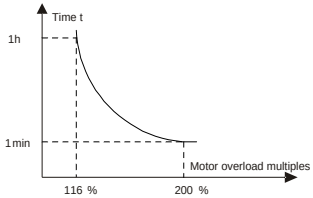
Function code	Name	Detailed parameter description	Default value	Modify
		0: The inverter continues running after overload/underload alarm; 1: The inverter continues running after underload alarm, and stops running after overload fault; 2: The inverter continues running after overload alarm, and stops running after underload fault; 3: The inverter stops running after overload/underload fault. Hundreds: 0: Always detect 1: Detect during constant-speed running Setting range of P11.09: P11.11–200% Setting range of P11.10: 0.1–3600.0s		
P11.11	Underload pre-alarm detection level	Underload pre-alarm signal will be outputted if the output current of the inverter or motor is lower than underload pre-alarm detection level (P11.11), and the duration exceeds underload pre-alarm detection time (P11.12). Setting range of P11.11: 0– P11.09 Setting range of P11.12: 0.1–3600.0s	50%	○
P11.12	Underload pre-alarm detection time		1.0s	○
P11.13	Fault output terminal action during fault	This function code is used to set the action of fault output terminals during undervoltage and fault reset. 0x00–0x11 Ones: 0: Act during undervoltage fault 1: Do not act during undervoltage fault Tens: 0: Act during fault reset 1: Do not act during fault reset	0x00	○
P11.14	Speed deviation detection value	0.0–50.0% This parameter is used to set the speed deviation detection value.	10.0%	○
P11.15	Speed deviation detection time	This parameter is used to set the speed deviation detection time. **Note: Speed deviation protection will be invalid if P11.15 is set to 0.0.**	1.0s	○

Function code	Name	Detailed parameter description	Default value	Modify
		 t1<t2, so the inverter continues running t2=P11.15 Setting range: 0.0–10.0s		
P11.16	Automatic frequency-reduction during voltage drop	0–1 0: Invalid 1: Valid	0	○
P11.17	Proportional coefficient of voltage regulator during undervoltage stall	0–1000	100	○
P11.18	Integral coefficient of voltage regulator during undervoltage stall	0–1000	40	○
P11.19	Proportional coefficient of current regulator during undervoltage stall	0–1000	25	○
P11.20	Integral coefficient of current regulator during undervoltage stall	0–2000	150	○
P11.21	Proportional coefficient of voltage regulator during overvoltage stall	0–1000	60	○
P11.22	Integral	0–1000	10	○

Function code	Name	Detailed parameter description	Default value	Modify
	coefficient of voltage regulator during overvoltage stall			
P11.23	Proportional coefficient of current regulator during overvoltage stall	0–1000	60	○
P11.24	Integral coefficient of current regulator during overvoltage stall	0–2000	250	○
P11.25	Enable inverter overload integral	0: Disable 1: Enable	0	
P11.26–P11.27	Reserved variables	0–65536	0	○
P12 group Parameters of motor 2				
P12.00	Type of motor 2	0: Asynchronous motor 1: Synchronous motor	0	◎
P12.01	Rated power of asynchronous motor 2	0.1–3000.0kW	Depend on model	◎
P12.02	Rated frequency of asynchronous motor 2	0.01Hz–P00.03 (max. output frequency)	50.00Hz	◎
P12.03	Rated speed of asynchronous motor 2	1–36000rpm	Depend on model	◎
P12.04	Rated voltage of asynchronous motor 2	0–1200V	Depend on model	◎
P12.05	Rated current of asynchronous motor 2	0.8–6000.0A	Depend on model	◎
P12.06	Stator resistance of asynchronous	0.001–65.535Ω	Depend on model	○

Function code	Name	Detailed parameter description	Default value	Modify
	motor 2			
P12.07	Rotor resistance of asynchronous motor 2	0.001–65.535Ω	Depend on model	○
P12.08	Leakage inductance of asynchronous motor 2	0.1–6553.5mH	Depend on model	○
P12.09	Mutual inductance of asynchronous motor 2	0.1–6553.5mH	Depend on model	○
P12.10	No-load current of asynchronous motor 2	0.1–6553.5A	Depend on model	○
P12.11	Magnetic saturation coefficient 1 of iron core of asynchronous motor 2	0.0–100.0%	80%	○
P12.12	Magnetic saturation coefficient 2 of iron core of asynchronous motor 2	0.0–100.0%	68%	○
P12.13	Magnetic saturation coefficient 3 of iron core of asynchronous motor 2	0.0–100.0%	57%	○
P12.14	Magnetic saturation coefficient 4 of iron core of asynchronous	0.0–100.0%	40%	○

Function code	Name	Detailed parameter description	Default value	Modify
	motor 2			
P12.15	Rated power of synchronous motor 2	0.1–3000.0kW	Depend on model	◎
P12.16	Rated frequency of synchronous motor 2	0.01Hz–P00.03 (max. output frequency)	50.00Hz	◎
P12.17	Number of pole pairs of synchronous motor 2	1–128	2	◎
P12.18	Rated voltage of synchronous motor 2	0–1200V	Depend on model	◎
P12.19	Rated voltage of synchronous motor 2	0.8–6000.0A	Depend on model	◎
P12.20	Stator resistance of synchronous motor 2	0.001–65.535Ω	Depend on model	○
P12.21	Direct-axis inductance of synchronous motor 2	0.01–655.35mH	Depend on model	○
P12.22	Quadrature-axis inductance of synchronous motor 2	0.01–655.35mH	Depend on model	○
P12.23	Counter-emf constant of synchronous motor 2	0–10000V	300	○
P12.24	Initial pole position of synchronous motor 2 (reserved)	0–0xFFFF	0x0000	●
P12.25	Identification	0%–50% (rated motor current)	10%	●

Function code	Name	Detailed parameter description	Default value	Modify
	current of synchronous motor 2 (reserved)			
P12.26	Overload protection of motor 2	0: No protection 1: Common motor (with low-speed compensation) 2: Frequency-variable motor (without low-speed compensation)	2	◎
P12.27	Overload protection coefficient of motor 2	Motor overload multiples M = Iout/(In×K) In is rated motor current, Iout is inverter output current, K is motor overload protection coefficient. The smaller the K, the larger the value of M, the easier the protection. if M is 116%, protection will be applied when motor overloads for 1h; if M is 200%, protection will be applied when motor overloads for 60s; if M is no less than 400%, protection will be applied immediately.  Setting range: 20.0%–120.0%	100.0%	○
P12.28	Power display calibration coefficient of motor 2	0.00–3.00	1.00	○
P12.29	Parameter display of motor 2	0: Display based on the motor type; under this mode, only parameters related to current motor type will be displayed. 1: Display all; under this mode, all the parameters will be displayed.	0	○
P12.30	System inertia of motor 2	0–30.000kgm^2	0.000	○
P12.31–P12.32	Reserved variables	0–65535	0	○
P13 group Control parameters of synchronous motor				

Function code	Name	Detailed parameter description	Default value	Modify
P13.00	Reduction rate of the injection current of synchronous motor	0.0%–100.0% rated motor current	80.0%	○
P13.01	Initial pole detection mode	0: Pull-in current 1: High-frequency superposition (reserved) 2: Pulse superposition (reserved)	0	◎
P13.02	Pull-in current 1	Pull-in current is the pole position orientation current; pull-in current 1 is valid within the lower limit of pull-in current switch-over frequency threshold. If users need to increase the starting torque, increase the value of this function code properly. Setting range: 0.0%–100.0% (rated motor current)	20.0%	○
P13.03	Pull-in current 2	Pull-in current is the pole position orientation current; pull-in current 2 is valid within the upper limit of pull-in current switch-over frequency threshold, and users do not need to change pull-in current 2 under common situations. Setting range: 0.0%–100.0% (rated motor current)	10.0%	○
P13.04	Switch-over frequency of pull-in current	0.00Hz–P00.03 (max. output frequency)	10.00Hz	○
P13.05	High-frequency superposition frequency (reserved)	200Hz–1000Hz	500Hz	◎
P13.06	High-frequency superposition voltage	0.0–300.0% rated motor voltage	100.0%	◎
P13.07	Reserved variables	0–400.0	0.0	○
P13.08	Control parameter 1	0–0xFFFF	0	○
P13.09	Control parameter 2	0–655.35	2.00	○
P13.10	Reserved variables	0–359.9	0	○

Function code	Name	Detailed parameter description	Default value	Modify
P13.11	Maladjustment detection time	This parameter is used to adjust the responsiveness of anti-maladjustment function. If the load inertia is large, increase the value of this parameter properly, however, the responsiveness may slow down accordingly. Setting range: 0.0–10.0s	0.5s	○
P13.12	High-frequency compensation coefficient of synchronous motor	This parameter is valid when the motor speed exceeds the rated speed. If motor oscillation occurred, adjust this parameter properly. Setting range: 0.0–100.0%	0.0	○
P13.13–P13.19	Reserved variables	0–65535	0	○
P14 group Serial communication function				
P14.00	Local communication address	Setting range: 1–247 When the master is writing frames, and the slave communication address is set to 0, it is the broadcast communication address, and all the slaves on the MODBUS bus will accept this frame, but the slave never responds. Local communication address is unique in the communication network, which is the basis for point-to-point communication between the upper computer and the inverter. **Note: The slave address cannot be set to 0.**	1	○
P14.01	Communication baud rate setup	This parameter is used to set the data transmission speed between upper computer and the inverter. 0: 1200BPS 1: 2400BPS 2: 4800BPS 3: 9600BPS 4: 19200BPS 5: 38400BPS 6: 57600BPS 7: 115200BPS **Note: Baud rate of the upper computer must be the same with the inverter; otherwise, communication cannot be performed. The larger**	4	○

Function code	Name	Detailed parameter description	Default value	Modify
		the baud rate, the faster the communication speed.		
P14.02	Data bit check setup	The data format of upper computer must be the same with the inverter; otherwise, communication cannot be performed. 0: No parity check (N, 8, 1) for RTU 1: Even parity (E, 8, 1) for RTU 2: Odd parity (O, 8, 1) for RTU 3: No parity check (N, 8, 2) for RTU 4: Even parity (E, 8, 2) for RTU 5: Odd parity (O, 8, 1) for RTU	1	○
P14.03	Communication response delay	0–200ms It refers to the time interval from when the data is received by the inverter to the moment when the data is sent to the upper computer. If the response delay is less than the system processing time, the response delay will be subject to system processing time; if the response delay is longer than the system processing time, data will be sent to the upper computer at a delay after data process is done by system.	5	○
P14.04	Communication timeout period	0.0 (invalid) –60.0s This parameter will be invalid if it is set to 0.0; When it is set to a non-zero value, if the time interval between current communication and the next communication exceeds the communication timeout period, the system will report "485 communication fault" (CE). Under common situations, it is set to 0.0. In systems which have continuous communication, users can monitor the communication condition by setting this parameter.	0.0s	○
P14.05	Transmission error processing	0: Alarm and coast to stop 1: Do not alarm and continue running 2: Do not alarm and stop as per the stop mode (under communication control mode only) 3: Do not alarm and stop as per the stop mode (under all control modes)	0	○

Function code	Name	Detailed parameter description	Default value	Modify
P14.06	Communication processing action	0x00–0x11 Ones: 0: Write operation has response 1: Write operation has no response Tens: 0: Communication password protection is invalid 1: Communication password protection is valid	0x00	○
P14.07–P14.24	Reserved variables	0–65535	0	●
P15 group Functions of communication extension card 1				
P15.00–P15.27	See the operation manual of communication extension card for details			
P15.28	Master/slave CAN communication address	0–127	1	◎
P15.29	Master/slave CAN communication baud rate selection	0: 50Kbps 1: 100 Kbps 2: 125Kbps 3: 250Kbps 4: 500Kbps 5: 1M bps	4	◎
P15.30	Master/slave CAN communication timeout period	0.0 (invalid)–300.0s	0.0s	○
P15.31–P15.69	See the operation manual of communication extension card for details			
P16 group Functions of communication extension card 2				
P16.00–P16.23	See the operation manual of communication extension card for details			
P16.24	Identification time for the extension card in card slot 1	0.0–600.0s If it is set to 0.0, identification fault will not be detected	0.0–600.00	0.0
P16.25	Identification time for the extension card in	0.0–600.0s If it is set to 0.0, offline fault will not be detected	0.0–600.00	0.0

Function code	Name	Detailed parameter description	Default value	Modify
	card slot 2			
P16.26	Identification time for the extension card in card slot 3	0.0–600.0s If it is set to 0.0, offline fault will not be detected	/	/
P16.27	Communication timeout period of extension card in card slot 1	0.0–600.0s If it is set to 0.0, offline fault will not be detected	/	/
P16.28	Communication timeout period of extension card in card slot 2	0.0–600.0s If it is set to 0.0, offline fault will not be detected	/	/
P16.29	Communication timeout period of extension card in card slot 3	0.0–600.0s If it is set to 0.0, offline fault will not be detected	/	/
P16.30–P16.69	See the operation manual of communication extension card for details			
P17 group State-check functions				
P17.00	Set frequency	Display current set frequency of the inverter. Range: 0.00Hz–P00.03	50.00Hz	●
P17.01	Output frequency	Display current output frequency of the inverter. Range: 0.00Hz–P00.03	0.00Hz	●
P17.02	Ramps reference frequency	Display current ramps reference frequency of the inverter. Range: 0.00Hz–P00.03	0.00Hz	●
P17.03	Output voltage	Display current output voltage of the inverter. Range: 0–1200V	0V	●
P17.04	Output current	Display the valid value of current output current of the inverter. Range: 0.0–5000.0A	0.0A	●
P17.05	Motor speed	Display current motor speed. Range: 0–65535RPM	0 RPM	●
P17.06	Torque current	Display current torque current of the inverter. Range: -3000.0–3000.0A	0.0A	●
P17.07	Exciting current	Display current exciting current of the inverter. Range: -3000.0–3000.0A	0.0A	●

