Goodrive880 Series Regenerative Rectifier Unit

Software Manual

SHENZHEN INVT ELECTRIC CO., LTD.

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1	First release.	V1.0	June 2024

Preface

Thank you for choosing INVT Goodrive880 series engineering variable-frequency drive (VFD).

For ease of use, read the manual carefully before using Goodrive880 series product.

Goodrive880 series engineering VFD provides two topology forms: single drive and multi drive. It is a transmission product positioned for high-end applications. The product is modularly designed based on the DFX concept and adopts advanced control algorithms, which has the advantages of excellent speed and torque control performance, high reliability, high power density, convenient installation, commissioning, maintenance, and comprehensive protection, and helps to upgrade the localization of process industry and continuous production equipment.

- Excellent speed and torque control performance
- Modular design, as flexible as building blocks, which makes the project integration simple and efficient
- Long-life component selection and fast fault recovery design to ensure efficient process control
- Ergonomic design to make installation and maintenance easier
- Enriched expansion capability to support various protection options

Goodrive880 series engineering VFD can be widely used in:

Metallurgy: Such as high-speed wire rod and hot strip rolling equipment, wide and thick plate equipment, cold rolling equipment, pickling lines, annealing lines, galvanizing line, color coating lines, non-ferrous metal alloy manufacturing equipment, and non-ferrous metal rolling equipment.

Petroleum: All-electric oil drilling rigs, large well repair machines, large oil machinery and equipment electric-drive power transformation, oilfield water injection equipment and other heavy oil equipment.

Paper making: Paper making joint equipment, including flow box, net section, press section, drying section, sizing, hard calendering, coating, supercalender, rewinder and other continuous production lines.

Port and other large lifting equipment: Such as shore-side container overhead cranes, tire-type (orbital) container gantry cranes, grab unloaders, grab gantry cranes, large shipbuilding gantry cranes, and large metallurgical casting cranes.

Others: Such as unit test benches, military equipment, oil and gas transmission, and mining transmission equipment.

GD880-81 series is the regenerative rectifier product of Goodrive880 series (hereinafter referred to as the regenerative rectifier unit). If not otherwise specified, the regenerative rectifier unit in this manual refers to the regenerative rectifier of Goodrive880 series and Goodrive880-81 series product. The regenerative rectifier unit consists of fuse, bus capacitor, IGBT, output reactor, and other components. It is compact in structure and easy to integrate and maintain.

This is the software manual of Goodrive880 series regenerative rectifier unit. Read through this manual carefully before installation to ensure the product is installed and operated in a proper manner to give full play to its excellent performance and powerful functions. If you have any question about the function and performance of the product, please consult our technical support.

If the product is ultimately used for military affairs or weapon manufacture, comply with the export control regulations in the Foreign Trade Law of the People's Republic of China and complete related formalities.

To continuously improve the performance of the product to meet higher application requirements, we reserve the right to continuously improve the product and accordingly the product manual, which may be made without prior notice. We have the final interpretation of the manual content.

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1 Safety precautions

1.1 Safety declaration

Read this manual carefully and follow all safety precautions before moving, installing, operating and servicing the product. Otherwise, equipment damage or physical injury or death may be caused.

We shall not be liable or responsible for any equipment damage or physical injury or death caused due to your or your customers' failure to follow the safety precautions.

1.2 Safety definition

Danger: Severe personal injury or even death can result if related requirements are not followed.

Warning: Personal injury or equipment damage can result if related requirements are not followed.

Note: Actions taken to ensure proper running.

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

1.3 Warning symbols

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

Symbol	Name	Description
	Danger	Severe personal injury or even death can result if related requirements are not followed.
	Warning	Personal injury or equipment damage can result if related requirements are not followed.
	Electrostatic discharge	The PCBA may be damaged if related requirements are not followed.
	Hot sides	Do not touch. The rectifier unit base may become hot.
	Electric shock	As high voltage still presents in the bus capacitor after power off, wait for at least 25 minutes (depending on the warning symbols on the machine) after power off to prevent electric shock.
Note	Note	Actions taken to ensure proper running.

1.4 Safety guidelines

	• Only trained and qualified professionals 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 have been disconnected before wiring or inspection, and wait for at least the time designated on the Goodrive880 series product or until the DC bus voltage is less than 36V. The minimum waiting time is listed in the following.

<table>
<tr><td></td><td></td><td colspan="2"><table>
<tr><th colspan="2">Rectifier unit model</th><th>Minimum waiting time</th></tr>
<tr><td rowspan="3">380V</td><td>76–120kW</td><td>5 minutes</td></tr>
<tr><td>161–341kW</td><td>15 minutes</td></tr>
<tr><td>Higher than 423kW</td><td>25 minutes</td></tr>
<tr><td>690V</td><td>>685kW</td><td>25 minutes</td></tr>
</table></td></tr>
<tr><td>  </td><td colspan="2">● Do not modify the product unless authorized; otherwise fire, electric shock or other injury may result.</td></tr>
<tr><td>  </td><td colspan="2">● The base may become hot when the product is running. Do not touch. Otherwise, you may get burnt.</td></tr>
<tr><td>  </td><td colspan="2">● The electrical parts and components inside the product are electrostatic sensitive. Take measurements to prevent electrostatic discharge when performing related operations.</td></tr>
</table>

1.4.1 Delivery and installation

<table>
<tr><td>  </td><td>● Do not install the rectifier unit on inflammables. In addition, prevent the rectifier unit from contacting or adhering to inflammables.
● Do not run the rectifier unit if it is damaged or incomplete.
● Do not contact the rectifier unit with damp objects or body parts. Otherwise, electric shock may result.</td></tr>
<tr><td>Note</td><td>● Select appropriate tools for rectifier unit delivery and installation to ensure the safe and proper running and avoid physical injury or death. To ensure personal safety, take mechanical protective measures like wearing safety shoes and working uniforms.
● Protect the rectifier unit against physical shock or vibration during the delivery and installation.
● Do not carry the product only by its front cover as the cover may fall off.
● The installation site must be away from children and other public places.
● Prevent the screws, cables and other conductive parts from falling into the rectifier unit.
● As rectifier unit leakage current caused during running may exceed 3.5mA, ground properly and ensure the grounding resistance is less than 10Ω. The conductivity of PE grounding conductor must meet the following requirements:
<table><tr><th>Power cable conductor cross-sectional area S (mm²)</th><th>Grounding conductor cross-sectional area</th></tr><tr><td>S≤16</td><td>S</td></tr><tr><td>16<S≤35</td><td>16</td></tr><tr><td>35<S</td><td>S/2</td></tr></table>● L1, L2, and L3 are the grid input terminals, while + and - are the DC bus output terminals. Connect the input power cables and input busbars properly; otherwise, the rectifier unit may be damaged.</td></tr>
</table>

1.4.2 Commissioning and running

<table>
<tr><td>  </td><td>● Cut off all power grids connected to the rectifier unit before terminal wiring, and wait for at least the time designated on the rectifier unit after disconnecting the power grids.
● High voltage presents inside the rectifier unit during running. Do not carry out any operation on the rectifier unit during running except for keypad setup. For products</td></tr>
</table>

	at voltage class of 4 or 6, the control terminals form extra-low voltage circuits. Therefore, you need to prevent the control terminals from connecting to accessible terminals of other devices. ● Before turning on the power supply, check the cable connection status. ● Prevent anyone from directly touching the energized part of the cabinet door. Pay special attention to safety when handling shields that are made of metal sheets. ● Do not do any withstand voltage testing during unit connection. Do not open the cabinet door since medium voltage presents inside the rectifier during running.
Note	● Do not switch on or switch off the input grid and output bus voltage of the rectifier unit frequently. ● If the rectifier unit has been stored for a long time without use, perform checking and carry out pilot run for the rectifier unit before using it again. ● Close the rectifier unit front cover before running; otherwise, electric shock may occur.

1.4.3 Maintenance and component replacement

	● Only trained and qualified professionals are allowed to perform maintenance, inspection, and component replacement for the rectifier unit. ● Cut off all power grids connected to the rectifier unit before terminal wiring, and wait for at least the time designated on the rectifier unit after disconnecting the power grids. ● During maintenance and component replacement, take measures to prevent screws, cables and other conductive matters from falling into the internal of the rectifier unit.
Note	● Use proper torque to tighten screws. ● During maintenance and component replacement, keep the rectifier unit and its parts and components away from combustible materials and ensure they have no combustible materials adhered. ● Do not carry out insulation voltage-endurance test on the rectifier unit, or measure the control circuits of the rectifier unit with a megohmmeter. ● During maintenance and component replacement, take proper anti-static measures on the rectifier unit and its internal parts.

1.4.4 Disposal

	● The rectifier unit contains heavy metals. Dispose of a scrap rectifier unit as industrial waste.
	● Dispose of a scrap product separately at an appropriate collection point but not place it in the normal waste stream.

2 Quick startup

2.1 Safety notes

	Equipment can tip over if transported incorrectly or with disallowed means of transport. Serious injury, property damage, or even death may result. ● Only trained and qualified professionals are allowed to carry out the operations mentioned in this chapter. Please carry out operations according to instructions presented in section 1.4.1 Delivery and installation Delivery and installation. Ignoring these safety precautions may lead to physical injury or death, or device damage. ● Ensure the rectifier unit power has been disconnected before installation. If the rectifier unit has been powered on, disconnect the rectifier unit power and wait for at least the time specified on the rectifier unit, and ensure the POWER indicator is off. You are recommended to use a multimeter to check and ensure the rectifier unit DC bus voltage is below 36V. ● The equipment installation must be designed and done according to applicable local laws and regulations. We do not assume any liability whatsoever for any equipment installation which breaches local laws or regulations. If recommendations given by us are not followed, the rectifier unit may experience problems that the warranty does not cover. ● Only trained and qualified professionals 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 have been disconnected before wiring or inspection, and wait for at least the time designated on the Goodrive880 series product or until the DC bus voltage is less than 36V.

2.2 Unpacking inspection

Check the following after receiving the product.

1.	Whether the packing box is damaged or dampened.
2.	Whether the model identifier on the exterior surface of the packing box is consistent with the purchased model.
3.	Whether the interior surface of the packing box is abnormal, for example, in wet condition, or whether the enclosure of the VFD is damaged or cracked.
4.	Whether the VFD nameplate is consistent with the model identifier on the exterior surface of the packing box.
5.	Whether the accessories (including the manual, keypad, and expansion card) inside the packing box are complete.

If any problems are found, contact the local INVT dealer or office.

2.3 Checking before use

Check the following before using the rectifier unit.

1.	Application type of the rectifier unit to verify whether the rectifier unit will be overloaded during work. Whether the power class of the product needs to be increased.
2.	Whether the actual running current of the load is less than the rated current of the rectifier.
3.	Whether the voltage of the grid is within the allowable input voltage range of the product.
4.	Whether the product meets the communication requirements.

2.4 Environment checking

Check the following before installing the rectifier unit:

1.	Whether the actual ambient temperature exceeds 40°C. When the temperature exceeds 40°C, derate by 2% for every increase of 1°C. Do not use the product when the ambient temperature exceeds 50°C.
2.	Whether the actual ambient temperature is lower than -10°C. If the temperature is lower than -10°C, use heating devices.
3.	Whether the altitude device the application site exceeds 1000m. When the altitude exceeds 1000m, derate by 1% for every increase of 100m.
4.	Whether the ambient humidity is higher than 90% or condensation occurs. If yes, take additional protective measures.
5.	Whether there is direct sunlight or biological invasion in the environment where the rectifier unit is to be used. If yes, take additional protective measures.
6.	Whether there is dust or inflammable and explosive gas in the environment where the rectifier unit is to be used. If yes, take additional protective measures.

2.5 Checking after installation

Check the following after the rectifier installation is complete.

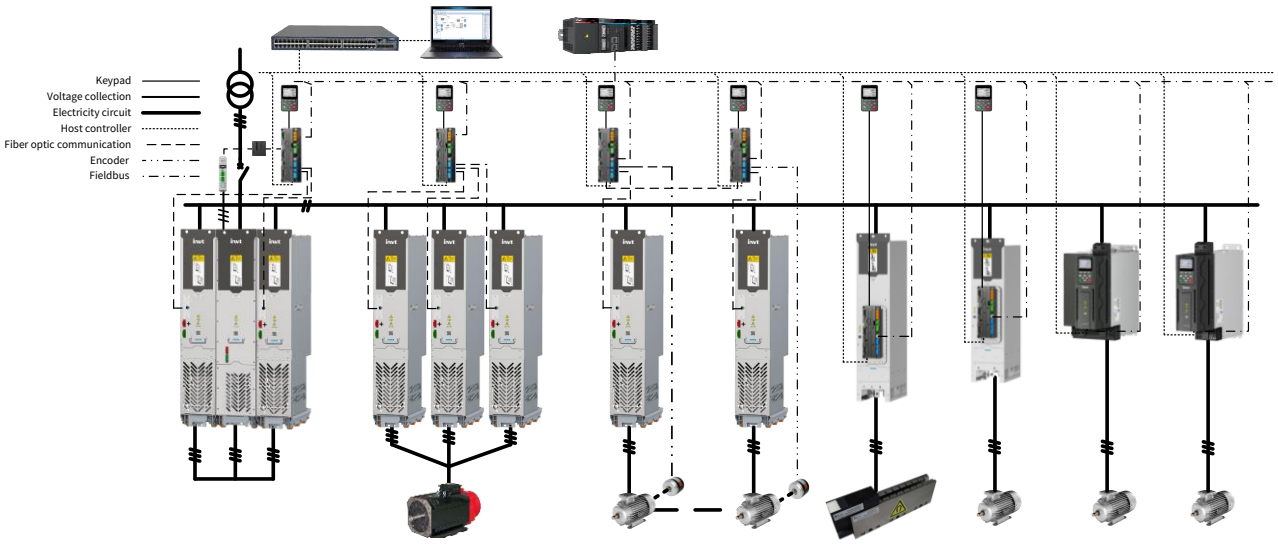
1.	Whether the input power cables and output load cables meet the current-carrying capacity requirements of the actual load.
2.	Whether correct accessories are selected for the product, the accessories are correctly and properly installed, and the installation cables meet the capacity carrying requirements of all components (including the reactor, input filter, DC reactor, braking unit and braking resistor).
3.	Whether the product is installed on non-flammable materials and the heat-radiating accessories (such as the reactor and braking resistor) are away from flammable materials.
4.	Whether all the control cables and power cables are separately routed and the routing complies with EMC requirement.
5.	Whether all grounding systems are properly grounded.
6.	Whether all the installation clearances of the product meet the requirements in the manual.
7.	Whether the external wiring terminals are tightened, and whether the torque meets the requirements.
8.	Take protective measures to prevent screws, cables and other conductive parts from falling into the product.

3 System introduction

3.1 System topology

GD880 multi-drive typical topology consists of rectifier (basic rectifier, regenerative rectifier, active rectifier), inverter and brake, as shown in the following figure. The module can be expanded through the parallel connection of control units. The control unit and PLC are connected through the bus, which realizes the centralized control and enables the host controller debugging and monitoring functions through Ethernet.

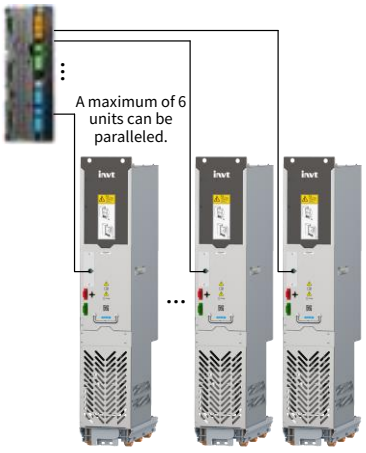
Figure 3-1 GD880 multi-drive typical topology



3.2 Parallel connection for expansion

A rectifier control unit (RCU) can be used to control multiple rectifier units so as to achieve power expansion, and a RCU supports a maximum of 6 rectifier units paralleled. GD880 series A8 regenerative rectifier unit and regenerative reactor unit form a regenerative rectifier unit.

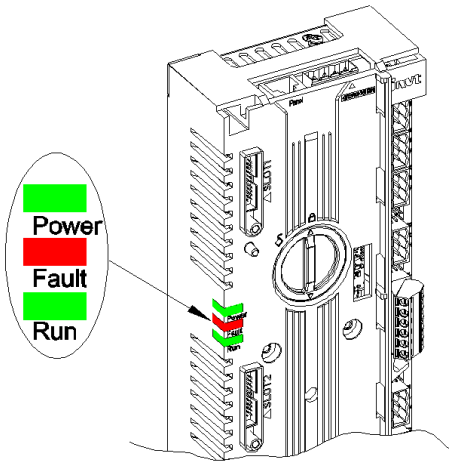
Figure 3-2 Parallel diagram of the regenerative rectifier unit



Note: Rectifier units of different specifications cannot be used in parallel. A control unit is configured for each winding in a transformer..

3.3 Control unit (RCU)

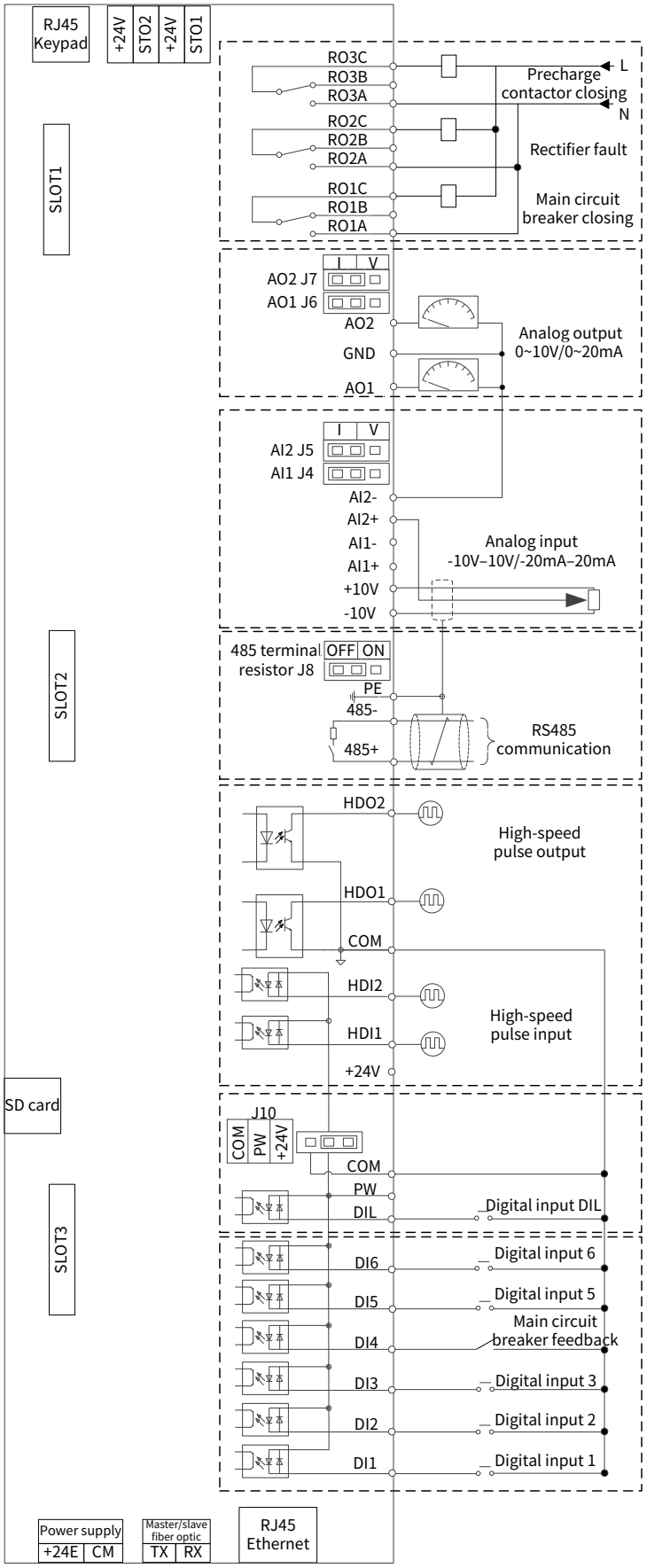
3.3.1 Indicator

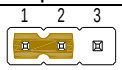


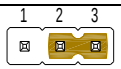
No.	Name	State	Description
1	Power	ON	RCU is properly powered.
		OFF	RCU is not powered or power failure occurs.
2	Fault	ON	The system is faulty.
		OFF	The system is normal.
3	RUN	ON	The power module is running.
		Blinking	The power module is stopped.

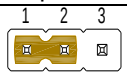
3.3.2 Control unit interface

Figure 3-3 Control unit circuit wiring

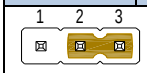
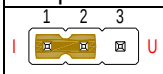
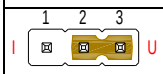
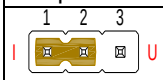
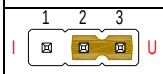
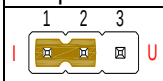
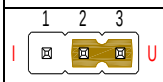
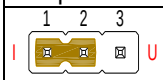
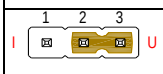


<table>
<tr><th>Terminal</th><th>Terminal symbol</th><th>Function description</th><th>Cable specifications</th></tr>
<tr><td colspan="4">Input power</td></tr>
<tr><td>1</td><td>+24E</td><td rowspan="2">24VDC±10% 2A</td><td rowspan="2">Two-core twisted-pair cable is recommended.
Cross-sectional area: 0.5–2.5mm²</td></tr>
<tr><td>2</td><td>CM</td></tr>
<tr><td colspan="4">DI input terminal</td></tr>
<tr><td>1</td><td>DI1</td><td rowspan="6">1. Input impedance: 3.3kΩ
2. Voltage input range: 12–30V
3. Supports NPN and PNP bi-direction input, relay contact input
4. Max. input frequency: 1kHz</td><td rowspan="6">Single-core wire
Cross-sectional area: 0.5–2.5mm²</td></tr>
<tr><td>2</td><td>DI2</td></tr>
<tr><td>3</td><td>DI3</td></tr>
<tr><td>4</td><td>DI4</td></tr>
<tr><td>5</td><td>DI5</td></tr>
<tr><td>6</td><td>DI6</td></tr>
<tr><td colspan="4">DIL input terminal</td></tr>
<tr><td>1</td><td>DIL</td><td>Digital interlock. When its input is high, all other input terminals are forced to be invalid.</td><td rowspan="3">Two-core twisted-pair cable is recommended.
Cross-sectional area: 0.5–2.5mm²</td></tr>
<tr><td>2</td><td>PW</td><td>Provides power supply for DIL, DI1–DI6, HDI, and HDO.</td></tr>
<tr><td>3</td><td>COM</td><td>Digital common ground</td></tr>
<tr><td colspan="4">Jumper J10: power supply selection</td></tr>
<tr><td colspan="4"> 

1 is short connected to 2 , PW is short connected to internal COM, and DI uses the internal power ground. If external power is required, you need to remove the shorting cap.</td></tr>
<tr><td colspan="4"> 

2 is short connected to 3 , PW is short connected to internal +24V, and DI uses the internal power. If external power is required, you need to remove the shorting cap.</td></tr>
<tr><td colspan="4">HDIO terminal</td></tr>
<tr><td>1</td><td>+24V</td><td>Provides power supply 24V±10% 0.2A for DI, HDI and HDO</td><td rowspan="6">Two-core twisted-pair cable is recommended.
Cross-sectional area: 0.5–2.5mm²
HDI and COM, HDO and COM use twisted-pair cables.</td></tr>
<tr><td>2</td><td>HDI1</td><td rowspan="2">1. Input type: PNP, NPN
2. Input frequency range: 0–50kHz
3. Input voltage range: 12–30V
4. Duty ratio: 30%–70%</td></tr>
<tr><td>3</td><td>HDI2</td></tr>
<tr><td>4</td><td>COM</td><td>Digital common ground</td></tr>
<tr><td>5</td><td>HDO1</td><td rowspan="2">1. Output type: OC
2. Output frequency range: 0–50kHz
3. Switch capacity: 50mA/30V
4. Duty ratio: 50%</td></tr>
<tr><td>6</td><td>HDO2</td></tr>
<tr><td colspan="4">RS485 communication terminals</td></tr>
<tr><td>1</td><td>485+</td><td rowspan="3">RS485 bus, standard 5V electrical level
Terminal resistor: 120Ω
Max. baud rate: 115200
Max. number of nodes: 32 (without relay)</td><td rowspan="3">Two-core twisted-pair cable is recommended.
Cross-sectional area: 0.5–2.5mm²</td></tr>
<tr><td>2</td><td>485-</td></tr>
<tr><td>3</td><td>PE</td></tr>
<tr><td colspan="4">Jumper J8: terminal resistor selection</td></tr>
<tr><td colspan="4"> 

When 1 and 2 are short-circuited, the terminal resistor is disconnected.</td></tr>
</table>

Terminal	Terminal symbol	Function description	Cable specifications
	When 2 and 3 are short-circuited, the terminal resistor is connected.		
Analog input terminal			
1	-10V	Power: ±10V Max. output current: 10mA Current input: -20mA–20mA, Rin: 500Ω Voltage input: -10V–10V, Rin: 30kΩ Differential input range: ±30V Sampling interval: 0.1ms Resolution: 11 bit+signbit	Cross-sectional area: 0.5–2.5mm² When two AIs are used, use two two-core shielded twisted-pair cables. When reference voltage is used, use one four-core shielded twisted-pair cable for one AI.
2	+10V		
3	AI1+		
4	AI1-		
5	AI2+		
6	AI2-		
Jumper J4: Selection between AI1 voltage and current signal inputs			
	When 1 and 2 are short-circuited, AI1 current input is used.		
	When 2 and 3 are short-circuited, AI1 voltage input is used.		
Jumper J5: Selection between AI2 voltage and current signal inputs			
	When 1 and 2 are short-circuited, AI2 current input is used.		
	When 2 and 3 are short-circuited, AI2 voltage input is used.		
Analog output terminal			
Analog output	AO1	AO output range: 0–20mA, Rload≤500Ω 0–10V, Rload≥10kΩ Resolution: 11 bit+signbit Accuracy: 2% of full scale range	Two-core twisted-pair cable is recommended. Cross-sectional area: 0.5–2.5mm² AO1 and GND, AO2 and GND use twisted-pair cables.
	GND		
	AO2		
Jumper J6: Selection between AO1 voltage and current signal outputs			
	When 1 and 2 are short-circuited, AO1 current output is used.		
	When 2 and 3 are short-circuited, AO1 voltage output is used.		
Jumper J7: Selection between AO2 voltage and current signal inputs			
	When 1 and 2 are short-circuited, AO2 current output is used.		
	When 2 and 3 are short-circuited, AO2 voltage output is used.		
Relay 1 output terminal			
1	RO1A	Output type: passive NO and NC contacts Contact parameters: 250VAC/30VDC, 3A	Single-core wire Cross-sectional area: 0.5–2.5mm²
2	RO1B		
3	RO1C		
Relay 2 output terminal			
1	RO2A	Output type: passive NO and NC contacts Contact parameters: 250VAC/30VDC, 3A	Single-core wire Cross-sectional area: 0.5–2.5mm²
2	RO2B		
3	RO2C		
Relay 3 output terminal			
1	RO3A	Output type: passive NO and NC	Single-core wire

Terminal	Terminal symbol	Function description	Cable specifications
2	RO3B	contacts Contact parameters: 250VAC/30VDC, 3A	Cross-sectional area: 0.5–2.5mm²
3	RO3C		
Master/slave fiber optic (reserved)			
1	TX	Transmitting optical fiber communication	Dedicated fiber optic cable
2	RX	Receiving optical fiber communication	
Safe torque off terminal (reserved)			
1	STO1	Inverter module STO input They has been short connected before delivery by default.	Four-core shielded twisted-pair cable Cross-sectional area: 0.5–2.5mm²
2	+24V		
3	STO2		
4	+24V		
RJ45 keypad			
1	RJ45	Connect the SOP-880-01	Standard shielded network cable
RJ45 Ethernet			
1	RJ45	Ethernet communication with a PC	Standard shielded network cable

3.3.3 Expansion modules

RCU can be used with expansion modules to achieve specific functions.

No.	Name	Model	Function description	Connect with ICU through	Dimensions (W×H×D) (unit: mm)
1	Input/output module	EC-IO801	Two AIs Two AOs Three DIs 3 relay outputs	SLOT	73.5×103×23.5
2	PROFINET IO module	EC-TX809	PROFINET IO industrial Ethernet	SLOT	73.5×74×23.5
3	PROFIBUS-DP module	EC-TX803	PROFIBUS-DP bus adapter	SLOT	73.5×74×23.5
4	CAN bus module	EC-TX805	CANopen bus adapter	SLOT	73.5×74×23.5
5	Optical fiber expansion module	EC-TX821	One 25M expansion optical fiber	SLOT	73.5×74×23.5
6	Optical fiber expansion module	EC-TX823	Three 25M expansion optical fibers	SLOT	73.5×74×23.5
7	SLOT expansion module	I-ESM-30	SLOT expansion module	Fiber optic	99.5×303×65
8	Voltage detection module	I-VDM-10	AC voltage detection module	Fiber optic	37.4×180×113
9	Intelligent operation keypad	SOP-880-01	Human-machine interface keypad	RS422	74×121.5×26

Note:

- EC-TX821 and EC-TX823 can only be inserted in SLOT2 or SLOT3.
- It is recommended to install the EC-TX803 card in SLOT3.

3.4 Per unit system

In general circuit calculations, the units of current, voltage, power, and impedance are used as A, V, W, and Ω, and this method of representing physical quantities in actual named units is called the system of named units.

In the calculation using the named unit system, the parameters are completely different for the same type of rectifier unit due to different capacities, resulting inconvenience. Calculations are often performed using the per unit system in engineering, which simplifies the calculations and makes it easier to analyze changes in physical state. Engineering calculations often use per unit values to mark values, representing the relative values of each physical quantity and parameter. A per unit value is relative to a certain reference value. For a same named unit value, when different reference values are selected, the per unit values are also different. The conversion relationship between the per unit value and named unit value is as follows:

Per unit value = Named unit value/Reference value

In rectifier control systems, the nominal values of the rectifier unit are usually selected as the reference values for the per unit system. Take the rectifier unit current as an example. If the rated current of the rectifier unit is 100A, the running current is 40A, and the rectifier unit rated current 100A is used as the reference value for calculation, the per unit value of the rectifier running current 40A is 40%.

The per unit value selection in this software system shall comply with the following:

Name	Reference value
AC voltage	Uses the effective value of the grid line voltage as the reference value.
AC current	Uses the current effective value of the rectifier unit as the reference value.
Input voltage	Uses the rated voltage of the rectifier unit as the reference value. The rated voltage is calculated based on the line voltage of the grid.
Input current	Uses the rectifier unit rated current as the reference value.
Output power	Uses the rectifier unit rated power as the reference value.
Output voltage	Unit rated voltage (P99.03)* 1.414
16-bit parameter	When a 16-bit parameter is used to represent a per unit value, 4096 (hexadecimal 0x1000) represents 100%, indicating the accuracy of up to 0.0244%. A value range of -799.9% – 799.9% (32768/4096) can be represented. They are usually used to indicate the per unit values of current and voltage.

4 Basic operation guidelines

4.1 Keypad introduction

Advantages of LCD keypad:

- The LCD display is more intuitive, eliminating the need to consult manuals and saving time in commissioning.
- It supports parameter upload, storage, and download, and parameter copying reduces project batch commissioning time.
- IP54 high-protection design supports externally installing the keypad on the cabinet door for easy integration.
- Type-C firmware/word library upgrades, quick respond to custom software and multi-language adaptation.

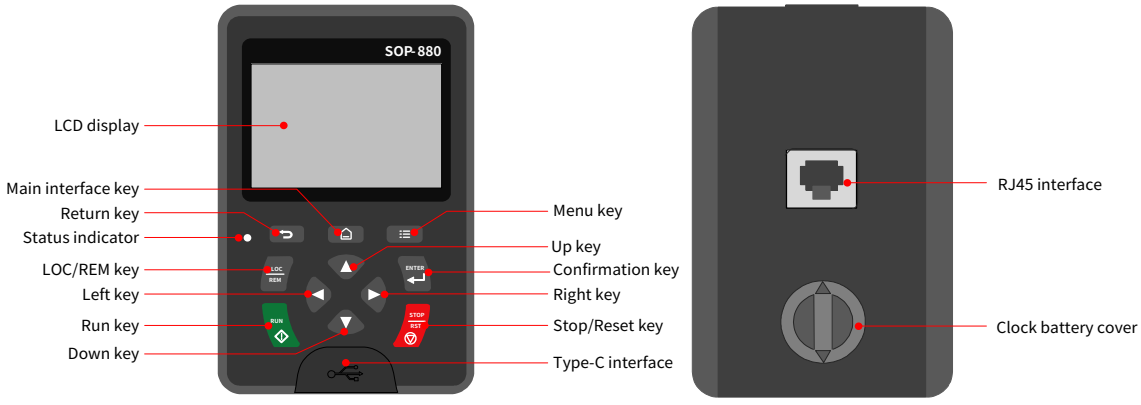
Note:

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

4.1.1 Keypad appearance

The GD880 series rectifier unit has been equipped with a LCD keypad as a standard configuration part. You can use the keypad to control the start and stop, read status data, and set parameters of the rectifier unit.

Figure 4-1 Keypad display



4.1.2 Keys

Table 4-1 Key description

Key	Name	Description
	Return key	Press it to return to the previous interface.

Key	Name	Description
	Main interface key	Press it to return directly to the main interface.
	Menu key	The function of function key varies with the menu.
	Up key	The function of Up key varies with interfaces, such as shifting up the displayed item, shifting up the selected item, and changing digits.
	Down key	The function of DOWN key varies with interfaces, such as shifting down the displayed item, shifting down the selected item, changing digits.
	Left key	The function of LEFT key varies with interfaces, such as switch over the monitoring interface, such as shifting the cursor leftward, exiting current menu and returning to previous menu
	Right key	The function of RIGHT key varies with interfaces, such as switch over the monitoring interface, shifting the cursor rightward, enter the next menu.
	LOC/REM key	Press it to switch between the local SOP-880 and the remote.
	Confirmation key	The confirmation key function varies with menus, such as confirming parameter setup, confirming parameter selection, and entering the next-level menu.
	Run key	Press it to run the product when using the keypad for control.
	Stop/Reset key	Press it to stop the product or perform autotuning that is running. In fault alarm state, this key can be used for reset in any control modes.