Function code	Name	Detailed parameter description	Default value	Modify
P17.08	Motor power	Display current motor power; 100% relative to rated motor power, positive value is motoring state, negative value is generating state. Range: -300.0–300.0% (relative to rated motor power)	0.0%	●
P17.09	Motor output torque	Display current output torque of the inverter; 100% relative to rated motor torque, during forward running, positive value is motoring state, negative value is generating state, during reverse running, positive value is generating state, negative value is motoring state. Range: -250.0–250.0%	0.0%	●
P17.10	Estimated motor frequency	The estimated motor rotor frequency under open-loop vector condition. Range: 0.00– P00.03	0.00Hz	●
P17.11	DC bus voltage	Display current DC bus voltage of the inverter. Range: 0.0–2000.0V	0V	●
P17.12	Digital input terminal state	Display current digital input terminal state of the inverter. 0000–03F Corresponds to HDIB, HDIA, S4, S3, S2 and S1 respectively	0	●
P17.13	Digital output terminal state	Display current digital output terminal state of the inverter. 0000–000F Corresponds to R02, RO1, HDO and Y1 respectively	0	●
P17.14	Digital adjustment variable	Display the regulating variable by UP/DOWN terminals of the inverter. Range: 0.00Hz–P00.03	0.00Hz	●
P17.15	Torque reference value	Relative to percentage of the rated torque of current motor, display torque reference. Range: -300.0%–300.0% (rated motor current)	0.0%	●
P17.16	Linear speed	0–65535	0	●
P17.17	Reserved variables	0–65535	0	●
P17.18	Count value	0–65535	0	●
P17.19	AI1 input voltage	Display input signal of AI 1 Range: 0.00–10.00V	0.00V	●

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

Function code	Name	Detailed parameter description	Default value	Modify
		Range: -3000.0–3000.0A		
P17.34	Torque current reference	Display torque current reference value under vector control mode Range: -3000.0–3000.0A	0.0A	●
P17.35	AC incoming current	Display the valid value of incoming current on AC side Range: 0.0–5000.0A	0.0A	●
P17.36	Output torque	Display output torque value, during forward running, positive value is motoring state, negative value is generating state; during reverse running, positive value is generating state, negative value is motoring state. Range: -3000.0Nm–3000.0Nm	0.0Nm	●
P17.37	Motor overload count value	0–65535	0	●
P17.38	Process PID output	-100.0%–100.0%	0.00%	●
P17.39	Parameter download wrong function code	0.00–99.00	0.00	●
P17.40	Motor control mode	Ones: Control mode 0: Vector 0 1: Vector 1 2: SVPWM control 3: VC Tens: Control state 0: Speed control 1: Torque control Hundreds: Motor number 0: Motor 1 1: Motor 2	2	●
P17.41	Upper limit of the torque when motoring	0.0%–300.0% (rated motor current)	180.0%	●
P17.42	Upper limit of brake torque	0.0%–300.0% (rated motor current)	180.0%	●
P17.43	Upper limit frequency of	0.00–P00.03	50.00Hz	●

Function code	Name	Detailed parameter description	Default value	Modify
	forward running of torque control			
P17.44	Upper limit frequency of reverse running of torque control	0.00–P00.03	50.00Hz	●
P17.45	Inertia compensation torque	-100.0%–100.0%	0.0%	●
P17.46	Friction compensation torque	-100.0%–100.0%	0.0%	●
P17.47	Motor pole pairs	0–65535	0	●
P17.48	Inverter overload count value	0–65535	0	●
P17.49	Frequency set by A source	0.00–P00.03	0.00Hz	●
P17.50	Frequency set by B source	0.00–P00.03	0.00Hz	●
P17.51	PID proportional output	-100.0%–100.0%	0.00%	●
P17.52	PID integral output	-100.0%–100.0%	0.00%	●
P17.53	PID differential output	-100.0%–100.0%	0.00%	●
P17.54–P17.63	Reserved variables	0–65535	0	●
P18 group Closed-loop control state check				
P18.00	Actual frequency of encoder	The actual-measured encoder frequency; the value of forward running is positive; the value of reverse running is negative. Range: -999.9–3276.7Hz	0.0Hz	●
P18.01	Encoder position count value	Encoder count value, quadruple frequency, Range: 0–65535	0	●
P18.02	Encoder Z pulse count value	Corresponding count value of encoder Z pulse. Range: 0–65535	0	●
P18.03	High bit of	High bit of position reference value, zero out after	0	●

Function code	Name	Detailed parameter description	Default value	Modify
	position reference value	stop. Range: 0–30000		
P18.04	Low bit of position reference value	Low bit of position reference value, zero out after stop. Range: 0–65535	0	●
P18.05	High bit of position feedback value	High bit of position feedback value, zero out after stop. Range: 0–30000	0	●
P18.06	Low bit of position feedback value	Low bit of position feedback value, zero out after stop. Range: 0–65535	0	●
P18.07	Position deviation	Deviation between current reference position and actual running position. Range: -32768–32767	0	●
P18.08	Position of position reference point	Position of reference point of Z pulse when the spindle stops accurately. Range: 0–65535	0	●
P18.09	Current position setup of spindle	Current position setup when the spindle stops accurately. Range: 0–359.99	0.00	●
P18.10	Current position when spindle stops accurately	Current position when spindle stops accurately. Range: 0–65535	0	●
P18.11	Encoder Z pulse direction	Z pulse direction display. When the spindle stops accurately, there may be a couple of pulses' error between the position of forward and reverse orientation, which can be eliminated by adjusting Z pulse direction of P20.02 or exchanging phase AB of encoder. 0: Forward 1: Reverse	0	●
P18.12	Encoder Z pulse angle	Reserved. Range: 0.00–359.99	0.00	●
P18.13	Encoder Z pulse error times	Reserved. Range: 0–65535	0	●
P18.14	High bit of encoder pulse count value	0–65535	0	●

Function code	Name	Detailed parameter description	Default value	Modify
P18.15	Low bit of encoder pulse count value	0–65535	0	●
P18.16	Reserved variables	0–65535	0	●
P18.17	Pulse command frequency	Pulse command (A2, B2 terminal) is converted to the set frequency, and it is valid under pulse position mode and pulse speed mode. Range: 0–655.35Hz	0.00Hz	●
P18.18	Pulse command feedforward	Pulse command (A2, B2 terminal) is converted to the set frequency, and it is valid under pulse position mode and pulse speed mode. Range: 0–655.35Hz	0.00Hz	●
P18.19	Position regulator output	The output frequency of the position regulator during position control. Range: 0–65535	0	●
P18.20	Count value of resolver	Count value of resolver. Range: 0–65535	0	●
P18.21	Resolver angle	The pole position angle read according to the resolver-type encoder. Range: 0.00–359.99	0.00	●
P18.22	Pole angle of closed-loop synchronous motor	Current pole position. Range: 0.00–359.99	0.00	●
P18.23	State control word 3	0–65535	0	●
P18.24	High bit of count value of pulse reference	0–65535	0	●
P18.25	Low bit of count value of pulse reference	0–65535	0	●
P18.26	Spindle reduction ratio	It is the drive ratio (speed ratio) between the mounting shaft and the spindle of the encoder when spindle stops accurately. Range: 0.000–65.535	0.000	●
P18.27	Encoder UVW	0–7	0	●

Function code	Name	Detailed parameter description	Default value	Modify
	sector			
P18.28	Encoder PPR (pulse-per-revolution) display	0–65535	0	●
P18.29	Angle compensation value of synchronous motor	-180.0–180.0	0.00	●
P18.30	Reserved variables	0–65535	0	●
P18.31	Pulse reference Z pulse value	0–65535	0	●
P18.32–P18.35	Reserved variables	0–65535	0	●
P19 group Extension card state check				
P19.00	State of card slot 1	0–65535 0: No card 1: PLC programmable card 2: I/O card 3: Incremental PG card 4: Incremental PG card with UVW 5: Ethernet communication card 6: DP communication card 7: Bluetooth card 8: Resolver PG card 9: CANopen communication card 10: WIFI card 11: Profinet communication card 12: Sine/Cosine PG card without CD signal 13: Sine/Cosine PG card with CD signal 14: Absolute encoder PG card 15: CAN master/slave communication card 16: MODBUS communication card 17: EtherCat communication card 18: BacNet communication card 19: DeviceNet communication card	0	●

Function code	Name	Detailed parameter description	Default value	Modify
P19.01	State of card slot 2	0–65535 0: No card 1: PLC programmable card 2: I/O card 3: Incremental PG card 4: Incremental PG card with UVW 5: Ethernet communication card 6: DP communication card 7: Bluetooth card 8: Resolver PG card 9: CANopen communication card 10: WIFI card 11: Profinet communication card 12: Sine/Cosine PG card without CD signal 13: Sine/Cosine PG card with CD signal 14: Absolute encoder PG card 15: CAN master/slave communication card 16: MODBUS communication card 17: EtherCat communication card 18: BacNet communication card 19: DeviceNet communication card	0	●
P19.02	State of card slot 3	0–65535 0: No card 1: PLC programmable card 2: I/O card 3: Incremental PG card 4: Incremental PG card with UVW 5: Ethernet communication card 6: DP communication card 7: Bluetooth card 8: Resolver PG card 9: CANopen communication card 10: WIFI card 11: Profinet communication card 12: Sine/Cosine PG card without CD signal 13: Sine/Cosine PG card with CD signal 14: Absolute encoder PG card 15: CAN master/slave communication card 16: MODBUS communication card	0	●

Function code	Name	Detailed parameter description	Default value	Modify
		17: EtherCat communication card 18: BacNet communication card 19: DeviceNet communication card		
P19.03	Software version of the extension card in card slot 1	0.00–655.35	0.00	●
P19.04	Software version of the extension card in card slot 2	0.00–655.35	0.00	●
P19.05	Software version of the extension card in card slot 3	0.00–655.35	0.00	●
P19.06	Input state of extension I/O card terminals	0–0xFFFF	0	●
P19.07	Output state of extension I/O card terminals	0–0xFFFF	0	●
P19.08	HDI3 input frequency of extension I/O card	0.000–50.000kHz	0.000 kHz	●
P19.09	AI3 input voltage of extension I/O card	0.00–10.00V	0.00V	●
P19.10–P19.39	Reserved variables	0–65535	0	●
P20 group Encoder of motor 1				
P20.00	Encoder type display	0: Incremental encoder 1: Resolver-type encoder 2: Sin/Cos encoder 3: Endat absolute encoder	0	●
P20.01	Encoder pulse number	Number of pulses generated when the encoder revolves for one circle. Setting range: 0–60000	1024	◎
P20.02	Encoder direction	Ones: AB direction 0: Forward 1: Reverse	0x000	◎

Function code	Name	Detailed parameter description	Default value	Modify
		Tens: Z pulse direction (reserved) 0: Forward 1: Reverse Hundreds: CD/UVW pole signal direction 0: Forward 1: Reverse		
P20.03	Detection time of encoder offline fault	The detection time of encoder offline fault. Setting range: 0.0–10.0s	1.0s	○
P20.04	Detection time of encoder reversal fault	Detection time of encoder reversal fault. Setting range: 0.0–100.0s	0.8s	○
P20.05	Filter times of encoder detection	Setting range: 0x00–0x99 Ones: Low-speed filter time, corresponds to 2^(0–9)×125us. Tens: High-speed filter times, corresponds to2^(0–9)×125us.	0x33	○
P20.06	Speed ratio between encoder mounting shaft and motor	Users need to set this parameter when the encoder is not installed on the motor shaft and the drive ratio is not 1. Setting range: 0.001–65.535	1.000	○
P20.07	Control parameters of synchronous motor	Bit0: Enable Z pulse calibration Bit1: Enable encoder angle calibration Bit2: Enable SVC speed measurement Bit3: Select resolver speed measurement mode Bit4: Z pulse capture mode Bit5: Do not detect encoder initial angle in v/f control Bit6: Enable CD signal calibration Bit7: Disable sin/cos sub-division speed measurement Bit8: Do not detect encoder fault during autotuning Bit9: Enable Z pulse detection optimization Bit10: Enable initial Z pulse calibration optimization Bit12: Clear Z pulse arrival signal after stop	0x3	○
P20.08	Enable Z pulse offline detection	0x00–0x11 Ones: Z pulse 0: Do not detect 1: Enable	0x10	○

Function code	Name	Detailed parameter description	Default value	Modify
		Tens: UVW pulse (for synchronous motor) 0: Do not detect 1: Enable		
P20.09	Initial angle of Z pulse	Relative electric angle of encoder Z pulse and motor pole position. Setting range: 0.00–359.99	0.00	○
P20.10	Initial angle of the pole	Relative electric angle of encoder position and motor pole position. Setting range: 0.00–359.99	0.00	○
P20.11	Autotuning of initial angle of pole	0–3 1: Rotary autotuning (DC brake) 2: Static autotuning (suitable for resolver-type encoder, sin/cos with CD signal feedback) 3: Rotary autotuning (initial angle identification)	0	◎
P20.12	Speed measurement optimization selection	0: No optimization 1: Optimization mode 1 2: Optimization mode 2	1	◎
P20.13	CD signal zero offset gain	0–65535	0	○
P20.14	Encoder type selection	Ones: Incremental encoder 0: without UVW 1: with UVW Tens: Sin/Cos encoder 0: without CD signal 1: with CD signal	0x00	◎
P20.15	Speed measurement mode	0: PG card 1: local; realized by HDIA and HDIB; supports incremental 24V encoder only	0	◎
P20.16	Frequency-division coefficient	0–255	0	○
P20.17	Pulse filer processing	0x0000–0xffff Bit0: Enable/disable encoder input filter 0: No filter 1: Filter Bit1: Encoder signal filter mode (set Bit0 or Bit2 to 1) 0: Self-adaptive filter 1: Use P20.18 filter parameters	0x0011	○

Function code	Name	Detailed parameter description	Default value	Modify
		Bit2: Enable/disable encoder frequency-division output filter 0: No filter 1: Filter Bit3: Reserved Bit4: Enable/disable pulse reference filter 0: No filter 1: Filter Bit5: Pulse reference filter mode (valid when Bit4 is set to 1) 0: Self-adaptive filter 1: Use P20.19 filter parameters Bit6–15: Reserved		
P20.18	Encoder pulse filter width	0–63 0 means 0.25us	39	○
P20.19	Pulse reference filter width	0–63 0 means 0.25us	39	○
P20.20	Pulse number of pulse reference	0–65535	1024	◎
P20.21	Enable angle compensation of synchronous motor	0–1	0	○
P20.22	Switch-over frequency threshold of speed measurement mode	0–630.00Hz	1.00Hz	○
P20.23–P20.24	Reserved variables	0–65535	0	○
P21 group Position control				
P21.00	Positioning mode	Ones: Control mode selection 0: Speed control 1: Position control Tens: Position command source 0: Pulse string 1: Digital position	0x0000	○

Function code	Name	Detailed parameter description	Default value	Modify
		2: Positioning of photoelectric switch during stop Hundreds: Position feedback source (reserved, fixed to channel P) 0: PG1 1: PG2 Thousands: servo mode Bit0: Position deviation mode 0: No deviation 1: With deviation Bit1: Enable/disable servo 0: Disable (The servo can be enabled by terminals.) 1: Enable Bit2: (reserved)		
P21.01	Pulse command mode	Ones: Pulse mode 0: A/B quadrature pulse; A precedes B 1: A: PULSE; B: SIGN If channel B is of low electric level, the edge counts up; if channel B is of high electric level, the edge counts down. 2: A: Positive pulse Channel A is positive pulse; channel B needs no wiring 3: A\B dual-channel pulse; channel A pulse edge counts up, channel B pulse edge counts down Tens: Pulse direction Bit0: Set pulse direction 0: Forward 1: Reverse Bit1: Set pulse direction by running direction 0: Disable, and BIT0 is valid; 1: Enable Hundreds: Pulse/direction frequency-doubling selection (reserved) 0: No frequency-doubling 1: Frequency-doubling Thousands: Pulse control selection Bit0: Pulse filter selection 0: Inertia filter 1: Average moving filter	0x0000	◎

Function code	Name	Detailed parameter description	Default value	Modify
		Bit1: Overspeed control 0: No control 1: Control		
P21.02	Position loop gain 1	0–400.0	20.0	○
P21.03	Position loop gain 2	0–400.0	30.0	○
P21.04	Switch-over mode of position loop gain	0: No switch-over 1: Torque command 2: Speed command 3–5: Reserved	0	○
P21.05	Torque command level during position gain switch-over	0.0–100.0% (rated motor torque)	10.0%	○
P21.06	Speed command level during position gain switch-over	0.0–100.0% (rated motor speed)	10.0%	○
P21.07	Smooth filter coefficient during gain switch-over	The smooth filter coefficient during position gain switch-over. Setting range: 0–15	5	○
P21.08	Output limit of position controller	The output limit of position regulator, if the limit value is 0, position regulator will be invalid, and no position control can be performed, however, speed control is available. Setting range: 0.0–100.0% (max. output frequency P00.03)	20.0%	○
P21.09	Completion range of positioning	When the position deviation is less than P21.09, and the duration is larger than P21.10, positioning completion signal will be outputted. Setting range: 0–1000	10	○
P21.10	Detection time for positioning completion	0.0–1000.0ms	10.0ms	○
P21.11	Numerator of position command ratio	Electronic gear ratio, used to adjust the corresponding relation between position command and actual running displacement.	1000	○

Function code	Name	Detailed parameter description	Default value	Modify
		Setting range: 1–65535		
P21.12	Denominator of position command ratio	Setting range: 1–65535	1000	○
P21.13	Position feedforward gain	0.00–120.00% For pulse string reference only (position control)	100.00	○
P21.14	Position feedforward filter time constant	0.0–3200.0ms For pulse string reference only (position control)	3.0ms	○
P21.15	Position command filter time constant	The position feedforward filter time constant during pulse string positioning. 0.0–3200.0ms	0.0ms	◎
P21.16	Digital positioning mode	Bit0: Positioning mode selection 0: Relative position 1: Absolute position (home) (reserved) Bit1: Positioning cycle selection 0: Cyclic positioning by terminals 1: Automatic cyclic positioning Bit2: Cycle mode 0: Continuous 1: Repetitive (supported by automatic cyclic positioning only) Bit3: P21.17 digital setting mode 0: Incremental 1: Position type (do not support continuous mode) Bit4: Home searching mode 0: Search for the home just once 1: Search for the home during each run Bit5: Home calibration mode 0: Calibrate in real time 1: Single calibration Bit6: Positioning completion signal selection 0: Valid during the time set by P21.25 (Hold time of positioning completion signal) 1: Always valid Bit7: Initial positioning selection (for cyclic positioning by terminals) 0: Invalid (do not rotate)	0	○

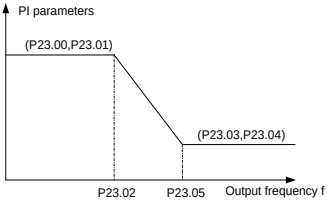
Function code	Name	Detailed parameter description	Default value	Modify
		1: Valid Bit8: Positioning enable signal selection (for cyclic positioning by terminals only; positioning function is always enabled for automatic cyclic positioning) 0: Pulse signal 1: Level signal Bit9: Position source 0: P21.17 setting 1: PROFIBUS/CANopen setting Bit10–11: Reserved Bit12: Positioning curve selection (reserved) 0: Straight line 1: S curve		
P21.17	Position digital reference	Set digital positioning position; Actual position=P21.17×P21.11/P21.12 0–65535	0	○
P21.18	Positioning speed setup selection	0: Set by P21.19 1: Set by AI1 2: Set by AI2 3: Set by AI3 4: Set by high speed pulse HDIA 5: Set by high speed pulse HDIB	0	○
P21.19	Positioning speed digits	0–100.0% max. frequency	20.0%	○
P21.20	Acceleration time of positioning	Set the acceleration/deceleration time of positioning process.	3.00s	○
P21.21	Deceleration time of positioning	Acceleration time of positioning means the time needed for the inverter to accelerate from 0Hz to the max. output frequency (P00.03). Deceleration time of positioning means the time needed for the inverter to decelerate from the max. output frequency (P00.03) to 0hz. Setting range of P21.20: 0.01–300.00s Setting range of P21.21: 0.01–300.00s	3.00s	○
P21.22	Hold time of positioning arrival	Set the hold time of waiting when target positioning position is reached. Setting range: 0.000–60.000s	0.100s	○
P21.23	Home search	0.00–50.00Hz	2.00Hz	○

Function code	Name	Detailed parameter description	Default value	Modify
	speed			
P21.24	Home position offset	0–65535	0	○
P21.25	Hold time of positioning completion signal	The hold time of positioning completion signal, this parameter is also valid for positioning completion signal of spindle orientation. Setting range: 0.000–60.000s	0.200s	○
P21.26	Pulse superposition value	0–65535	0	○
P21.27	Pulse superposition speed	0–6553.5	8.0	○
P21.28	Acceleration/deceleration time after disabling pulse	000.0–3000.0s	5.0s	○
P21.29	Speed feedforward filter time constant (pulse string speed mode)	It is the filter time constant detected by pulse string when the speed reference source is set to pulse string (P0.06=12 or P0.07=12). Setting range: 0–3200.0ms	10.0ms	○
P21.30	Numerator of the 2nd command ratio	1–65535	1000	○
P21.31–P21.33	Reserved variables	0–65535	0	○
P22 group Spindle positioning				
P22.00	Spindle positioning mode selection	Bit0: Enable spindle positioning 0: Disable 1: Enable Bit1: Select spindle positioning reference point 0: Z pulse input 1: S2/S3/S4 terminal input Bit2: Search for reference point 0: Search the reference point only once 1: Search the reference point every time Bit3: Enable reference point calibration	0	○

Function code	Name	Detailed parameter description	Default value	Modify
		0: Disable 1: Enable Bit4: Positioning mode selection 1 0: Set direction positioning 1: Near-by direction positioning Bit5: Positioning mode selection 2 0: Forward positioning 1: Reverse positioning Bit6: Zeroing command selection 0: Electric level mode 1: Pulse mode Bit7: Reference point calibration mode 0: Calibrate at the first time 1: Calibrate in real time Bit8: Action selection after zeroing signal cancellation (electric level type) 0: Switch to speed mode 1: Position lock mode Bit9: Positioning completion signal selection 0: Electric level signal 1: Pulse signal Bit10: Z pulse signal source 0: Motor 1: Spindle Bit11–15: Reserved		
P22.01	Speed of spindle orientation	During spindle orientation, the speed of the position point of orientation will be searched, and then it will switch over to position control orientation. Setting range: 0.00–100.00Hz	10.00Hz	○
P22.02	Deceleration time of spindle orientation	Deceleration time of spindle orientation. Spindle orientation deceleration time means the time needed for the inverter to decelerate from the max. output frequency (P00.03) to 0Hz. Setting range: 0.0–100.0s	3.0s	○
P22.03	Spindle zeroing position 0	Users can select the zeroing positions of four spindles by terminals (function code 46, 47). Setting range: 0–39999	0	○
P22.04	Spindle zeroing position 1	Setting range: 0–39999	0	○

Function code	Name	Detailed parameter description	Default value	Modify
P22.05	Spindle zeroing position 2	Setting range: 0–39999	0	○
P22.06	Spindle zeroing position 3	Setting range: 0–39999	0	○
P22.07	Spindle scale-division angle 1	Users can select seven spindle scale-division values by terminals (function code 48, 49 and 50). Setting range: 0.00–359.99	15.00	○
P22.08	Spindle scale-division angle 2	Setting range: 0.00–359.99	30.00	○
P22.09	Spindle scale-division angle 3	Setting range: 0.00–359.99	45.00	○
P22.10	Spindle scale-division angle 4	Setting range: 0.00–359.99	60.00	○
P22.11	Spindle scale-division angle 5	Setting range: 0.00–359.99	90.00	○
P22.12	Spindle scale-division angle 6	Setting range: 0.00–359.99	120.00	○
P22.13	Spindle scale-division angle 7	Setting range: 0.00–359.99	180.00	○
P22.14	Spindle drive ratio	This function code sets the reduction ratio of the spindle and the mounting shaft of the encoder. Setting range: 0.000–30.000	1.000	○
P22.15	Zero-point communication setup of spindle	P22.15 sets spindle zero-point offset, if the selected spindle zero point is P22.03, the final spindle zero point will be the sum of P22.03 and P22.15. Setting range: 0–39999	0	○
P22.16	Reserved variables	0–65535	0	○
P22.17	Reserved variables	0–65535	0	○
P22.18	Rigid tapping selection	Ones: Enable/disable 0: Disable	0x00	◎

Function code	Name	Detailed parameter description	Default value	Modify
		1: Enable Tens: Analog port selection 0: Invalid 1: AI1 2: AI2 3: AI3		
P22.19	Analog filter time of rigid tapping	0.0ms–1000.0ms	1.0ms	○
P22.20	Max. frequency of rigid tapping	0.00–400.00Hz	50.00Hz	○
P22.21	Corresponding frequency of analog zero drift of rigid tapping	0.00–10.00Hz	0.00Hz	○
P22.22	Reserved variables	0–1	0	○
P22.23–P22.24	Reserved variables	0–65535	0	○
P23 group	**Vector control of motor 2**			
P23.00	Speed loop proportional gain 1	P23.00–P23.05 fit for vector control mode only. Below switch-over frequency 1 (P23.02), the speed loop PI parameters are P23.00 and P23.01. Above switch-over frequency 2 (P23.05), the speed loop PI parameters are P23.03 and P23.04; in between them, the PI parameters are obtained by linear variation between two groups of parameters, as shown in the figure below.	20.0	○
P23.01	Speed loop integral time 1		0.200s	○
P23.02	Switch over low point frequency		5.00Hz	○
P23.03	Speed loop proportional gain 2		20.0	○
P23.04	Speed loop integral time 2		0.200s	○
P23.05	Switch over high point frequency	The speed loop dynamic response characteristics of vector control can be adjusted by setting the proportional coefficient and integral time of speed regulator. Increase proportional gain or decrease integral time can accelerate dynamic response of	10.00Hz	○



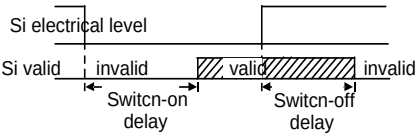
Function code	Name	Detailed parameter description	Default value	Modify
		speed loop, however, if the proportional gain is too large or integral time is too small, system oscillation and large overshoot may occur; if proportional gain is too small, stable oscillation or speed offset may occur. Speed loop PI parameter is closely related to the system inertia, users should make adjustment according to different load characteristics based on the default PI parameter to fulfill different needs. Setting range of P23.00: 0.0–200.0 Setting range of P23.01: 0.000–10.000s Setting range of P23.02: 0.00Hz–P23.05 Setting range of P23.03: 0.0–200.0 Setting range of P23.04: 0.000–10.000s Setting range of P23.05: P23.02–P00.03 (max. output frequency)		
P23.06	Speed loop output filter	0–8 (corresponds to 0–2^8/10ms)	0	○
P23.07	Slip compensation coefficient of vector control (motoring)	Slip compensation coefficient is used to adjust the slip frequency of vector control to improve system speed control precision. Users can effectively control the static error of speed by adjusting this parameter properly. Setting range: 50–200%	100%	○
P23.08	Slip compensation coefficient of vector control (generating)		100%	○
P23.09	Current loop proportional coefficient P	**Note:** 1. These two parameters are used to adjust PI parameters of current loop; it affects dynamic response speed and control precision of the system directly. The default value needs no adjustment under common conditions; 2. Fit for SVC mode 0 (P00.00=0) and VC mode (P00.00=3); 3. The value of this function code will be updated automatically after parameter autotuning of synchronous motor is done.	1000	○
P23.10	Current loop integral coefficient I		1000	○

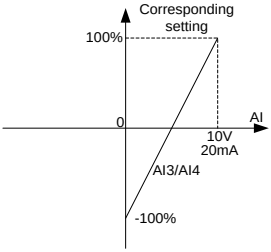
Function code	Name	Detailed parameter description	Default value	Modify
		Setting range: 0–65535		
P23.11	Speed loop differential gain	0.00–10.00s	0.00s	○
P23.12	Proportional coefficient of high-frequency current loop	Under VC mode (P00.00=3), below current loop high-frequency switch-over threshold (P23.14), current loop PI parameters are P23.09 and P23.10; above current loop high-frequency switch-over threshold, current loop PI parameters are P23.12 and P23.13. Setting range of P23.12: 0–20000 Setting range of P23.13: 0–20000 Setting range of P23.14: 0.0–100.0% (relative to max. frequency)	1000	○
P23.13	Integral coefficient of high-frequency current loop		1000	○
P23.14	High-frequency switch-over threshold of current loop		100.0%	○
P23.15–P23.19	Reserved variables	0–65535	0	●
P24 group Encoder of motor 2				
P24.00	Encoder type display	0: Incremental encoder 1: Resolver-type encoder 2: Sin/Cos encoder 3: Endat absolute encoder	0	●
P24.01	Encoder pulse number	Number of pulses generated when the encoder revolves for one circle. Setting range: 0–60000	1024	◎
P24.02	Encoder direction	Ones: AB direction 0: Forward 1: Reverse Tens: Z pulse direction (reserved) 0: Forward 1: Reverse Hundreds: CD/UVW pole signal direction 0: Forward 1: Reverse	0x000	◎
P24.03	Detection time of encoder offline fault	The detection time of encoder offline fault. Setting range: 0.0–10.0s	1.0s	○
P24.04	Detection time of	Detection time of encoder reversal fault.	0.8s	○