4.1.3 Status indicator description

Table 4-2 State indicator description

Indicator	State	Description
Off	OFF	It indicates that the rectifier unit is in the standby state.
The green indicator is on.	ON	It indicates that the rectifier unit is running.
The green indicator blinks.	Blinking	It indicates that the rectifier unit is in the remote control state.
The red indicator is on.	ON	It indicates that the rectifier unit is in the fault state.
The red indicator blinks.	Blinking	It indicates that the rectifier unit is in the pre-alarm state.

4.1.4 LCD display screen description

The LCD main interface is shown in Figure 4-2. The LCD display can be switched to different main pages, and each main page includes more than one message. The following figure shows the content displayed in the main interface for the stopped state.

Figure 4-2 LCD display screen description

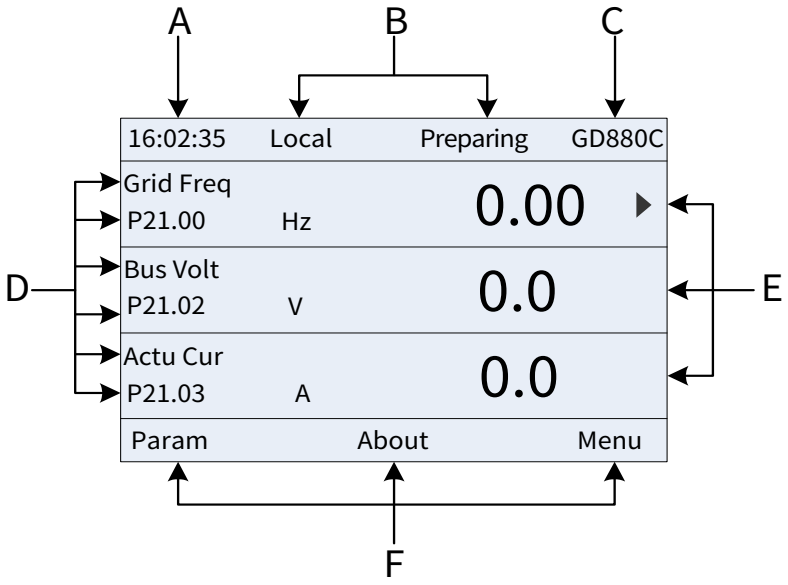


Table 4-3 LCD display screen description

Area	Name	Display
Header A	Real-time display area	Displays the real-time; clock battery is not included; the time needs to be reset when powering on the rectifier unit.
Header B	Running state display area	Displays channels of running commands ● Local: Keypad running command channel ● Terminal: Terminal running command channel ● Remote: Communication running command channel
		Displays running-state parameters ● Preparing: The rectifier unit is preparing to start (no fault). ● Pre-charge: The rectifier unit is in the pre-charge state (no fault). ● Ready: The rectifier unit is ready to run. ● Run: The rectifier unit is in the running state. ● Alarm: The rectifier unit is in the alarm state during running. ● Fault: A fault occurred to the rectifier unit.
Header C	Station No. and model display area	Display station No. 01–99, applied in multi-drive applications (reserved function); Displays the model GD880C: The present rectifier unit is GD880 series.
Display D	Parameter name and function code monitored	Displays the parameter name and corresponding function code monitored by the rectifier unit; three monitoring parameters can be displayed simultaneously. The monitoring parameter list can be edited.
Display E	Parameter value monitored	Displays the parameter value monitored by the rectifier unit. The monitoring value will be refreshed in real time.
Footer F	Menu corresponding to the key	Menu corresponding to the key. The corresponding menu of the key varies with interfaces, and the content displayed in this area also varies.

4.1.5 Other description

Table 4-4 Other description

Appearance	Name	Description
	Type-C interface	Connect to a PC through an adapter.
	RJ45 interface	Connect to the rectifier unit.
	Clock battery cover	Remove this cover when replacing or installing clock battery, and close the cover after battery is installed.

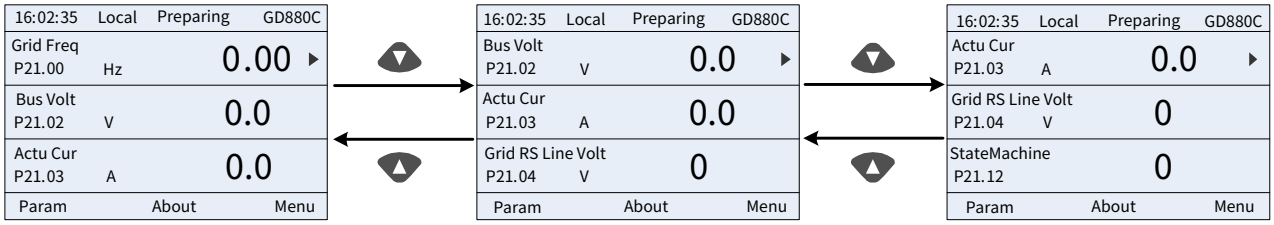
4.2 LCD keypad display

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

4.2.1 Displaying stopped-state parameters

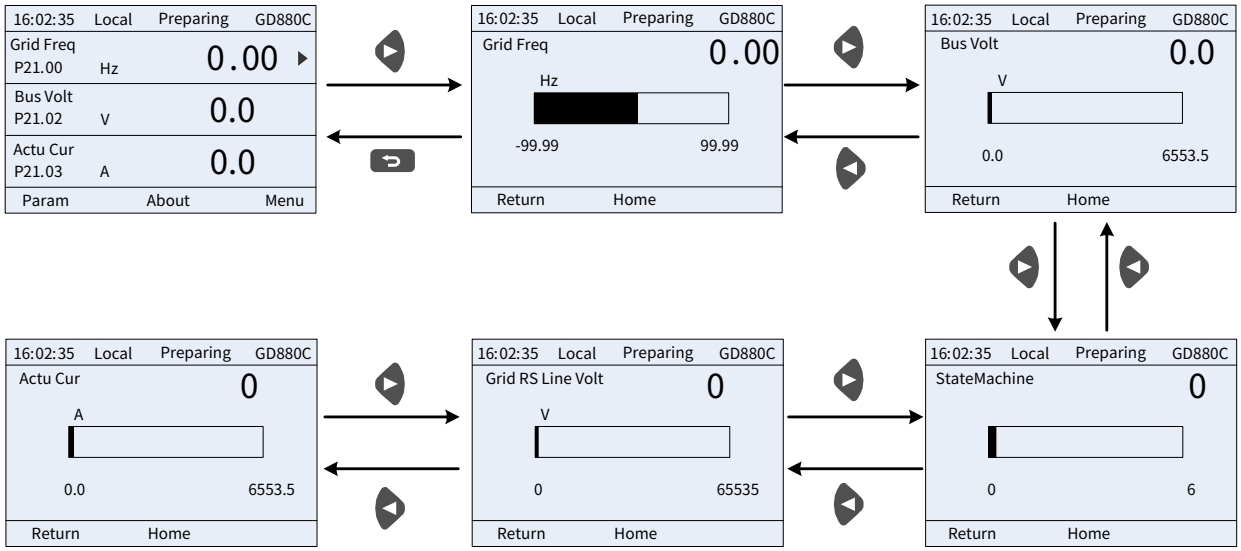
When the rectifier unit is in stopped state, the keypad displays stopped-state parameters, and this interface is the main interface during power-on by default. Under stop state, parameters in various states can be displayed. Press or to shift the displayed parameter up or down.

Figure 4-3 Stopped-state parameter display interface



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

Figure 4-4 Stopped-state parameter display styles

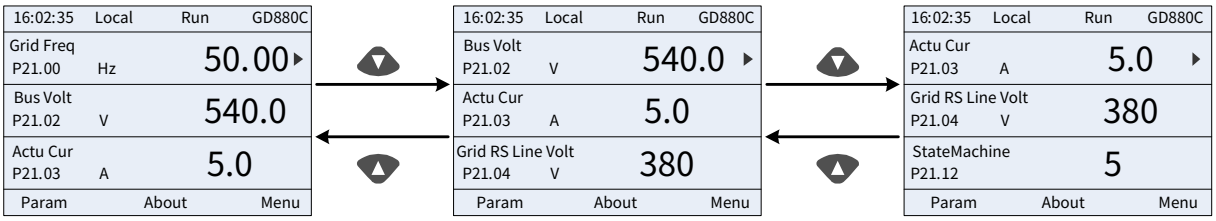


The stop display parameter list is user defined, and each state variable function code can be added to the stop display parameter list as needed. The state variable which has been added to the stop display parameter list can also be deleted or shifted.

4.2.2 Displaying running-state parameters

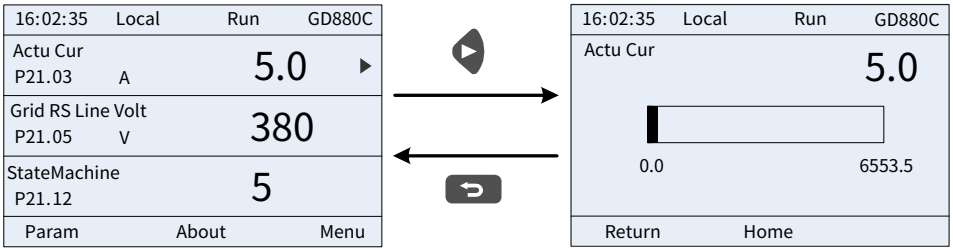
After receiving a valid running command, the rectifier unit will enter the running state, and the keypad displays running state parameter with the keypad Run indicator turning on. Under running state, multiple kinds of state parameters can be displayed. Press or to shift up or down.

Figure 4-5 Running-state parameter display interface



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

Figure 4-6 Running-state parameter display styles

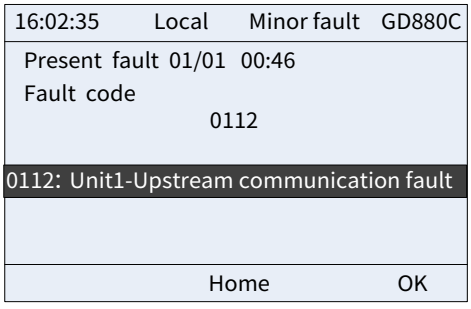


Under running state, multiple kinds of state parameters can be displayed. The running display parameter list is user defined, and each state variable function code can be added to the running display parameter list as needed. The state variable which has been added to the running display parameter list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

4.2.3 Displaying fault alarms

The rectifier unit enters the fault alarm display state once fault signal is detected, and the keypad displays the fault code and fault information with the keypad red indicator turning on. You can perform fault reset by using the STOP/RST key, control terminals, or communication commands. If the fault persists, the fault code is continuously displayed.

Figure 4-7 Fault alarm display interface



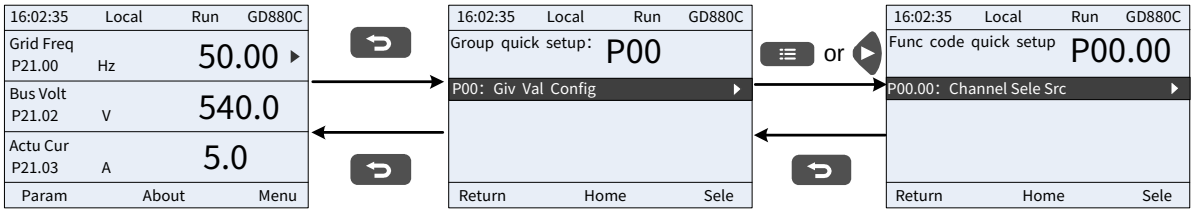
4.3 Operation procedure

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

4.3.1 Enter/exit menu

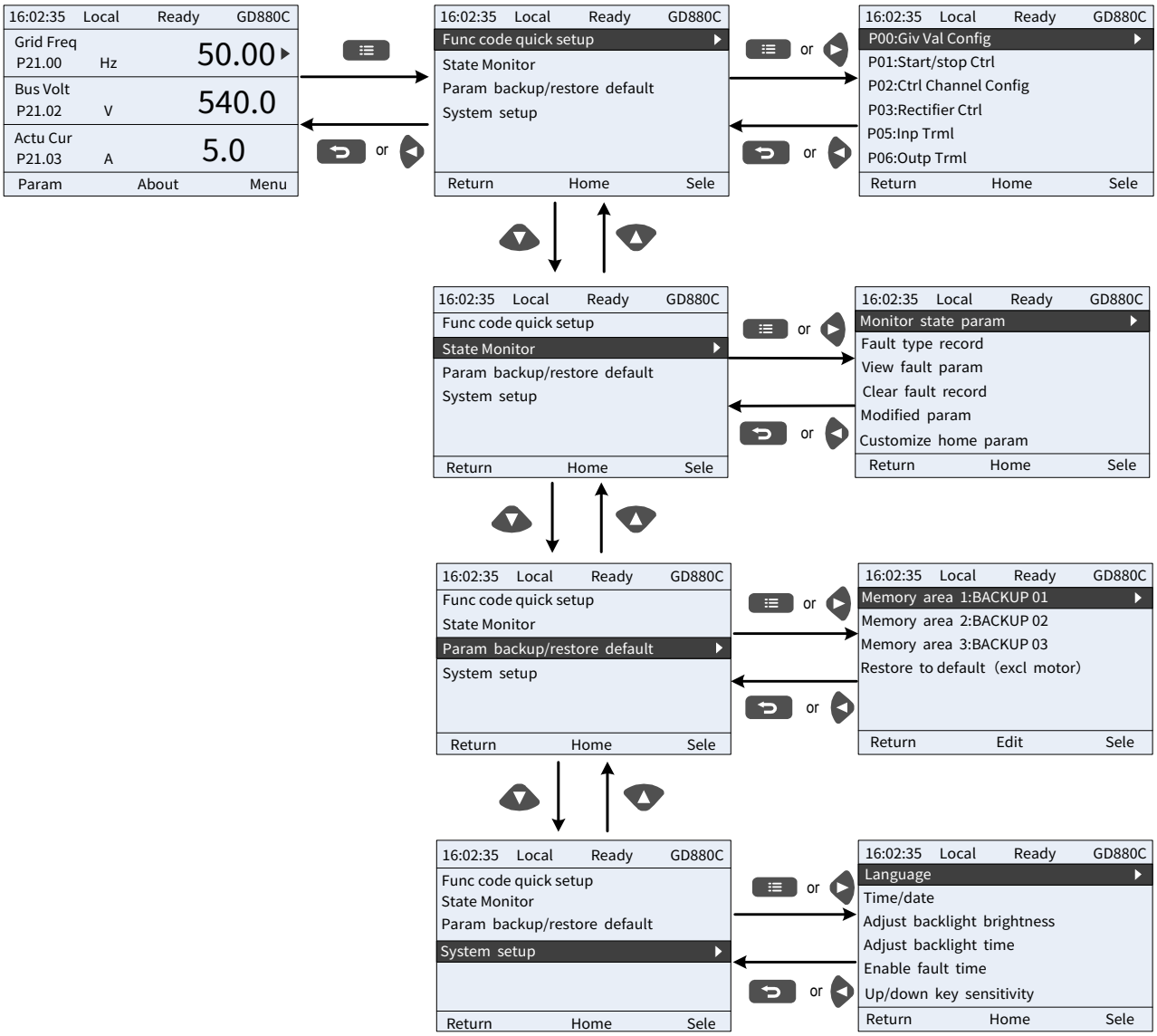
The following figure shows how to enter or exit the parameter menu step by step.

Figure 4-8 Entering/exiting different level menus



The following figure shows how to enter or exit different level menus step by step, as shown in the following figure.

Figure 4-9 Entering/exiting different menus



The keypad menu setup is shown as follows:

Level 1	Level 2	Level 3
Func code quick setup	P00:Giv Val Config	P00.XX
	P01:Start/stop Ctrl	P01.XX
	P02:Ctrl Channel Config	P02.XX
	P03:Rectifier Ctrl	P03.XX
	P05:Inp Trml	P05.XX

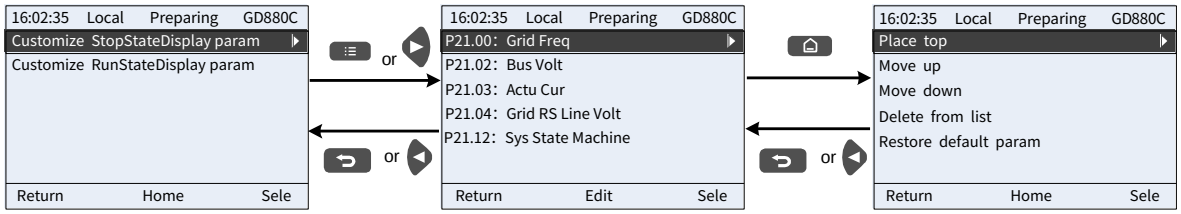
Level 1	Level 2	Level 3
	P06:Outp Trml	P06.XX
	P07:SYS Info	P07.XX
	P08:Fault Record	P08.XX
	P11:Unit Config	P11.XX
	P13:Prot Config	P13.XX
	P20:CW and SW	P20.XX
	P21:RT Data	P21.XX
	P23:SYS Config	P23.XX
	P24:Param Disp Set	P24.XX
	P33:Blackbox Channel Config	P33.XX
	P37:BusAdapter A	P37.XX
	P38:BusAdapter B	P38.XX
	P40:Profibus-DP Module	P40.XX
	P41:Profinet-IO Module	P41.XX
	P42:ModbusRTU Module	P42.XX
	P43:CANopen Module	P43.XX
	P44:EtherNet Module-Ethernet Comm Group	P44.XX
	P54:DC/AC Sampling CardSet	P54.XX
	P80:BitDataSet 1-Summary of Data of BO Type	P80.XX
	P98: AIAO CalibraFunc	P98.XX
	P99: Factory Func	P99.XX
State Monitor	Monitor state param	P21.XX
	Fault type record	P08.00:Present Fault Code
		P08.01:Last Fault Code
		P08.02:2nd-last Fault Code
		P08.03:3rd-last Fault Code
		P08.04:4th-last Fault Code
		P08.05:5th-last Fault Code
		P08.06:RT Fault Code 1
		P08.07:RT Fault Code 2
		P08.08:RT Fault Code 3
		P08.09:RT Fault Code 4
		P08.10:RT Fault Code 5
		P08.11:RT Fault Code 6
		P08.12:Present Alarm Code 1
		P08.13:Present Alarm Code 2
		P08.14:Present Alarm Code 3
		P08.15:Present Alarm Code 4
		P08.16:Present Alarm Code 5
		P08.17:Present Alarm Code 6
		P08.18: Reserved
		P08.19: Reserved
		P08.20:Grid voltage at Present Fault
		P08.21:Input Cur at Present Fault
		P08.22:Bus Volt at Present Fault

Level 1	Level 2	Level 3
		P08.23:Max Temp at Present Fault
		P08.24:Inp Trml State at Present Fault
		P08.25:Outp Trml State at Present Fault
		P08.26: Reserved
		P08.27: Reserved
		P08.28:Grid voltage at Last Fault
		P08.29:Input Cur at Last Fault
		P08.30:Bus Volt at Last Fault
		P08.31:Max Temp at Last Fault
		P08.32:Inp Trml State at Last Fault
		P08.33:Outp Trml State at Last Fault
		P08.34: Reserved
		P08.35: Reserved
		P08.36: Grid Voltage at 2nd-last Fault
		P08.37:Outp Cur at 2nd-last Fault
		P08.38:Bus Volt at 2nd-last Fault
		P08.39:Max Temp at 2nd-last Fault
		P08.40:Inp Trml State at 2nd-last Fault
		P08.41:Outp Trml State at 2nd-last Fault
	View fault param	-
	Clear fault records	Sure to clear fault records?
	Modified parameter	Searching
	Customize Homepage param	Customize StopStateDisplay param
		Customize RunStateDisplay param
Parameter backup/restore default value	Memory area 1: BACKUP01	Upload param from local to keypad
		Download all param from keypad
	Memory area 2: BACKUP02	Upload param from local to keypad
		Download all param from keypad
	Memory area 3: BACKUP03	Upload param from local to keypad
		Download all param from keypad
	Restore to default values	Sure to restore to default values?
System setup	-	Language
		Time/date
		Adjust backlight brightness
		Adjust backlight time
		Enable fault time
		Up/down key sensitivity

4.3.2 Editting list

The monitoring items displayed in the parameter list of stop state can be added as needed (through the "State Monitor" > "Customize home param" menu), and the list can also be edited such as "Place top", "Move up", "Move down", "Delete from list", and "Restore default param". The following figure shows the editing function.

Figure 4-10 Editing list at the stop state

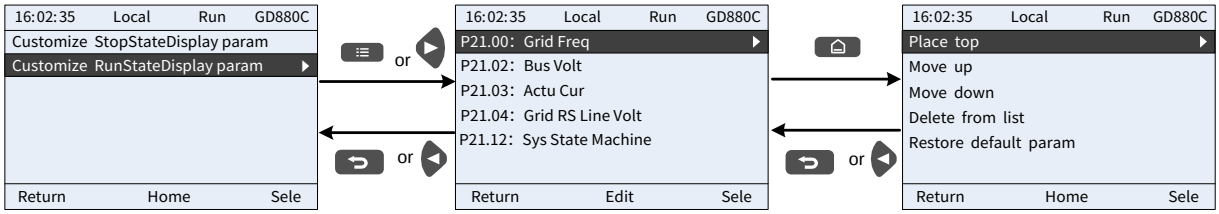


Press the key to enter the edit interface, select the operation needed, and press the key, key or key to confirm the edit operation and return to the previous menu (parameter list). The returned list is the list edited. If the key or key is pressed in the edit interface without selecting the edit operation,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

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

The monitoring items displayed in the parameter list of running state can be added as needed (through the "State Monitor" > "Customize home param" menu), and the list can also be edited such as "Place top", "Move up", "Move down", "Delete from list", and "Restore default param". The following figure shows the editing function.

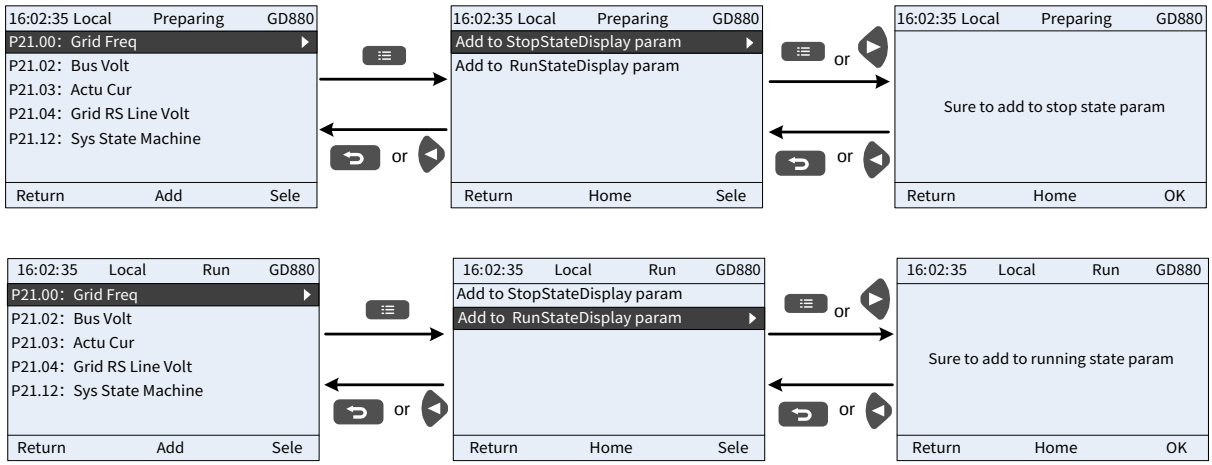
Figure 4-11 Editing list at the running state



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

In the third-level menu of "State Monitor", the parameters in the list can be added to the "StopStateDisplay param" list or "RunStateDisplay param" list as shown in the following figure.

Figure 4-12 Adding parameters



Press the key to enter the addition interface, select the operation needed, and press the key, key or key to confirm the addition operation. If the key or key is pressed without selecting the addition operation in "Add", it will return to the monitoring parameter list menu.

If this parameter is not included in the "StopStateDisplay param" list or "RunStateDisplay param" list, the parameter added will be at the end of the list; if the parameter is already in the "StopStateDisplay param" list or "RunStateDisplay param " list, the addition operation will be invalid.

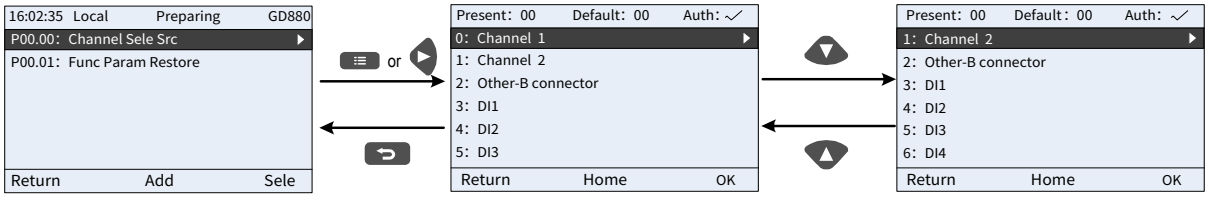
Up to 16 monitoring parameters can be added to the "StopStateDisplay param" list; and up to 32 monitoring parameters can be added to the "RunStateDisplay param" list.

4.3.4 Parameter selection edit interface

In the fourth-level menu of "Func code quick setup" menu, press the key, key or key to enter parameter selection edit interface. After entering the edit interface, the present value will be highlighted. Press key and key to edit present parameter value, and the corresponding parameter item of present value will be highlighted automatically.

After parameter selection is done, press key or key to save the selected parameter and return to the previous menu. In parameter selection edit interface, press key to maintain the parameter value and return to the previous menu.

Figure 4-13 Parameter selection edit interface



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

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

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

"Present " indicates the value of present option.

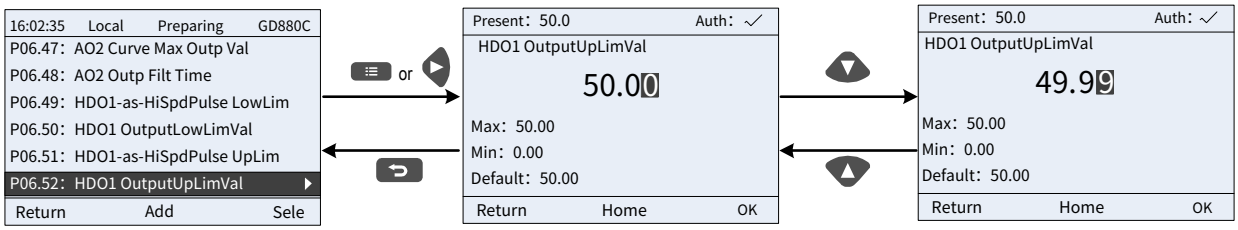
"Default" indicates the default value of this parameter.

4.3.5 Parameter setup edit interface

In the fourth-level menu in "Func code quick setup" menu, press key, key or key to enter parameter setup edit interface. After entering edit interface, set the parameter from low bit to high bit, and the bit under setting will be highlighted. Press key or key to increase or decrease the parameter value (this operation is valid until the parameter value exceeds the max. value or min. value); press or to shift the edit bit.

After parameters are set, press key or key to save the set parameters and return to the previous parameter. In parameter setup edit interface, press to maintain the original parameter value and return to the previous menu.

Figure 4-14 Parameter setup edit interface



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

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

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

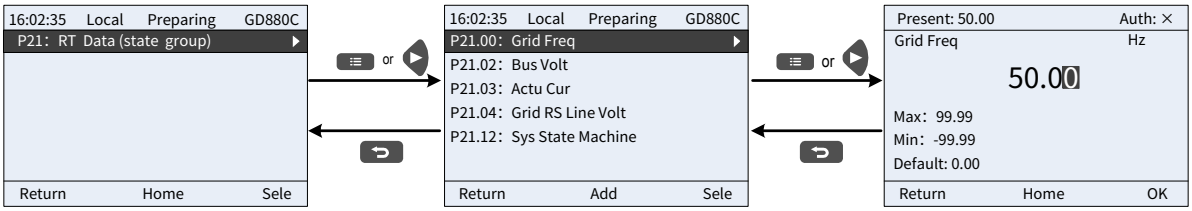
"Present" indicates the value of present option.

"Default" indicates the default value of this parameter.

4.3.6 State monitoring interface

In the "State Monitor" menu, press the key, key or key to enter the state monitoring interface. After entering the state monitoring interface, the present parameter value will be displayed in real time, this value is the actually detected value which cannot be modified. In the state monitoring interface, press the key or key to return to the previous menu.

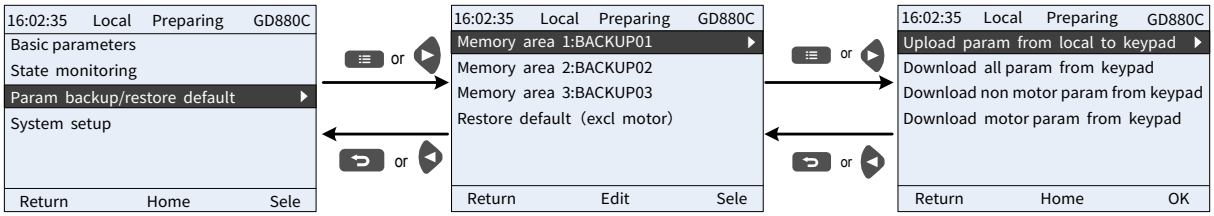
Figure 4-15 State monitoring interface



4.3.7 Parameter backup

In the "Param backup/restore default" menu, press the key, key or key to enter the function parameter backup setting interface and function parameter restoration setup interface to upload/download rectifier unit parameters, or restore rectifier unit parameters to default values. The keypad has three different storage areas for parameter backup, and each storage area can save the parameters of one rectifier unit, namely it can save parameters of three rectifier unit s in total.

Figure 4-16 Parameter backup

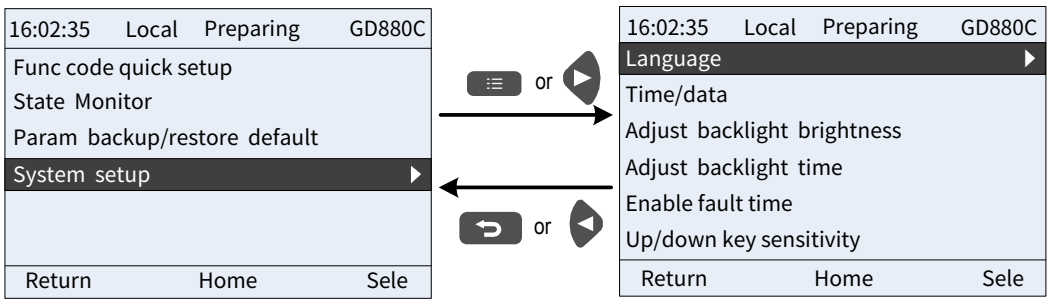


4.3.8 System setting

In the "System setup" menu, press the key, key or key to enter the system setup interface to set the keypad language, time/date, backlight brightness, backlight time and up/down key sensitivity.

Note: No clock battery is equipped by default, and the keypad time/date needs to be reset after keypad re-power on. If time-keeping after power off is needed, you should purchase the clock batteries separately.

Figure 4-17 System setup



5 Workshop debugging software

5.1 Workshop key features

INVT Workshop is used to configure and monitor INVT medium- and low-voltage VFD and DA series servo products, in which the VFD supports serial ports, Ethernet, CAN, and LIN communication, and the servo supports USB and Ethernet communication. The software can be run on Windows XP and later, including Windows XP/Win7/Win8/Win10.

Main functions:

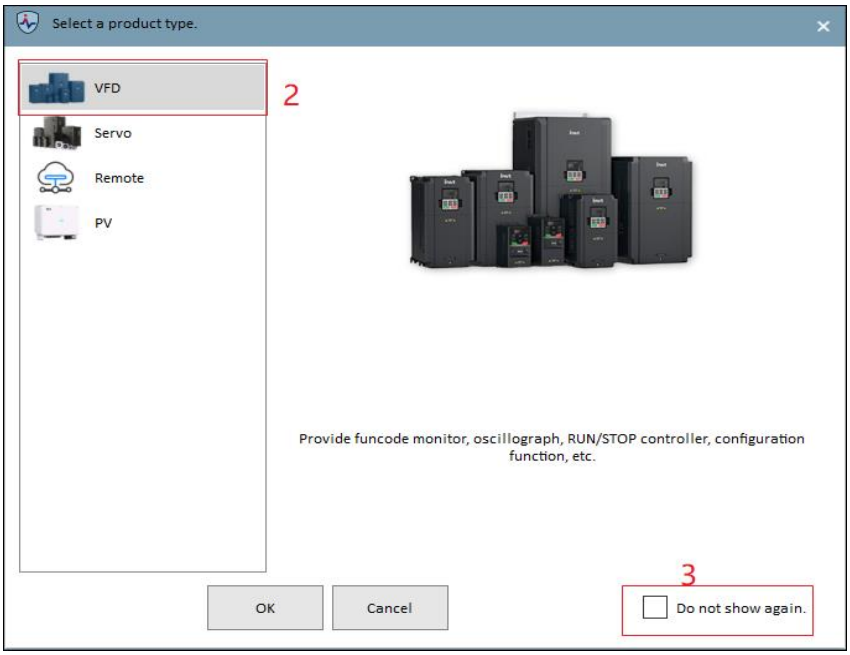
- Monitor multiple VFDs or one servo device at the same time.
- Set and monitor function parameters; upload and download function parameters in batches; preview and print function parameters.
- View modified function codes, compare default values, and follow up and query for function codes.
- View and follow up status parameters; print and export status parameters.
- View real-time and historical faults; print and export historical faults.
- Display function codes in configuration mode.
- Control device startup, stop, forward running, reverse running, and other operations.
- Jump to the help document for more information about function codes.
- View oscillographic curves, save and replay waveform data, operate waveforms through cursor, and simulate waveform data.
- Switch interface styles and languages.
- Flexibly create function code tables, supporting customized function code tables.

5.2 Main interface

Step 1 Double-click the icon to open the software to enter the product selection interface.

Step 2 Select "**VFD**" and enter the software main page.