Function code	Name	Detailed parameter description	Default value	Modify
	encoder reversal fault	Setting range: 0.0–100.0s		
P24.05	Filter times of encoder detection	Setting range: 0x00–0x99 Ones: Low-speed filter times, corresponds to 2^(0–9)×125us. Tens: High-speed filter times; corresponds to 2^(0–9)×125us.	0x33	○
P24.06	Speed ratio between encoder mounting shaft and motor	Users need to set this parameter when the encoder is not installed on the motor shaft and the drive ratio is not 1. Setting range: 0.001–65.535	1.000	○
P24.07	Control parameters of synchronous motor	Bit0: Enable Z pulse calibration Bit1: Enable encoder angle calibration Bit2: Enable SVC speed measurement Bit3: Select resolver speed measurement mode Bit4: Z pulse capture mode Bit5: Do not detect encoder initial angle in v/f control Bit6: Enable CD signal calibration Bit7: Disable sin/cos sub-division speed measurement Bit8: Do not detect encoder fault during autotuning Bit9: Enable Z pulse detection optimization Bit10: Enable initial Z pulse calibration optimization Bit12: Clear Z pulse arrival signal after stop	0x3	○
P24.08	Enable Z pulse offline detection	0x00–0x11 Ones: Z pulse Reserved Tens: UVW pulse 0: Do not detect 1: Enable	0x10	○
P24.09	Initial angle of Z pulse	Relative electric angle of encoder Z pulse and motor pole position. Setting range: 0.00–359.99	0.00	○
P24.10	Initial angle of the pole	Relative electric angle of encoder position and motor pole position. Setting range: 0.00–359.99	0.00	○
P24.11	Autotuning of initial angle of	0–3 1: Rotary autotuning (DC brake)	0	◎

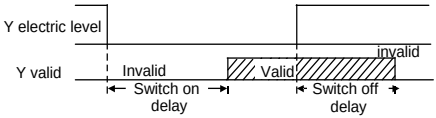
Function code	Name	Detailed parameter description	Default value	Modify
	pole	2: Static autotuning (suitable for resolver-type encoder, sin/cos with CD signal feedback) 3: Rotary autotuning (initial angle identification)		
P24.12	Speed measurement optimization selection	0: No optimization 1: Optimization mode 1 2: Optimization mode 2	1	◎
P24.13	CD signal zero offset gain	0–65535	0	○
P24.14	Encoder type selection	Ones: Incremental encoder 0: without UVW 1: with UVW Tens: Sin/Cos encoder 0: without CD signal 1: with CD signal	0x00	◎
P24.15	Speed measurement mode	0: PG card 1: local; realized by HDIA and HDIB; supports incremental 24V encoder only	0	◎
P24.16	Frequency-division coefficient	0–255	0	○
P24.17	Pulse filer processing	0x0000–0xffff Bit0: Enable/disable encoder input filter 0: No filter 1: Filter Bit1: Encoder signal filter mode (set Bit0 or Bit2 to 1) 0: Self-adaptive filter 1: Use P20.18 filter parameters Bit2: Enable/disable encoder frequency-division output filter 0: No filter 1: Filter Bit3: Reserved Bit4: Enable/disable pulse reference filter 0: No filter 1: Filter Bit5: Pulse reference filter mode (valid when Bit4 is set to 1)	0x0011	○

Function code	Name	Detailed parameter description	Default value	Modify
		0: Self-adaptive filter 1: Use P24.19 filter parameters Bit6–15: Reserved		
P24.18	Encoder pulse filter width	0–63 0 means 0.25us	39	○
P24.19	Pulse reference filter width	0–63 0 means 0.25us	39	○
P24.20	Pulse number of pulse reference	0–65535	1024	◎
P24.21	Enable angle compensation of synchronous motor	0–1	0	○
P24.22	Switch-over frequency threshold of speed measurement mode	0–630.00Hz	1.00Hz	○
P24.23–P24.24	Reserved variables	0–65535	0	○
P25 group	**Extension I/O card input functions**			
P25.00	HDI3 input type selection	0: HDI3 is high-speed pulse input 1: HDI3 is digital input	0	◎
P25.01	S5 terminal function	The same with P05 group	0	◎
P25.02	S6 terminal function		0	◎
P25.03	S7 terminal function		0	◎
P25.04	S8 terminal function		0	◎
P25.05	S9 terminal function		0	◎
P25.06	S10 terminal function		0	◎
P25.07	HDI3 terminal function		0	◎

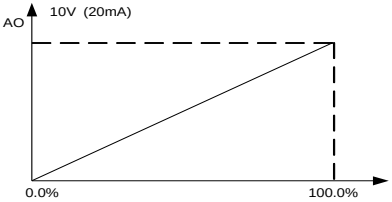
Function code	Name	Detailed parameter description	Default value	Modify
P25.08	Input terminal polarity of extension card	0x00–0x7F	0x00	○
P25.09	Virtual terminal setup of extension card	0x000–0x7F (0: disable, 1: enable) BIT0: S5 virtual terminal BIT1: S6 virtual terminal BIT2: S7 virtual terminal BIT3: S8 virtual terminal BIT4: S9 virtual terminal BIT5: S10 virtual terminal BIT6: HDI3 virtual terminal	0x00	◎
P25.10	HDI3 terminal switch-on delay	These function codes define corresponding delay of the programmable input terminals during level variation from switch-on to switch-off .  Setting range: 0.000–50.000s	0.000s	○
P25.11	HDI3 terminal switch-off delay		0.000s	○
P25.12	S5 terminal switch-on delay		0.000s	○
P25.13	S5 switch-off delay		0.000s	○
P25.14	S6 terminal switch-on delay		0.000s	○
P25.15	S6 switch-off delay		0.000s	○
P25.16	S7 terminal switch-on delay		0.000s	○
P25.17	S7 switch-off delay		0.000s	○
P25.18	S8 terminal switch-on delay		0.000s	○
P25.19	S8 switch-off delay		0.000s	○
P25.20	S9 terminal switch-on delay		0.000s	○
P25.21	S9 switch-off delay		0.000s	○
P25.22	S10 terminal switch-on delay		0.000s	○
P25.23	S10 switch-off		0.000s	○

Function code	Name	Detailed parameter description	Default value	Modify
	delay			
P25.24	Lower limit value of AI3	These function codes define the relation between analog input voltage and corresponding set value of analog input. When the analog input voltage exceeds the range of max./min. input, the max. input or min. input will be adopted during calculation. When analog input is current input, 0–20mA current corresponds to 0–10V voltage. In different application cases, 100% of the analog setting corresponds to different nominal values. The figure below illustrates several settings.  Input filter time: Adjust the sensitivity of analog input, increase this value properly can enhance the anti-interference capacity of analog variables; however, it will also degrade the sensitivity of analog input. **Note:** AI3 and AI4 can support 0–10V/0–20mA input, when AI3 and AI4 select 0–20mA input, the corresponding voltage of 20mA is 10V; Setting range of P25.24: 0.00V–P25.26 Setting range of P25.25: -100.0%–100.0% Setting range of P25.26: P25.24–10.00V Setting range of P25.27: -100.0%–100.0% Setting range of P25.28: 0.000s–10.000s Setting range of P25.29: 0.00V–P25.31 Setting range of P25.30: -100.0%–100.0% Setting range of P25.31: P25.29–10.00V Setting range of P25.32: -100.0%–100.0% Setting range of P25.33: 0.000s–10.000s	0.00V	○
P25.25	Corresponding setting of lower limit of AI3		0.0%	○
P25.26	Upper limit value of AI3		10.00V	○
P25.27	Corresponding setting of upper limit of AI3		100.0%	○
P25.28	Input filter time of AI3		0.030s	○
P25.29	Lower limit value of AI4		0.00V	○
P25.30	Corresponding setting of lower limit of AI4		0.0%	○
P25.31	Upper limit value of AI4		10.00V	○
P25.32	Corresponding setting of upper limit of AI4		100.0%	○
P25.33	Input filter time of AI4		0.030s	○
P25.34	HDI3 high-speed pulse input	0: Set input via frequency 1: Count	0	◎

Function code	Name	Detailed parameter description	Default value	Modify
	function			
P25.35	Lower limit frequency of HDI3	0.000 KHz – P25.37	0.000 KHz	○
P25.36	Corresponding setting of lower limit frequency of HDI3	-100.0%–100.0%	0.0%	○
P25.37	Upper limit frequency of HDI3	P25.35 –50.000KHz	50.000 KHz	○
P25.38	Corresponding setting of upper limit frequency of HDI3	-100.0%–100.0%	100.0%	○
P25.39	HDI3 frequency input filter time	0.000s–10.000s	0.030s	○
P25.40	AI3 input signal type	Range: 0–1 0: Voltage type 1: Current type	0	○
P25.41	AI4 input signal type	Range: 0–1 0: Voltage type 1: Current type	0	○
P25.42–P25.45	Reserved variables	0–65535	0	○
P26 group	**Output functions of extension I/O card**			
P26.00	HDO2 output type	0: Open collector high-speed pulse output 1: Open collector output	0	◎
P26.01	HDO2 output selection	The same with P06.01	0	○
P26.02	Y2 output selection		0	○
P26.03	Y3 output selection		0	○
P26.04	Relay RO3 output selection		0	○
P26.05	Relay RO4 output selection		0	○

Function code	Name	Detailed parameter description	Default value	Modify
P26.06	Relay RO5 output selection		0	○
P26.07	Relay RO6 output selection		0	○
P26.08	Relay RO7 output selection		0	○
P26.09	Relay RO8 output selection		0	○
P26.10	Relay RO9 output selection		0	○
P26.11	Relay RO10 output selection		0	○
P26.12	Output terminal polarity of extension card	0x0000–0x7FF RO10, RO9…RO3, HDO2,Y3, Y2 in sequence	0x000	○
P26.13	HDO2 switch-on delay	This function code defines the corresponding delay of the level variation from switch-on to switch-off.  Setting range: 0.000–50.000s **Note: P26.13 and P26.14 are valid only when P26.00 is set to 1.**	0.000s	○
P26.14	HDO2 switch-off delay		0.000s	○
P26.15	Y2 switch-on delay		0.000s	○
P26.16	Y2 switch-off delay		0.000s	○
P26.17	Y3 switch-on delay		0.000s	○
P26.18	Y3 switch-off delay		0.000s	○
P26.19	Relay RO3 switch-on delay		0.000s	○
P26.20	Relay RO3 switch-off delay		0.000s	○
P26.21	Relay RO4 switch-on delay		0.000s	○
P26.22	Relay RO4 switch-off delay		0.000s	○
P26.23	Relay RO5 switch-on delay		0.000s	○
P26.24	Relay RO5		0.000s	○

Function code	Name	Detailed parameter description	Default value	Modify
	switch-off delay			
P26.25	Relay RO6 switch-on delay		0.000s	○
P26.26	Relay RO6 switch-off delay		0.000s	○
P26.27	Relay RO7 switch-on delay		0.000s	○
P26.28	Relay RO7 switch-off delay		0.000s	○
P26.29	Relay RO8 switch-on delay		0.000s	○
P26.30	Relay RO8 switch-off delay		0.000s	○
P26.31	Relay RO9 switch-on delay		0.000s	○
P26.32	Relay RO9 switch-off delay		0.000s	○
P26.33	Relay RO10 switch-on delay		0.000s	○
P26.34	Relay RO10 switch-off delay		0.000s	○
P26.35	AO2 output selection	The same with P06.14	0	○
P26.36	AO3 output selection		0	○
P26.37	Reserved variables		0	○
P26.38	Lower limit of AO2 output	Above function codes define the relation between output value and analog output. When the output value exceeds the set max./min. output range, the upper/low limit of output will be adopted during calculation. When analog output is current output, 1mA corresponds to 0.5V voltage. In different applications, 100% of output value corresponds to different analog outputs.	0.0%	○
P26.39	Corresponding AO2 output of lower limit		0.00V	○
P26.40	Upper limit of AO2 output		100.0%	○
P26.41	Corresponding AO2 output of upper limit		10.00V	○

Function code	Name	Detailed parameter description	Default value	Modify
P26.42	AO2 output filter time	 Setting range of P26.38: -100.0%–P26.40 Setting range of P26.39: 0.00V–10.00V Setting range of P26.40: P26.38–100.0% Setting range of P26.41: 0.00V–10.00V Setting range of P26.42: 0.000s–10.000s Setting range of P26.43: -100.0%–P26.45 Setting range of P26.44: 0.00V–10.00V Setting range of P26.45: P26.43–100.0% Setting range of P26.46: 0.00V–10.00V Setting range of P26.47: 0.000s–10.000s	0.000s	○
P26.43	Lower limit of AO3 output		0.0%	○
P26.44	Corresponding AO3 output of lower limit		0.00V	○
P26.45	Upper limit of AO3 output		100.0%	○
P26.46	Corresponding AO3 output of upper limit		10.00V	○
P26.47	AO3 output filter time		0.000s	○
P26.48–P26.52	Reserved variables	0–65535	0	○
P28 group Master/slave control functions				
P28.00	Master/slave mode selection	0: The master/slave control is invalid 1: This machine is a master 2: This machine is a slave	0	◎
P28.01	Master/slave communication data selection	0: CAN 1: Reserved	0	◎
P28.02	Master/slave control mode	Ones: Master/slave running mode selection 0: Master/slave mode 0 (The master and slave adopt speed control and maintains the power balance by droop control) 1: Master/slave mode 1 (The master and slave must be in the same type of vector control mode. The master is speed control, and the slave will be forced to be in the torque control mode. 2: Master/slave mode 2 Start in the slave first speed mode (master/slave mode 0) and then switch to torque mode at a certain frequency point (master/slave mode 1)	0x001	◎

Function code	Name	Detailed parameter description	Default value	Modify
		Tens: Slave start command source selection 0: Follow the master to start 1: Determined by P00.01 Hundreds: Slave transmitting/master receiving data enable 0: Enable 1: Disable		
P28.03	Slave speed gain	0.0–500.0%	100.0%	○
P28.04	Slave torque gain	0.0–500.0%	100.0%	○
P28.05	Master/slave mode 2 speed mode / torque mode switching frequency point	0.00–10.00Hz	5.00Hz	○
P28.06	Number of slaves	0–15	1	◎
P28.07–P28.29	Reserved variables	0–65535	0	○
P90 group	**Customized function group 1**			
P90.00–P90.39	Reserved variables	0–65535	0	○
P91 group	**Customized function group 2**			
P91.00–P91.39	Reserved variables	0–65535	0	○
P92 group	**Customized function group 3**			
P92.00–P92.39	Reserved variables	0–65535	0	○
P93 group	**Customized function group 4**			
P93.00–P93.39	Reserved variables	0–65535	0	○

Chapter 6 Troubleshooting

6.1 What this chapter contains

The chapter tells users how to reset faults and check faults history. A complete list of alarms and fault information as well as possible causes and corrective measures are presented in this chapter.

✧ Only well-trained and qualified professionals are allowed to carry out the work described in this chapter. Operations should be carried out according to the instructions presented in Safety precautions.

6.2 Indications of alarms and faults

The fault is indicated by indicators (refer to the "Keypad operation process"). When TRIP indicator is on, the alarm or fault code displayed in the keypad indicates the inverter is in exception state. This chapter covers most of the alarms and faults, and their possible causes and corrective measures, if users cannot figure out the alarm or fault causes, contact local INVT office.

6.3 Fault reset

Users can reset the inverter via STOP/RST key on the keypad, digital inputs, or by cutting off the inverter power. After faults are removed, the motor can be start again.

6.4 Fault history

P07.27–P07.32 record the six latest fault types; P07.33–P07.40, P07.41–P07.48, and P07.49–P07.56 record the running data of the inverter when the latest three faults occurred.

6.5 Inverter faults and solutions

When fault occurred, process the fault as shown below.

1. When inverter fault occurred, confirm whether keypad display is improper? If yes, contact INVT;
2. If keypad works properly, check the function codes in P07 group to confirm the corresponding fault record parameters, and determine the real state when current fault occurred through parameters;
3. Check the table below to see whether corresponding exception states exist based on the corresponding corrective measures;
4. Rule out the faults or ask for help from professionals;
5. After confirming faults are removed, reset the fault and start running.

6.5.1 Details of faults and solutions

Fault code	Fault type	Possible cause	Corrective measures
OUt1	Inverter unit Phase-U protection	Acceleration is too fast; IGBT module is damaged; Misacts caused by interference; drive wires are poorly connected ; To-ground short circuit	Increase acceleration time; Replace the power unit; Check drive wires; Check whether there is strong interference surrounds the peripheral equipment
OUt2	Inverter unit Phase-V protection		
OUt3	Inverter unit Phase-W protection		

Fault code	Fault type	Possible cause	Corrective measures
		occurs	
OV1	Over-voltage during acceleration	Exception occurred to input voltage; Large energy feedback; Lack of brake units; Dynamic brake is not enabled	Check input power; Check whether load deceleration time is too short; or the motor starts during rotating; Install dynamic brake units; Check the setup of related function codes
OV2	Over-voltage during deceleration		
OV3	Over-voltage during constant speed running		
OC1	Over-current during acceleration	Acceleration is too fast; Grid voltage is too low; Inverter power is too small; Load transient or exception occurred; To-ground short circuit or output phase loss occur; Strong external interference sources; Overvoltage stall protection is not enabled	Increase acceleration /deceleration time; Check input power; Select the inverter with larger power; Check if the load is short circuited (to-ground short circuit or line-to-line short circuit) or the rotation is not smooth; Check the output wiring; Check if there is strong interference; Check the setup of related function codes.
OC2	Over-current during deceleration		
OC3	Over-current during constant speed running		
UV	Bus undervoltage fault	Grid voltage is too low; Overvoltage stall protection is not enabled	Check grid input power; Check the setup of related function codes
OL1	Motor overload	Grid voltage is too low; Rated motor current is set improperly; Motor stall or load jumps violently	Check grid voltage; Reset rated motor current; Check the load and adjust torque boost
OL2	Inverter overload	Acceleration is too fast; The motor in rotating is restarted; Grid voltage is too low; Load is too large; Power is too small;	Increase acceleration time; Avoid restart after stop; Check grid voltage; Select the inverter with larger power; Select proper motor
SPI	Phase loss on input	Phase loss or violent	Check the input power;

Fault code	Fault type	Possible cause	Corrective measures
	side	fluctuation occurred to R, S and T input	Check installation wiring
SPO	Phase loss on output side	Phase loss occurred to U, V, W output (or the three phases of motor is asymmetrical)	Check the output wiring; Check the motor and cable
OH1	Overheat of rectifier module	Air duct is blocked or fan is damaged; Ambient temperature is too high; Long-time overload running	Ventilate the air duct or replace the fan; Lower the ambient temperature
OH2	Overheat of inverter module		
EF	External fault	SI external fault input terminal acts	Check external device input
CE	485 communication fault	Baud rate is set improperly; Communication line fault; Communication address error; Communication suffers from strong interference	Set proper baud rate; Check the wiring of communication interfaces; Set proper communication address; Replace or change the wiring to enhance anti-interference capacity
ItE	Current detection fault	Poor contact of the connector of control board; Hall component is damaged; Exception occurred to amplification circuit	Check the connector and re-plug; Replace the hall component; Replace the main control board
tE	Motor autotuning fault	Motor capacity does not match with the inverter capacity, this fault may occur easily if the difference between them is exceeds five power classes; Motor parameter is set improperly; The parameters gained from autotuning deviate sharply from the standard parameters; Autotuning timeout	Change the inverter model, or adopt V/F mode for control; Set proper motor type and nameplate parameters; Empty the motor load and carry out autotuning again; Check motor wiring and parameter setup; Check whether upper limit frequency is larger than 2/3 of the rated frequency

Fault code	Fault type	Possible cause	Corrective measures
EEP	EEPROM fault	R/W error occurred to the control parameters; EEPROM is damaged	Press STOP/RST to reset; Replace the main control board
PIDE	PID feedback offline fault	PID feedback offline; PID feedback source disappears;	Check PID feedback signal wires; Check PID feedback source
bCE	Brake unit fault	Brake circuit fault or brake tube is damaged; The resistance of external brake resistor is too small	Check the brake unit, replace with new brake tubes; Increase brake resistance
END	Running time is up	The actual running time of the inverter is larger than the set running time	Ask help from the supplier, adjust the set running time
OL3	Electronic overload fault	The inverter releases overload pre-alarm based on the set value	Check the load and overload pre-alarm threshold
PCE	Keypad communication fault	The keypad wire is poorly contacted or disconnected; The keypad wire is too long and suffers strong interference; Circuit fault occurred to the keypad or communication part of the main board	Check the keypad wires to confirm whether fault exists; Check the surroundings to rule out interference source; Replace the hardware and ask for maintenance service
UPE	Parameter upload error	The keypad wire is poorly contacted or disconnected; The keypad wire is too long and suffers strong interference; Circuit fault occurred to the keypad or communication part of the main board	Check the surroundings to rule out interference source; Replace the hardware and ask for maintenance service; Replace the hardware and ask for maintenance service
DNE	Parameter download error	The keypad wire is poorly contacted or disconnected; The keypad wire is too long and suffers strong interference; Data storage error occurred to the keypad	Check the surroundings to rule out interference source; Replace the hardware and ask for maintenance service; Re-backup keypad data

Fault code	Fault type	Possible cause	Corrective measures
ETH1	To-ground short circuit fault 1	Inverter output is short connected to the ground; Current detection circuit is faulty; Actual motor power setup deviates sharply from the inverter power	Check whether motor wiring is proper; Replace the hall component; Replace the main control board; Reset the motor parameters properly
ETH2	To-ground short circuit fault 1	Inverter output is short connected to ground; Current detection circuit is faulty; Actual motor power setup deviates sharply from the inverter power	Check whether motor wiring is proper; Replace the hall component; Replace the main control board; Reset the motor parameters properly
dEu	Speed deviation fault	Load is too heavy, or stall occurred	Check the load to ensure it is proper, increase the detection time; Check whether control parameters are set properly
STo	Maladjustment fault	Control parameters of synchronous motor is set improperly; The parameter gained from autotuning is inaccurate; The inverter is not connected to motor	Check the load to ensure it is proper, Check whether load is proper; Check whether control parameters are set correctly; Increase maladjustment detection time
LL	Electronic underload fault	The inverter performs underload pre-alarm based on the set value	Check the load and overload pre-alarm threshold
ENC1O	Encoder offline fault	Encoder line sequence is wrong, or signal wires are poorly connected	Check the encoder wiring
ENC1D	Encoder reversal fault	The encoder speed signal is contrary to the motor running direction	Reset encoder direction
ENC1Z	Encoder Z pulse offline fault	Z signal wires are disconnected	Check the wiring of Z signal
OT	Motor over-temperature	Motor over-temperature input terminal is valid;	Check the wiring of motor over-temperature input terminal

Fault code	Fault type	Possible cause	Corrective measures
	fault	Exception occurred to t temperature detection Exception occurred to resistor; Long-time overload running or exception occurred	(terminal function 57); Check whether temperature sensor is proper; Check the motor and perform maintenance on the motor
STO	Safe torque off	Safe torque off function is enabled by external forces	/
STL1	Exception occurred to safe circuit of channel H1	The wiring of STO is improper; Fault occurred to external switch of STO; Hardware fault occurred to safety circuit of channel H1	Check whether terminal wiring of STO is proper and firm enough; Check whether external switch of STO can work properly; Replace the control board
STL2	Exception occurred to channel H2 safe circuit	The wiring of STO is improper; Fault occurred to external switch of STO; Hardware fault occurred to safety circuit of channel H2	Check whether terminal wiring of STO is proper and firm enough; Check whether external switch of STO can work properly; Replace the control board
STL3	Exception occurred to channel H1 and channel H2	Hardware fault occurred to STO circuit	Replace the control board
CrCE	Safety code FLASH CRC check fault	Control board is faulty	Replace the control board
E-Err	Repetitive extension card type	The two inserted extension cards are of the same type	Users should not insert two cards with the same type; check the type of extension card, and remove one card after power down
ENCUV	Encoder UVW loss fault	No electric level variation occurred to UVW signal	Check the wiring of UVW; Encoder is damaged
F1-Er	Failed to identify the extension card in card slot 1	There is data transmission in interfaces of card slot 1, however, it cannot read the card type	Confirm whether the extension card inserted can be supported; Stabilize the extension card interfaces after power down, and confirm whether fault still occurs at next power-on;

Fault code	Fault type	Possible cause	Corrective measures
			Check whether the insertion port is damaged, if yes, replace the insertion port after power down
F2-Er	Failed to identify the extension card in card slot 2	There is data transmission in interfaces of card slot 2, however, it cannot read the card type	Confirm whether the extension card inserted can be supported; Stabilize the extension card interfaces after power down, and confirm whether fault still occurs at next power-on; Check whether the insertion port is damaged, if yes, replace the insertion port after power down
F3-Er	Failed to identify the the extension card in card slot 3	There is data transmission in interfaces of card slot 3, however, it cannot read the card type	Confirm whether the extension card inserted can be supported; Stabilize the extension card interfaces after power down, and confirm whether fault still occurs at next power-on; Check whether the insertion port is damaged, if yes, replace the insertion port after power down
C1-Er	Communication timeout occurred to the extension card in card slot 1	There is no data transmission in interfaces of card slot 1	Confirm whether the extension card inserted can be supported; Stabilize the extension card interfaces after power down, and confirm whether fault still occurs at next power-on; Check whether the insertion port is damaged, if yes, replace the insertion port after power down
C2-Er	Communication timeout occurred to the extension card in card slot 2	There is no data transmission in interfaces of card slot 2	Confirm whether the extension card inserted can be supported; Stabilize the extension card interfaces after power down, and confirm whether fault still

Fault code	Fault type	Possible cause	Corrective measures
			occurs at next power-on; Check whether the insertion port is damaged, if yes, replace the insertion port after power down
C3-Er	Communication timeout occurred to the extension card in card slot 3	There is no data transmission in interfaces of card slot 3	Confirm whether the extension card inserted can be supported; Stabilize the extension card interfaces after power down, and confirm whether fault still occurs at next power-on; Check whether the insertion port is damaged, if yes, replace the insertion port after power down
E-DP	Profibus card communication timeout fault	There is no data transmission between the communication card and the host computer (or PLC)	Check whether the communication card wiring is loose or dropped
E-NET	Ethernet card communication timeout fault	There is no data transmission between the communication card and the host computer	Check whether the communication card wiring is loose or dropped
E-CAN	CANopen card communication timeout fault	There is no data transmission between the communication card and the host computer (or PLC)	Check whether the communication card wiring is loose or dropped
E-PN	Profinet card communication timeout fault	There is no data transmission between the communication card and the host computer (or PLC)	Check whether the communication card wiring is loose or dropped
E-CAT	EtherCat card communication timeout fault	There is no data transmission between the communication card and the host computer (or PLC)	Check whether the communication card wiring is loose or dropped
E-BAC	BACNet card communication timeout fault	There is no data transmission between the communication card and the host computer (or PLC)	Check whether the communication card wiring is loose or dropped

Fault code	Fault type	Possible cause	Corrective measures
E-DEV	DeviceNET card communication timeout fault	There is no data transmission between the communication card and the host computer (or PLC)	Check whether the communication card wiring is loose or dropped
ESCAN	Can master/slave communication card communication timeout fault	There is no data transmission between the CAN master and slave communication cards	Check whether the communication card wiring is loose or dropped
S-Err	Master-slave synchronous CAN slave fault	Fault occurred to one of the CAN slave inverters	Detect the CAN slave inverter and analyze the corresponding fault cause of the inverter

6.5.2 Other state

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

7、Warranty agreement

(1) The warranty period of this product is subject to the sales invoice, the warranty period according to the normal use of the manual, the product failure or damage our company is responsible for free maintenance

(2) During the warranty period, due to the damage caused by the following toilets, a certain maintenance fee will be charged:

A: due to the use of errors and their own unauthorized repair, modification caused by machine damage;

B: Machine damage caused by fire, flood, abnormal voltage, other natural disasters and secondary disasters:

C: hardware damage caused by artificial fall and transportation after purchase;

D: Machine damage caused by not operating according to the user manual provided by our company;

E: Failure and damage caused by obstacles other than the machine (such as external equipment factors) :

(3) When the product fails or is damaged, please fill in the contents of the "Product Warranty Card" correctly and in detail.