Step 3 If you select "**Do not show again**", the next time you start the software, the engineering wizard interface will not appear automatically.



5.3 Creating a project

5.3.1 Local project

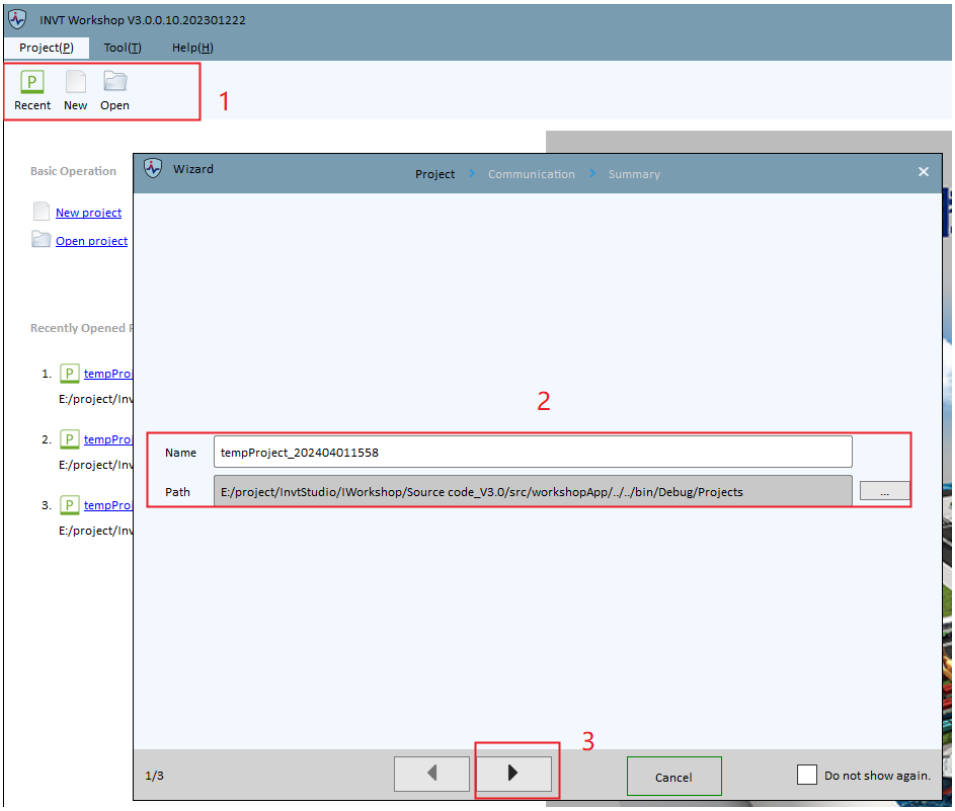
5.3.1.1 Adding a project offline

Step 1 After selecting the VFD, three options will appear: **Recent**, **New**, and **Open**.

- Recent: to display the recently opened projects. A maximum of 10 projects can be saved, and all recent projects can be cleared.
- New: A new project is created.
- Open: Open the project file for the product in the specified directory, click the **Open** button, and select the project you want to open.

Step 2 Name the newly created project and select the path where the project will be stored (change the default path if the creation fails).

Step 3 Click ▶ at the bottom of the dialog box to set the communication parameters.

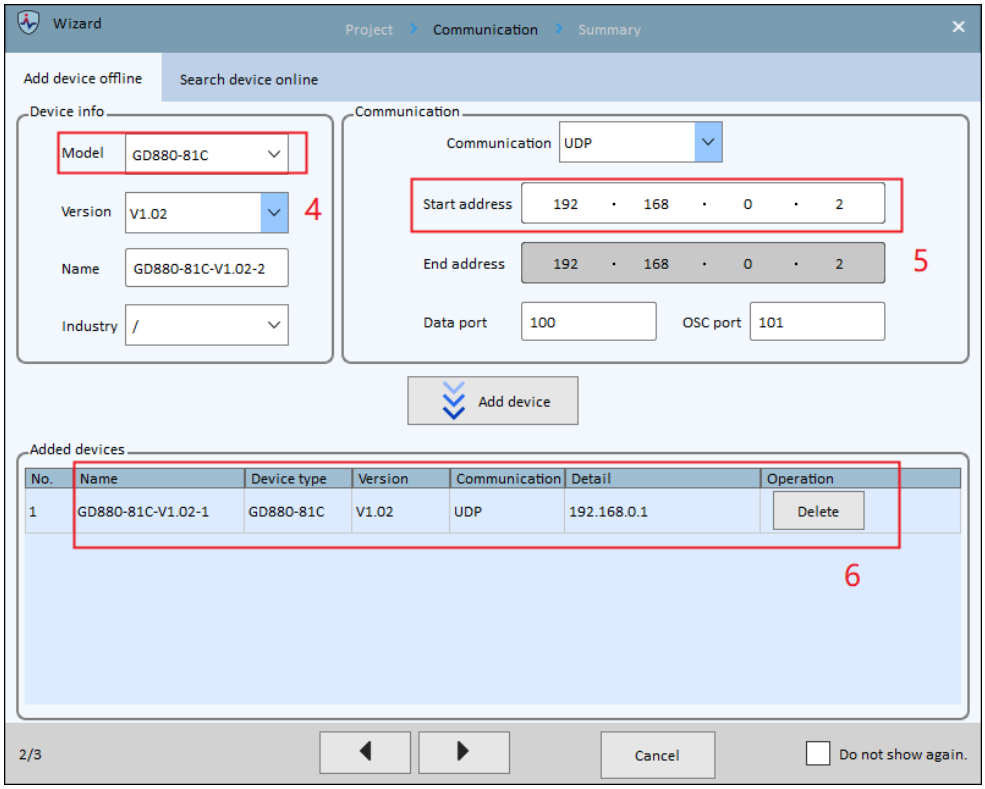


Step 4 Select the device model "**GD880-81C**". The version, name and communication method (the name is by default composed of device model + version + quantity, which varies with the number of devices added or can be manually modified) will be generated automatically.

Step 5 Enter the device start address.

Step 6 Click **Add device**.

Note: It will add the device with the start address entered into the **Added devices** list below. To add multiple devices, modify the start address (the end address changes based on the start address), and click the **Add device** button again.



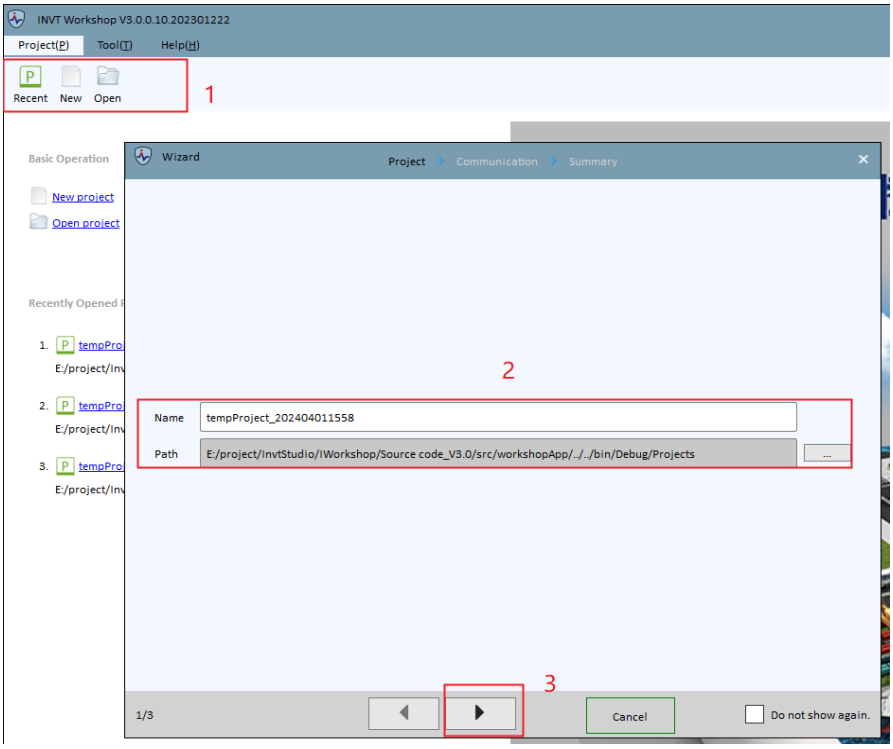
Step 7 Verify the device type, version, communication type, and communication details again.

Step 8 Click **OK**, and the new project is completed.

5.3.1.2 Adding a project online

Step 1 Name the newly created project in the **Name** field and select the path where the project will be stored (change the default path if the creation fails).

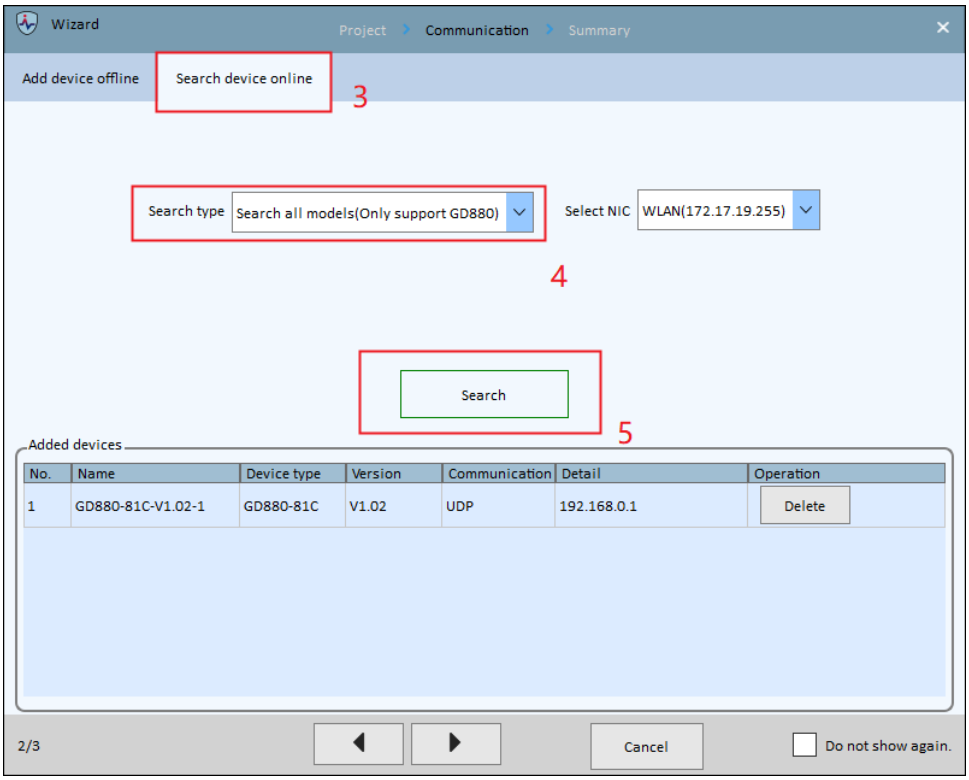
Step 2 Click ▶ at the bottom of the dialog box to set the communication parameters.



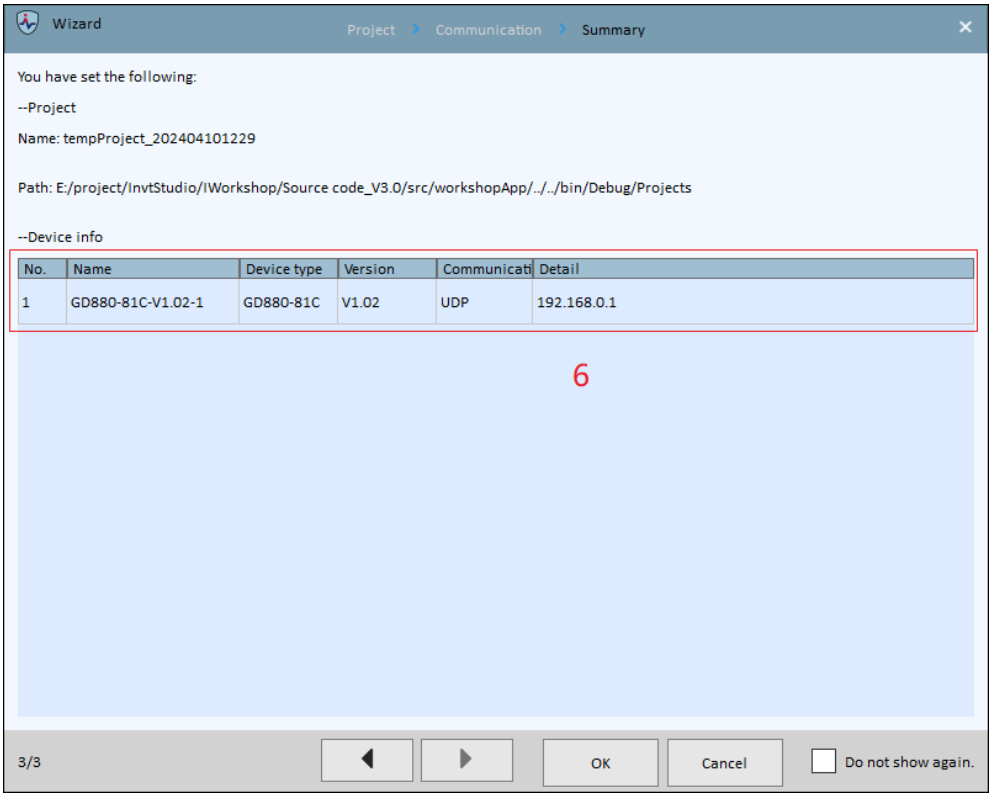
Step 3 Click "**Search device online**".

Step 4 Select "**Search all models**" as the search type.

Step 5 Click the **Search** button.



Step 6 After finding the device, click **OK**.



Step 7 Verify the device type, version, communication type, and communication details again.

Step 8 Click **OK**, and the new project is completed.

5.4 PC side connection

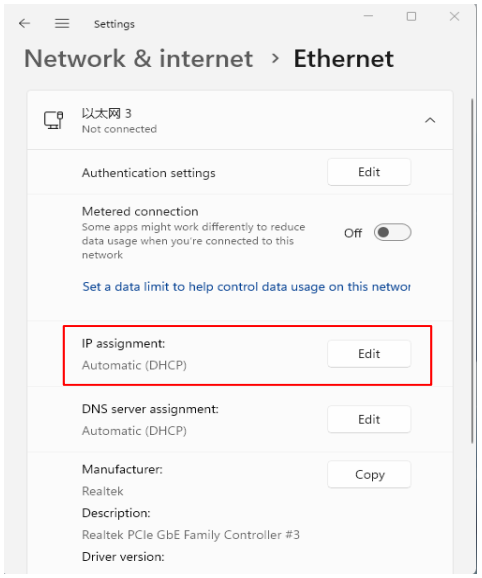
When Ethernet communication is used, connect one end of a network cable to the PC network port and the other end to the device Ethernet port, and note that the PC IP address needs to be set to be on the same network segment as the device. The device IP address is 192.168.0.1.

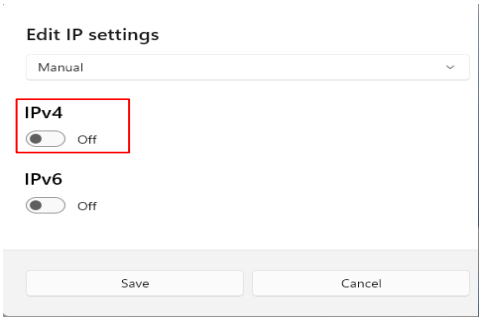
Step 1 For the PC side settings, choose **Network & internet** > **Ethernet**, and click **Edit** for IP assignment.

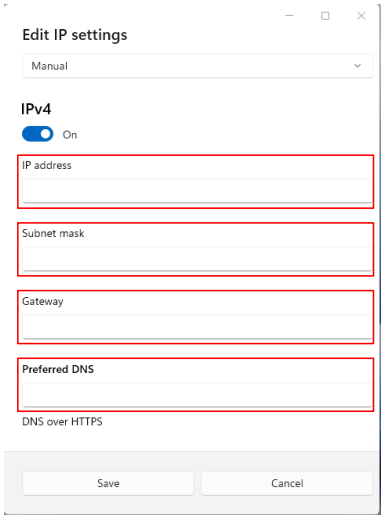
Step 2 Right-click on the NIC and select **Properties**.

Step 3 Locate "**Internet Protocol Version 4**" and right-click **Properties**.

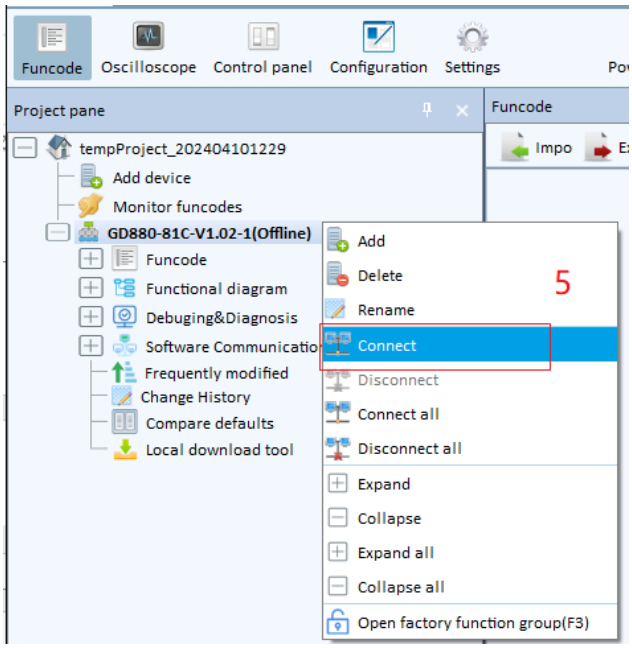
Note: Change only the IP address and subnet mask, and note that the IP address should be different from the device IP address.







Step 4 Right-click on the product model, and choose **Connect**. The connection is successful when the status of the active machine changes from offline to standby (or failed).

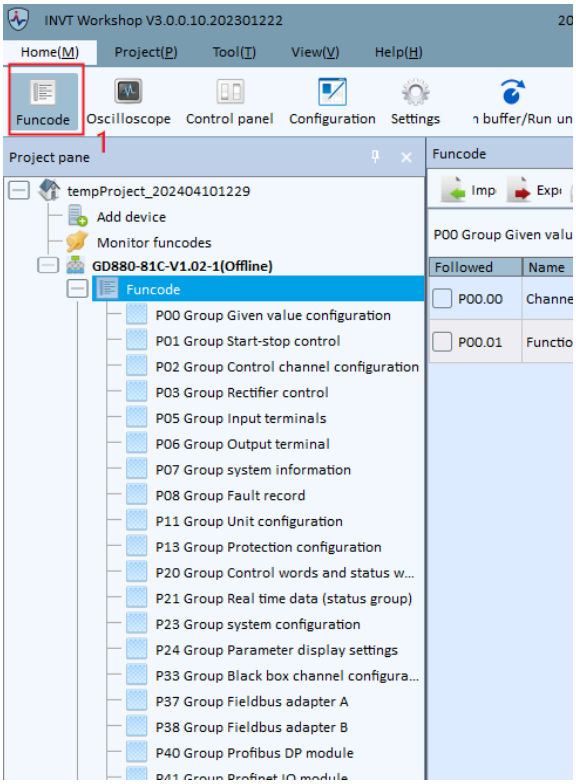


5.5 Basic functions

5.5.1 Viewing and modifying parameters

The function code information table allows you to view the function code name, current value, default value, min. value, max value, unit, read/write mode, modification time, and comments.

Step 1 Choose **Home** > **Funcode** to enter the function code interface.



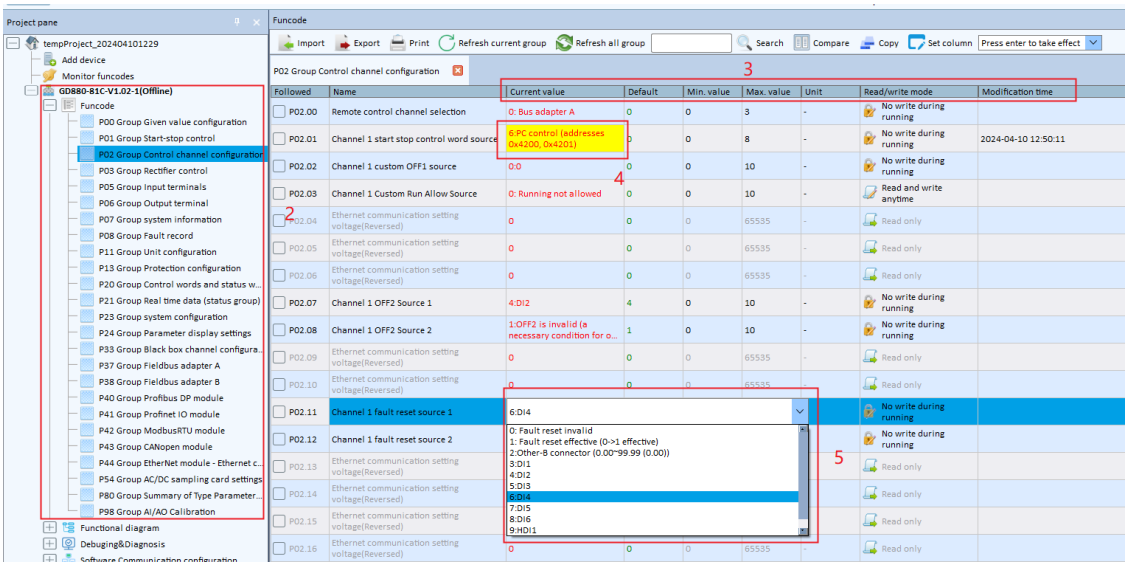
Step 2 Click the function code group in the project tree to display the function code information. The

function code groups are displayed on the left. You can switch the function code information by clicking on the function code groups on the left. Only one function code group is displayed at a time. For example, if group P01 is clicked again, group P00 is hidden and group P01 is displayed.

Step 3 You can select the check boxes before function codes to determine which are displayed. All is displayed by default.

Step 4 When the current value does not match the default value, the current value is filled in yellow.

Step 5 Double-click the current value of a function code to edit it, and press **Enter** to take effect. The modification is sent to the device instantly. You can select pressing Enter to take effect or instant taking effect for the function code modification effective method option.



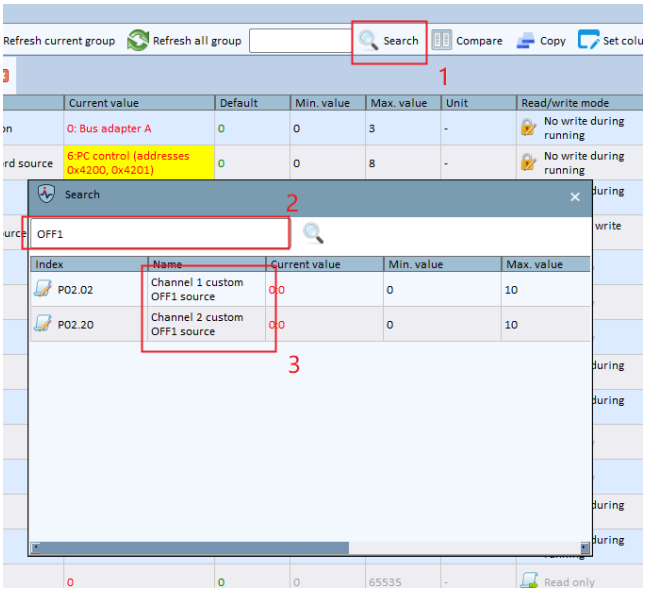
5.5.2 Searching for parameters

You can search a function code through the **Search** tool, which supports fuzzy query.

Step 1 Click **Search** in the function code interface.

Step 2 Enter the function name or index, select a value from the drop-down list box, select one or none, and click **Search**. Results can be displayed on a table.

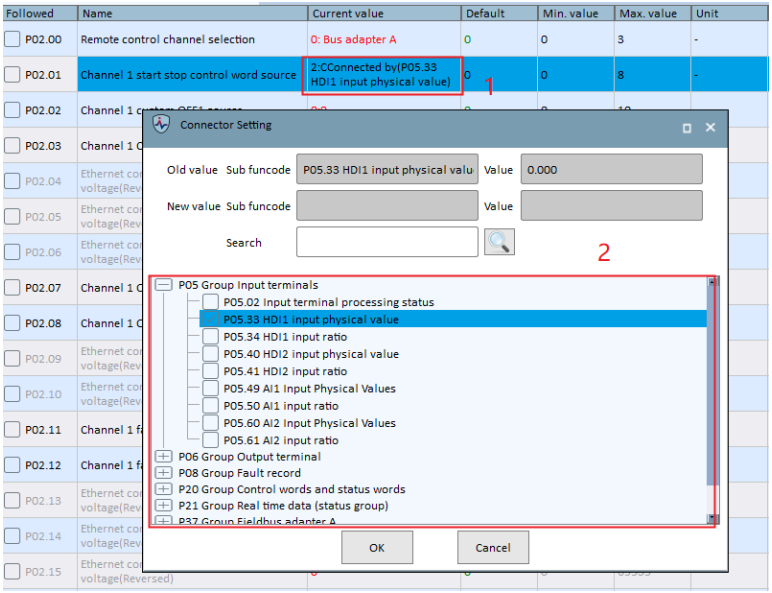
Step 3 Double-click a line to jump to the function code line of the function code interface without closing the search interface.



5.5.3 Interconnecting parameters

You can link the parameter source or display of one function code to another function code through Other-B or Other-C.

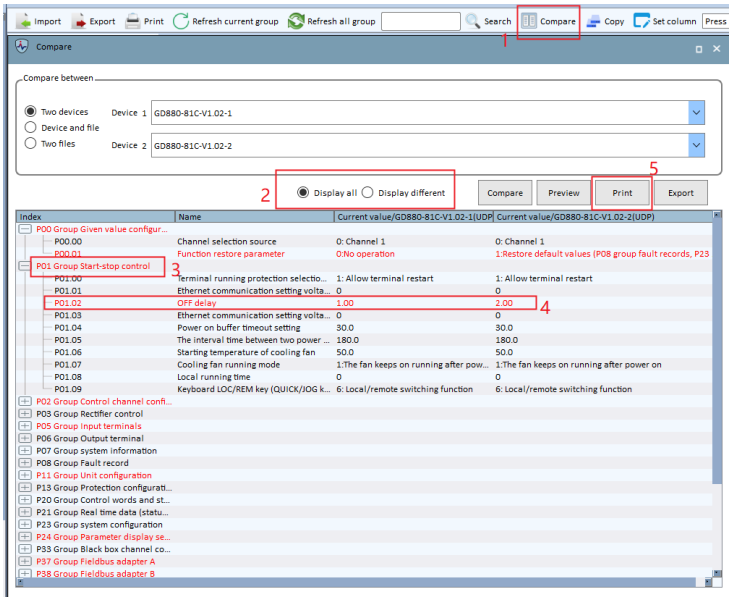
After setting the current value of the function code to Other-B or Other-C, the connector settings will automatically pop up. In this interface, select the function code that needs to be connected.



5.5.4 Comparing parameters

You can compare the function codes of two devices, function codes in two files, or function codes of a device and in a file. You can compare all values and different values. Different values are highlighted in red. In addition to exporting comparison values (to **.csv** files), you can print, preview, and print the comparison values.

1. Click **Compare** in the function code interface.
2. **Display All** shows all function codes after comparison, both the same values and different values; **Display different** shows all function codes with different values.
3. A parent node highlighted indicates there are different values.
4. A child node highlighted indicates that the function code is different.



5. Printing comparison function codes allows you to print all values or different values. The following is a print preview interface example for all values. The format is the same as that of the current comparison function code interface.

GD880-81C-V1.02-1(UDP) VS GD880-81C-V1.02-2(UDP)

2024-04-10,13:37:27

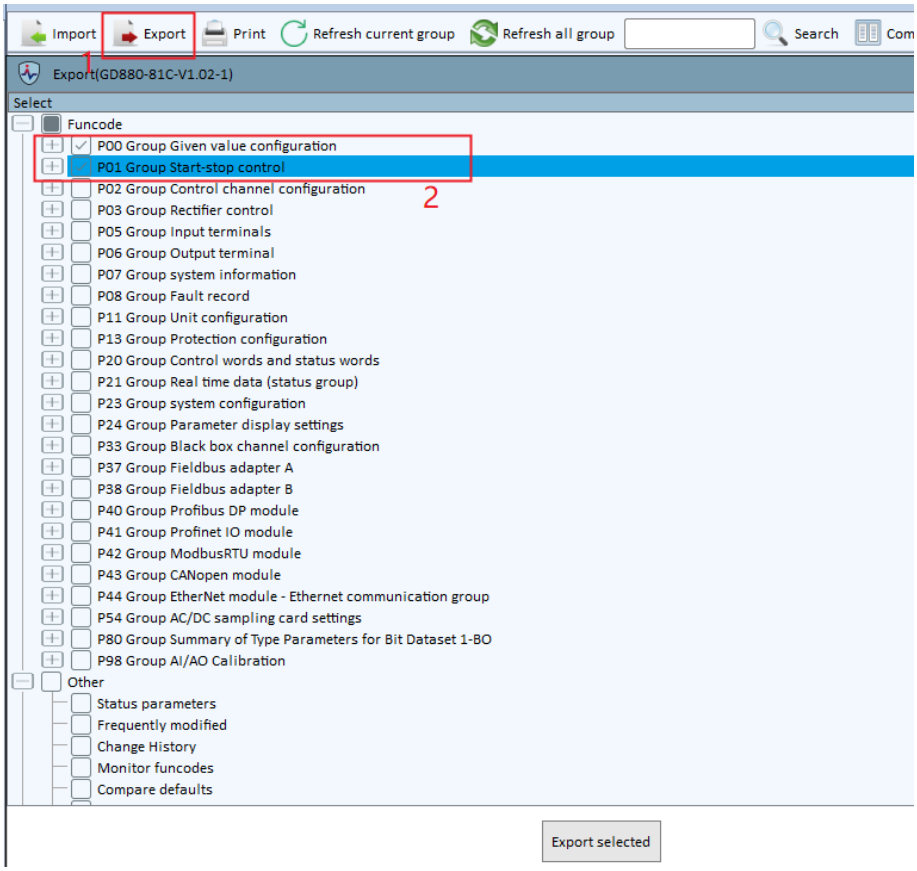
-Compare-

Index	Name	Current value/GD880-81C-V1.02-1(UDP)	Current value/GD880-81C-V1.02-2(UDP)
P00.00	Channel selection source	0: Channel 1	0: Channel 1
P00.01	Function restore parameter	1:Restore default values (P08 group fault records, P23 system time cannot be restored)	0:No operation
P01.00	Terminal running protection selection when powering on	1: Allow terminal restart	1: Allow terminal restart
P01.01	Ethernet communication setting voltage(Reversed)	0	0
P01.02	OFF delay	2.00	1.00
P01.03	Ethernet communication setting voltage(Reversed)	0	0
P01.04	Power on buffer timeout setting	30.0	30.0
P01.05	The interval time between two power on buffers	180.0	180.0
P01.06	Starting temperature of cooling fan	50.0	50.0
P01.07	Cooling fan running mode	1:The fan keeps on running after power on	1:The fan keeps on running after power on
P01.08	Local running time	0	0
P01.09	Keyboard LOC/REM key (QUICK/JOG key on LED keyboard) for multifunctional	6: Local/remote switching function	6: Local/remote switching function

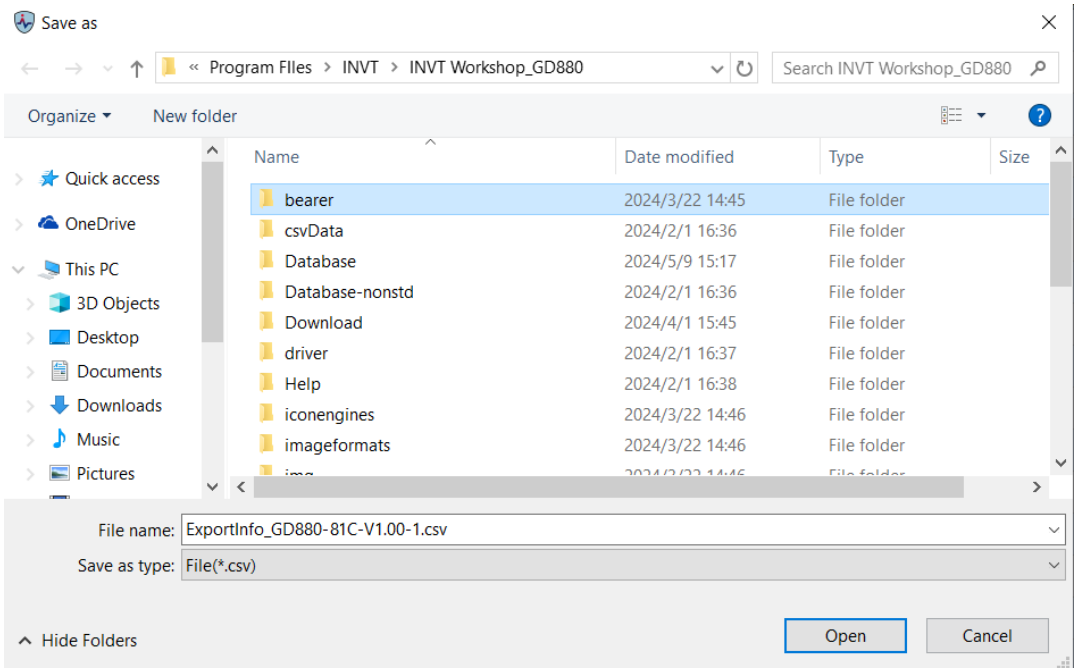
1

5.5.5 Backing up and downloading parameters

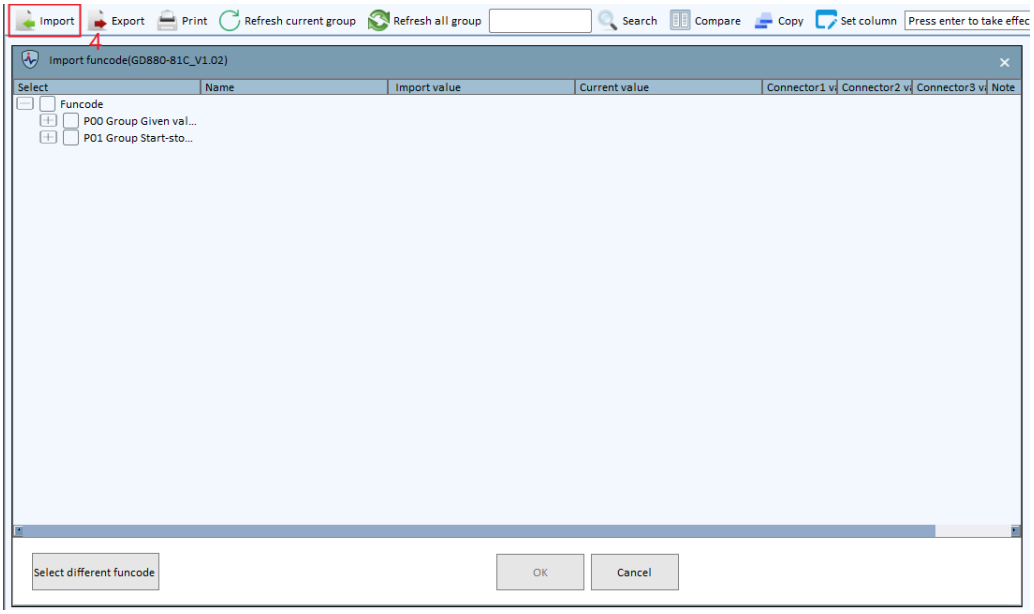
Step 1 Click **Export** in the function code interface. Select the required function codes to be exported for easy copying of values to other devices.



Step 2 Click **Export selected** button to export the selected items to a CSV file.



Step 3 The exported function code database file can be imported into any device of the same mode, overwriting the current values. The values that are different from the current values are marked in red. Click **OK** to conduct device writing.



5.5.6 Copying function codes

Copying function codes enables you to write the function code values on one device directly to another device.

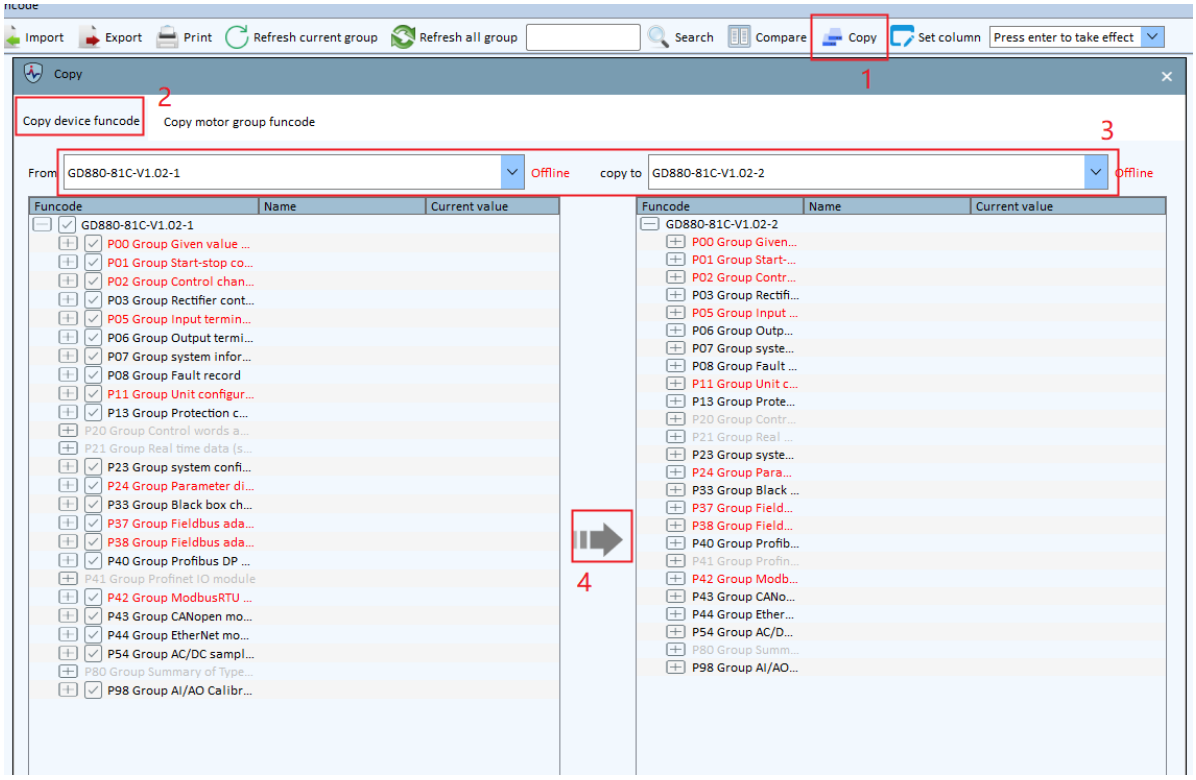
Note: The following conditions must be met: at least two devices are connected, the target device is the same model as the source device, and are currently online.

Step 1 Click **Copy** in the function code interface.

Step 2 Click "**Copy device funcode**".

Step 3 Select the devices that the function code is copied from and to.

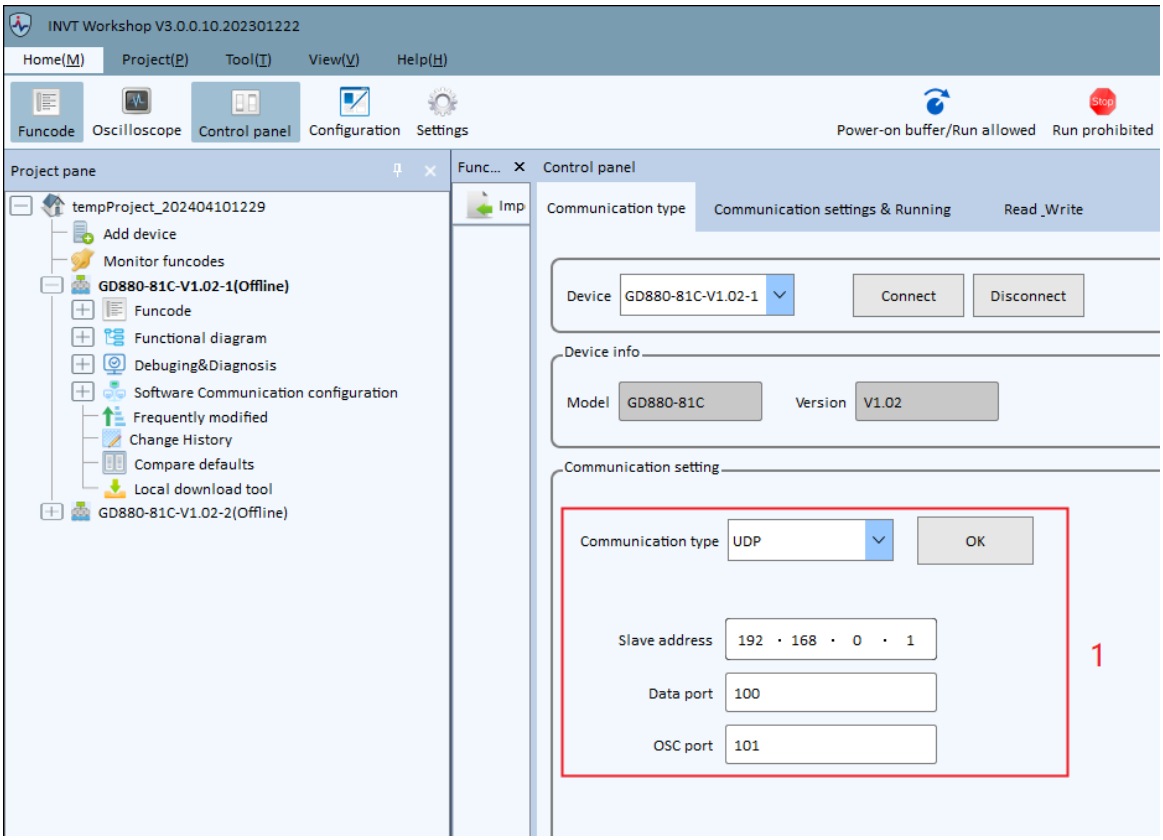
Step 4 Click the copy arrow.



5.5.7 Control panel

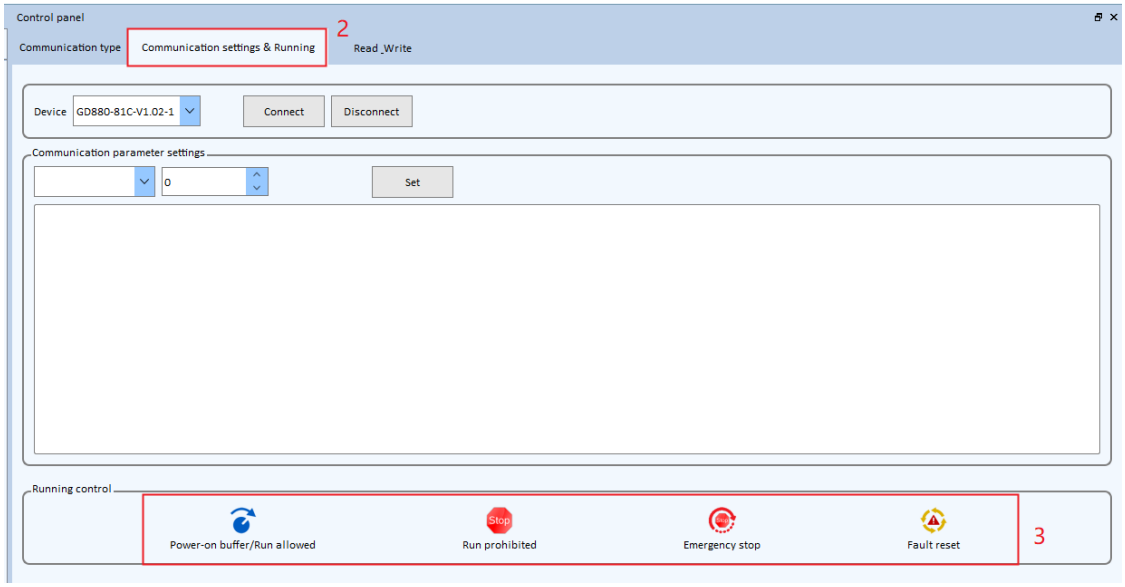
Step 1 Select the **Home** > **Control panel** to go to the control panel interface.

In the control panel interface, you can change the communication type, data port, and oscilloscope port.



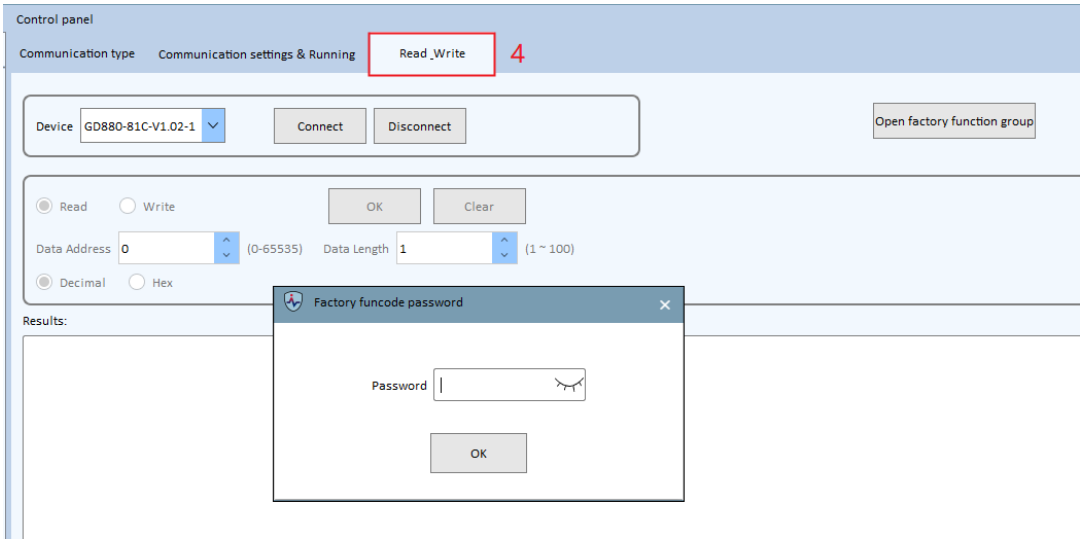
Step 2 Click the tab **Communication setting & Running**.

After connecting the device, you can control the operation of the selected device, including "**Power-on buffer/Run allowed**", "**Run prohibited**", "**Emergency stop**", and "**Fault reset**".

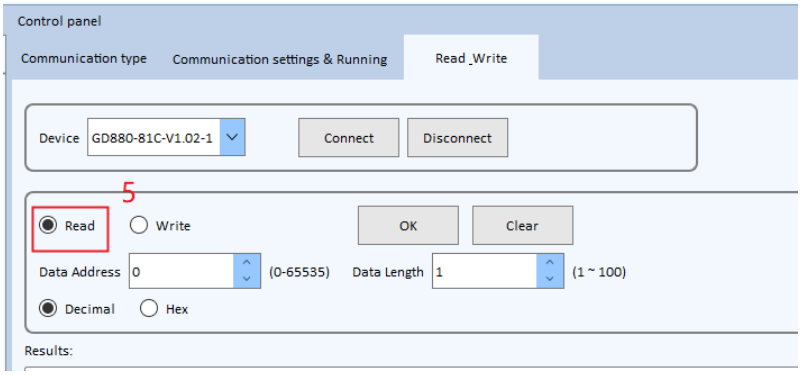


Step 3 The read/write testing supports the operation on any device, supports the connection to or disconnection from the device, and supports clearing result records.

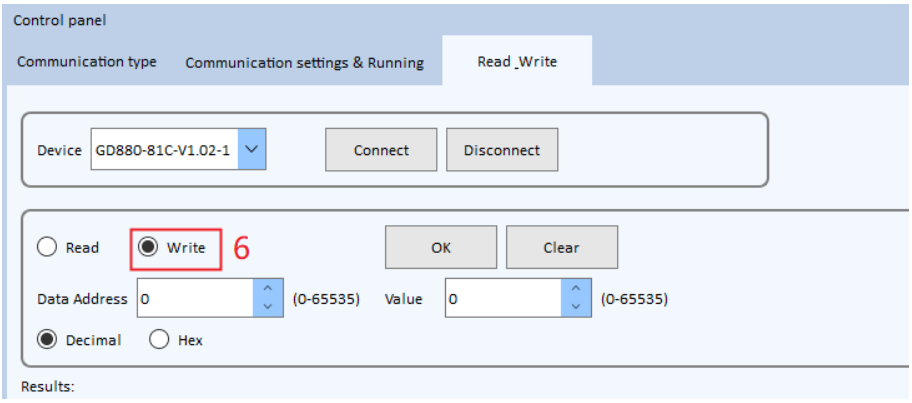
Note: The read/write testing requires a factory password.



- Read: Enter the start address of the data (as recorded in the configuration table) and the data length that can be read (range 1–20), and then the data will return to the result display interface. If the transmission fails, the corresponding information will be prompted, such as device offline.



- Write: Enter the start address of the data (as recorded in the data table), the data length can only be 1, and enter the data value. After confirmation, the data can be returned to the result display interface. If the transmission fails, the corresponding information will be prompted, such as device offline.



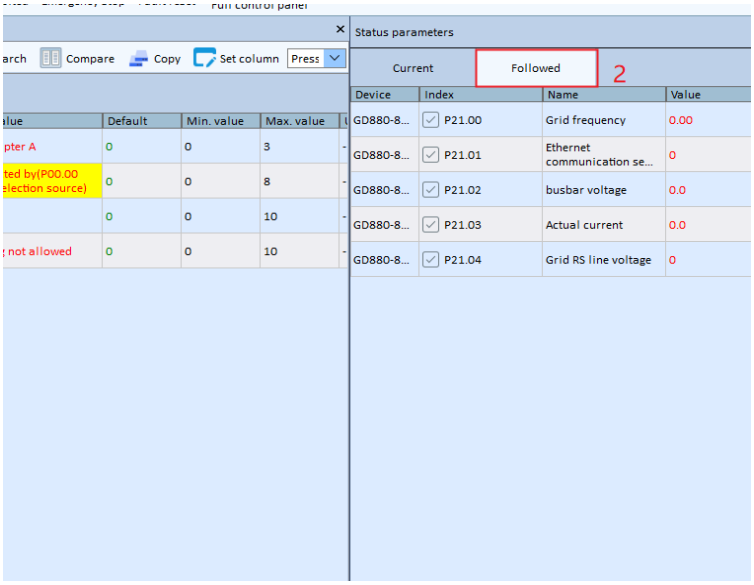
5.5.8 Status parameters

Status parameters are also function codes, but can only be read and cannot be modified, and the interface periodically refreshes the status parameters.

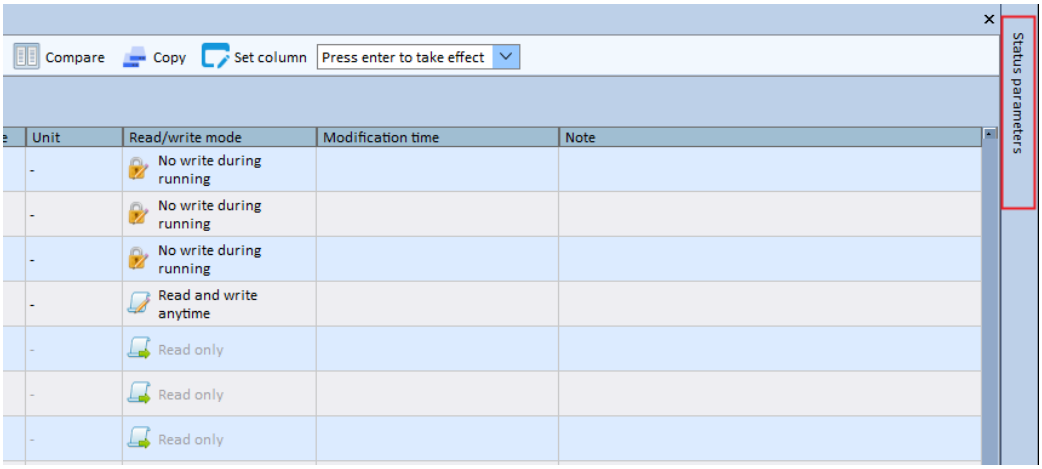
Step 1 In the status parameter interface, click **Current** to enter the current status parameter interface. In this interface, the select parameters become the followed status parameters. When the parameters are deselected, the parameters are removed from the followed status parameters.

Note: The followed parameters will be automatically saved when you close the project or software, and loaded when you start the software next time.

Step 2 Click **Followed** to enter the followed status parameter interface. In this interface, right-click the parameter and choose **Deselect** from the menu to deselect all status parameters.



Step 3 The status window can be hidden or closed. When hidden, the status window is displayed vertically; when closed, the status window will not be displayed, but the status parameters can be redisplayed by choosing **View** > **State parameters**.

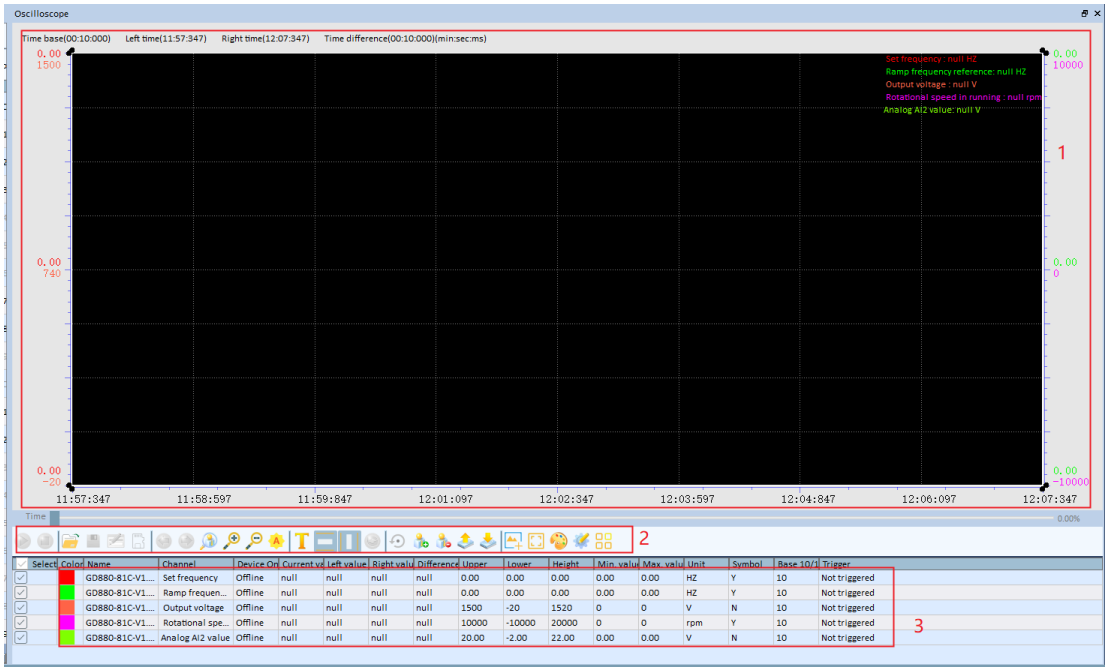


5.6 Waveform recording and analysis

5.6.1 Oscilloscope

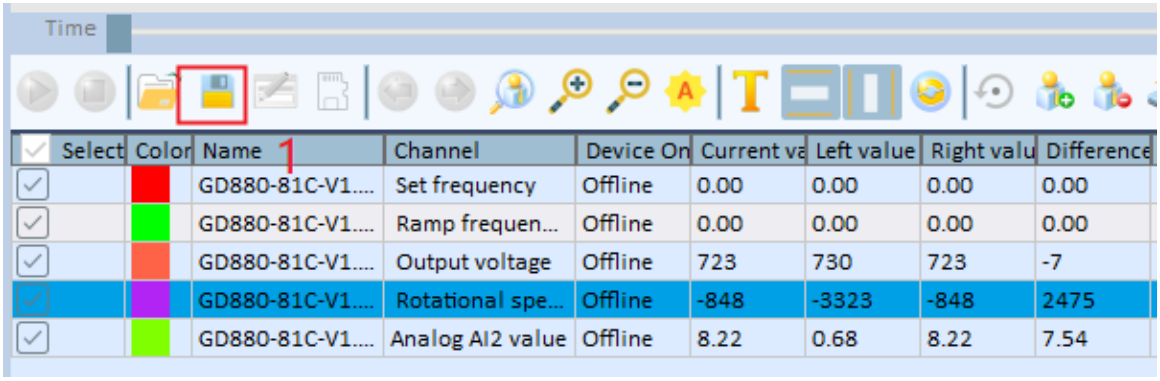
Choose **Home** > **Oscilloscope** to enter the oscilloscope interface. The interface consists of a plot area, a toolbar, and channel information.

- Plot area: Displays waveforms.
- Toolbar: Adjusts, saves and imports waveforms, allowing you to select the waveforms to be observed in the channel information.
- Channel information: Displays the specific waveform numeric values (which you can select for observation).

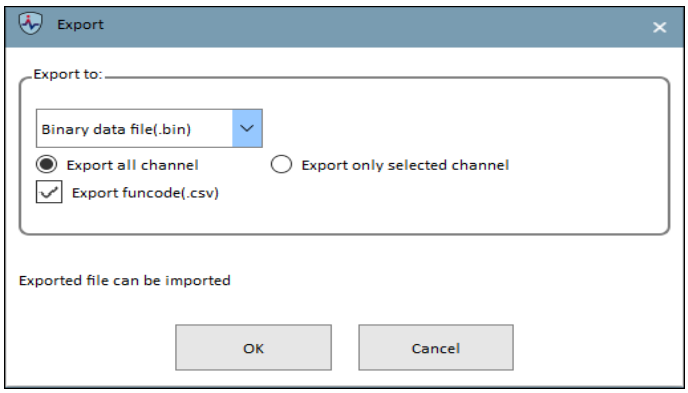


5.6.2 Waveform storage

Step 1 Click the **Save** button on the toolbar in the **Oscilloscope** interface to save the present wave data locally.



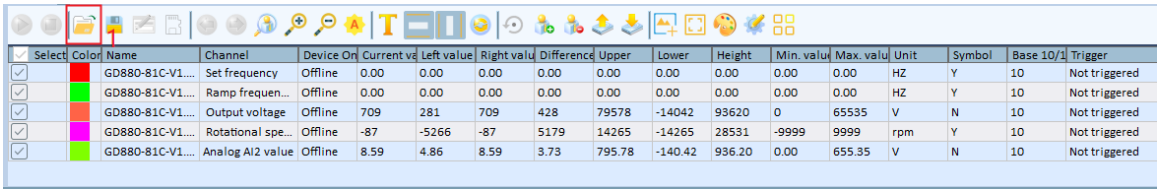
Step 2 The following window is displayed. If you also select **Export funcodes(.csv)** at the same time, all present function code values are automatically exported as a database file (CSV file). When saving waveforms, you can select the format of file to export and channel waveforms(all channel waveforms are exported by default).



Step 3 Click **OK** and enter the save location and name.

5.6.3 Waveform reading

Step 1 Click the button for loading historical waveforms from the toolbar.



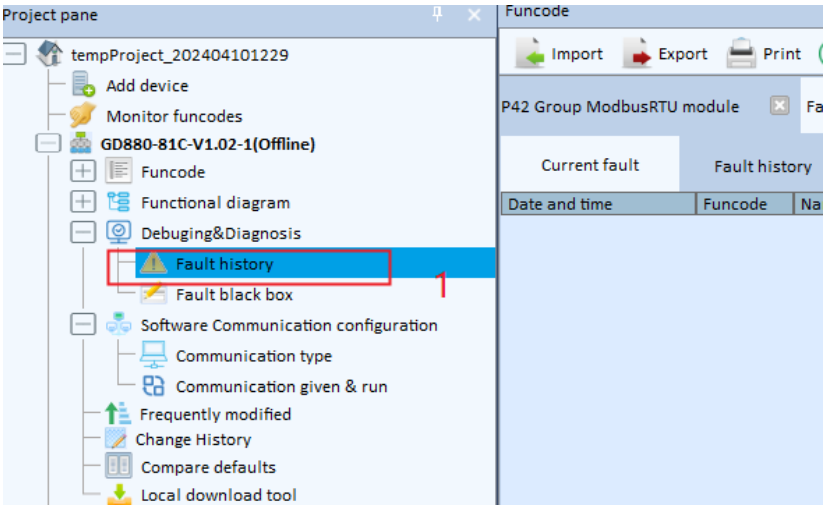
Select	Color	Name	Channel	Device On	Current va	Left value	Right valu	Difference	Upper	Lower	Height	Min. valu	Max. valu	Unit	Symbol	Base 10/1	Trigger
☑		GD880-81C-V1....	Set frequency	Offline	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	HZ	Y	10	Not triggered
☑		GD880-81C-V1....	Ramp frequen...	Offline	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	HZ	Y	10	Not triggered
☑		GD880-81C-V1....	Output voltage	Offline	709	281	709	428	79578	-14042	93620	0	65535	V	N	10	Not triggered
☑		GD880-81C-V1....	Rotational spe...	Offline	-87	-5266	-87	5179	14265	-14265	28531	-9999	9999	rpm	Y	10	Not triggered
☑		GD880-81C-V1....	Analog AI2 value	Offline	8.59	4.86	8.59	3.73	795.78	-140.42	936.20	0.00	655.35	V	N	10	Not triggered

Step 2 In the window that is displayed, select the waveform to be read, and click **Open** to import.

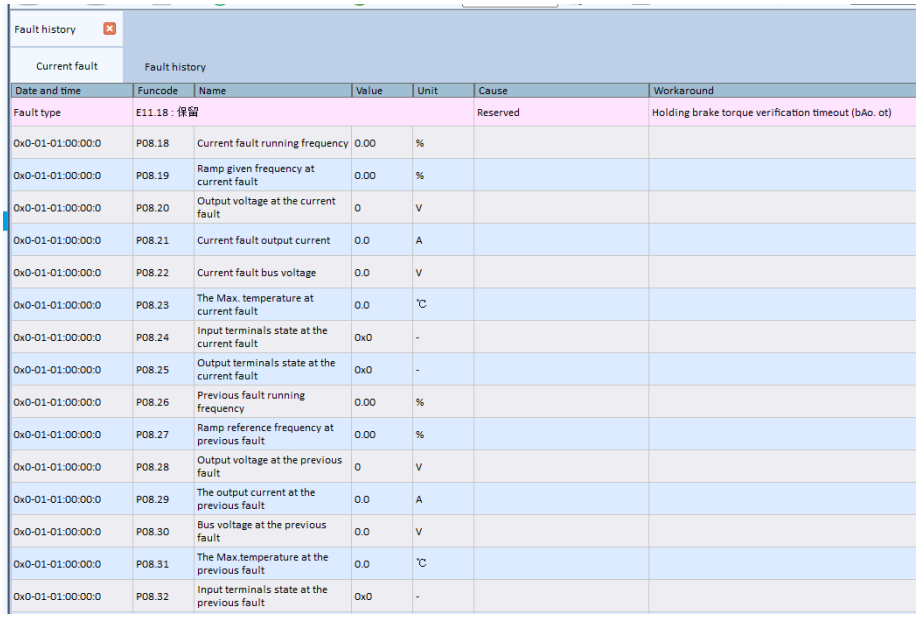
5.7 Fault wizard

5.7.1 Fault records

Step 1 When a device fails, choose **Project pane** > **Debugging&Diagnosis** > **Fault history** to view device fault information.



Step 2 A window is displayed, in which you can view the parameters related to the present and historical faults.



Fault history

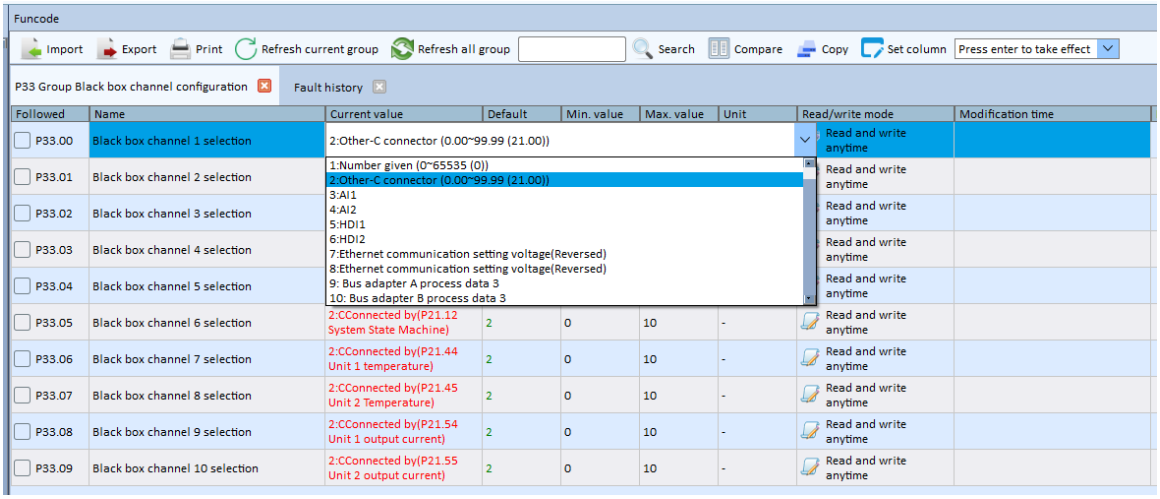
Current fault | Fault history

Date and time	Funcode	Name	Value	Unit	Cause	Workaround
Fault type	E11.18 : 保留				Reserved	Holding brake torque verification timeout (bAo. ot)
0x0-01-01:00:00:0	P08.18	Current fault running frequency	0.00	%		
0x0-01-01:00:00:0	P08.19	Ramp given frequency at current fault	0.00	%		
0x0-01-01:00:00:0	P08.20	Output voltage at the current fault	0	V		
0x0-01-01:00:00:0	P08.21	Current fault output current	0.0	A		
0x0-01-01:00:00:0	P08.22	Current fault bus voltage	0.0	V		
0x0-01-01:00:00:0	P08.23	The Max. temperature at current fault	0.0	℃		
0x0-01-01:00:00:0	P08.24	Input terminals state at the current fault	0x0	-		
0x0-01-01:00:00:0	P08.25	Output terminals state at the current fault	0x0	-		
0x0-01-01:00:00:0	P08.26	Previous fault running frequency	0.00	%		
0x0-01-01:00:00:0	P08.27	Ramp reference frequency at previous fault	0.00	%		
0x0-01-01:00:00:0	P08.28	Output voltage at the previous fault	0	V		
0x0-01-01:00:00:0	P08.29	The output current at the previous fault	0.0	A		
0x0-01-01:00:00:0	P08.30	Bus voltage at the previous fault	0.0	V		
0x0-01-01:00:00:0	P08.31	The Max.temperature at the previous fault	0.0	℃		
0x0-01-01:00:00:0	P08.32	Input terminals state at the previous fault	0x0	-		

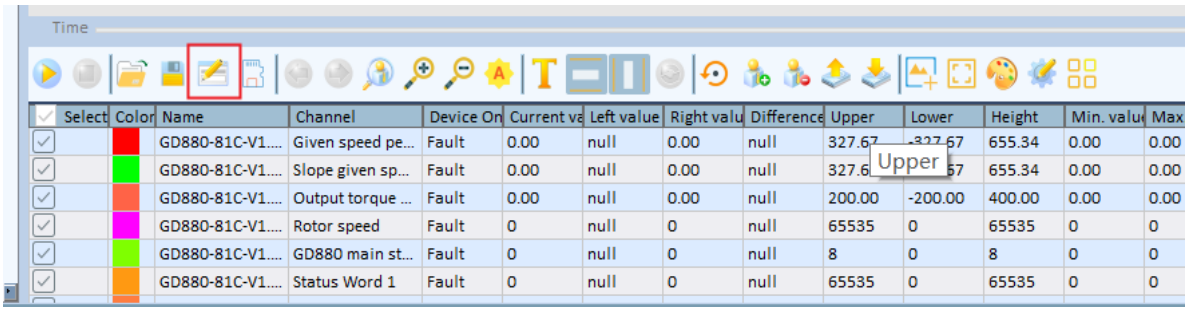
5.7.2 Fault blackbox

- **Host controller online fault black box**

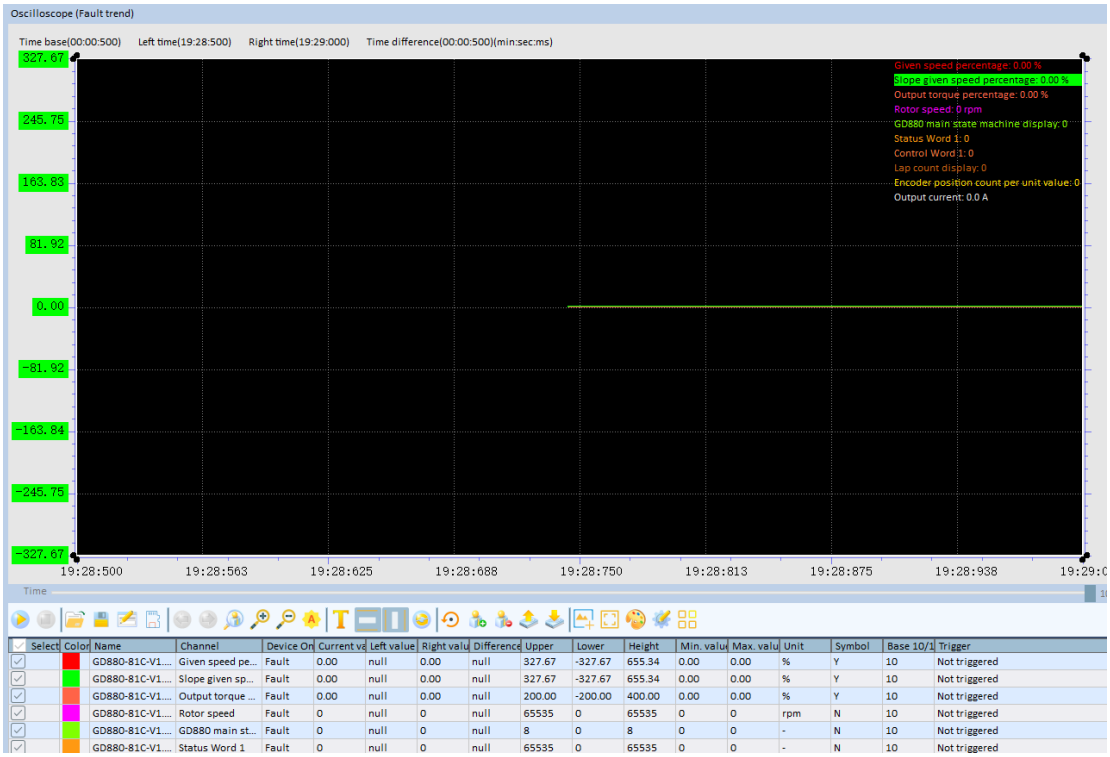
Step 1 Set group P33 Blackbox channel and select the Blackbox channel input source according to the requirements, or connect to other function codes through Other-C.