(4) Maintenance fees shall be charged in accordance with the latest Maintenance Price List adjusted by our company.

(5) This warranty card will not be reissued under normal circumstances, please be sure to keep this card, and show it to the maintenance personnel during the warranty.

(6) If there is any problem in the service process, please contact our agent or our company in time.

(7) The Company reserves the right to interpret this Agreement.

Product warranty card

<table>
<tr><td rowspan="5">Customer information</td><td>Company Name:</td><td colspan="2"></td></tr>
<tr><td>Company address:</td><td colspan="2"></td></tr>
<tr><td>Contact person:</td><td colspan="2"></td></tr>
<tr><td>Contact number:</td><td colspan="2"></td></tr>
<tr><td>Postal Code:</td><td colspan="2"></td></tr>
<tr><td></td><td colspan="3">Product model:</td></tr>
<tr><td rowspan="2">Product information</td><td colspan="3">Body bar code (paste here):</td></tr>
<tr><td colspan="3">Agent Name:</td></tr>
<tr><td rowspan="2">Fault information</td><td colspan="3">(Maintenance time and contents):</td></tr>
<tr><td colspan="2">Maintenance person:</td><td></td></tr>
</table>

Chapter 8 Communication protocol

8.1 What this chapter contains

This chapter describes the communication protocol of products.

Inverters provide RS485 communication interfaces and adopt the master-slave communication based on the international standard Modbus communication protocol. You can implement centralized control (setting commands for controlling the inverter, modifying the running frequency and related function code parameters, and monitoring the working state and fault information of the inverter) through PC/PLC, upper control computer, or other devices to meet specific application requirements.

8.2 Modbus protocol introduction

Modbus is a software protocol, a common language used in electronic controllers. By using this protocol, a controller can communicate with other devices through transmission lines. It is a general industrial standard. With this standard, control devices produced by different manufacturers can be connected to form an industrial network and be monitored in a centralized way.

The Modbus protocol provides two transmission modes, namely American Standard Code for Information Interchange (ASCII) and remote terminal units (RTU). On one Modbus network, all the device transmission modes, baud rates, data bits, check bits, end bits, and other basic parameters must be set consistently.

A Modbus network is a control network with one master and multiple slaves, that is, on one Modbus network, there is only one device serving as the master, and other devices are the slaves. The master can communicate with one slave or broadcast messages to all the slaves. For separate access commands, a slave needs to return a response. For broadcasted information, slaves do not need to return responses.

8.3 Application of Modbus

Inverters use the RTU mode provided by the Modbus protocol, and RS485 interfaces are used.

8.3.1 RS485

RS485 interfaces work in half-duplex mode and transmit data signals in the differential transmission way, which is also referred to as balanced transmission. An RS485 interface uses a twisted pair, where one wire is defined as A (+), and the other B (-). Generally, if the positive electrical level between the transmission drives A and B ranges from +2 V to +6 V, the logic is "1"; and if it ranges from -2 V to -6 V, the logic is "0".

The 485+ terminal on the terminal block of the inverter corresponds to A, and 485- corresponds to B.

The communication baud rate (P14.01) indicates the number of bits transmitted in a second, and the unit is bit/s (bps). A higher baud rate indicates faster transmission and poorer anti-interference capability. When a twisted pair of 0.56 mm (24 AWG) is used, the maximum transmission distance varies according to the baud rate, as described in the following table.

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

When RS485 interfaces are used for long-distance communication, it is recommended that you use shielded cables, and use the shield layer as the ground wires.

When there are fewer devices and the transmission distance is short, the whole network works well without terminal load resistors. The performance, however, degrades as the distance increases. Therefore, it is recommended that you use a 120 Ω terminal resistor when the transmission distance is long.

8.3.1.1 Application to one inverter

Fig 8.1 is the Modbus wiring diagram of one inverter and a PC. Generally, PCs do not provide RS485 interfaces, so you need to convert an RS232 interface or USB port of a PC to an RS485 interface. Connect end A of the RS485 interface to the 485+ port on the terminal block of the inverter, and connect end B to the 485- port. It is recommended that you use shielded twisted pairs. When an RS232-RS485 converter is used, the cable used to connect the RS232 interface of the PC and the converter cannot be longer than 15 m. Use a short cable when possible. It is recommended that you insert the converter directly into the PC. Similarly, when a USB-RS485 converter is used, use a short cable when possible.

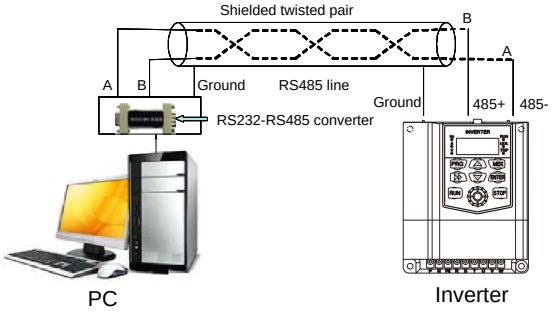


Fig 8.1 Wiring of RS485 applied to one inverter

8.3.1.2 Application to multiple inverters

In practical application to multiple inverters, chrysanthemum connection and star connection are commonly used.

According to the requirements of the RS485 industrial bus standards, all the devices need to be connected in chrysanthemum mode with one 120 Ω terminal resistor on each end, as shown in Fig 8.2. Fig 9.3 is the simplified wiring diagram, and Fig 8.4 is the practical application diagram.

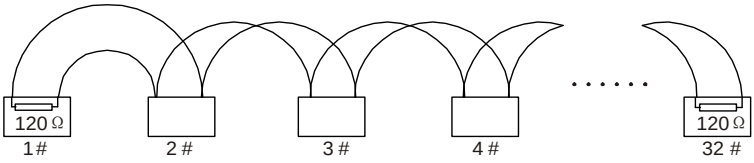


Fig 8.2 On-site chrysanthemum connection diagram

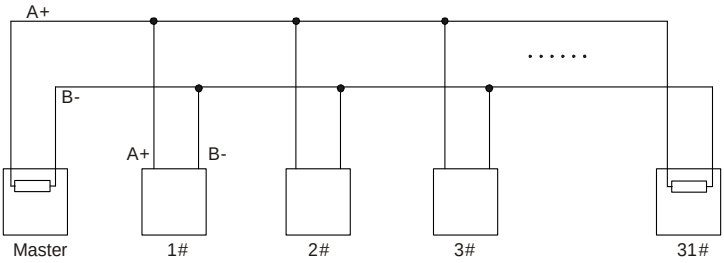


Fig 8.3 Simplified chrysanthemum connection diagram

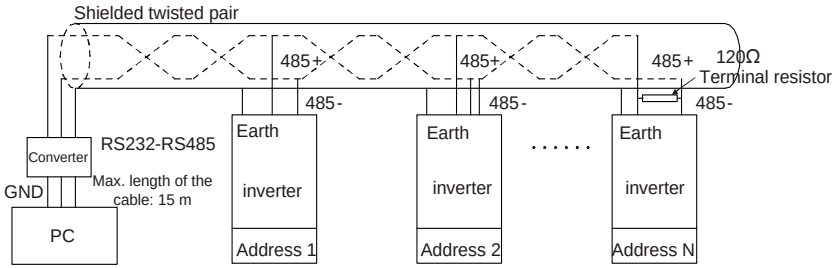


Fig 8.4 Practical application diagram of chrysanthemum connection

Fig 8.5 shows the start connection diagram. When this connection mode is adopted, the two devices that are farthest away from each other on the line must be connected with a terminal resistor (in Fig 8.5, the two devices are devices 1# and 15#).

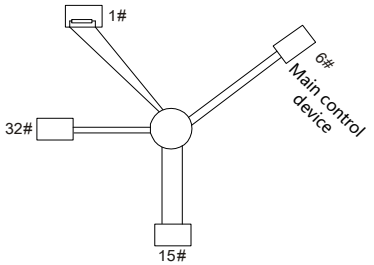


Fig 8.5 Star connection

Use shielded cable, if possible, in multi-device connection. The baud rates, data bit check settings, and other basic parameters of all the devices on the RS485 line must be set consistently, and

addresses cannot be repeated.

8.3.2 RTU mode

8.3.2.1 RTU communication frame structure

When a controller is set to use the RTU communication mode on a Modbus network, every byte (8 bits) in the message includes 2 hexadecimal characters (each includes 4 bits). Compared with the ASCII mode, the RTU mode can transmit more data with the same baud rate.

Code system

• 1 start bit

• 7 or 8 data bits; the minimum valid bit is transmitted first. Each frame domain of 8 bits includes 2 hexadecimal characters (0–9, A–F).

• 1 odd/even check bit; this bit is not provided if no check is needed.

• 1 end bit (with check performed), 2 bits (without check)

Error detection domain

• Cyclic redundancy check (CRC)

The following table describes the data format.

11-bit character frame (Bits 1 to 8 are data bits)

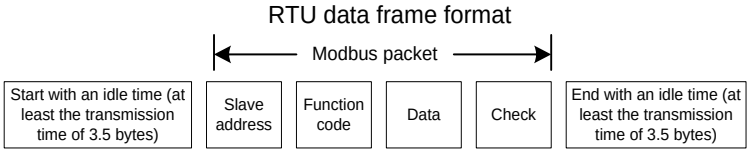
Start bit	BIT1	BIT2	BIT3	BIT4	BIT5	BIT6	BIT7	BIT8	Check bit	End bit

10-bit character frame (Bits 1 to 7 are data bits)

Start bit	BIT1	BIT2	BIT3	BIT4	BIT5	BIT6	BIT7	Check bit	End bit

In a character frame, only the data bits carry information. The start bit, check bit, and end bit are used to facilitate the transmission of the data bits to the destination device. In practical applications, you must set the data bits, parity check bits, and end bits consistently.

In RTU mode, the transmission of a new frame always starts from an idle time (the transmission time of 3.5 bytes). On a network where the transmission rate is calculated based on the baud rate, the transmission time of 3.5 bytes can be easily obtained. After the idle time ends, the data domains are transmitted in the following sequence: slave address, operation command code, data, and CRC check character. Each byte transmitted in each domain includes 2 hexadecimal characters (0–9, A–F). The network devices always monitor the communication bus. After receiving the first domain (address information), each network device identifies the byte. After the last byte is transmitted, a similar transmission interval (the transmission time of 3.5 bytes) is used to indicate that the transmission of the frame ends. Then, the transmission of a new frame starts.



The information of a frame must be transmitted in a continuous data flow. If there is an interval greater than the transmission time of 1.5 bytes before the transmission of the entire frame is complete, the receiving device deletes the incomplete information, and mistakes the subsequent byte for the address domain of a new frame. Similarly, if the transmission interval between two frames is shorter than the transmission time of 3.5 bytes, the receiving device mistakes it for the data of the last frame. The CRC check value is incorrect due to the disorder of the frames, and thus a communication fault occurs.

The following table describes the standard structure of an RTU frame.

START (frame header)	T1-T2-T3-T4 (transmission time of 3.5 bytes)
ADDR (slave address domain)	Communication address: 0–247 (decimal system) (0 is the broadcast address)
CMD (function domain)	03H: read slave parameters 06H: write slave parameters
DATA (N-1) ... DATA (0) (data domain)	Data of 2×N bytes, main content of the communication as well as the core of data exchanging
CRC CHK (LSBs)	Detection value: CRC (16 bits)
CRC CHK high bit (MSBs)	
END (frame tail)	T1-T2-T3-T4 (transmission time of 3.5 bytes)

8.3.2.2 RTU communication frame error check modes

During the transmission of data, errors may occur due to various factors. Without check, the data receiving device cannot identify data errors and may make a wrong response. The wrong response may cause severe problems. Therefore, the data must be checked.

The check is implemented as follows: The transmitter calculates the to-be-transmitted data based on a specific algorithm to obtain a result, adds the result to the rear of the message, and transmits them together. After receiving the message, the receiver calculates the data based on the same algorithm to obtain a result, and compares the result with that transmitted by the transmitter. If the results are the same, the message is correct. Otherwise, the message is considered wrong.

The error check of a frame includes two parts, namely, bit check on individual bytes (that is, odd/even check using the check bit in the character frame), and whole data check (CRC check).

Bit check on individual bytes (odd/even check)

You can select the bit check mode as required, or you can choose not to perform the check, which will affect the check bit setting of each byte.

Definition of even check: Before the data is transmitted, an even check bit is added to indicate whether the number of "1" in the to-be-transmitted data is odd or even. If it is even, the check bit is set to "0"; and if it is odd, the check bit is set to "1".

Definition of odd check: Before the data is transmitted, an odd check bit is added to indicate whether the number of "1" in the to-be-transmitted data is odd or even. If it is odd, the check bit is set to "0"; and if it is even, the check bit is set to "1".

For example, the data bits to be transmitted are "11001110", including five "1". If the even check is applied, the even check bit is set to "1"; and if the odd check is applied, the odd check bit is set to "0". During the transmission of the data, the odd/even check bit is calculated and placed in the check bit of the frame. The receiving device performs the odd/even check after receiving the data. If it finds that the odd/even parity of the data is inconsistent with the preset information, it determines that a communication error occurs.

CRC check mode

A frame in the RTU format includes an error detection domain based on the CRC calculation. The CRC domain checks all the content of the frame. The CRC domain consists of two bytes, including 16 binary bits. It is calculated by the transmitter and added to the frame. The receiver calculates the CRC of the received frame, and compares the result with the value in the received CRC domain. If the two CRC values are not equal to each other, errors occur in the transmission.

During CRC, 0xFFFF is stored first, and then a process is invoked to process a minimum of 6 contiguous bytes in the frame based on the content in the current register. CRC is valid only for the 8-bit data in each character. It is invalid for the start, end, and check bits.

During the generation of the CRC values, the "exclusive or" (XOR) operation is performed on the each 8-bit character and the content in the register. The result is placed in the bits from the least significant bit (LSB) to the most significant bit (MSB), and 0 is placed in the MSB. Then, LSB is detected. If LSB is 1, the XOR operation is performed on the current value in the register and the preset value. If LSB is 0, no operation is performed. This process is repeated 8 times. After the last bit (8^{th} bit) is detected and processed, the XOR operation is performed on the next 8-bit byte and the current content in the register. The final values in the register are the CRC values obtained after operations are performed on all the bytes in the frame.

The calculation adopts the international standard CRC check rule. You can refer to the related standard CRC algorithm to compile the CRC calculation program as required.