Step 2 When a fault occurs, click the **Read Fault Waveform** button in the oscilloscope interface.



Step 3 The fault waveforms are displayed in the oscilloscope plot area and the fault waveform data matches the channel configured in group P33.

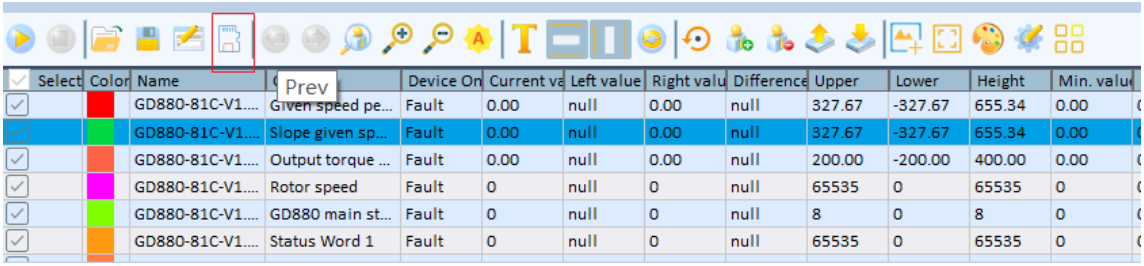


- **SD card fault blackbox**

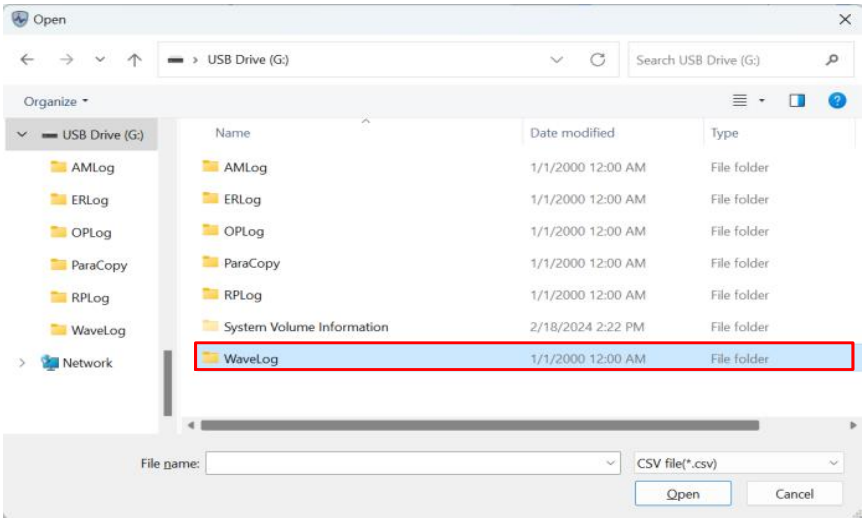
Step 1 Similar to host controller fault blackbox, set group P33 Blackbox channel according to the requirements, and select the channel you want to read at the time of the fault data.

Note: The SD card needs to be inserted into the master controller board. The SD card will automatically record the fault waveform data in the event of a fault.

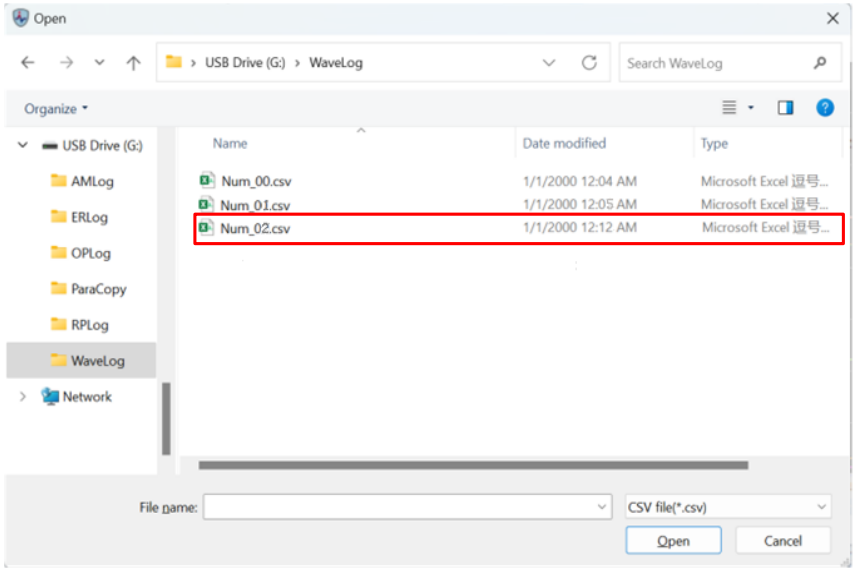
Step 2 Click the SD card oscilloscope button on the oscilloscope toolbar.



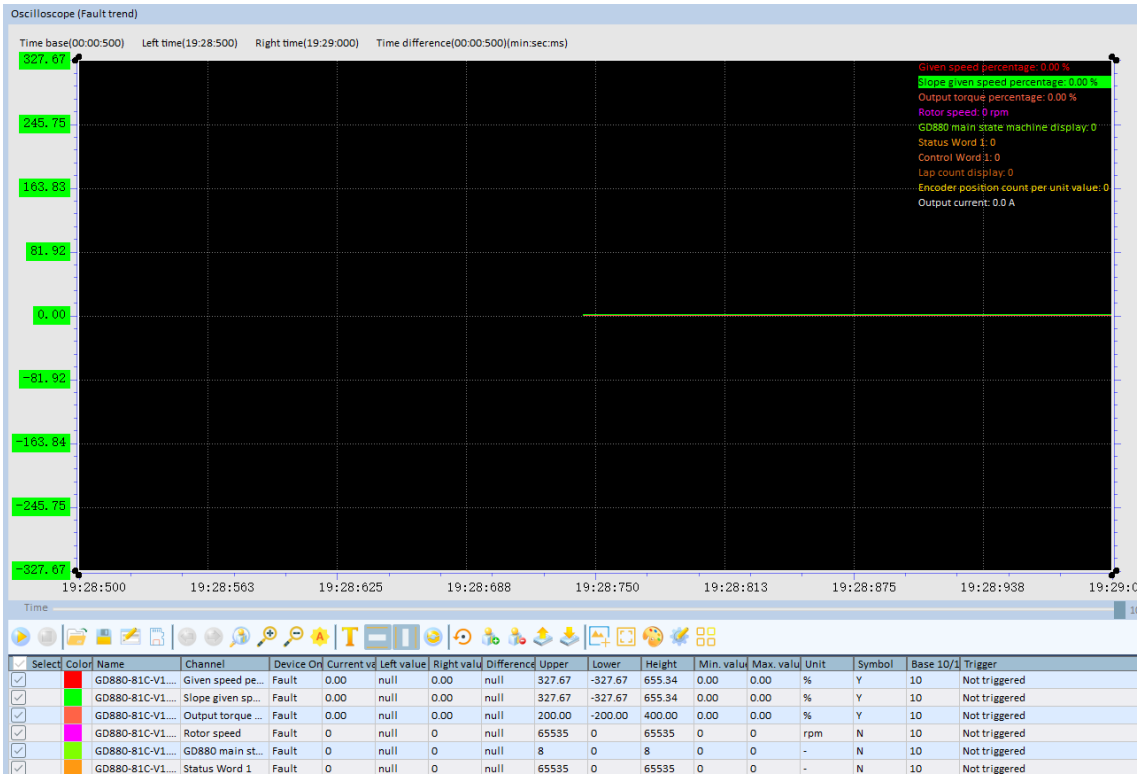
Step 3 In the window that is displayed, select the **WaveLog** folder where the fault waveform data is stored.



Step 4 Open the waveform data you want to view based on the recorded time. Select **Num_02.csv** if you want to open the most recent fault waveform.

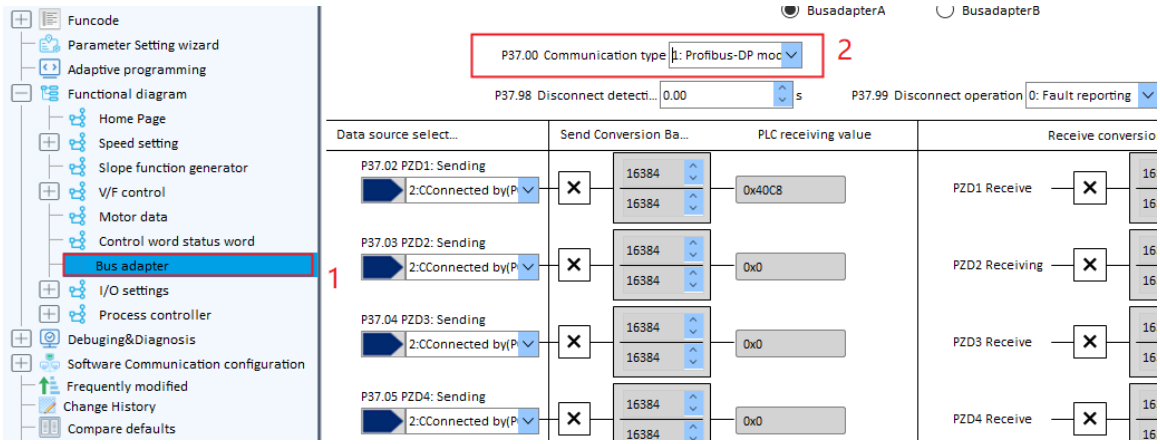


Step 5 The open waveform is the SD card fault waveform saved at the fault time, and the fault waveform data matches the channel configured in group P33.



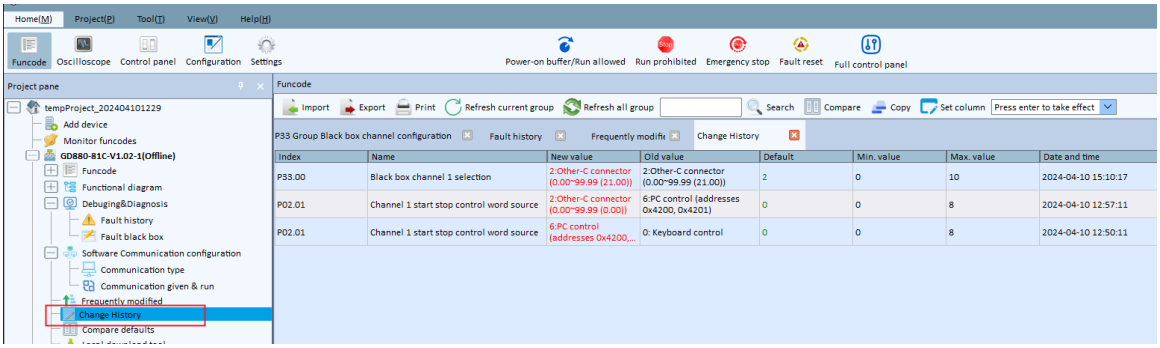
5.8 Device communication configuration

Different bus configurators and communication card modules can be selected.



5.9 Change history

You can view the function parameter values that have been modified by the host controller Workshop in the modification records.



6 Function description

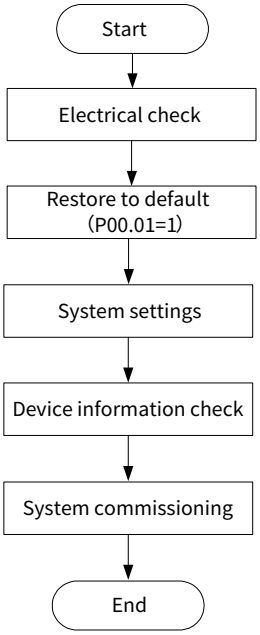
6.1 What this section describes

This section describes the internal function modules of the regenerative rectifier unit.

⚠	• Ensure that all terminals have been securely connected. • Ensure that the power of the rectifier unit matches that of the inverter unit.

6.2 Commissioning procedure

The power-on commissioning procedures of GD880 regenerative rectifier unit are shown in the following figure.



Note: If a fault occurred, find out the fault cause according to section 7.4 Faults and solutions.

6.2.1 Electrical check

No.	Item	Content
1	Main circuit check	• There is no short circuit between phases or between phases and ground in the three-phase AC incoming line of the regenerative rectifier module. • There is no short circuit between the positive and negative DC bus bars, and between the positive and negative busbars and the ground of the regenerative rectifier module. • The incoming phase sequences of the parallel regenerative rectifier modules must be consistent. • Ensure that the precharge circuit wiring is correct. • The voltage detection phase must be consistent with the incoming phase sequence.
2	Auxiliary circuit check	• Ensure that the grid input voltage is 400/690V, and the 24V power supply wiring is correct.

No.	Item	Content
		• Perform wiring according to the electrical schematic diagram to ensure solid wiring and reasonable routing.
3	Grounding check	• Ensure that all grounding wires in the cabinet are fastened to the grounding busbar. • Each group of cabinets needs to connect the grounding copper bars together and ensure their reliable grounding.
4	Power-on of auxiliary power supply and control power supply	• Switch off the auxiliary power switch in sequence. • Before closing a switch, it is required to measure the resistance of the lower port of the switch to determine the nature of the load, and then measure the upper port of the switch. Only after the voltage level is correct can the switch be closed.

6.2.2 System setting

Before running the rectifier, it is necessary to set up the rectifier system, including start/stop timing configuration (see section 6.3 Startup timing for details), control channel selection (see section 6.4 Control channel for details), rectifier unit control (see section 6.5 Start/Stop CW for details).

6.2.3 System information check

After the initial power-on, ensure that the model and software version information of the device are correct before operating the device.

Function code	Name	Description
P07.01	Product category	Displays the current device types. 2: Regenerative rectifier
P07.02	Working mode of control unit	Displays the working mode of the system. 0: Standalone mode 1: Parallel mode
P07.03	Controller ARM software version	-
P07.04	Controller DSP software version (CPU1)	-
P07.05	Controller DSP software version (CPU2)	-
P07.06	Controller FPGA software version	-
P07.07	Function code version	-
P07.08	Entire machine rated power	-
P07.09	Grid rated voltage	-
P07.10	Entire machine rated voltage	-
P07.11	Entire machine rated current	-
P07.30–P07.39	Unit 1–10 FPGA version	-

Note: If the rated power and voltage class of the power module are inconsistent with the module nameplate, the model setting may be incorrect. Please contact technical personnel for assistance.

6.2.4 System commissioning

For the first operation of the regenerative rectifier unit, it is recommended to use the keypad control panel startup or the terminal-based startup, or use INVT Workshop control. Before startup, check that the running signal is valid. After running for about 20 seconds, check if the bus voltage reaches 80% of the theoretical

value, VDC=1.41 × Vin × 80%.

- Keypad startup

Confirm the channel source for regenerative rectifier through P00.00 (channel 1 or channel 2), configure channel 1 (or channel 2) in function code group P02 as keypad startup, DI2 default for OFF2 source, and DI4 default for fault reset source. Confirm that the on-site wiring is consistent with the function code setting, click the RUN button on the keypad to turn on pre-charging. After pre-charging is completed, click the RUN button again to turn on regeneration.

- INVT Workshop control panel startup

Confirm the channel source for regenerative rectifier through P00.00 (channel 1 or channel 2), configure channel 1 (or channel 2) in function code group P02 as PC control, DI2 default for OFF2 source, and DI4 default for fault reset source. Confirm that the on-site wiring is consistent with the function code setting, click **Power-on buffer/Run allowed** on the control panel to turn on pre-charging. After pre-charging is completed, click **Power-on buffer/Run allowed** again to turn on regeneration.

- Terminal-based startup

To use terminal-based startup, you need to set the channel 1/channel 2 start/stop control word source (P02.01 or P02.19) to terminal-based start/stop or customized. Channel 2 is default to terminal-based start/stop. Ensure that the on-site terminal wiring is consistent with the function code settings.

6.3 Startup timing

6.3.1 System state machine

The running state of the regenerative rectifier is controlled by the system state machine. The jumping logic of the state machine is as follows:

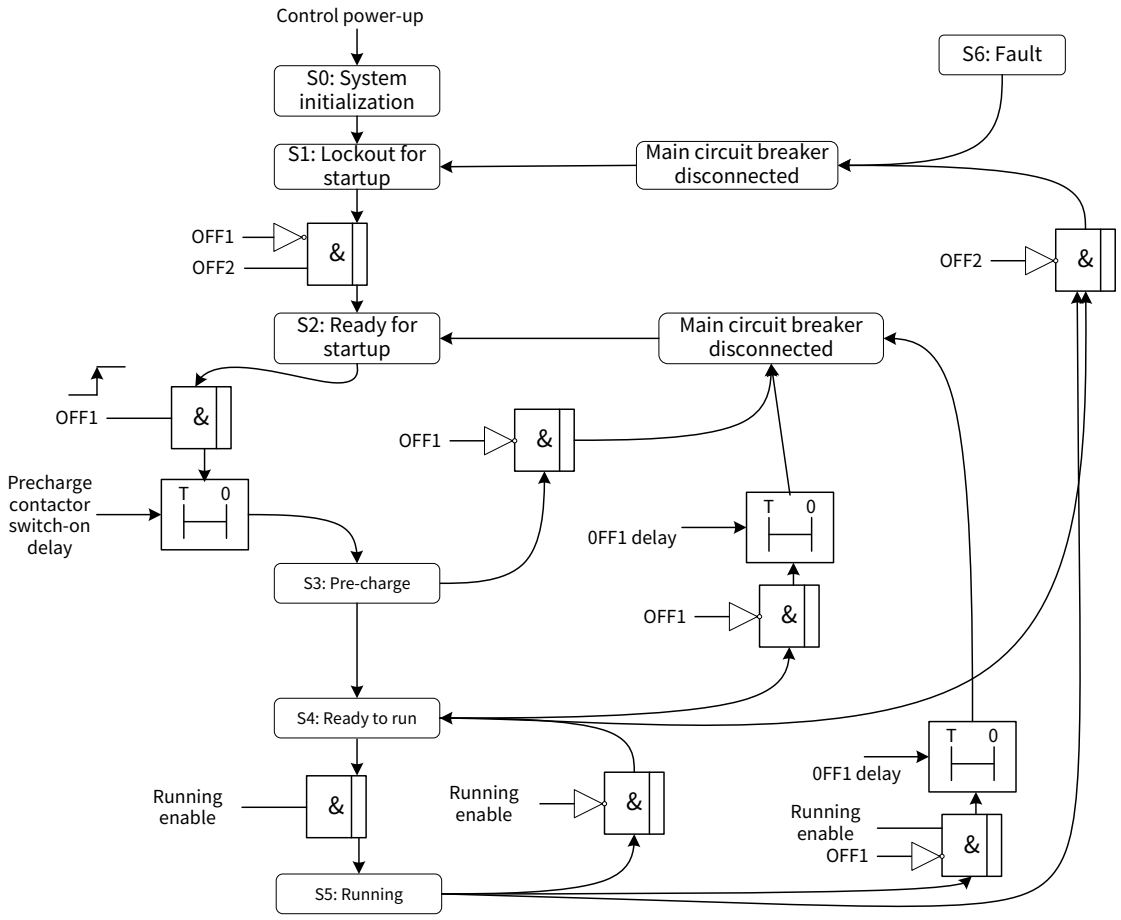


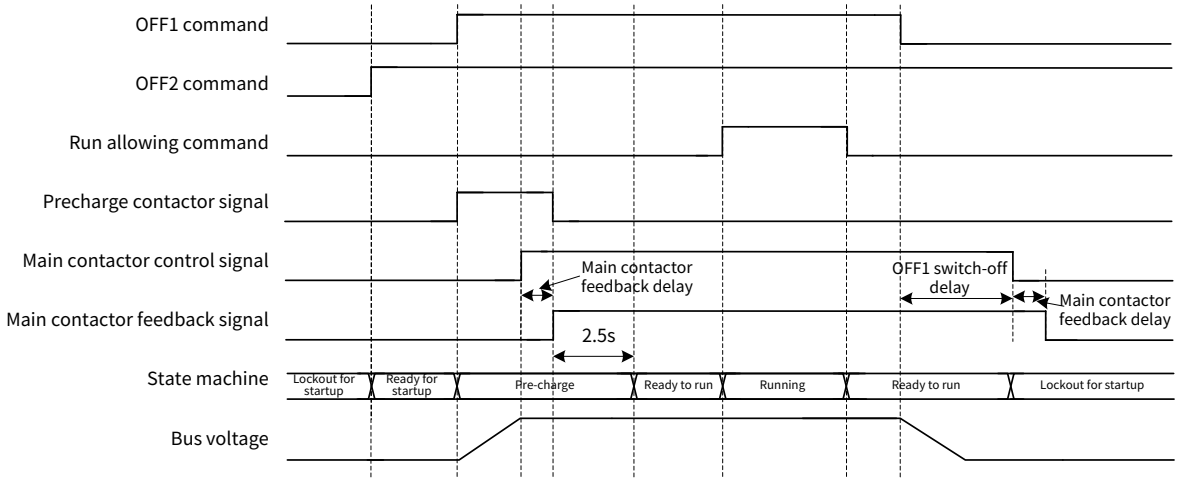
Table 6-1 System state

State	Name	State instruction
S0	Initialization	After initialization is completed, the state machine jumps to S1.
S1	Lockout for startup	When OFF2=1, OFF1=0, and there is no fault, the state machine jumps to S2.
S2	Ready for startup	When OFF1=1 signal is received, the precharge contactor is switched on and the state machine jumps to S3.
S3	Precharge	After the bus voltage is established, the main contactor is switched on. When the signal feedback of the main contactor is normal, the state machine jumps to S4. If OFF1 signal is withdraw during the precharge process, the main circuit breaker is switched off and the state machine jumps to S2.
S4	Ready to run	When Enabling run =1, the device runs and the state machine jumps to S5. If OFF1 signal is withdraw, the main circuit breaker is switched off after the delay time and the state machine jumps to S2.
S5	Run	When Enabling run =0, the device stops and the state machine jumps to S5. The regeneration function is enabled. If OFF1 signal is withdraw, the main circuit breaker is switched off after the delay time and the state machine jumps to S2.
S6	Fault	In any state, if there is a serious fault (precharge failure, device damage, running time reached), the state machine will jump to S6, and jump to S1 after resetting. In the states S4 and S5, the state machine will jump to S4 after minor fault reset.

6.3.2 Startup timing

When OFF1=0&OFF2=1, the rectifier system state machine enters the "Startup preparation" state. After receiving the OFF1=1 command, the regenerative rectifier unit closes the pre-charge contactor to enter the "Pre-charge" state. When the bus voltage is established during pre-charging, the main contactor (or main circuit breaker) is switched on and the pre-charge contactor is switched off. The system state machine enter the "Ready to run" state. At this point, the rectifier unit receives the run allowing command and then turns on the regeneration function. The system state machine enters the "Running" state. The system state machine goes back to the "Ready to run" state after the run allowing command is withdraw. At this time, the rectifier unit is working in diode rectification mode. If the rectifier unit receives the OFF1 stop command, the system goes back to the "Ready for startup" state; if the rectifier unit receives the OFF2 stop command, the system is switched off and goes back to the "Lockout for startup" state. Figure 6-1 shows the startup timing.

Figure 6-1 Rectifier unit startup timing



Function code	Name	Description	Setting range	Default
P01.00	Terminal-based running command protection at power-on	0: Disable restart 1: Enable restart	0–1	1
P01.02	OFF1 switch-off delay	Delay after OFF1 switch-off	1.00–10.00	1.00s
P01.04	Power-on precharge timeout time setting	-	5.0–30.0	30.0s
P01.05	Power-on pre-charge interval	Interval time between two power-on pre-charges. Short intervals may damage the pre-charge resistor.	10.0–300.0	180.0s
P02.49	Main contactor feedback timeout time	0.0–10.0s	0.0–10.0	10.0s

6.4 Control channel

The control channel includes channel 1 and channel 2, and the switching between channel 1 and channel 2 can be achieved through Other-B, input terminals DI1–DI6, and HDI1–HDI2.

The control channel commands include the circuit breaker switch-on command OFF1, emergency stop command OFF2, and fault reset command. The commands can come from the keypad, input terminals, digital settings, bus adapters, PC control, Modbus, and customization.

Function code	Name	Description	Setting range	Default
P00.00	Channel selection source	Used to select the channel source. (0 indicates channel 1 while 1 indicates channel 2) 0: Channel 1 1: Channel 2 2: Other-B connector (0.00–99.99(0.00)) 3: DI1 4: DI2 5: DI3 6: DI4 7: DI5 8: DI6 9: HDI1 10: HDI2	0–10	0

6.4.1 OFF1 switch-on command

The system enters the state of ready to turn on when the OFF1=0, OFF2 command is invalid (1 indicates invalid) and there are no faults. When the OFF1 command changes from 0 to 1 to send a run command, the auxiliary circuit breaker is switched on and the system enters the pre-charge state.

If OFF1=0, an opening command is sent, and the system exits the running state and enters the OFF1 opening state.

6.4.2 OFF2 emergency stop command

OFF2 emergency stop: to unconditionally stop and disconnect the main power supply when receiving the command. The emergency stop command is effective at low level, and the emergency stop action is taken when the corresponding effective parameter value is 0. The OFF2 command has several sources, and the parameters that are currently effective depend on the control channel settings, as shown in the following table.

Channel selection	CW source	OFF2				
		P02.07	P02.08	P02.25	P02.26	P20.02
P00.00=0	P02.01=0: Keypad	✓	✓	X	X	✓
	P02.01=1: Digital	✓	✓	X	X	✓
	P02.01=3: Terminal	✓	✓	X	X	✓
	P02.01=4 or 5: Bus adapter	✓	✓	X	X	✓
	P02.01=6: PC	✓	✓	X	X	✓
	P02.01=7: Modbus	✓	✓	X	X	✓
	P02.01=8: Customized	✓	✓	X	X	✓
P00.00=1	P02.19=0: Keypad	X	X	✓	✓	✓
	P02.19=1: Digital	X	X	✓	✓	✓
	P02.19=3: Terminal	X	X	✓	✓	✓
	P02.01=4 or 5: Bus	X	X	✓	✓	✓

Channel selection	CW source	OFF2				
		P02.07	P02.08	P02.25	P02.26	P20.02
	adapter					
	P02.19=6: PC	X	X	✓	✓	✓
	P02.19=7: Modbus	X	X	✓	✓	✓
	P02.19=8: Customized	X	X	✓	✓	✓

Note:

- In the table, "✓" indicates that the command source is effective.
- In the table, "X" indicates that the command source is ineffective.

6.4.3 Run allowing command

When the system works in the ready to run state and a run allowing command is given, the rectifier unit turns on the regeneration function and the system state machine enters the running state. After the run allowing command is disabled, the system state machine returns to the ready to run state and turns off the regeneration function.

6.4.4 Fault reset command

When the device stops due to a fault, the fault should be reset before restarting the device. The fault reset defaults to DI4 input.

6.5 Start/Stop CW

Channel 1 start/stop CW source and channel 2 start/stop CW source map to function codes P02.01 and P02.19, as shown in the following table.

Channel 1 start/stop CW source defaults to keypad-based control while channel 2 start/stop CW source defaults to terminal-based start/stop module.

Function code	Name	Description	Setting range	Default
P02.01	Channel 1 start/stop CW source	0: Keypad 1: Digital reference 2: Other-C connector 3: Terminal start/stop module (IN1, IN2) 4: Bus adapter A 5: Bus adapter B 6: PC control (addresses 0x4200, 0x4201) 7: Modbus (addresses 0x4200, 0x4201) 8: Customized	0–8	0
P02.19	Channel 2 start/stop CW source	0: Keypad 1: Digital reference 2: Other-C connector 3: Terminal start/stop module (IN1, IN2) 4: Bus adapter A 5: Bus adapter B 6: PC control (addresses 0x4200, 0x4201) 7: Modbus (addresses 0x4200, 0x4201) 8: Customized	0–8	3

6.5.1 Terminal-based start/stop CW

Set the start/stop CW source for channel 1 or 2 to terminal startup through P02.01 or P02.19. The following setting procedure is using channel 2 terminal startup CW as an example:

Step 1 P00.00=1, P02.19=3, selecting channel 2 as the control channel and setting channel 2 as the terminal startup/stop module.

Step 2 P02.38=0, selecting terminal-based start/stop command 1 (or P02.38=1, selecting terminal-based start/stop command 2) as the channel.

Step 3 P02.39=0, setting the terminal-based start/stop command mode to level mode.

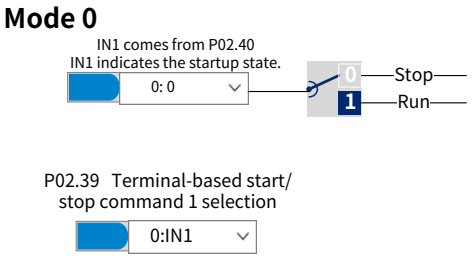
Step 4 P02.40=3, P02.41=0, P02.42=5, selecting DI1 as the start/stop command input IN1 source, IN2 invalid, and DI3 as the terminal-based start/stop command run allowing source.

Step 5 P02.25=4, P02.26=1, selecting DI2 as the channel 2 OFF2 source 1, and setting channel 2 OFF2 source 1 to invalid.

Step 6 After confirming the on-site wiring, switch on DI1 to generate a rectifier OFF1 closing signal. After the main circuit breaker is closed, switch on DI3 to turn on the regeneration function.

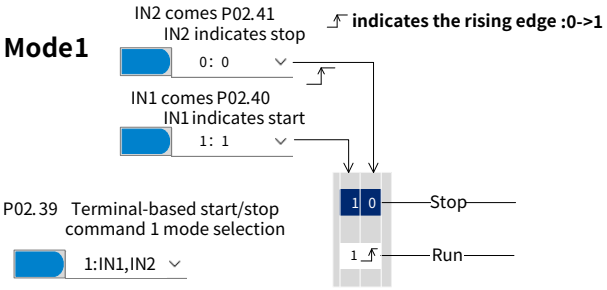
There are four terminal-based start/stop command mode.

1. Terminal-based start/stop mode 0 (P02.39=0, level mode IN1 (1), single-wire system)



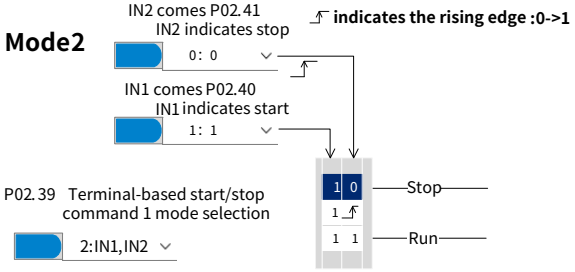
Only check IN1 (P02.40) input (0: Stop; 1: Run): when IN1 is 0, OFF1 is 0; when IN1 is 1, OFF1 is 1.

2. Terminal-based start/stop mode 1 (P02.39=1, IN1 (1), IN2(0->1), two-wire system 1)



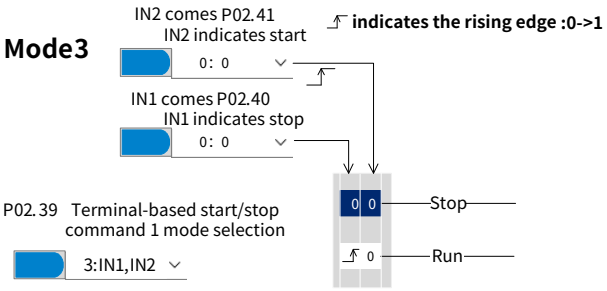
Check the inputs of IN1 (P02.40) and IN2 (P02.41): when IN1 is 1 and IN2 generates a rising edge change, OFF1 is 1; when IN1 is 0, OFF1 is 0.

3. Terminal-based start/stop mode 2 (P02.39=2, IN1 (1), IN2 (0->1 hold), two-wire system 2)



Check the inputs of IN1 (P02.40) and IN2 (P02.41): when IN1 is 1 and IN2 generates a rising edge and remains high level, OFF1 is 1; when IN1 is 0 or IN2 is 0, OFF1 is 0.

4. Terminal-based start/stop mode 3 (P02.39=3, IN1(0->1), IN2(0), two-wire system 3)



Check the inputs of IN1 (P02.40) and IN2 (P02.41): when IN2 is 0 and IN1 generates a rising edge, OFF1 is 1; when IN2 is 1, OFF1 is 0.

6.5.2 Communication-based start/stop CW

1. If P02.01 is set to 2, 4, 5:

When P02.01=2, Other-C connector serves as the start/stop CW source.

When P02.01=4 or 5, Other-A (or -B) connector serves as the start/stop CW source.

Communication-based start/stop CW 1 is indicated by P20.01–P20.16, each bit of which is described as follows:

Bits	Meaning
00	OFF1 command 0: OFF1 switched off 0->1: Switched on
01	OFF2 command 0: OFF2 emergency stop switched off 1: Normal state
02	Reserved
03	Run allowing command 0: Run allowing 1: Run prohibited
04	Reserved
05	Reserved
06	Reserved
07	Fault reset 0: Invalid 0->1: Fault reset is valid
08	Reserved
09	Reserved
10	Remote control 0: Invalid 1: Valid
11	Reserved
12	Reserved
13	Reserved
14	0: Invalid 1: Trigger external fault 1
15	0: Invalid 1: Trigger external fault 2

2. If P02.01 is set to 6, 7:

When P02.01=6, PC control (addresses 0x4200, 0x4201) serves as the start/stop CW source.

When P02.01=7, Modbus communication (addresses 0x4200, 0x4201) serves as the start/stop CW source.

Address (4200H start)	Name	Definition	R/W attribute
16896	Control command word 1 **Note:** It is different from the control word.	0001H: Power-on precharge/Run allowing 0002H: Run prohibited 0003H: Emergency stop switched off 0004H: Fault reset	W

<table>
<tr><th>Address (4200H start)</th><th>Name</th><th>Definition</th><th>R/W attribute</th></tr>
<tr><td>16897</td><td>Control word 2</td><td><table>
<tr><td>CW 2 bit0</td><td>1=Trigger external alarm 1</td></tr>
<tr><td>CW 2 bit1</td><td>1=Trigger external alarm 2</td></tr>
<tr><td>CW 2 bit2</td><td>Reserved</td></tr>
<tr><td>CW 2 bit3</td><td>Reserved</td></tr>
<tr><td>CW 2 bit4</td><td>Reserved</td></tr>
<tr><td>CW 2 bit5</td><td>Reserved</td></tr>
<tr><td>CW 2 bit6</td><td>Reserved</td></tr>
<tr><td>CW 2 bit7</td><td>Reserved</td></tr>
<tr><td>CW 2 bit8</td><td>1=Trigger channel 2
0=Trigger channel 1
PLC needs to change the control channel through P00.00.</td></tr>
<tr><td>CW 2 bit9</td><td>Reserved</td></tr>
<tr><td>CW 2 bit10</td><td>Reserved</td></tr>
<tr><td>CW 2 bit11</td><td>Reserved</td></tr>
<tr><td>CW 2 bit12</td><td>Reserved</td></tr>
<tr><td>CW 2 bit13</td><td>Reserved</td></tr>
<tr><td>CW 2 bit14</td><td>Reserved</td></tr>
<tr><td>CW 2 bit15</td><td>Reserved</td></tr>
</table></td><td>W</td></tr>
<tr><td>16898</td><td>Reserved</td><td>-</td><td>-</td></tr>
<tr><td>16899</td><td>Reserved</td><td>-</td><td>-</td></tr>
<tr><td>16900</td><td>Command to read fault records</td><td>Read the fault records stored in the fault black box.</td><td>W</td></tr>
</table>

6.5.3 Customized CW

P02.01=8, selecting the channel 1 customized channel as the start/stop CW source. The channel 1 OFF1 source is set through P02.02, while the channel 1 run allowing source is set through P02.03.

You can check P20.71 to read customized start/stop CW values (readable but not writable). Customized CW 1 is indicated by P20.01–P20.16, each bit of which is described as follows.

Bits	Meaning
00	OFF1 command 0: OFF1 switched off 0->1: Switched on
01	OFF2 command 0: OFF2 emergency stop switched off 1: Normal state
02	Reserved
03	Run allowing command 0: Run allowing 1: Run prohibited
04	Reserved
05	Reserved
06	Reserved
07	Fault reset 0: Invalid 0->1: Fault reset is valid
08	Reserved
09	Reserved
10	Remote control 0: Invalid 1: Valid
11	Reserved

Bits	Meaning
12	Reserved
13	Reserved
14	0: Invalid 1: Trigger external fault 1
15	0: Invalid 1: Trigger external fault 2

6.6 Phase-lock loop

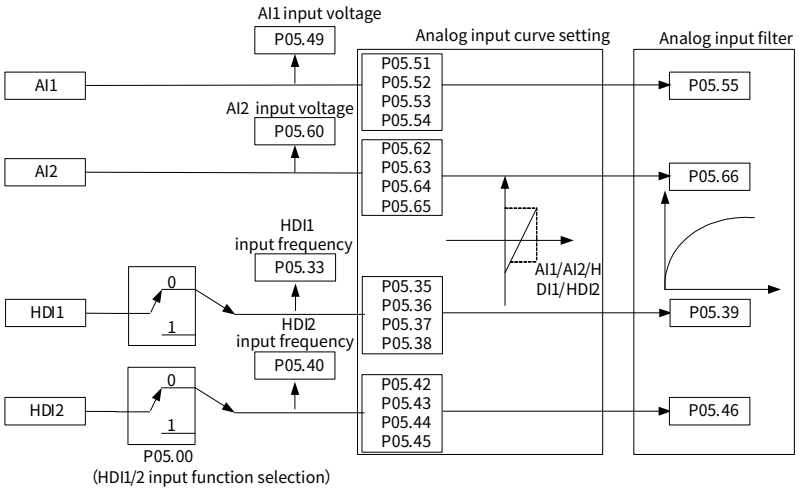
P03.16=1, using a software phase-lock loop based on a generalized second-order integrator (SOGI) by default. The default value is sufficient for most applications. This applies to situations where the grid frequency is relatively stable, and there may be imbalances or harmonics in the voltage of the power grid. This phase-lock loop can complete the phase-lock function.

P03.16=0, using a software phase-lock loop based on a single synchronous coordinate system (SRF). This is suitable for broadband applications, such as using a generator to provide an AC voltage input source.

6.7 Input and output

6.7.1 Analog input

The regenerative rectifier control unit carries two analog input terminals AI1 and AI2 with input range being 0–20mA/-10V–10V, and whether AI1 or AI2 uses voltage input or current input can be set through J4 or J5, and two HDI high-speed pulse input terminals. Each input can be filtered separately, and the corresponding reference curve can be set by adjusting the reference corresponds to the max. value and min. value. The HDI terminals can be set to work as high-speed pulse input terminals or regular digital input terminals through function code setting.



P05.00	Ones: HDI1 input type selection Tens: HDI2 input type selection	0: HDI is high-speed pulse input 1: HDI is digital input

Related parameter list:

Function code	Name	Description	Setting range	Default
P05.51	AI1 curve min. input value	-10.00–P05.53	-10.00–10.00	0.00
P05.52	AI1 curve min. input rate	-600.0%–P05.54	-600.0–600.0	0.0%
P05.53	AI1 curve max. input value	P05.51–10.00	-10.00–10.00	10.00
P05.54	AI1 curve max. input rate	P05.52–600.0%	-600.0–600.0	100.0%
P05.55	AI1 input filter time	0.000–10.000s	0.000–10.000	0.000s
P05.62	AI2 curve min. input value	-10.00–P05.64	-10.00–10.00	0.00
P05.63	AI2 curve min. input rate	-600.0%–P05.65	-600.0–600.0	0.0%
P05.64	AI2 curve max. input value	P05.62–10.00	-10.00–10.00	10.00
P05.65	AI2 curve max. input rate	P05.63–600.0%	-600.0–600.0	100.0%
P05.66	AI2 input filter time	0.000–10.000s	0.000–10.000	0.000s
P05.35	HDI1 high-speed pulse lower limit frequency	0.000kHz–P05.37	0.000–P05.32	0.000kHz
P05.36	Corresponding setting of HDI1 lower limit frequency	-100.0%–P05.38	-100.0–100.0	0.0%
P05.37	HDI1 high-speed pulse upper limit frequency	P05.35–50.000kHz	P05.30–50.000	50.000kHz
P05.38	Corresponding setting of HDI1 upper limit frequency	P05.36–100.0%	-100.0–100.0	100.0%
P05.39	HDI1 high-speed pulse input filter time	0.000–10.000s	0.000–10.000	0.030s
P05.42	HDI2 high-speed pulse lower limit frequency	0.000kHz–P05.44	0.000–P05.37	0.000kHz
P05.43	Corresponding setting of HDI2 lower limit frequency	-100.0%–P05.45	-100.0–100.0	0.0%
P05.44	HDI2 high-speed pulse upper limit frequency	P05.42–50.000kHz	P05.35–50.000	50.000kHz
P05.45	Corresponding	P05.43–100.0%	-100.0–100.0	100.0%

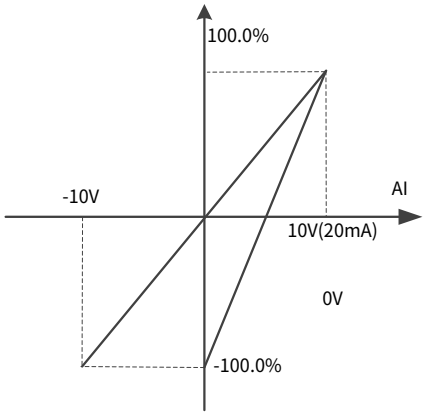
Function code	Name	Description	Setting range	Default
	setting of HDI2 upper limit frequency			
P05.46	HDI2 high-speed pulse input filter time	0.000–10.000s	0.000–10.000	0.030s

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

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

In different applications, 100.0% of the analog setting corresponds to different nominal values. See the descriptions of each application section for details.

The following figure illustrates the cases of several settings:

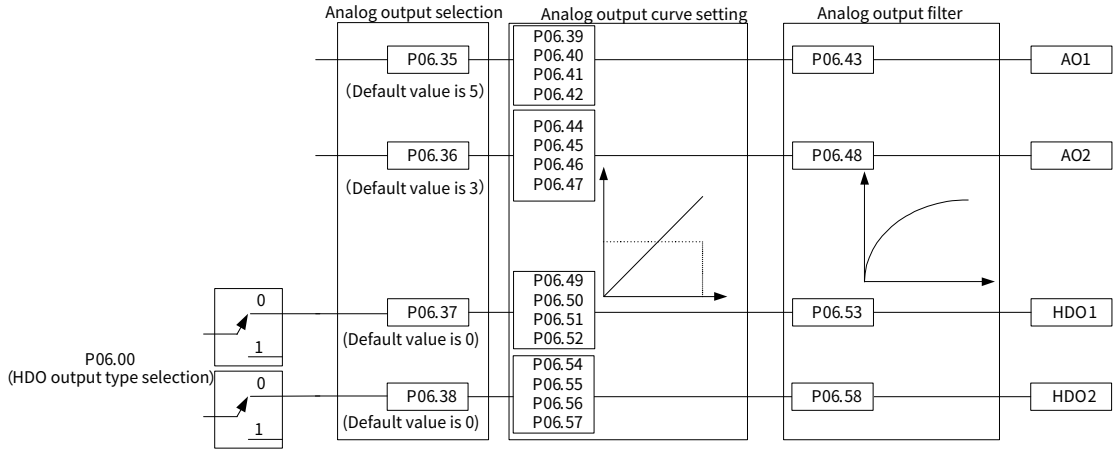


Input filter time: to adjust the sensitivity of analog input. Increasing the value properly can enhance analog input anti-interference but may reduce the sensitivity of analog input.

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

6.7.2 Analog output

The regenerative rectifier control unit carries two analog output terminals AO1 and AO2 with input range being 0–10V/0–20mA, and whether AO1 or AO2 uses voltage output or current output can be set through J6 or J7, and two high-speed pulse output terminals. Analog output signals can be filtered separately, and the proportional relation can be adjusted by setting the max. value, min. value, and the percentage of their corresponding output. The analog output signals can output bus voltage, grid frequency, grid current , grid voltage input power, max unit temperature in a certain proportion.



P06.00	Ones: HDO1 output type Tens: HDO2 output type 0: Open collector high-speed pulse output 1: Open collector output	P06.35 , P06.36 , P06.37 , P06.38 output signal source					
		0	Invalid	1	Digital	2	Other-C connector
		3	Actual bus voltage	4	Grid frequency	5	Grid current
		6	Grid voltage	7	Input frequency	8	Max. unit temperature

Function code	Name	Description	Setting range	Default
P06.35	AO1 signal source	0: Disable 1: Digital (4096 indicates 100%, for example, 2048 indicates 50%) 2: Other-C connector (4096 indicates 100%, for example, 2048 indicates 50%) 3: Actual bus voltage 4: Grid frequency 5: Grid current 6: Grid voltage 7: Input power 8: Max unit temperature	0–10	5
P06.36	AO2 signal source		0–10	3
P06.37	HDO1-as-HighSpeedPulseOutput signal source		0–10	0
P06.38	HDO2-as-HighSpeedPulseOutput signal source		0–10	0

Related parameter list:

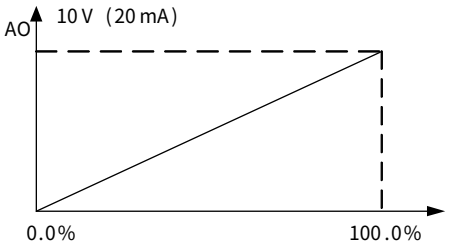
Function code	Name	Description	Setting range	Default
P06.39	AO1 curve min. output rate	-600.0%–P06.41	-600.0–600.0	0%
P06.40	AO1 curve min. output value	0.000V–P06.42	0.000–10.000	0.000V
P06.41	AO1 curve max output rate	P06.39–600.0%	-600.0–600.0	100.0%
P06.42	AO1 curve max output value	P06.40–10.000V	0.000–10.000	10.000V
P06.43	AO1 output filter time	0.000–10.000s	0.000–10.000	0.000s
P06.44	AO2 curve min. output rate	-600.0%–P06.46	-600.0–600.0	0.0%
P06.45	AO2 curve min. output value	0.000V–P06.47	0.000–10.000	0.000V
P06.46	AO2 curve max output rate	P06.44–600.0%	-600.0–600.0	100.0%
P06.47	AO2 curve max output value	P06.45–10.000V	0.000–10.000	10.000V
P06.48	AO2 output filter time	0.000–10.000s	0.000–10.000	0.000s
P06.49	HDO1-as-HighSpeedPulseOutput lower limit	-600.0%–P06.51	-600.0%–P06.51	0.0%

Function code	Name	Description	Setting range	Default
P06.50	HDO1 output corresponding to lower limit	0.00–50.00kHz	0.00–50.00	0.00kHz
P06.51	HDO1-as-HighSpeedPulseOutput upper limit	P06.49–600.0%	P06.49–600.0	100.0%
P06.52	HDO1 output corresponding to upper limit	0.00–50.00kHz	0.00–50.00	50.00kHz
P06.53	HDO1-as-HighSpeedPulseOutput filter time	0.000–10.000s	0.000–10.000	0.000s
P06.54	HDO2-as-HighSpeedPulseOutput lower limit	-600.0%–P06.56	-600.0–P06.56	0.00%
P06.55	HDO2 output corresponding to lower limit	0.00kHz – P00.57	0.00–50.00	0.00kHz
P06.56	HDO2-as-HighSpeedPulseOutput upper limit	P06.54–600.0%	P06.54–600.0	100.0%
P06.57	HDO2 output corresponding to upper limit	P06.55–50.00kHz	0.00–50.00	50.00kHz
P06.58	HDO2-as-HighSpeedPulseOutput filter time	0.000–10.000s	0.000–10.000	0.000s

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

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

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



6.7.3 AI&AO calibration

Note: The following uses only AO1 and AI1 for example.

- **AO voltage calibration**

Step 1 Short the AO terminal short cap to the voltage position, and set P06.25 (AO1 type) to 0 (0–10V).

Step 2 Set P06.35 (AO1 signal source) to 1 (Digital) with the corresponding value set to 0.

Step 3 Using a multimeter, measure the voltage between AO1 and GND, and enter the measured voltage value to P98.21 (Actual voltage value of AO1 for 0V).

Step 4 Set P06.35 (AO1 signal source) to 1 (Digital) with the corresponding value set to 4096.

Step 5 Using a multimeter, measure the voltage between AO1 and GND, and enter the measured voltage value to P98.22 (Actual voltage value of AO1 for 10V).

Step 6 AO voltage calibration is completed.

Function code	Name	Description	Setting range	Default
P06.25	AO1 type	0: 0–10V 1: 0–20mA	0–1	0
P06.35	AO1 signal source	0: Disable 1: Digital (4096 indicates 100%, for example, 2048 indicates 50%)	0–8	0

Function code	Name	Description	Setting range	Default
		2: Other-C connector (4096 indicates 100%, for example, 2048 indicates 50%) 3: Actual bus voltage 4: Grid frequency 5: Grid current 6: Grid voltage 7: Input power 8: Max unit temperature		
P98.21	Actual voltage value of AO1 for 0V	-1.000–12.500V	-1.000–12.500	0.000V
P98.22	Actual voltage value of AO1 for 10V	-1.000–12.500V	-1.000–12.500	10.000V

- **AO current calibration**

Step 1 Short the AO terminal short cap to the Current position, and set P06.25 (AO1 type) to 1 (0–20mA).

Step 2 Set P06.35 (AO1 signal source) to 1 (Digital) with the corresponding value set to 0.

Step 3 Using a multimeter, measure the voltage between AO1 and GND, and enter the measured current value to P98.23 (Actual current value of AO1 for 0mA output).

Step 4 Set P06.35 (AO1 signal source) to 1 (Digital) with the corresponding value set to 4096.

Step 5 Using a multimeter, measure the current between AO1 and GND, and enter the measured current value to P98.24 (Actual current value of AO1 for 20mA output).

Step 6 AO current calibration is completed.

Function code	Name	Description	Setting range	Default
P06.25	AO1 type	0: 0–10V 1: 0–20mA	0–1	0
P06.35	AO1 signal source	0: Disable 1: Digital (4096 indicates 100%, for example, 2048 indicates 50%) 2: Other-C connector (4096 indicates 100%, for example, 2048 indicates 50%) 3: Actual bus voltage 4: Grid frequency 5: Grid current 6: Grid voltage 7: Input power 8: Max unit temperature	0–10	0
P98.23	Actual current value of AO1 for 0mA output	-2.000–25.000mA	-2.000–25.000	0.000mA
P98.24	Actual current value of AO1 for 20mA output	-2.000–25.000mA	-2.000–25.000	20.000mA

- **AI voltage calibration**

Step 1 Set P05.47 (Enabling AI1) to Enable and set P05.48 (AI1 type) to 3 (-10–+10V).

Step 2 Using the calibrated AO voltage as the input for the AI terminals, set P06.25 (AO1 type) to 0 (0–10V), set P06.35 (AO1 signal source) to 1 (Digital) with the corresponding value set to 0, and view P98.01 (AI1 voltage input AD value).

Step 3 Set P98.03 (AI1 reference voltage 1 AD value) to the read value of P98.01 (AI1 voltage input AD value).

Step 4 Set P06.25 (AO1 type) to 0 (0–10V), set P06.35 (AO1 signal source) to 1 (Digital) with the corresponding value set to 4096, and view P98.01 (AI1 voltage AD input value).

Step 5 Set P98.05 (AI1 reference voltage 2 AD value) to the read value of P98.01 (AI1 voltage AD input value).

Step 6 AI voltage calibration is completed.

- **AI current calibration**

Step 1 Set P05.47 (Enabling AI1) to Enable and set P05.48 (AI1 type) to 1 (0–20mA).

Step 2 Using the calibrated AO voltage as the input for the AI terminals, set P06.25 (AO1 type) to 1 (0–20mA), set P06.35 (AO1 signal source) to 1 (Digital) with the corresponding value set to 0, and view P98.06 (AI1 current input AD value).

Step 3 Set P98.08 (AI1 reference current 1 AD value) to the read value of P98.01 (AI1 voltage AD input value).

Step 4 Set P06.25 (AO1 type) to 0 (0–10V), set P06.35 (AO1 signal source) to 1 (Digital) with the corresponding value set to 4096, and view P98.06 (AI1 current input AD value).

Step 5 Set P98.10 (AI1 reference current 2 AD value) to the read value of P98.06 (AI1 current input AD value).

Step 6 AI current calibration is completed.

Related function parameters

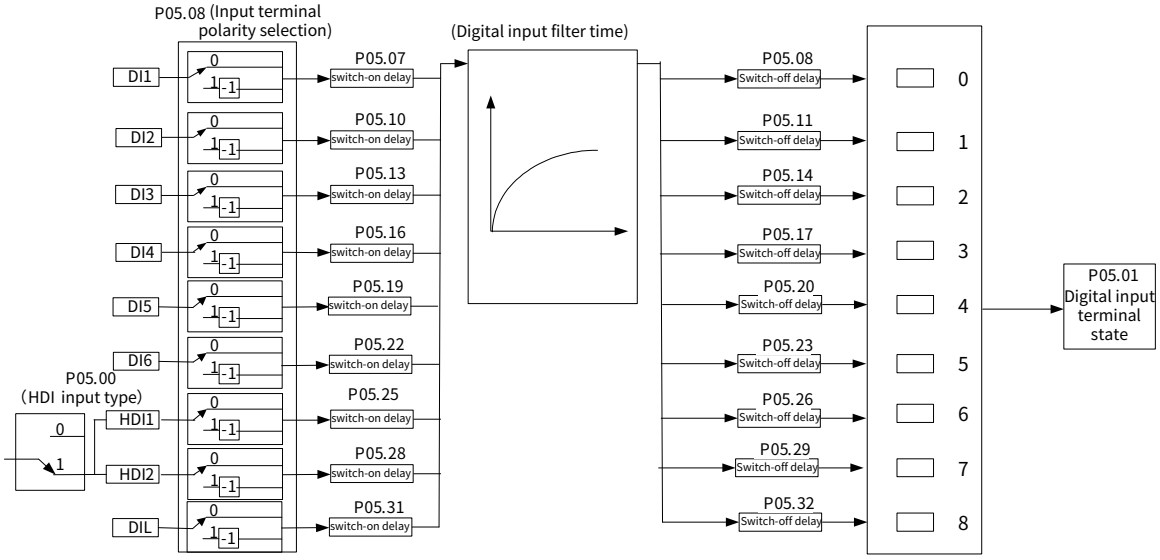
<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Setting range</th><th>Default</th></tr>
<tr><td>P05.47</td><td>Enabling AI1</td><td rowspan="2">0: Disable (AI1, AI2 input forced to 0)
1: Enable
2: Other-B connector
3: DI1
4: DI2
5: DI3
6: DI4
7: DI5
8: DI6
9: HDI1
10: HDI2</td><td rowspan="2">0–10</td><td rowspan="2">0</td></tr>
<tr><td>P05.58</td><td>Enabling AI2</td></tr>
<tr><td>P05.48</td><td>AI1 type</td><td rowspan="2">0: Reserved
1: 0–20mA
2: Reserved
3: -10V–10V</td><td rowspan="2">0–3</td><td rowspan="2">0</td></tr>
<tr><td>P05.59</td><td>AI2 Type</td></tr>
<tr><td>P06.25</td><td>AO1 type</td><td rowspan="2">0: 0–10V
1: 0–20mA
2: 4–20mA</td><td rowspan="2">0–2</td><td rowspan="2">0</td></tr>
<tr><td>P06.26</td><td>AO2 type</td></tr>
<tr><td>P06.35</td><td>AO1 signal source</td><td>0: Disable
1: Digital (4096 indicates 100%, for example, 2048 indicates 50%)</td><td>0–10</td><td>0</td></tr>
</table>

Function code	Name	Description	Setting range	Default
P06.36	AO2 signal source	2: Other-C connector (4096 indicates 100%, for example, 2048 indicates 50%) 3: Actual bus voltage 4: Grid frequency 5: Grid current 6: Grid voltage 7: Input power 8: Max unit temperature		
P98.01	AI1 voltage input AD value	0–4095	0–4095	0
P98.03	AI1 reference voltage 1 AD value	0–4095	0–4095	2048
P98.05	AI1 reference voltage 2 AD value	0–4095	0–4095	4095
P98.06	AI1 current input AD value	0–4095	0–4095	0
P98.08	AI1 reference current 1 AD value	0–4095	0–4095	2048
P98.10	AI2 reference current 2 AD value	0–4095	0–4095	4095
P98.11	AI2 voltage input AD value	0–4095	0–4095	0
P98.13	AI2 reference voltage 1 AD value	0–4095	0–4095	2048
P98.15	AI2 reference voltage 2 AD value	0–4095	0–4095	4095
P98.16	AI2 current input AD value	0–4095	0–4095	0
P98.18	AI2 reference current 1 AD value	0–4095	0–4095	2048
P98.20	AI2 reference current 2 AD value	0–4095	0–4095	4095
P98.21	Actual voltage value of AO1 for 0V	-1.000–12.500V	-1.000–12.500	0.000V
P98.22	Actual voltage value of AO1 for 10V	-1.000–12.500V	-1.000–12.500	10.000V
P98.23	Actual current value of AO1 for 0mA output	-2.000–25.000mA	-2.000–25.000	0.000mA
P98.24	Actual current value of AO1 for 20mA output	-2.000–25.000mA	-2.000–25.000	20.000mA
P98.25	Actual voltage value of AO2 for 0V	-1.000–12.500V	-1.000–12.500	0.000V
P98.26	Actual voltage value of AO2 for 10V	-1.000–12.500V	-1.000–12.500	10.000V

Function code	Name	Description	Setting range	Default
P98.27	Actual current value of AO2 for 0mA output	-2.000–25.000mA	-2.000–25.000	0.000mA
P98.28	Actual current value of AO2 for 20mA output	-2.000–25.000mA	-2.000–25.000	20.000mA

6.7.4 Digital input

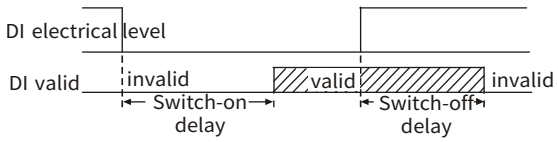
The regenerative rectifier control unit carries six programmable digital input terminals, two HDI input terminals, and one DIL terminal. The function of all the digital input terminals can be programmed through function codes. The HDI input terminals can be selected as either high speed pulse input terminals or normal digital input terminals through function code setting; DIL is a special input terminal, when its input is valid, all other input terminals are forced invalid, namely, the states of DI1–DI6 and HDI1–HDI2 are all 0 after processing.



Function code	Name	Description	Setting range	Default
P05.06	DI1 filter time	0.000–1.000s	0.000–1.000	0.010s
P05.07	DI1 switch-on delay	0.00–360.00s	0.00–360.00	0.00s
P05.08	DI1 switch-off delay	0.00–360.00s	0.00–360.00	0.00
P05.09	DI2 filter time	0.000–1.000s	0.000–1.000	0.010s
P05.10	DI2 switch-on delay	0.00–360.00s	0.00–360.00	0.00s
P05.11	DI2 switch-off delay	0.00–360.00s	0.00–360.00	0.00s
P05.12	DI3 filter time	0.000–1.000s	0.000–1.000	0.010s
P05.13	DI3 switch-on delay	0.00–360.00s	0.00–360.00	0.00s
P05.14	DI3 switch-off delay	0.00–360.00s	0.00–360.00	0.00s
P05.15	DI4 filter time	0.000–1.000s	0.000–1.000	0.010s
P05.16	DI4 switch-on delay	0.00–360.00s	0.00–360.00	0.00s
P05.17	DI4 switch-off delay	0.00–360.00s	0.00–360.00	0.00s
P05.18	DI5 filter time	0.000–1.000s	0.000–1.000	0.010s
P05.19	DI5 switch-on delay	0.00–360.00s	0.00–360.00	0.00s
P05.20	DI5 switch-off delay	0.00–360.00s	0.00–360.00	0.00s

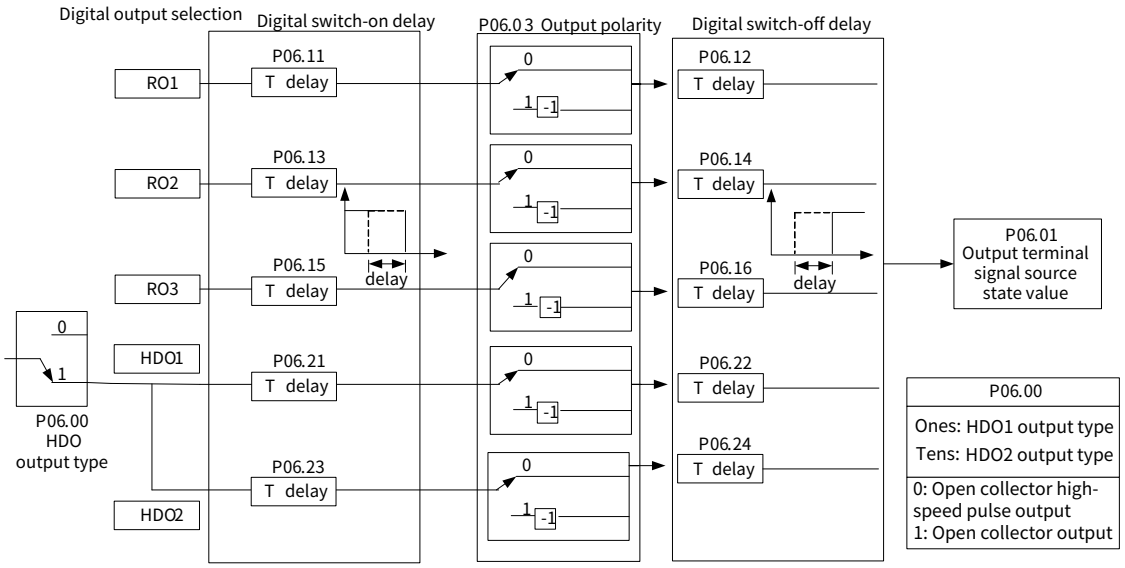
Function code	Name	Description	Setting range	Default
P05.21	DI6 filter time	0.000–1.000s	0.000–1.000	0.010s
P05.22	DI6 switch-on delay	0.00–360.00s	0.00–360.00	0.00s
P05.23	DI6 switch-off delay	0.00–360.00s	0.00–360.00	0.00s
P05.24	HDI1 filter time (Digital)	0.000–1.000s	0.000–1.000	0.010s
P05.25	HDI1 switch-on delay (Digital)	0.00–360.00s	0.00–360.00	0.00s
P05.26	HDI1 switch-off delay (Digital)	0.00–360.00s	0.00–360.00	0.00s
P05.27	HDI2 filter time (Digital)	0.000–1.000s	0.000–1.000	0.010s
P05.28	HDI2 switch-on delay (Digital)	0.00–360.00s	0.00–360.00	0.00s
P05.29	HDI2 switch-off delay (Digital)	0.00–360.00s	0.00–360.00	0.00s
P05.30	DIL filter time (Digital)	0.000–1.000s	0.000–1.000	0.010s
P05.31	DIL switch-on delay (Digital)	0.00–360.00s	0.00–360.00	0.00s
P05.32	DIL switch-off delay (Digital)	0.00–360.00s	0.00–360.00	0.00s

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



6.7.5 Digital output

The regenerative rectifier control unit carries three relay output terminals and two high-speed pulse output (HDO) terminals. All the digital output terminal functions can be used for programming through function code setting. The HDO terminals select high-speed pulse output or digital output through function code setting.



0	Low level	1	High level	2	Other - B connector
3	Ready for startup	4	Pre-charging	5	Main circuit breaker closing
6	Running	7	VFD fault	8	VFD alarm
9	Running time arrival				

- **Digital output terminal function selection**

Function code	Name	Description	Setting range	Default
P06.04	RO1 signal source	0: Low level 1: High level 2: Other-B connector 3: Startup preparation complete 4: Precharging 5: Main circuit breaker closing 6: Run 7: VFD in fault 8: VFD alarm 9: Running time reached	0–16	0
P06.05	RO2 signal source		0–16	7
P06.06	RO3 signal source		0–16	0
P06.09	HDO1-as-DO signal source		0–16	0
P06.10	HDO2-as-DO signal source		0–16	0

Note: When the output terminals RO1, RO2, and RO3 are selected as the main circuit breaker control in P02.47, the signal source shown in the above figure cannot be set for the RO terminal.

- **Terminal function parameter setting**

Function code	Name	Description	Setting range	Default
P06.03	Output terminal polarity selection	HDO2, HDO1, DO2, DO1, RO3, RO2, RO1 in sequence	0x00–0x7F	0x00

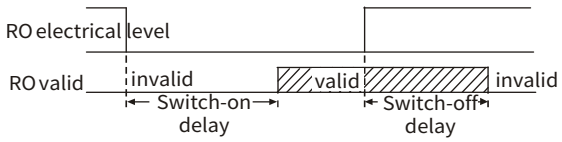
The function code is used to set the polarity of output terminals.