The following is a simple CRC calculation function for your reference (using the C programming language):

```
unsigned int crc_cal_value(unsigned char×data_value,unsigned char data_length)
{
    int i;
    unsigned int crc_value=0xffff;
    while(data_length--)
```

```
    {
        crc_value^=×data_value++;
        for(i=0;i<8;i++)
        {
            if(crc_value&0x0001)
                crc_value=(crc_value>>1)^0xa001;
            else
                crc_value=crc_value>>1;
        }
    }
    return(crc_value);
}
```

In the ladder logic, CKSM uses the table look-up method to calculate the CRC value according to the content in the frame. The program of this method is simple, and the calculation is fast, but the ROM space occupied is large. Use this program with caution in scenarios where there are space occupation limits on programs.

8.4 RTU command code and communication data

8.4.1 Command code: 03H, reading N words (continuously reading a maximum of 16 words)

The command code 03H is used by the master to read data from the inverter. The quantity of data to be read depends on the "data quantity" in the command. A maximum of 16 pieces of data can be read. The addresses of the read parameters must be contiguous. Each piece of data occupies 2 bytes, that is, one word. The command format is presented using the hexadecimal system (a number followed by "H" indicates a hexadecimal value). One hexadecimal value occupies one byte.

The 03H command is used to read information including the parameters and operation state of the inverter.

For example, starting from the data address of 0004H, to read two contiguous pieces of data (that is, to read content from the data addresses 0004H and 0005H), the structure of the frame is described in the following table.

RTU master command (transmitted by the master to the inverter)

START	T1-T2-T3-T4 (transmission time of 3.5 bytes)
ADDR (address)	01H
CMD (command code)	03H
Most significant byte (MSB) of the start address	00H
Least significant byte (LSB) of the start address	04H

MSB of data quantity	00H
LSB of data quantity	02H
LSB of CRC	85H
MSB of CRC	CAH
END	T1-T2-T3-T4 (transmission time of 3.5 bytes)

The value in START and END is "T1-T2-T3-T4 (transmission time of 3.5 bytes)", indicating that the RS485 needs to stay idle for at least the transmission time of 3.5 bytes. An idle time is required to distinguish on message from another to ensure that the two messages are not regarded as one.

The value of ADDR is 01H, indicating that the command is transmitted to the inverter whose address is 01H. The ADDR information occupies one byte.

The value of CMD is 03H, indicating that the command is used to read data from the inverter. The CMD information occupies one byte.

"Start address" indicates that data reading is started from this address. It occupies two bytes, with the MSB on the left and LSB on the right.

"Data quantity" indicates the quantity of data to be read (unit: word).

The value of "Start address" is 0004H, and that of "Data quantity" is 0002H, indicating that data is to be read from the data addresses of 0004H and 0005H.

CRC check occupies two bytes, with the LSB on the left, and MSB on the right.

RTU slave response (transmitted by the inverter to the master)

START	T1-T2-T3-T4 (transmission time of 3.5 bytes)
ADDR	01H
CMD	03H
Number of bytes	04H
MSB of data in 0004H	13H
LSB of data in 0004H	88H
MSB of data in 0005H	00H
LSB of data in 0005H	00H
LSB of CRC	7EH
MSB of CRC	9DH
END	T1-T2-T3-T4 (transmission time of 3.5 bytes)

The definition of the response information is described as follows:

The value of ADDR is 01H, indicating that the message is transmitted by the inverter whose address is 01H. The ADDR information occupies one byte.

The value of CMD is 03H, indicating that the message is a response of the inverter to the 03H command of the master for reading data. The CMD information occupies one byte.

"Number of bytes" indicates the number of bytes between a byte (not included) and the CRC byte (not

included). The value 04 indicates that there are four bytes of data between "Number of bytes" and "LSB of CRC", that is, "MSB of data in 0004H", "LSB of data in 0004H", "MSB of data in 0005H", and "LSB of data in 0005H".

A piece of data is two bytes, with the MSB on the left and LSB on the right. From the response, we can see that the data in 0004H is 1388H, and that in 0005H is 0000H.

CRC check occupies two bytes, with the LSB on the left, and MSB on the right.

8.4.2 Command code: 06H, writing a word

This command is used by the master to write data to the inverter. One command can be used to write only one piece of data. It is used to modify the parameters and operation mode of the inverter.

For example, to write 5000 (1388H) to 0004H of the inverter whose address is 02H, the structure of the frame is described in the following table.

RTU master command (transmitted by the master to the inverter)

START	T1-T2-T3-T4 (transmission time of 3.5 bytes)
ADDR	02H
CMD	06H
MSB of data writing address	00H
LSB of data writing address	04H
MSB of to-be-written data	13H
LSB of to-be-written data	88H
LSB of CRC	C5H
MSB of CRC	6EH
END	T1-T2-T3-T4 (transmission time of 3.5 bytes)

RTU slave response (transmitted by the inverter to the master)

START	T1-T2-T3-T4 (transmission time of 3.5 bytes)
ADDR	02H
CMD	06H
MSB of data writing address	00H
LSB of data writing address	04H
MSB of to-be-written data	13H
LSB of to-be-written data	88H
LSB of CRC	C5H
MSB of CRC	6EH
END	T1-T2-T3-T4 (transmission time of 3.5 bytes)

Note: The sections 8.2 and 8.3 mainly describes the command formats. For the detailed application, see the examples in section 8.4.8.

8.4.3 Command code: 08H, diagnosis

Sub-function code description

Sub-function code	Description
0000	Return data based on query requests

For example, to query about the circuit detection information about the inverter whose address is 01H, the query and return strings are the same, and the format is described in the following tables.

RTU master command

START	T1-T2-T3-T4 (transmission time of 3.5 bytes)
ADDR	01H
CMD	08H
MSB of the sub-function code	00H
LSB of the sub-function code	00H
MSB of data	12H
LSB of data	ABH
LSB of CRC CHK	ADH
MSB of CRC CHK	14H
END	T1-T2-T3-T4 (transmission time of 3.5 bytes)

RTU slave response

START	T1-T2-T3-T4 (transmission time of 3.5 bytes)
ADDR	01H
CMD	08H
MSB of the sub-function code	00H
LSB of the sub-function code	00H
MSB of data	12H
LSB of data	ABH
LSB of CRC CHK	ADH
MSB of CRC CHK	14H
END	T1-T2-T3-T4 (transmission time of 3.5 bytes)

9.4.4 Command code: 10H, continuous writing

The command code 10H is used by the master to write data to the inverter. The quantity of data to be written is determined by "Data quantity", and a maximum of 16 pieces of data can be written.

For example, to write 5000 (1388H) and 50 (0032H) respectively to 0004H and 0005H of the inverter whose slave address is 02H, the structure of the frame is described in the following table.

RTU master command (transmitted by the master to the inverter)

START	T1-T2-T3-T4 (transmission time of 3.5 bytes)
ADDR	02H
CMD	10H
MSB of data writing address	00H
LSB of data writing address	04H
MSB of data quantity	00H

LSB of data quantity	02H
Number of bytes	04H
MSB of data to be written to 0004H	13H
LSB of data to be written to 0004H	88H
MSB of data to be written to 0005H	00H
LSB of data to be written to 0005H	32H
LSB of CRC	C5H
MSB of CRC	6EH
END	T1-T2-T3-T4 (transmission time of 3.5 bytes)

RTU slave response (transmitted by the inverter to the master)

START	T1-T2-T3-T4 (transmission time of 3.5 bytes)
ADDR	02H
CMD	10H
MSB of data writing address	00H
LSB of data writing address	04H
MSB of data quantity	00H
LSB of data quantity	02H
LSB of CRC	C5H
MSB of CRC	6EH
END	T1-T2-T3-T4 (transmission time of 3.5 bytes)

8.4.5 Data address definition

This section describes the address definition of communication data. The addresses are used for controlling the running, obtaining the state information, and setting related function parameters of the inverter.

8.4.5.1 Function code address representation rules

The address of a function code consists of two bytes, with the MSB on the left and LSB on the right. The MSB ranges from 00 to ffH, and the LSB also ranges from 00 to ffH. The MSB is the hexadecimal form of the group number before the dot mark, and LSB is that of the number behind the dot mark. Take P05.06 as an example, the group number is 05, that is, the MSB of the parameter address is the hexadecimal form of 05; and the number behind the dot mark is 06, that is, the LSB is the hexadecimal form of 06. Therefore, the function code address is 0506H in the hexadecimal form. For P10.01, the parameter address is 0A01H.

Function code	Name	Detailed parameter description	Setting range	Default value	Modify
P10.00	Simple PLC mode	0: Stop after running once 1: Keep running in the final value after running once 2: Cyclic running	0-2	0	○
P10.01	Simple PLC memory	0: No memory after power down 1: Memory after power down	0-1	0	○

Function code	Name	Detailed parameter description	Setting range	Default value	Modify
	selection				

Note:

1. The parameters in the P99 group are set by the manufacturer. They cannot be read or modified. Some parameters cannot be modified when the inverter is running; some cannot be modified regardless of the state of the inverter. Pay attention to the setting range, unit, and related description of a parameter when modifying it.
2. The service life of the Electrically Erasable Programmable Read-Only Memory (EEPROM) may be reduced if it is frequently used for storage. For users, some function codes do not need to be stored during communication. The application requirements can be met by modifying the value of the on-chip RAM, that is, modifying the MSB of the corresponding function code address from 0 to 1. For example, if P00.07 is not to be stored in the EEPROM, you need only to modify the value of the RAM, that is, set the address to 8007H. The address can be used only for writing data to the on-chip RAM, and it is invalid when used for reading data.

8.4.5.2 Description of other function code addresses

In addition to modifying the parameters of the inverter, the master can also control the inverter, such as start and stop it, and monitor the operation state of the inverter. The following table describes other function parameters.

Function	Address	Data description	R/W
Communication-based control command	2000H	0001H: Forward running	R/W
		0002H: Reverse running	
		0003H: Forward jogging	
		0004H: Reverse jogging	
		0005H: Stop	
		0006H: Coast to stop (emergency stop)	
		0007H: Fault reset	
		0008H: Jogging to stop	
Communication-based value setting	2001H	Communication-based frequency setting (0–Fmax, unit: 0.01 Hz)	R/W
	2002H	PID setting, range (0–1000, 1000 corresponding to 100.0%)	
	2003H	PID feedback, range (0–1000, 1000 corresponding to 100.0%)	R/W
	2004H	Torque setting (-3000–+3000, 1000 corresponding to 100.0% of the rated current of the motor)	R/W
	2005H	Setting of the upper limit of the forward running frequency (0–Fmax, unit: 0.01 Hz)	R/W

Function	Address	Data description	R/W
	2006H	Setting of the upper limit of the reverse running frequency (0–Fmax, unit: 0.01 Hz)	R/W
	2007H	Upper limit of the electromotion torque (0–3000, 1000 corresponding to 100.0% of the rated current of the inverter)	R/W
	2008H	Upper limit of the brake torque (0–3000, 1000 corresponding to 100.0% of the rated current of the motor)	R/W
	2009H	Special control command word: Bit0–1: =00: Motor 1 =01: Motor 2 =10: Motor 3 =11: Motor 4 Bit2: =1 Torque control disabled =0: Torque control cannot be disabled Bit3: =1 Power consumption reset to 0 =0: Power consumption not reset Bit4: =1 Pre-excitation =0: Pre-excitation disabled Bit5: =1 DC brake =0: DC brake disabled	R/W
	200AH	Virtual input terminal command, range: 0x000–0x1FF	R/W
	200BH	Virtual output terminal command, range: 0x00–0x0F	R/W
	200CH	Voltage setting (used when V/F separation is implemented) (0–1000, 1000 corresponding to 100.0% of the rated voltage of the motor)	R/W
	200DH	AO output setting 1 (-1000–+1000, 1000 corresponding to 100.0%)	R/W
	200EH	AO output setting 2 (-1000–+1000, 1000 corresponding to 100.0%)	R/W
Inverter state word 1	2100H	0001H: Forward running	R
		0002H: Reverse running	
		0003H: Stopped	
		0004H: Faulty	
		0005H: POFF	
		0006H: Pre-excited	
Inverter state word 2	2101H	Bit0: =0: Not ready to run =1: Ready to run Bi1–2: =00: Motor 1 =01: Motor 2 =10: Motor 3 =11: Motor 4	R

Function	Address	Data description		R/W
		Bit3: =0: Asynchronous machine =1: Synchronous machine Bit4: =0: No overload alarm =1: Overload alarm Bit5–Bit6: =00: Keypad-based control =01: Terminal-based control =10: Communication-based control		
Inverter fault code	2102H	See the description of fault types.		R
Inverter identification code	2103H	GD35-----0x0109		R
Running frequency	3000H	0–Fmax (unit: 0.01Hz)	Compatible with CHF100A and CHV100 communication addresses	R
Set frequency	3001H	0–Fmax (unit: 0.01Hz)		R
Bus voltage	3002H	0.0–2000.0 V (unit: 0.1V)		R
Output voltage	3003H	0–1200V (unit: 1V)		R
Output current	3004H	0.0–3000.0A (unit: 0.1A)		R
Rotating speed	3005H	0–65535 (unit: 1RPM)		R
Ouptut power	3006H	-300.0–+300.0% (unit: 0.1%)		R
Output torque	3007H	-250.0–+250.0% (unit: 0.1%)		R
Closed-loop setting	3008H	-100.0–+100.0% (unit: 0.1%)		R
Closed-loop feedback	3009H	-100.0–+100.0% (unit: 0.1%)		R
Input state	300AH	000–1FF		R
Output state	300BH	000–1FF		R
Analog input 1	300CH	0.00–10.00V (unit: 0.01V)		R
Analog input 2	300DH	0.00–10.00V (unit: 0.01V)		R
Analog input 3	300EH	-10.00–10.00V (unit: 0.01V)		R
Analog input 4	300FH			R
Read input of high-speed pulse 1	3010H	0.00–50.00kHz (unit: 0.01Hz)		R
Read input of high-speed pulse 2	3011H			R
Read current step of multi-step speed	3012H	0–15		R
External length	3013H	0–65535		R
External count value	3014H	0–65535		R
Torque setting	3015H	-300.0–+300.0% (unit: 0.1%)		R
Identification code	3016H			R
Fault code	5000H			R

The Read/Write (R/W) characteristics indicate whether a function can be read and written. For example, "Communication-based control command" can be written, and therefore the command code 6H is used to control the inverter. The R characteristic indicates that a function can only be read, and

W indicates that a function can only be written.

Note: Some parameters in the preceding table are valid only after they are enabled. Take the running and stop operations as examples, you need to set "Running command channel" (P00.01) to "Communication", and set "Communication running command channel" (P00.02) to the Modbus communication channel. For another example, when modifying "PID setting", you need to set "PID reference source" (P09.00) to Modbus communication.

8.4.6 Fieldbus scale

In practical applications, communication data is represented in the hexadecimal form, but hexadecimal values cannot represent decimals. For example, 50.12 Hz cannot be represented in the hexadecimal form. In such cases, we can multiply 50.12 by 100 to obtain an integer 5012, and then 50.12 can be represented as 1394H (5012 in the decimal form) in the hexadecimal form.

In the process of multiplying a non-integer by a multiple to obtain an integer, the multiple is referred to as a fieldbus scale.

The fieldbus scale depends on the number of decimals in the value specified in "Detailed parameter description" or "Default value". If there are *n* decimals in the value, the fieldbus scale m is the n^{th}-power of 10. Take the following table as an example, m is 10.

Function code	Name	Detailed parameter description	Default value
P01.20	Wake-up-from-sleep delay	0.0–3600.0s (valid when P01.19 is 2)	0.0s
P01.21	Restart after power cut	0: Restart is disabled 1: Restart is enabled	0

The value specified in "Detailed parameter description" or "Default value" contains one decimal, so the fieldbus scale is 10. If the value received by the upper computer is 50, the value of "Wake-up-from-sleep delay" of the inverter is 5.0 (5.0=50/10).

To set the "Wake-up-from-sleep delay" to 5.0s through Modbus communication, you need first to multiply 5.0 by 10 according to the scale to obtain an integer 50, that is, 32H in the hexadecimal form, and then transmit the following write command:

01	06	01 14	00 32	49 E7
Inverter address	Write command	Parameter address	Parameter data	CRC

After receiving the command, the inverter converts 50 into 5.0 based on the fieldbus scale, and then sets "Wake-up-from-sleep delay" to 5.0s.

For another example, after the upper computer transmits the "Wake-up-from-sleep delay" parameter read command, the master receives the following response from the inverter:

01	**03**	**02**	**00 32**	**39 91**
Inverter address	Read command	2-byte data	Parameter data	CRC

The parameter data is 0032H, that is, 50, so 5.0 is obtained based on the fieldbus scale (50/10=5.0). In this case, the master identifies that the "Wake-up-from-sleep delay" is 5.0s.

8.4.7 Error message response

Operation errors may occur in communication-based control. For example, some parameters can only be read, but a write command is transmitted. In this case, the inverter returns an error message response.

Error message responses are transmitted by the inverter to the master. The following table describes the codes and definitions of the error message responses.

Code	Name	Definition
01H	Invalid command	The command code received by the upper computer is not allowed to be executed. The possible causes are as follows: • The function code is applicable only on new devices and is not implemented on this device. • The slave is in the faulty state when processing this request.
02H	Invalid data address	For the inverter, the data address in the request of the upper computer is not allowed. In particular, the combination of the register address and the number of the to-be-transmitted bytes is invalid.
03H	Invalid data bit	The received data domain contains a value that is not allowed. The value indicates the error of the remaining structure in the combined request. **Note:** It does not mean that the data item submitted for storage in the register includes a value unexpected by the program.
04H	Operation failure	The parameter is set to an invalid value in the write operation. For example, a function input terminal cannot be set repeatedly.
05H	Password error	The password entered in the password verification address is different from that set in P03.00.
06H	Data frame error	The length of the data frame transmitted by the upper computer is incorrect, or in the RTU format, the value of the CRC check bit is inconsistent with the CRC value calculated by the lower computer

Code	Name	Definition
07H	Parameter read-only	The parameter to be modified in the write operation of the upper computer is a read-only parameter.
08H	Parameter cannot be modified in running	The parameter to be modified in the write operation of the upper computer cannot be modified during the running of the inverter.
09H	Password protection	A user password is set, and the upper computer does not provide the password to unlock the system when performing a read or write operation. The error of "system locked" is reported.

When returning a response, the device uses a function code domain and fault address to indicate whether it is a normal response (no error) or exception response (some errors occur). In a normal response, the device returns the corresponding function code and data address or sub-function code. In an exception response, the device returns a code that is equal to a normal code, but the first bit is logic 1.

For example, if the master device transmits a request message to a slave device for reading a group of function code address data, the code is generated as follows:

0 0 0 0 0 0 1 1 (03H in the hexadecimal form)

For a normal response, the same code is returned.

For an exception response, the following code is returned:

1 0 0 0 0 0 1 1 (83H in the hexadecimal form)

In addition to the modification of the code, the slave returns a byte of exception code that describes the cause of the exception. After receiving the exception response, the typical processing of the master device is to transmit the request message again or modify the command based on the fault information.

For example, to set the "Running command channel" (P00.01, the parameter address is 0001H) of the inverter whose address is 01H to 03, the command is as follows:

01	**06**	**00 01**	**00 03**	**98 0B**
Inverter address	Write command	Parameter address	Parameter data	CRC

But the setting range of the "Running command channel" is 0 to 2. The value 3 exceeds the setting range. In this case, the inverter returns an error message response as shown in the following:

01	**86**	**04**	**43 A3**
Inverter address	Exception response code	Error code	CRC

The exception response code 86H (generated based on the MSB "1" of the write command 06H)

indicates that it is an exception response to the write command (06H). The error code is 04H. From the preceding table, we can see that it indicates the error "Operation failure", which means "The parameter is set to an invalid value in the write operation".

8.4.8 Read/Write operation example

For the formats of the read and write commands, see sections 9.4.1 and 9.4.2.

8.4.8.1 Read command 03H examples

Example 1: Read state word 1 of the inverter whose address is 01H. From the table of other function parameters, we can see that the parameter address of state word 1 of the inverter is 2100H.

The read command transmitted to the inverter is as follows:

01	03	21 00	00 01	8E 36
Inverter address	Read command	Parameter address	Data quantity	CRC

Assume that the following response is returned:

01	03	02	00 03	F8 45
Inverter address	Read command	Number of bytes	Data content	CRC

The data content returned by the inverter is 0003H, which indicates that the inverter is in the stopped state.

Example 2: View information about the inverter whose address is 03H, including "Type of current fault" (P07.27) to "Type of last but four fault" (P07.32) of which the parameter addresses are 071BH to 0720H (contiguous 6 parameter addresses starting from 071BH).

The command transmitted to the inverter is as follows:

03	03	07 1B	00 06	B5 59
Inverter address	Read command	Start address	6 parameters in total	CRC

Assume that the following response is returned:

03	03	0C	00 23	00 23	00 23	00 23	00 23	00 23	5F D2
Inverter address	Read command	Number of bytes	Type of current fault	Type of last fault	Type of last but one fault	Type of last but two fault	Type of last but three fault	Type of last but four fault	CRC

From the returned data, we can see that all the fault types are 0023H, that is, 35 in the decimal form, which means the maladjustment fault (STo)

8.4.8.2 Write command 06H examples

Example 1: Set the inverter whose address is 03H to be forward running. Refer to the table of other function parameters, the address of "Communication-based control command" is 2000H, and 0001H indicates forward running, as shown in the following figure.

Function	Address	Data description	R/W
Communication-based control command	2000H	0001H: Forward running	R/W
		0002H: Reverse running	
		0003H: Forward jogging	
		0004H: Reverse jogging	
		0005H: Stop	
		0006H: Coast to stop (emergency stop)	
		0007H: Fault reset	
		0008H: Jogging to stop	

The command transmitted by the master is as follows:

03	06	20 00	00 01	42 28
Inverter address	Write command	Parameter address	Forward running	CRC

If the operation is successful, the following response is returned (same as the command transmitted by the master):

03	06	20 00	00 01	42 28
Inverter address	Write command	Parameter address	Forward running	CRC

Example 2: Set the "Max. output frequency" of the inverter whose address is 03H to 100 Hz.

Function code	Name	Detailed parameter description	Default value	Modify
P00.03	Max. output frequency	Used to set the max. output frequency of the inverter. It is the basis of frequency setup and the acceleration/deceleration. Setting range: Max (P00.04, 10.00) –630.00Hz	50.00Hz	◎

From the number of decimals, we can see that the fieldbus scale of the "Max. output frequency" (P00.03) is 100. Multiply 100 Hz by 100. The value 10000 is obtained, and it is 2710H in the hexadecimal form.

The command transmitted by the master is as follows:

03	06	00 03	27 10	62 14
Inverter address	Write command	Parameter address	Parameter data	CRC

If the operation is successful, the following response is returned (same as the command transmitted by the master):

03	06	00 03	27 10	62 14
Inverter address	Write command	Parameter address	Parameter data	CRC

Note: In the preceding command description, spaces are added to a command just for explanatory purposes. In practical applications, no space is required in the commands.

8.4.8.3 Continuously write command 10H examples

Example 1: Set the inverter whose address is 01H to be forward running at the frequency of 10 Hz. Refer to the table of other function parameters, the address of "Communication-based control command" is 2000H, 0001H indicates forward running, and the address of "Communication-based value setting" is 2001H, as shown in the following figure. 10 Hz is 03E8H in the hexadecimal form.

Function	Address	Data description	R/W
Communication-based control command	2000H	0001H: Forward running	R/W
		0002H: Reverse running	
		0003H: Forward jogging	
		0004H: Reverse jogging	
		0005H: Stop	
		0006H: Coast to stop (emergency stop)	
		0007H: Fault reset	
		0008H: Jogging to stop	
Communication-based value setting	2001H	Communication-based frequency setting (0–Fmax, unit: 0.01 Hz)	R/W
	2002H	PID setting, range (0–1000, 1000 corresponding to 100.0%)	

In the actual operation, set P00.01 to 2 and P00.06 to 8.

The command transmitted by the master is as follows:

01	10	20 00	00 02	04	00 01	03 E8	3B 10
Inverter address	Continuous write command	Parameter address	Parameter quantity	Number of bytes	Froward running	10 Hz	CRC

If the operation is successful, the following response is returned:

01	10	20 00	00 02	4A 08
Inverter address	Continuous write command	Parameter address	Parameter quantity	CRC

Example 2: Set "Acceleration time" of the inverter whose address is 01H to 10s, and "Deceleration time" to 20s.

Function code	Name	Detailed parameter description	Default value	Modify
P00.11	Acceleration time 1	Acceleration time is the time needed for accelerating from 0Hz to max. output frequency (P00.03).	Depend on model	○
P00.12	Deceleration time 1	Deceleration time is the time needed from decelerating from max. output frequency (P00.03) to 0Hz. Goodrive350 series inverter defines four groups of acceleration and deceleration time, which can be selected via multi-function digital input terminals (P05 group). The acceleration/deceleration time of the inverter is the first group by default. Setting range of P00.11 and P00.12: 0.0–3600.0s	Depend on model	○

The address of P00.11 is 000B, 10s is 0064H in the hexadecimal form, and 20s is 00C8H in the hexadecimal form.

The command transmitted by the master is as follows:

01	10	00 0B	00 02	04	00 64	00 C8	F2 55
Inverter address	Continuous write command	Parameter address	Parameter quantity	Number of bytes	10s	20s	CRC

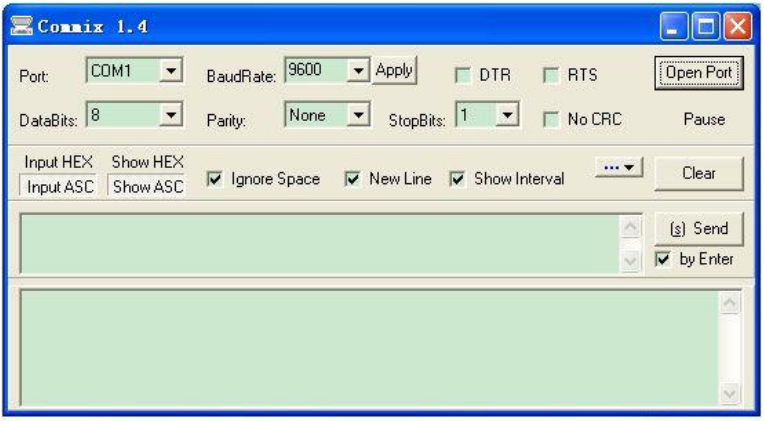
If the operation is successful, the following response is returned:

01	10	00 0B	00 02	30 0A
Inverter address	Continuous write command	Parameter address	Parameter quantity	CRC

Note: In the preceding command description, spaces are added to a command just for explanatory purposes. In practical applications, no space is required in the commands.

8.4.8.4 Modbus communication commissioning example

A PC is used as the host, an RS232-RS485 converter is used for signal conversion, and the PC serial port used by the converter is COM1 (an RS232 port). The upper computer commissioning software is the serial port commissioning assistant Commix, which can be downloaded from the Internet. Download a version that can automatically execute the CRC check function. The following figure shows the interface of Commix.



First, set the serial port to **COM1**. Then, set the baud rate consistently with P14.01. The data bits, check bits, and end bits must be set consistently with P14.02. If the RTU mode is selected, you need to select the hexadecimal form **Input HEX**. To set the software to automatically execute the CRC function, you need to select **ModbusRTU**, select **CRC16 (MODBU SRTU)**, and set the start byte to **1**. After the auto CRC check function is enabled, do not enter CRC information in commands. Otherwise, command errors may occur due to repeated CRC check.

The commissioning command to set the inverter whose address is 03H to be forward running is as follows:

03	06	20 00	00 01	42 28
Inverter address	Write command	Parameter address	Forward running	CRC

Note:

1. Set the address (P14.00) of the inverter to 03.
2. Set "Channel of running commands" (P00.01) to "Communication", and set "Communication channel of running commands" (P00.02) to the Modbus communication channel.
3. Click **Send**. If the line configuration and settings are correct, a response transmitted by the inverter is received as follows:

03	06	20 00	00 01	42 28
Inverter address	Write command	Parameter address	Forward running	CRC

8.5 Common communication faults

Common communication faults include the following:

- No response is returned.

- The inverter returns an exception response.

Possible causes of no response include the following:

- The serial port is set incorrectly. For example, the converter uses the serial port COM1, but COM2 is selected for the communication.
- The settings of the baud rates, data bits, end bits, and check bits are inconsistent with those set on the inverter.
- The positive pole (+) and negative pole (-) of the RS485 bus are connected reversely.
- The resistor connected to 485 terminals on the terminal block of the inverter is set incorrectly.