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

Bit6	Bit5	Bit2	Bit1	Bit0
HDO2	HDO1	RO3	R02	RO1

Function code	Name	Description	Setting range	Default
P06.11	RO1 switch-on delay	0.00–360.00s	0.00–360.00	0.00s
P06.12	RO1 switch-off delay	0.00–360.00s	0.00–360.00	0.00s
P06.13	RO2 switch-on delay	0.00–360.00s	0.00–360.00	0.00s
P06.14	RO2 switch-off delay	0.00–360.00s	0.00–360.00	0.00s
P06.15	RO3 switch-on delay	0.00–360.00s	0.00–360.00	0.00s
P06.16	RO3 switch-off delay	0.00–360.00s	0.00–360.00	0.00s
P06.21	HDO1-as-DO switch-off delay	0.00–360.00s	0.00–360.00	0.00s
P06.22	HDO1-as-DO switch-off delay	0.00–360.00s	0.00–360.00	0.00s
P06.23	HDO2-as-DO switch-on delay	0.00–360.00s	0.00–360.00	0.00s
P06.24	HDO2-as-DO switch-off delay	0.00–360.00s	0.00–360.00	0.00s

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



6.8 HMI

6.8.1 User password

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

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

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

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

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

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

6.8.2 Function selection of LOC/REM

Function code	Name	Description	Setting range	Default
P01.09	LOC/REM (QUICK/JOG on LED keypad) function selection	0: No function 1: Reserved 2: Shift key to switch the display state 3: Reserved 4: Reserved 5: OFF2 stop 6: Local and remote switching	0–6	6

The function code is used to set the function of the LOC/REM key.

0: No function

1: Reserved

2: Shift key to switch the display state. Press the LOC/REM key to shift the selected function code. For details, see the description for P24.08, P24.09, and P24.10.

3: Reserved

4: Reserved

5: OFF2 stop. Press the LOC/REM key to achieve emergency stop.

6: Local/remote command switching. Switch between local and remote control command channels.

The LOC/REM key on the LCD keypad (or the QUICK/JOG key on the LED keypad) is used for local/remote command switching, impacting the control channel and start/stop CW source settings; when the LOC/REM key function is selected as local/remote command switching (P01.56=6), press this key to switch between the local control channel and the remote control channel. When the local command channel is used, the control channel start/stop CW source is forcibly set to the keypad control; when the remote command channel is used, the control channel start/stop CW source is forcibly set the control channel specified by P02.00 and corresponding setting.

Related function codes:

Function code	Name	Description	Setting range	Default
P24.08	Selection of parameters to be displayed in the stop state	Bit0: Reserved Bit1: Bus voltage (V on) Bit2: Input voltage Bit3: Input terminal state Bit4: Output terminal state Bit5–Bit7: Reserved Bit8: AI1 (V on) Bit9: AI2 (V on) Bit10: High-speed pulse HDI1 frequency Bit11: High-speed pulse HDI2 frequency Bit12–Bit15: Reserved	0x0000–0xFFFF	0x000E
P24.09	Selection 1 of parameters to be displayed in the	0x0000–0xFFFF Bit0–Bit1: Reserved Bit2: Bus voltage (V on)	0x0000–0xFFFF	0x001C

Function code	Name	Description	Setting range	Default
	running state	Bit3: Input voltage (V on) Bit4: Input current (A on) Bit5: Reserved Bit6: Input power (% on) Bit7–Bit9: Reserved Bit10: Input terminal status Bit11: Output terminal state Bit12–Bit15: Reserved		
P24.10	Selection 2 of parameters to be displayed in the running state	0x0000–0xFFFF Bit0: AI1 (V on) Bit 1: AI2 value (V on) Bit 2: High-speed pulse HDI1 frequency Bit 3: High-speed pulse HDI2 frequency Bit4: Reserved Bit5: VFD overload percentage (% on) Bit6–Bit15: Reserved	0x0000–0xFFFF	0x0000

In running state, the parameter display is restricted by P24.09 and P24.06. For a 16-bit binary number, if a bit is 1, the parameter corresponding to this bit can be viewed through the >>/SHIFT key during running. If this bit is 0, the parameter corresponding to this bit is not displayed. When setting P24.09 or P24.10, convert the binary number to an hex number before the input to the function code. The method for setting P24.08 is similar to that for P24.09. In stopped state, the parameter display is restricted by P24.08.

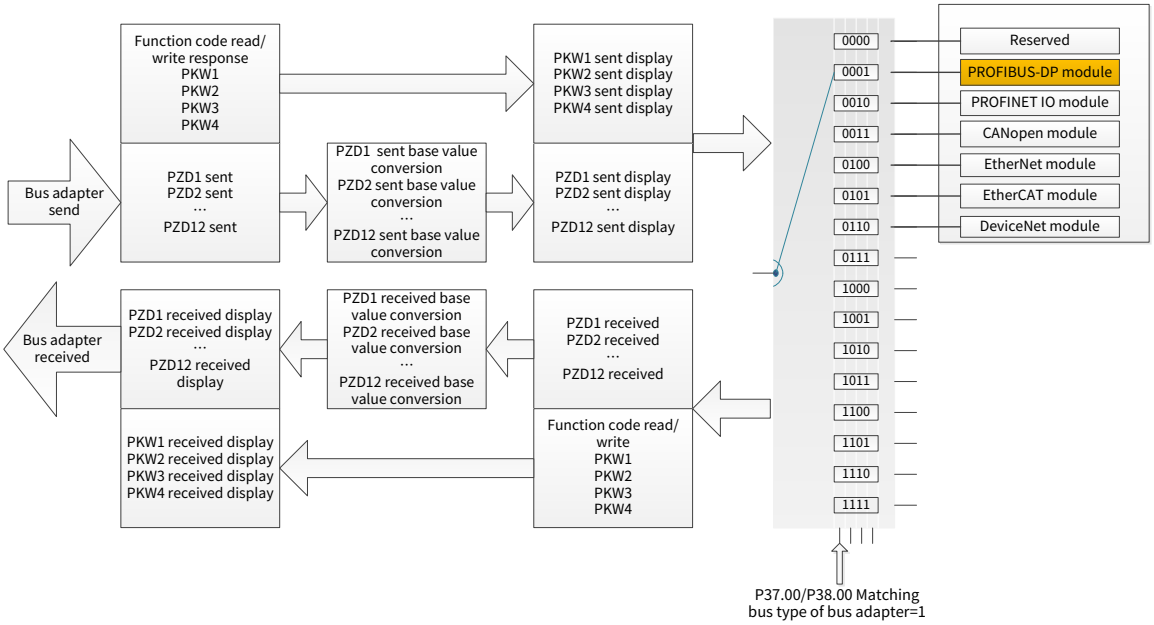
6.9 Bus adapter

The product has two bus adapters, bus adapter A whose function codes are in group P37 Combination adapter B whose function codes are in group P38. The supported bus types are as follows.

Function code	Name	Description	Setting range	Default
P37.00	Bus adapter supporting bus type	0: None 1: PROFIBUS-DP module 2: PROFINET IO module 3: CANopen module 4: Reserved 5: Reserved 6: Reserved The setting of P37.00 must be different from that of P38.00, which is automatically processed in the software; if two identical cards are required, use a redundant bus. For example, if bus adapter B selects the PROFINET module but multiple PROFINET expansion cards are inserted into the card slots, the card with the smallest slot number will automatically be the valid expansion card; other types of cards comply	0–6	1
P38.00				2

Function code	Name	Description	Setting range	Default
		with the same rule.		

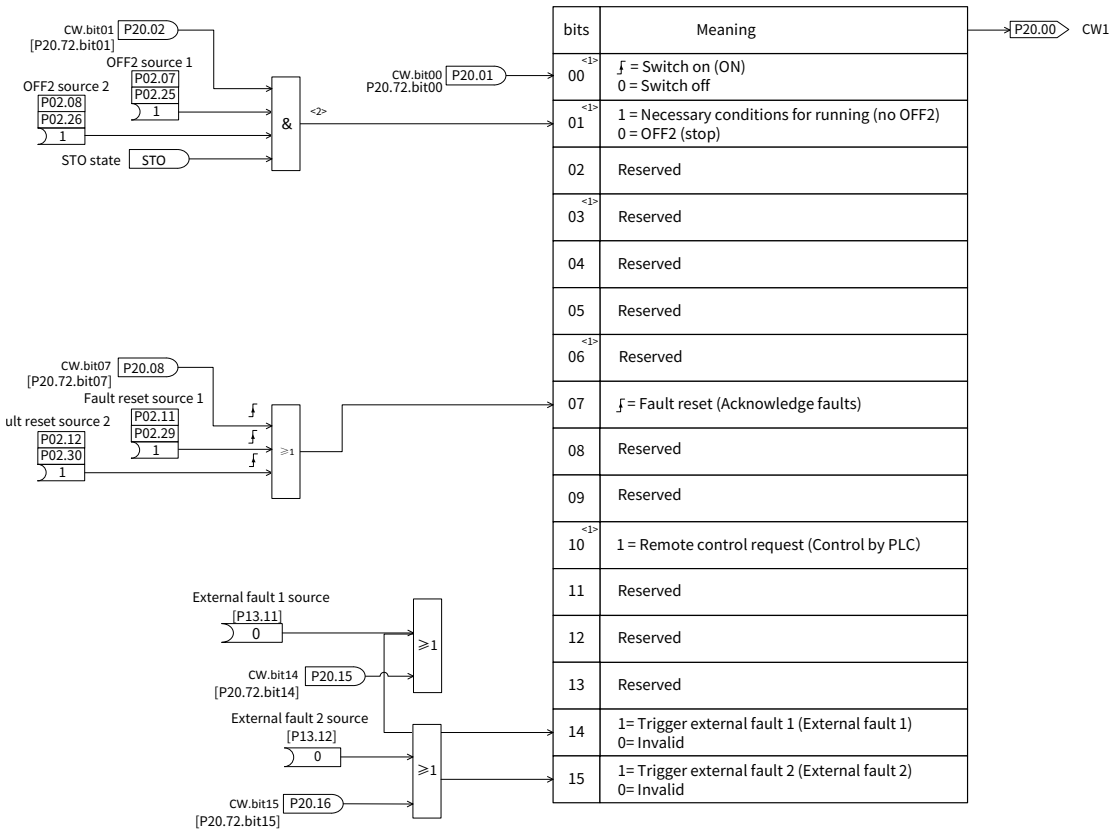
The bus adapter data flow is shown as follows.



Bus adapter CW source:

Function code	Name	Description	Setting range	Default
P37.94	Bus adapter A CW 1 source	0: 0 1: Keypad (0–65535) 2: Other-C connector (2: P37.82)	0–2	2
P38.94	Bus adapter B CW 1 source	0: 0 1: Keypad (0–65535) 2: Other-C connector (2: P38.82)	0–2	2

The default CW source of a bus adapter is PZD1, and the corresponding bit information for CW 1 is as follows.



Note: If the PLC controls start/stop, bit 10 of CW 1 must be set to 1.

Bus adapter communication disconnection is handled as follows:

When the system does not receive correct data frames and the duration of this situation exceeds the communication disconnection detection delay time P37.98 (for bus adapter A) or P38.98 (for bus adapter B), the system bus adapter communication disconnection flag is set, and a fault or alarm can be reported for the communication disconnection.

Function code	Name	Description	Setting range	Default
P37.98	Communication disconnection detection delay for bus adapter A	0: No detection 0.00–60.00s	0.00–60.00	0.00s
P37.99	Communication disconnection handling for bus adapter A	0: Report a fault 1: Report an alarm, and keeps running	0–1	0
P38.98	Communication disconnection detection delay for bus adapter B	0: No detection 0.00–60.00s	0.00–60.00	0.00s
P38.99	Communication disconnection handling for bus adapter B	0: Report a fault 1: Report an alarm, and keeps running	0–1	0

Bus adapter related function codes

Function code	Name	Description	Setting range	Default
P37.00	Bus adapter supporting bus type	0: None 1: PROFIBUS-DP module 2: PROFINET IO module 3: CANopen module The setting of P37.00 must be different from that of P38.00, which is automatically processed in the software; if two identical cards are required, use a redundant bus. For example, if bus adapter A selects the DP module but multiple DP expansion cards are inserted into the card slots, the card with the smallest slot number will automatically be the valid expansion card; other types of cards comply with the same rule.	0–6	1
P37.02–P37.13	Sent PZD1 source – Sent PZD12 source	0: 0 1: Keypad (0–65535) 2: Other-C connector 3: AI1 4: AI2 5: HDI1 6: HDI2	0–6	2(P20.34)
P37.14, P37.16, P37.18, P37.20, P37.22, P37.24, P37.26, P37.28, P37.30, P37.32, P37.34, P37.36	Conversion base value numerator of sent PZD1 – Conversion base value numerator of sent PZD12	0–65535 Sent PZD = Link (Sent PZD source) * Sent PZD conversion base value numerator / Sent PZD conversion base value denominator.	0–65535	1
P37.15, P37.17, P37.19, P37.21,	Conversion base value denominator of sent PZD1 – Conversion base value	1–65535	1–65535	1

Function code	Name	Description	Setting range	Default
P37.23, P37.25, P37.27, P37.29, P37.31, P37.33, P37.35, P37.37,	denominator of sent PZD12			
P37.38, P37.40, P37.42, P37.44, P37.46, P37.48, P37.50, P37.52, P37.54, P37.56, P37.58, P37.60,	Conversion base value numerator of received PZD1 – Conversion base value numerator of received PZD12	0–65535 Received PZD data display = Received PZD * Received PZD conversion base value numerator / Received PZD conversion base value denominator.	0–65535	1
P37.39, P37.41, P37.43, P37.45, P37.47, P37.49, P37.51, P37.53, P37.55, P37.57, P37.59, P37.61	Conversion base value denominator of received PZD1 – Conversion base value denominator of received PZD12	1–65535	1–65535	1
P37.62–P37.65	Sent PKW1 data display – Sent PKW4 data display	0x0000–0xFFFF	0x0000–0xFFFF	0x0000
P37.66–P37.77	Sent PZD1 data display – Sent PZD12 data display	0x0000–0xFFFF Sent PZD data display = Link (Sent PZD source) * Sent PZD conversion base value numerator / Sent PZD conversion base value denominator.	0x0000–0xFFFF	0x0000
P37.78–P37.81	Received PKW1 data display – Received PKW4 data display	0x0000–0xFFFF PKW physically received data	0x0000–0xFFFF	0x0000
P37.82	Received PZD1 data display (PZD1)	0x0000–0xFFFF Received PZD data display = PZD physically received data with base value processed + Data with polarity processed.	0x0000–0xFFFF	0x0000
P37.83	Received PZD2 data display (PZD2)	0x0000–0xFFFF Received PZD data display = PZD	0x0000–0xFFFF	0x0000

Function code	Name	Description	Setting range	Default
		physically received data with base value processed + Data with polarity processed.		
P37.84–P37.93	Received PZD3 data display – Received PZD12 data display	0x0000–0xFFFF Received PZD data display = PZD physically received data with base value processed.	0x0000–0xFFFF	0x0000
P37.94	Bus adapter A CW 1 source	0: 0 1: Keypad (0–65535) 2: Other-C connector (2: P37.82)	0–2	2
P37.96	Bus adapter A received PZD1 polarity	0x0000–0xFFFF	0x0000–0xFFFF	0x0000
P37.97	Bus adapter A received PZD2 polarity	0x0000–0xFFFF	0x0000–0xFFFF	0x0000
P37.98	Communication disconnection detection delay	0.00: No detection 0.00–60.00s	0.00–60.00	0.00s
P37.99	Communication disconnection handling	0: Report a fault 1: Report an alarm, and keeps running	0–1	0
P38.00	Bus adapter supporting bus type	0: None 1: PROFIBUS-DP module 2: PROFINET IO module 3: CANopen module 4–6: Reserved The setting of P37.00 must be different from that of P38.00, which is automatically processed in the software; if two identical cards are required, use a redundant bus. For example, if bus adapter A selects the DP module but multiple DP expansion cards are inserted into the card slots, the card with the smallest slot number will automatically be the valid expansion card; other types of cards comply with the same rule.	0–6	1
P38.02–P38.13	Sent PZD1 source – Sent PZD12 source	0: 0 1: Keypad (0–65535) 2: Other-C connector 3: AI1 4: AI2 5: HDI1 6: HDI2	0–6	2
P38.14, P38.16, P38.18, P38.20, P38.22, P38.24, P38.26, P38.28,	Conversion base value numerator of sent PZD1 – Conversion base value numerator of sent PZD12	0–65535 Sent PZD = Link (Sent PZD source) * Sent PZD conversion base value numerator / Sent PZD conversion base value denominator.	0–65535	1

Function code	Name	Description	Setting range	Default
P38.30, P38.32, P38.34, P38.36				
P38.15, P38.17, P38.19, P38.21, P38.23, P38.25, P38.27, P38.29, P38.31, P38.33, P38.35, P38.37	Conversion base value denominator of sent PZD1 – Conversion base value denominator of sent PZD12	1–65535	1–65535	1
P38.38, P38.40, P38.42, P38.44, P38.46, P38.48, P38.50, P38.52, P38.54, P38.56, P38.58, P38.60	Conversion base value numerator of received PZD1 – Conversion base value numerator of received PZD12	0–65535 Received PZD data display = Received PZD * Received PZD conversion base value numerator / Received PZD conversion base value denominator.	0–65535	1
P38.39, P38.41, P38.43, P38.45, P38.47, P38.49, P38.51, P38.53, P38.55, P38.57, P38.59, P38.61	Conversion base value denominator of received PZD1 – Conversion base value denominator of received PZD12	1–65535	1–65535	1
P38.62–P38.65	Sent PKW1 data display – Sent PKW4 data display	0x0000–0xFFFF	0x0000–0xFFFF	0x0000
P38.66–P38.77	Sent PZD1 data display – Sent PZD12 data display	0x0000–0xFFFF Sent PZD data display = Link (Sent PZD source) * Sent PZD conversion base value numerator / Sent PZD conversion base value denominator.	0x0000–0xFFFF	0x0000
P38.78–P38.81	Received PKW1 data display – Received PKW4 data	0x0000–0xFFFF PKW physically received data	0x0000–0xFFFF	0x0000

Function code	Name	Description	Setting range	Default
	display			
P38.82	Received PZD1 data display (PZD1)	0x0000–0xFFFF Received PZD data display = PZD physically received data with base value processed + Data with polarity processed	0x0000–0xFFFF	0x0000
P38.83	Received PZD2 data display (PZD2)	0x0000–0xFFFF Received PZD data display = PZD physically received data with base value processed + Data with polarity processed	0x0000–0xFFFF	0x0000
P38.84–P38.93	Received PZD3 data display – Received PZD12 data display	0x0000–0xFFFF Received PZD data display = PZD physically received data with base value processed	0x0000–0xFFFF	0x0000
P38.94	Bus adapter B CW 1 source	0: 0 1: Keypad (0–65535) 2: Other-C connector (2: P38.82)	0–2	2
P38.96	Bus adapter B received PZD1 polarity	0x0000–0xFFFF	0x0000–0xFFFF	0x0000
P38.97	Bus adapter B received PZD2 polarity	0x0000–0xFFFF	0x0000–0xFFFF	0x0000
P38.98	Communication disconnection detection delay	0: No detection 0.00–60.00s	0.00–60.00	0.00s
P38.99	Communication disconnection handling	0: Report a fault 1: Report an alarm, and keeps running	0–1	0

6.10 Overload mode

For details about overload modes, see the relevant sections in *Goodrive880 Series Regenerative Rectifier Hardware Manual*.

The rectifier unit automatically records the real-time input current of the power module and calculates the load rate. When the module exceeds the permissible load, the "VFD overload" fault is reported. It is necessary to check whether the drive matches the load properly and the output current has exceeded the module's allowable specification.

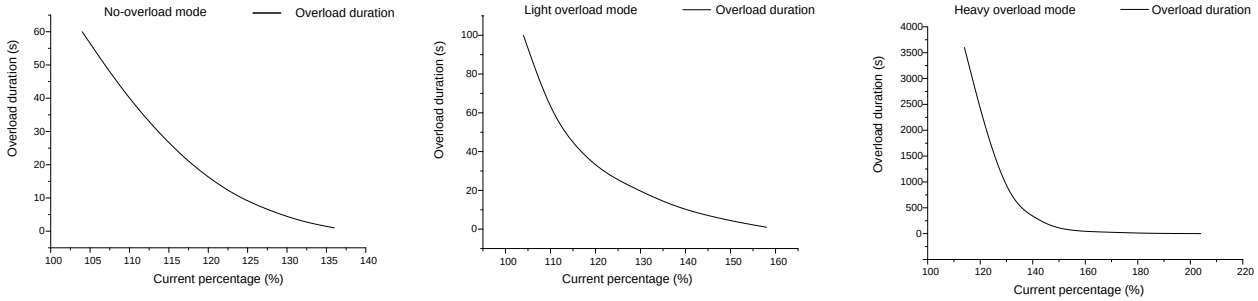
Overload mode can be set through P03.19 and P03.20. It includes no-overload mode, light-overload mode, and heavy-overload mode.

Function code	Name	Description	Setting range	Default
P03.19	Overload mode enabling	0: Disable 1: Enable	0–1	1
P03.20	Overload mode selection	0: No overload 1: Light overload 2: Heavy overload	0–2	0

After setting, the whole machine rated current and rated power are shown in the following table.

Function code	Name	Description	Setting range	Default
P07.08	Entire machine rated power	-	Model depended	0.0
P07.11	Entire machine rated current	-	Model depended	0.0

The overload mode current percentage and overload duration are shown in the following figure. The current percentage is defined as the ratio of actual current to rated current.



6.11 Fan control

The VFD fan has three running modes: normal running mode, continuous running mode after power-on, and speed regulation mode (for high-power equipment with the unit rated power greater than 90kW).

Function code	Name	Description	Setting range	Default
P01.07	Fan operating mode	0: Normal mode 1: Permanent running after power-on 2: Speed regulation mode	0–2	1

1: Normal mode

The fan will operate when the machine is running or the unit temperature exceeds P01.06 (fan startup temperature). The fan will stop running with a 30s delay after the machine is stopped and the temperature is 3°C below the fan startup temperature.

A. Set P01.07 (Fan operating mode) to 0.

B. Set P01.06 (Starting temperature of cooling fan), which takes effect only when the normal operating mode is selected as the fan working mode.

Function code	Name	Description	Setting range	Default
P01.06	Starting temperature of cooling fan	50.0–120.0°C	50.0–120.0	50°C

2: Permanent running after power-on mode

The fan is always running after equipment power-on.

Set P01.07 (Fan operating mode) to 1.

3: Speed regulation mode

Set P01.07 (Fan operating mode) to 2. The speed regulation mode automatically switches gears according to the temperature and current. There are 4 gears:

7 Fault information

The chapter tells you 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.

- Only trained and qualified professionals are allowed to carry out the operations mentioned in this chapter. Please carry out operations according to instructions presented in chapter 1 Safety precautions.

7.1 Indications of alarms and faults

Faults are indicated by indicators. For details, see chapter 4 Basic operation guidelines. When the TRIP indicator is on, the alarm or fault code displayed on the keypad indicates the rectifier unit is in abnormal state. This chapter covers most of the alarms and faults, and their possible causes and corrective measures. If you cannot find out the causes of alarms or faults, contact local INVT office.

7.2 Fault reset

The rectifier unit can be reset by pressing the keypad key STOP/RST, digital inputs, or by cutting off the power signal. After faults are removed, the rectifier unit can be started again.

7.3 Fault history

The function codes from P08.00 to P08.05 record the types of the last six faults. The function codes P08.12–P08.17 record the types of the last six faults. The function codes P08.18–P08.25, P08.26–P08.33, P08.34–P08.41 record the running data of the rectifier unit at the last three faults. The function codes P08.75–P08.92 record the time when the last three faults occurred.

Related parameter list:

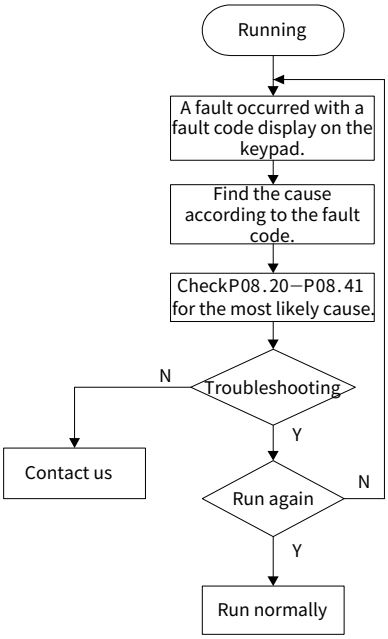
Function code	Name	Description	Setting range	Default
P08.00	Present fault code	See section9.2 Fault code list.	0.00–99.99	0.00
P08.01	Last fault code		0.00–99.99	0.00
P08.02	2nd-last fault code		0.00–99.99	0.00
P08.03	3rd-last fault code		0.00–99.99	0.00
P08.04	4th-last fault code		0.00–99.99	0.00
P08.05	5th-last fault code		0.00–99.99	0.00
P08.06	RT fault code 1	Real time (RT) faults only record fault codes, excluding the parameters at the fault time; the difference between the current fault code and the real time fault code is that if the current rectifier unit is already in the fault state, the other faults will not be logged by the current fault code and the real time fault code will still be logged.	0.00–99.99	0.00
P08.07	RT fault code 2		0.00–99.99	0.00
P08.08	RT fault code 3		0.00–99.99	0.00
P08.09	RT fault code 4		0.00–99.99	0.00
P08.10	RT fault code 5		0.00–99.99	0.00
P08.11	RT fault code 6		0.00–99.99	0.00
P08.12	Present alarm code 1	DSP–CPU2 alarm codes: A50.nn–A99.nn DSP–CPU1 alarm codes: A11.nn–A49.nn	0.00–99.99	0.00
P08.13	Last alarm code 2		0.00–99.99	0.00

Function code	Name	Description	Setting range	Default
P08.14	2nd-last alarm code 3	Unit alarm codes: A01.nn–A10.nn Alarm: nn=0–99	0.00–99.99	0.00
P08.15	3rd-last alarm code 4		0.00–99.99	0.00
P08.16	4th-last alarm code 5		0.00–99.99	0.00
P08.17	5th-last alarm code 6		0.00–99.99	0.00
P08.18–P08.19	Reserved	-	-	-
P08.20	Grid voltage at present fault	0–1200V	0–1200	0V
P08.21	Input current at present fault	0.0–3000.0A	0.0–3000.0	0.0A
P08.22	Bus voltage at present fault	0.0–2000.0V	0.0–2000.0	0.0V
P08.23	Max. temperature at present fault	-20.0–120.0°C	-20.0–120.0	0.0°C
P08.24	Input terminal state at present fault	0x0000–0xFFFF	0x0000–0xFFFF	0x0000
P08.25	Output terminal status at present fault	0x0000–0xFFFF	0x0000–0xFFFF	0x0000
P08.26–P08.27	Reserved	-	-	-
P08.28	Grid voltage at last fault	0–1200V	0–1200	0V
P08.29	Input current at last fault	0.0–3000.0A	0.0–3000.0	0.0A
P08.30	Bus voltage at last fault	0.0–2000.0V	0.0–2000.0	0.0V
P08.31	Max. temperature at last fault	-20.0–120.0°C	-20.0–120.0	0.0°C
P08.32	Input terminal status at last fault	0x0000–0xFFFF	0x0000–0xFFFF	0x0000
P08.33	Output terminal status at last fault	0x0000–0xFFFF	0x0000–0xFFFF	0x0000
P08.34–P08.35	Reserved	-	-	-
P08.36	Grid voltage at 2nd-last fault	0–1200V	0–1200	0V
P08.37	Input current at 2nd-last fault	0.0–3000.0A	0.0–3000.0	0.0A
P08.38	Bus voltage at 2nd-last fault	0.0–2000.0V	0.0–2000.0	0.0V
P08.39	Max. temperature at 2nd-last fault	-20.0–120.0°C	-20.0–120.0	0.0°C
P08.40	Input terminal status at 2nd-last fault	0x0000–0xFFFF	0x0000–0xFFFF	0x0000
P08.41	Output terminal status at 2nd-last fault	0x0000–0xFFFF	0x0000–0xFFFF	0x0000
P08.75	Present fault occur	Records the month and date when the	Mon Day	01.01

Function code	Name	Description	Setting range	Default
	month.day	fault occurred.	01.01–12.31	
P08.76	Present fault occur hour.minute	Records the hour and minute when the fault occurred.	Hour Min 00.00–23.59	00.00
P08.77	Present fault occur second	Records the second when the fault occurred.	Sec 0–59	0
P08.78	Last fault occur month.day	Records the month and date when the fault occurred.	Mon Day 01.01–12.31	01.01
P08.79	Last fault occur hour.minute	Records the hour and minute when the fault occurred.	Hour Min 00.00–23.59	00.00
P08.80	Last fault occur second	Records the second when the fault occurred.	Sec 0–59	0
P08.81	2nd-last fault occur month.day	Records the month and date when the fault occurred.	Mon Day 01.01–12.31	01.01
P08.82	2nd-last fault occur hour.minute	Records the hour and minute when the fault occurred.	Hour Min 00.00–23.59	00.00
P08.83	2nd-last Fault occur second	Records the second when the fault occurred.	Sec 0–59	0
P08.84	3rd-last fault occur month.day	Records the month and date when the fault occurred.	Mon Day 01.01–12.31	01.01
P08.85	3rd-last fault occur hour.minute	Records the hour and minute when the fault occurred.	Hour Min 00.00–23.59	00.00
P08.86	3rd-last fault occur second	Records the second when the fault occurred.	Sec 0–59	0
P08.87	4th-last fault occur month.day	Records the month and date when the fault occurred.	Mon Day 01.01–12.31	01.01
P08.88	4th-last fault occur hour.minute	Records the hour and minute when the fault occurred.	Hour Min 00.00–23.59	00.00
P08.89	4th-last Fault occur second	Records the second when the fault occurred.	Sec 0–59	0
P08.90	5th-last fault occur month.day	Records the month and date when the fault occurred.	Mon Day 01.01–12.31	01.01
P08.91	5th-last fault occur hour.minute	Records the hour and minute when the fault occurred.	Hour Min 00.00–23.59	00.00
P08.92	5th-last fault occur second	Records the second when the fault occurred.	Sec 0–59	0

7.4 Faults and solutions

The following provides fault handling information.



When a fault occurred, handle the fault as follows:

Step 1 Check whether keypad display is improper. If yes, contact the local INVT office.

Step 2 If no, check function code group P08 for the corresponding fault record parameters to determine the real state when the fault occurred.

Step 3 See the following table for a detailed solution and check for exceptions.

Step 4 Rectify the fault or ask for help.

Step 5 Ensure the fault has been rectified, perform fault reset, and run the product again.

7.4.1 Whole machine fault

Fault No.	Fault code	Fault type	Possible cause	Solution
E1101	ov	Bus overvoltage	Exception occurred to input grid voltage. Software bus overvoltage point is set too small. Large energy feedback.	Check the input power. Check P13.05. Check whether the load regenerative current is too large.
E1102	Lv	Bus undervoltage	Grid voltage too low. Software bus undervoltage point is set too large.	Check the grid input power. Check P13.06.
E1103	CUnb	Unit current imbalance	The rectifier unit models are different.	Replace the unit.
E1104	E-485	RS485 communication fault	Baud rate set improperly. Communication line fault. Incorrect communication address. Communication suffers from strong interference.	Set a proper baud rate. Check the wiring of communication interfaces. Set the communication address correctly. Change or replace the wire or improve the anti-interference capability.
E1105	SoC	Software overcurrent	Grid voltage too low. The rectifier device power is too	Check the input power. Select the rectifier device with

Fault No.	Fault code	Fault type	Possible cause	Solution
			small. Load transient or exception occurred. To-ground short circuit or output phase loss occurred. Strong external interference sources.	larger power. Check whether 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 whether there is strong interference.
E1107	EF1	External fault 1	SI external faulty input terminal action.	Check external device input.
E1108	EF2	External fault 2	SI external faulty input terminal action.	Check external device input.
E1109	EA1	External alarm 1	SI external faulty input terminal action.	Check external device input.
E1110	EA2	External alarm 2	SI external faulty input terminal action.	Check external device input.
E1112	End	Running time reached	The actual running time of the VFD is longer than the internal set running time.	Ask for the supplier and adjust the set running time.
E1113	F.bEAt	FPGA heartbeat fault	FPGA heartbeat is lost. The communication between the FPGA and DSP is abnormal.	FPGA internal program is missing or abnormal. Main control board hardware is damaged.
E1114	d.bEAt	DSP handshake fault	Abnormal handshake between dual-core chips.	Dual-core chip program mismatch.
E1116	E-FbA	Bus adapter A communication disconnection	**PROFIBUS communication fault:** The communication address is incorrect. The GSD file of the master station is set improperly. The peripheral interference is too large. **CANopen communication fault:** Line contact is poor. The build-out resistor is not removed. Communication baud rates do not match. The peripheral interference is too large.	**PROFIBUS communication fault:** Check related settings. Check the surrounding environment, and eliminate interference effects. **CANopen communication fault:** Check the line. Remove the build-out resistor. Set the same baud rate. Check the surrounding environment, and eliminate interference effects.
E1122	Cbov	Main breaker feedback timeout	No main circuit breaker signal is received.	Check whether P02.49 is set properly.

Fault No.	Fault code	Fault type	Possible cause	Solution
E1123	OFF2	OFF2 is invalid in the lockout for startup state	OFF2 is set to 1.	Check whether OFF2 source wiring is proper.
E1124	pbot	Power-on recharge timeout	Bus voltage failed to be established after the precharge is completed.	Check whether the grid voltage is too low.
E1125	-	The interval between two power-on pre-charges is less than the set time.	The time interval between two consecutive startups of the rectifier device is too small.	Check whether the value of P01.05 is smaller than the actual startup interval.
E1128	Sd	SD card fault	The SD card is not inserted or has poor contact.	Check the SD card insertion status.
E1129	-	VFD overload (warning)	Rectifier unit model is selected improperly.	Replace the rectifier unit.
E1130	E-FbB	Bus adapter B communication disconnection	**PROFIBUS communication fault:** The communication address is incorrect. The GSD file of the master station is set improperly. The peripheral interference is too large. **CANopen communication fault:** Line contact is poor. The build-out resistor is not removed. Communication baud rates do not match. The peripheral interference is too large.	**PROFIBUS communication fault:** Check related settings. Check the surrounding environment, and eliminate interference effects. **CANopen communication fault:** Check the line. Remove the build-out resistor. Set the same baud rate. Check the surrounding environment, and eliminate interference effects.
E5001	SoC	Software overcurrent	Grid voltage too low. The rectifier device power is too small. Load transient or exception occurred. To-ground short circuit or output phase loss occurred. Strong external interference sources.	Check the input power. Select the rectifier device with larger power. Check whether 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 whether there is strong interference.
E5002	HoC	Hardware overcurrent		
E5003	Gov	Grid overvoltage	Exception occurred to input grid voltage. Overvoltage point for grid voltage is abnormal.	Check the input grid voltage. Check P13.00.

Fault No.	Fault code	Fault type	Possible cause	Solution
E5004	GLv	Grid undervoltage	Exception occurred to input grid voltage. Undervoltage point for grid voltage is abnormal.	Check the input grid voltage. Check P13.01.
E5005	oL	VFD overload (fault)	Grid voltage too low. Rated current is set incorrectly. Sudden change of load is too large.	Check the grid voltage. Reset the rated current of the VFD. Check the load.
E5006	SPR	Grid phase-R loss	Unreliable grid wiring.	Check the grid wiring.
E5007	SPS	Grid phase-S loss		
E5008	SPT	Grid phase-T loss		
E5009	PLLE	Phase lock failure	Unreliable grid wiring. Exception occurred to input grid frequency.	Check the grid wiring. Check the input grid frequency.
E5012	HSE	DSP handshake fault	Abnormal handshake between dual-core chips.	Dual-core chip program mismatch.
E5013	ov	DC bus overvoltage	Exception occurred to input grid voltage. Software bus overvoltage point is set too small. Large energy feedback.	Check the input power. Check P13.05. Check whether the load regenerative current is too large.
E5014	Lv	DC bus undervoltage	Grid voltage too low. Software bus undervoltage point is set too large.	Check the grid input power. Check P13.06.
E5015	oF	Grid overfrequency	Unreliable grid wiring. The grid frequency is inconsistent with the input grid frequency.	Check the wiring. Check whether P03.21 is set properly.
E5016	LF	Grid underfrequency	Unreliable grid wiring. The grid frequency is inconsistent with the input grid frequency.	Check the wiring. Check whether P03.21 is set properly.

7.4.2 Unit fault

Fault No.	Fault code	Fault type	Possible cause	Solution
E0101–E1001	m.oUt	Unit-m VCE fault	Unit internal IGBT is damaged. Strong interference. External short circuit occurred.	Ask for technical support. Check and remove the external interference source. Check the external circuit and eliminate the load fault.
E0104–E1004	m. HoC	Unit-m hardware overcurrent fault	The IGBT inside the unit is damaged. Short circuit occurred at the	Ask for technical support. Check the external circuit and eliminate the short circuit

Fault No.	Fault code	Fault type	Possible cause	Solution
			unit output side.	fault.
E0105–E1005	m. LC	Unit-m current limit protection	Unit in continuous overload running.	Check the rectifier unit load and reduce the load power.
E0106–E1006	m.ItE	Unit-m zero drift fault	Unit current detection component is damaged. Interference exists.	Ask for technical support. Check for and remove the external interference source. Replace the unit.
E0107–E1007	m.E24	Unit-m power supply fault	The working voltage of switch power is too low.	Check the input power. Ask for technical support.
E0108–E1008	m.E15			
E0109–E1009	m.Sto	Unit-m Sto fault	Sto is not shorted.	Check whether the unit board is shorted to the Sto terminals. Ask for technical support.
E0110–E1010	m.FAn	Unit-m fan stalling fault	Fan is unable to rotate.	Check the fan wiring. Ask for technical support.
E0111–E1011	m.dn	Unit-m downstream communication fault	Optical fiber connection exception.	Check the wiring. Ask for technical support.
E0112–E1012	m.UP	Unit-m upstream communication fault	Optical fiber connection exception.	Check the wiring. Ask for technical support.
E0113–E1013	m.roH	Unit-m reactor overtemperature fault	Instantaneous overcurrent occurred to the rectifier. Air duct blocked or fan damaged. Ambient temperature is too high. Control board cable or add-on loosened.	See solutions for overcurrent. Perform wiring again. Ventilate the air duct or replace the fan. Lower the ambient temperature. Ask for technical support.
E0116–E1016	m.ov	Unit-m bus overvoltage fault	The grid voltage is too high. Large energy feedback.	Check the input power. Check the load. Ask for technical support.
E0117–E1017	m.Lv	Unit-m bus undervoltage fault	The grid voltage is too low.	Check the input power.
E0118–E1018	m.U.oH	Unit-m overtemperature	Instantaneous overcurrent occurred to the rectifier. Air duct blocked or fan damaged. Ambient temperature too high. Control board cable or add-on loosened.	See solutions for overcurrent. Perform wiring again. Ventilate the air duct or replace the fan. Lower the ambient overtemperature. Ask for technical support.
E0119–E1019	-	Unit-m overtemperature pre-alarm		

8 Communication

8.1 Modbus protocol

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

8.1.1 Modbus protocol introduction

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

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

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

8.1.2 Application of Modbus

The VFD uses the Modbus RTU mode and communicates through RS485 interfaces.

8.1.2.1 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 +2V to +6V, the logic is "1"; and if it ranges from -2V to -6V, the logic is "0".

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

The communication baud rate (P42.01) indicates the number of bits sent in a second, and the unit is bit/s (bps). A higher baud rate indicates faster transmission and poorer anti-interference capability. When a twisted pair of 0.56mm (24 AWG) is used, the maximum transmission distance varies according to the baud rate, as described in the following table.

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

In long-distance RS485 communication, it is recommended that you use shielded cables, and use the shielding layer as the ground wire.

When there are fewer devices and the transmission distance is short, the whole network works well without terminal load resistors. The performance, however, degrades as the distance increases. Therefore, it is

recommended that you use a 120Ω terminal resistor when the transmission distance is long.

8.1.2.2 RTU mode

(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 achieves transmission of more data at the same baud rate.

Code system

- 1 start bit
- 7 or 8 data bits; the minimum valid bit is transmitted first. Each frame domain of 8 bits includes 2 hexadecimal characters (0–9, A–F).
- 1 odd/even check bit; this bit is not provided if no check is needed.
- 1 stop bit (with check performed), 2 bits (without check)

Error detection domain

- Cyclic redundancy check (CRC)

The following table describes the data format.

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

Start bit	Bit1	Bit2	Bit3	Bit4	Bit5	Bit6	Bit7	Bit8	Check bit	Stop bit

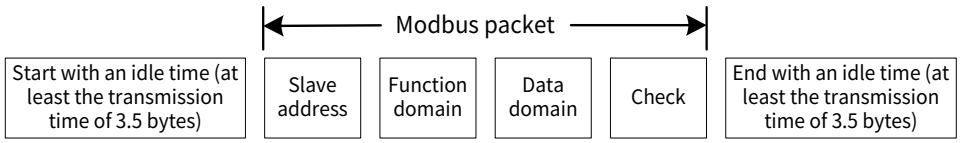
10-bit character frame (bits 1 to 7 are data bits):

Start bit	Bit1	Bit2	Bit3	Bit4	Bit5	Bit6	Bit7	Check bit	Stop bit

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

In RTU mode, 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 sent in each domain includes 2 hexadecimal characters (0–9, A–F). The network devices always monitor the communication bus. After receiving the first domain (address information), each network device identifies the byte. After the last byte is sent, a similar transmission interval (with a minimum transmission time of 3.5 bytes) is used to indicate that the frame transmission ends. Then, the transmission of a new frame starts.

RTU data frame format



The information of a frame must be 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 (time gap with a min. length of 3.5 bytes)
ADDR (slave address domain)	Communication address: 0–247 (decimal system) (0 is the broadcast address)
CMD (function domain)	03H: read slave parameters 06H: write slave parameters
Data domain DATA (N-1) ... DATA (0)	Data of 2*N main content of the communication as well as the core of data exchanging.
CRC CHK LSB	Detection value: CRC verification value (16 bits)
CRC CHK MSB	
END (frame tail)	T1-T2-T3-T4 (time gap with a min. length of 3.5 bytes)

(2) RTU communication frame error check methods

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

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

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

Bit check on individual bytes (odd/even check)

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

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

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

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

Cyclic redundancy check (CRC)

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, stop, 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 (8th bit) is detected and processed, the XOR operation is performed on the next 8-bit byte and the current content in the register. The final values in the register are the CRC values obtained after operations are performed on all the bytes in the frame.

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

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

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

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

8.1.3 RTU command codes and communication data

8.1.3.1 Command code 03H, reading N words (continuously up to 16 words)

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

The 03H command is used to read information including the parameters and running status of the VFD.

For example, to read two contiguous data content pieces from 0004H from the VFD with the address of 01H (that is, to read content from data addresses 0004H and 0005H), the frame structure is as follows:

RTU master command (from the master to the VFD)

START	T1-T2-T3-T4 (transmission time of 3.5 bytes)
ADDR (address)	01H
CMD (command code)	03H
Start address MSB	00H
Start address LSB	04H
Data count MSB	00H
Data count LSB	02H
CRC LSB	85H
CRC MSB	CAH
END	T1-T2-T3-T4 (time gap with a min. length of 3.5 bytes)

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

ADDR=01H means the command message is sent to the VFD with the address of 01H and ADDR occupies one byte.

CMD=03H means the command message is sent to read data from the VFD and CMD occupies one byte.

"Start address" means reading data from the address and it occupies two bytes with the MSB on the left and LSB on the right.

"Data count" indicates the count of data to be read (unit: word). "Start address" is "0004H" and "Data count" is 0002H, indicating that data is to be read from the data addresses of 0004H and 0005H.

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

RTU slave response (from the VFD to the master)

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

The definition of the response information is described as follows:

"ADDR" is "01H", indicating that the message is sent by the VFD whose address is 01H. The ADDR information occupies one byte.

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

"Number of bytes" indicates the number of bytes between a byte (not included) and the CRC byte (not included). The value "04" indicates that there are four bytes of data between "Number of bytes" and "CRC LSB", that is, "MSB of data in 0004H", "LSB of data in 0004H", "MSB of data in 0005H", and "LSB of data in 0005H".

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

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

8.1.3.2 Command code 06H, writing a word

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

For example, if the master writes 5000 (1388H) to 0004H of the VFD whose address is 02H, the frame structure is as follows.

RTU master command (from the master to the VFD) is as follows:

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

RTU slave response (from the VFD to the master) is as follows:

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

Note: The sections 8.1.3.1 and 8.1.3.2 mainly describe the command formats. For the detailed application, see the examples in section 8.1.3.7.

8.1.3.3 Command code 08H, diagnosis

Sub-function code description:

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

For example, to query about the circuit detection information about the VFD whose address is 01H, the query and return strings are the same, and the format is described as follows.

RTU master command:

START	T1-T2-T3-T4 (transmission time of 3.5 bytes)
ADDR	01H
CMD	08H
Sub-function code MSB	00H
Sub-function code LSB	00H
MSB of to-be-written data	12H
LSB of to-be-written data	ABH

CRC CHK LSB	ADH
CRC CHK MSB	14H
END	T1-T2-T3-T4 (transmission time of 3.5 bytes)

RTU slave response:

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

8.1.3.4 Data address definition

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

- **Function code address format rules**

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

Function code	Name	Description	Setting range	Default
P05.06	DI1 filter time	0.000–1.000s	0.000–1.000	0.010s
P13.01	Grid voltage undervoltage point (line voltage) setting	80.0–84.0%	80.0–84.0	80.0%

Note: The parameters in group P99 are set by the manufacturer and cannot be read or modified. Some parameters cannot be modified when the VFD is running; some cannot be modified regardless of the VFD status. Pay attention to the setting range, unit, and description of a parameter when modifying it.

- **Addresses of other Modbus functions**

In addition to modifying the parameters of the VFD, the master can also control the VFD, such as starting and stopping the VFD, and monitoring the running status of the VFD.

The following table lists other function parameters.

Address definition	Function	Data description	R/W attribute
4000H	VFD status 1	0001H: Running	R
		0002H: Reserved	R
		0003H: Standby	R
		0004H: Faulty	R
		0005H: POFF state	R

Address definition	Function	Data description	R/W attribute
		For the UDP/IP protocol, this information is given in handshake information, but whether it is the master's UDP/IP protocol or another protocol, needs to be obtained by querying the address.	R
4001H	VFD status 2	-	R
4002H	VFD status 3	-	R
4003H	VFD status 4	-	R
4004H	Device code	880	R
4005H	Remote/local status	0: Local status	R
		1: Remote status	R
4006H	VFD readiness status	0: Initialization	R
		1: Lockout for startup	R
		1: Ready to start up	R
		3: Pre-charge	R
		4: Ready to run	R
		5: Running	R
		6: Faulty	R
4007H	Reserved	-	-
4008H	Reserved	-	-
4009H	A1 unit version	0.00–655.35	R
400AH	A2 unit version	0.00–655.35	R
400BH	A3 unit version	0.00–655.35	R
400CH	A4 unit version	0.00–655.35	R
400DH	A5 unit version	0.00–655.35	R
400EH	A6 unit version	0.00–655.35	R
400FH	A7 unit version	0.00–655.35	R
4010H	A8 unit version	0.00–655.35	R
4011H	A9 unit version	0.00–655.35	R
4012H	A10 unit version	0.00–655.35	R
4013H	A1 unit temperature	-20.0–120.0°C	R
4014H	A2 unit temperature	-20.0–120.0°C	R
4015H	A3 unit temperature	-20.0–120.0°C	R
4016H	A4 unit temperature	-20.0–120.0°C	R
4017H	A5 unit temperature	-20.0–120.0°C	R
4018H	A6 unit temperature	-20.0–120.0°C	R
4019H	A7 unit temperature	-20.0–120.0°C	R
401AH	A8 unit temperature	-20.0–120.0°C	R
401BH	A9 unit temperature	-20.0–120.0°C	R
401CH	A10 unit temperature	-20.0–120.0°C	R
401DH	A1 unit bus	0–1400V	R
401EH	A2 unit bus	0–1400V	R
401FH	A3 unit bus	0–1400V	R
4020H	A4 unit bus	0–1400V	R
4021H	A5 unit bus	0–1400V	R
4022H	A6 unit bus	0–1400V	R
4023H	A7 unit bus	0–1400V	R

Address definition	Function	Data description	R/W attribute
4024H	A8 unit bus	0–1400V	R
4025H	A9 unit bus	0–1400V	R
4026H	A10 unit bus	0–1400V	R
4027H	Reserved	-	-
4028H	Reserved	-	-
4029H	Valid unit count	0–10	R
402AH	Present fault code 1	P08: Fault record parameter group	R
402BH	Present fault code 2		R
402CH	Present fault code 3		R
402DH	Present fault code 4		R
402EH	Present fault code 5		R
402FH	Present fault code 6		R
4030H	Present minor fault code 1		R
4031H	Present minor fault code 2		R
4032H	Present minor fault code 3		R
4033H	Present minor fault code 4		R
4034H	Present minor fault code 5		R
4035H	Present minor fault code 6		R
4036H	Present alarm code 1		R
4037H	Present alarm code 2		R
4038H	Present alarm code 3		R
4039H	Present alarm code 4		R
403AH	Present alarm code 5		R
403BH	Present alarm code 6		R
403CH	Running voltage at present fault		R
403DH	Reserved		-
403EH	Grid voltage at present fault		R
403FH	Input current at present fault		R
4040H	Bus voltage at present fault		R
4041H	Max. temperature at present fault		R
4042H	Input terminal state at present fault		R
4043H	Output terminal status at present fault		R
4044H	Running voltage at last fault		R
4045H	Reserved		R
4046H	Grid voltage at last fault		R
4047H	Input current at last fault		R
4048H	Bus voltage at last fault		R
4049H	Max. temperature at last fault		R

Address definition	Function	Data description		R/W attribute
404AH	Input terminal status at last fault			R
404BH	Output terminal status at last fault			R
404CH	Running voltage at 2nd-last fault			R
404DH	Reserved			R
404EH	Grid voltage at 2nd-last fault			R
404FH	Input current at 2nd-last fault			R
4050H	Bus voltage at 2nd-last fault			R
4051H	Max. temperature at 2nd-last fault			R
4052H	Input terminal status at 2nd-last fault			R
4053H	Output terminal status at 2nd-last fault			R
4200H	Control command word 1 **Note:** It is different from the control word.	0001H: Power-on precharge/Run allowing		W
		0002H: Run prohibited		
		0003H: Emergency stop switched off		
		0004H: Fault reset		
4201H	Control word 1	CW 1 bit 0	0: OFF1 switched off 0->1: Switched on (It is effective at the rising edge.)	-
		CW 1 bit 1	0: OFF2 emergency stop switched off 1: Normal	-
		CW 1 bit2 (Reserved)	-	-
		CW 1 bit 3	0: Run prohibited 0: Run allowing	-
		CW 1 bit4 (Reserved)	-	-
		CW 1 bit5 (Reserved)	-	-
		CW 1 bit6 (Reserved)	-	-
		CW 1 bit 7	0: Invalid 0->1: Fault reset	-
		CW 1 bit8 (Reserved)	-	-
		CW 1 bit9 (Reserved)	-	-
		CW 1 bit 10	0: Remote control is invalid 1: Remote control is valid	-
		CW 1 bit11 (Reserved)	-	-
		CW 1 bit12 (Reserved)	-	-
		CW 1 bit13 (Reserved)	-	-
		CW 1 bit 14	0: Invalid	-

Address definition	Function	Data description		R/W attribute
			1: Trigger external fault 1	
		CW 1 bit 15	0: Invalid 1: Trigger external fault 2	-
4202H	Control word 2	CW 2 bit 0	0: Invalid 1: Trigger external alarm 1	W
		CW 2 bit 1	0: Invalid 1: Trigger external alarm 2	
		CW 2 bit 2	Reserved	W
		CW 2 bit 3	Reserved	
		CW 2 bit 4	Reserved	W
		CW 2 bit 5	Reserved	
		CW 2 bit 6	Reserved	
		CW 2 bit 7	Reserved	
		CW 2 bit 8	0: Trigger channel 1 1: Trigger channel 2 PLC needs to change the control channel through P00.00.	
		CW 2 bit 9	Reserved	
		CW 2 bit 10	Reserved	W
		CW 2 bit 11	Reserved	
		CW 2 bit 12	Reserved	
		CW 2 bit 13	Reserved	
		CW 2 bit 14	Reserved	W
		CW 2 bit 15	Reserved	
4203H	Reserved	-		-
4204H	Command to read fault records	Read the fault records stored in the fault black box.		W
4300H	Reserved	-		-
4301H	Reserved	-		-
4302H	Reserved	-		-
4303H	Reserved	-		-
4304H	Reserved	-		-
4305H	Reserved	-		-
4306H	Reserved	-		-
4307H	Reserved	-		-
4308H	Reserved	-		-
4309H	Reserved	-		-
430AH	Reserved	-		-
430BH	Sampling frequency of the oscilloscope	Configure the oscilloscope sampling frequency.		W
		0: 2k, once every 0.5ms		
		1: 1k, once every 1ms		
		2: 0.5k, once every 2ms		
		3: 0.25k, once every 4ms		
		4: 0.125k, once every 8ms		

Address definition	Function	Data description	R/W attribute
		Once the ARM reaches 64 points, all channels are uploaded uniformly.	

The Read/Write (R/W) attribute indicate whether a function parameter can be read and written. For example, "Communication-based control command" can be written, and therefore the command code 06H is used to control the VFD. The R characteristic indicates that a function parameter can only be read, and W indicates that a function parameter can only be written.

Note: Some parameters in the preceding table are valid only after they are enabled. For example, in the case of running and stopping operations, the "Channel 1 start/stop CW source" (P02.01) should be set to "Modbus".

8.1.3.5 Fieldbus scale

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

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

The fieldbus scale depends on the number of decimal places in the value specified in "Setting range" or "Default". If there are n decimal places in the value, the fieldbus scale m is the nth-power of 10. Take the following table as an example, m is the value of 10 to the power of n.

Function code	Name	Description	Setting range	Default
P01.10	Wake-up-from-sleep delay	0.0–3600.0s (valid when P1.08=1)	0.0–3600.0	1.0s
P01.11	FWD/REV running deadzone time	0.0–3600.0s	0.0–3600.0	0.0s

The value specified in "Setting range" or "Default" contains one decimal place, and therefore the fieldbus scale is 10. If the value received by the host controller is 50, "Delay of auto fault reset" of the rectifier is 5.0 (5.0=50/10).

To set the wait time for restart after power-off to 5.0s through Modbus communication, you need first to multiply 5.0 by 10 according to the scale to obtain an integer 50, that is, 32H in the hexadecimal form, and then send the following write command:

01	06	01 10	00 32	08 26
VFD address	Write command	Parameter address	Parameter data	CRC

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

For another example, after the host controller sends the "Wake-up-from-sleep delay" parameter read command, the master receives the following response from the VFD:

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

The parameter data is 0032H, that is, 50, and therefore 5.0 is obtained based on the fieldbus scale

(50/10=5.0). In this case, the master identifies that "Wake-up-from-sleep delay" is 5.0s.

8.1.3.6 Error message response

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

Error message responses are sent from the VFD to the master. The following table lists the codes and definitions of the error message responses.

Code	Name	Definition
01H	Invalid command	The command code received by the host controller is not allowed to be executed. The possible causes are as follows: The function code is applicable only on new devices and is not implemented on this device.☒ The slave is in the faulty state when processing this request.
02H	Invalid data Address	For the VFD, the data address in the request of the host controller is not allowed. In particular, the combination of the register address and the number of the to-be-sent bytes is invalid.
03H	Invalid data value	The received data domain contains a value that is not allowed. The value indicates the error of the remaining structure in the combined request. **Note:** It does not mean that the data item submitted for storage in the register includes a value unexpected by the program.
04H	Operation failure	The parameter setting is invalid in the write operation. For example, a function input terminal cannot be set repeatedly.
05H	Incorrect password	The password entered in the password verification address is different from that is specified by P07.00.
06H	Incorrect data frame	The data frame sent from the host controller is incorrect in the length, or in the RTU format, the value of the CRC check bit is inconsistent with the CRC value calculated by the lower computer.
07H	Parameter read-only	The parameter to be modified in the write operation of the host controller is a read-only parameter.
08H	Parameter cannot be modified in running	The parameter to be modified in the write operation of the host controller cannot be modified during the running of the VFD.
09H	Password protection	If the host controller does not provide the correct password to unlock the system to perform a read or write operation, the error of “system being locked” is reported.

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

For example, if the master sends a request message to a slave for reading a group of function code address data, the following code is generated:

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

In a normal response, the slave returns the same function code. In an exception response, the slave returns the following code:

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

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

For example, to set the "Channel 1 start/stop CW source" (P02.01, the parameter address is 0201H) to 08 for the VFD whose address is 0201H, the command is as follows:

01	06	02 01	00 08	D8 74
VFD address	Write command	Parameter address	Parameter data	CRC

However, the "Running command channel" ranges from 0 to 10. The value 11 is out of the setting range. In this case, the VFD returns an error message response as shown in the following:

01	86	03	99 CD
VFD address	Exception response code	Error code	CRC

The exception response code 86H (generated based on the highest-order bit "1" of the write command 06H) indicates that it is an exception response to the write command (06H). The error code is 03H, which indicates "Illegal data value", meaning "the received data field contains values that are not allowed".

8.1.3.7 Read/Write operation examples

For the formats of the read and write commands, see section 8.1.3.1 and 8.1.3.1.

(1) Example of reading command 03H

Example 1: Read SW 1 of the VFD whose address is 01H. According to the other function parameter table, the parameter address for the VFD SW 1 is 4000H (16384), with the address MSB being A3H (163) and the address LSB being 54H (84).

The read command transmitted to the VFD is as follows:

01	03	A3 54	00 01	E7 9E
VFD address	Read command	Parameter address	Parameter data	CRC

Assume that the following response is returned:

01	03	02	00 04	B9 87
VFD address	Read command	2-byte data	Parameter data	CRC

The data content returned by the VFD is 0004H, which indicates that the VFD is in the stopped state.

Example 2: View information about the VFD whose address is 03H, including "Present fault type" (P08.00) to "5th-last fault type" (P08.05) of which the parameter addresses are 0800H to 0805H (contiguous 6 parameter addresses starting from 0320H).

The command transmitted to the VFD is as follows:

03	03	00 08	00 06	C6 4A
VFD address	Read command	Start address	6 parameters in total	CRC

Assume that the following response is returned:

03	03	0C	00 70	00 00	00 00	00 00	00 00	00 00	BB B0
VFD address	Read command	Number of bytes	Present fault type	Last fault type	2nd-last fault type	3rd-last fault type	4th-last fault type	5th-last fault type	CRC

According to the returned data, all the fault types are 0070H, that is, 112 in the decimal form, which means Unit 1 upstream communication fault (E01.12).

(2) Example of writing command 06H

Example 1: Set the VFD whose address is 03H to "Power-on precharge/Run allowing". The address of "Communication-based control command" is 4200H, and the "Power-on precharge/Run allowing" command is 0001H.

Function description	Address	Data description	R/W attribute
Communication-based control command	4200H	0001H: Power-on precharge/Run allowing	W
		0002H: Run prohibited	
		0003H: Emergency stop	
		0004H: Fault reset	

The command transmitted from the master is as follows:

03	06	A8 60	00 01	69 96
VFD address	Write command	Parameter address	Power-on precharge Enable running	CRC

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

03	06	A8 60	00 01	69 96
VFD address	Write command	Parameter address	Power-on precharge Enable running	CRC

Example 2: Set the "OFF1 switch-off delay" to 10.00s for the VFD with the address of 03H.

Function code	Name	Description	Setting range	Default	Modify
P01.02	OFF1 switch-off delay	1.00–10.00s	1.00–10.00	1.00s	◎

See the figures behind the radix point, the fieldbus ratio value of OFF1 switch-off delay (P01.02) is 100. Multiply 10.00 by 100. The value 10000 is obtained, and it is 2710H in the hexadecimal form.

The command sent from the master is as follows:

03	06	01 02	27 10	32 28
VFD address	Write command	Parameter address	Parameter data	CRC

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

03	06	01 02	27 10	32 28
VFD address	Write command	Parameter address	Parameter data	CRC

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

(3) Example of Modbus communication commissioning

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

First, set the serial port to **COM1**. Then, set the baud rate consistently with P42.01. The data bits, check bits, and end bits must be set consistently with P42.02. 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 (Modbus RTU)**, and set the start byte to **1**. After the auto CRC check function is enabled, do not enter CRC information in commands. Otherwise, command errors may occur due to repeated CRC check.

The commissioning command to set the VFD whose address is 03H to run forward is as follows:

03	06	A8 60	00 01	69 96
VFD address	Write command	Parameter address	Running	CRC

Note:

- **Set the address (P42.03) of the VFD to 03.**
- Set Channel Selection Source (P00.00) to Channel 1 and Channel 1 Start/Stop CW Source (P02.01) to Modbus.
- Click **Send**. If the line configuration and settings are correct, a response transmitted from the VFD is received.

8.1.4 Common communication faults

Common communication faults include the following:

- No response is returned.
- The VFD returns an exception response.

Possible causes of no response include the following:

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

8.1.5 Related function codes

Function code	Name	Description	Setting range	Default
P42.01	Modbus baud rate	0: 1200bps 1: 2400bps 2: 4800bps	0–7	4

Function code	Name	Description	Setting range	Default
		3: 9600bps 4: 19200bps 5: 38400bps 6: 57600bps 7: 115200bps		
P42.02	Data bit check	0: No check (N, 8, 1) for RTU 1: Even check (E, 8, 1) for RTU 2: Odd check (O, 8, 1) for RTU 3: No check (N, 8, 2) for RTU 4: Even check (E, 8, 2) for RTU 5: Odd check (O, 8, 2) for RTU	0–5	1
P42.03	Local Modbus address	1–247	1–247	1
P42.04	Communication response delay	0–200ms	0–200	5ms
P42.05	Communication timeout time	0.0: Invalid; 0.1–60.0s	0.0–60.0	0.0s
P42.06	Transmission error processing	0: Faulty (do not switch off) or report an alarm (fault severity can be changed through the group 08) 1: Keep running without reporting an alarm	0–3	0

8.2 PROFIBUS protocol

PROFIBUS is an international open fieldbus standard that can implement data exchange between various automation components. It is widely applicable to automation in various industries, such as the manufacturing, process, building, transportation, and power industries. It provides effective solutions for implementing integrated automation and intelligentization of field devices.

PROFIBUS consists of three mutually compatible components, namely PROFIBUS-Decentralised Peripherals (DP), PROFIBUS-Process Automation (PA), and PROFIBUS-Fieldbus Message Specification (FMS). It adopts the master/slave mode and is generally used for periodic data exchange between VFD devices.

The transmission media of a PROFIBUS field bus are twisted pairs (complying with the RS-485 standard), paired cables, or optical cables. The baud rate ranges from 9.6kbit/s to 12Mbit/s. The maximum length of a fieldbus cable must be within the range of 100m to 1200m, and the specific length depends on the selected transmission rate. A maximum of 31 nodes can be connected to one PROFIBUS network segment when no repeater is used. If repeaters are used, a maximum of 127 nodes (including the repeaters and master nodes) can be connected.

In PROFIBUS communication, tokens are transmitted between master nodes or by master nodes to slave nodes. Single-master or multi-master systems are supported. The node to respond to the command of a master is selected by the master node, generally a programmable logic controller (PLC). For cyclic master/slave user data transmission and non-cyclic master-master data transmission, a master can also transmit commands to multiple nodes in broadcast mode. When the broadcast mode is adopted, the nodes do not need to transmit feedback signals to the master. On PROFIBUS networks, nodes cannot communicate with each other.

The PROFIBUS protocol is described in details in the EN 50170 standard. For details, refer to the EN 50170 standard.

8.2.1 System configuration

- **System configuration**

After correctly installing the communication card, you need to configure the master station and VFD so that the master station can communicate with the communication card.

One device description file (GSD file) is required for each PROFIBUS slave on the PROFIBUS bus. The GSD file is used to describe the characteristics of a PROFIBUS-DP device. The software we provided for the user includes VFD related GSD files (device data files) information, users can obtain type definition file (GSD) of master machines from local INVT agent.

Parameter number	Parameter name	Optional setting	Default	Remarks
0	Module type	Read only	PROFIBUS-DP	This parameter shows communication module type detected by VFD; users can not adjust this parameter. If this parameter is not defined, communication between the communication card and VFD cannot be established.
1	Node address	0–99	2	In a PROFIBUS network, each device corresponds to a unique node address. The node address selection switch is used to define the node address, the value of this parameter cannot be adjusted, and it is used to only display the node address that is set.
2	Baud rate setting	0: 9.6k bps 1: 19.2k bps 2: 45.45k bps 3: 93.75k bps 4: 187.5k bps 5: 500k bps 6: 1.5M bps 7: 3M bps 8: 6M bps 9: 9M bps 10: 12M bps	6	-
3	PZD2	0–65535	0	-
4	PZD3	0–65535	0	-
…	…	0–65535	0	-
10	PZD12	0–65535	0	-

Master station and VFD should be configured so that the master station can communicate with the communication card after correctly installing communication card.

- **Module type**

This parameter displays the communication card type detected by the VFD. You cannot modify the value of this parameter. If this parameter is not defined, communication between the communication card and VFD cannot be established.

- **Node address**

In a PROFIBUS network, each device corresponds to a unique node address, using the node address selection switch to define the node address (switch is not in the 0 position), and this parameter is only used to display the node address that is set. If the node address selection switch is set to 0, you can use this parameter to define the node address.

In PROFIBUS network, each device corresponds to a unique node address, you can use the node address selection switch to define node address, but you cannot adjust the parameter by yourself and the parameter is only used to display the node address.

- **GSD file**

One device description file (GSD file) is required for each PROFIBUS slave on the PROFIBUS bus. The GSD file is used to describe the characteristics of a PROFIBUS-DP device. GSD file contains all defined parameters, including the supported baud rate, information length, amount of input/output data, meaning of diagnostic data.

A CD-ROM will be offered in which contains GSD file of the EC-TX103 communication card (expansion name is .gsd) for fieldbus adapter. Users can copy GSD file to relevant subdirectory of configuration tools. Please refer to relevant system configuration software instructions to know specific operations and PROFIBUS system configuration.

8.2.2 PROFIBUS-DP networking

- **PROFIBUS-DP**

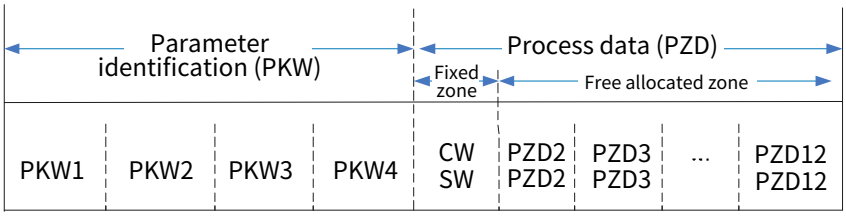
A PROFIBUS-DP network is a distributed I/O system that enables the master to use a large number of peripheral modules and onsite devices. Periodic data transmission: The master reads input information from a slave and sends feedback signals to the slave. EC-TX803 communication card supports PROFIBUS-DP protocol.

- **Service access points (SAP)**

PROFIBUS-DP has access to PROFIBUS data link layer (Layer 2) services through service access point SAP. Every independent SAP has clearly defined function. Please refer to relevant PROFIBUS user manual to know more about service access point information. PROFIDRIVE - Variable speed drive adopts PROFIBUS model or EN50170 standards (PROFIBUS protocol).

- **PROFIBUS-DP information frame data structure**

PROFIBUS-DP bus mode allows rapid data exchange between master station and VFD. Adopting master-slave mode dealing with VFD access, VFD is always subsidiary station, and each has definite address. PROFIBUS periodic transmission messages use 16 words (16 bit) transmission, the structure shown in the following figure.



Parameter zone:

PKW1–Parameter identification

PKW2–array index number

PKW3–parameter value 1

PKW4–parameter value 2

Process data:

CW–control word

SW–state word

PZD–process data (user defined)

(When the process data is output by the master to a slave, it is a [reference value]; and when the process data is input by a slave to the master, it is an [actual value].)

PZD zone (process data zone)
The PZD zone in a communication packet is designed for controlling and monitoring a VFD. The master and slave stations always process the received PZD with the highest priority. The processing of PZD takes priority over that of PKW, and the master and slave nodes always transmit the latest valid data on the interfaces.

Control word (CW) and state word (SW)

Using CWs is the basic method of the fieldbus system to control the VFD. A CW is transmitted by the fieldbus master node to the VFD. In this case, the adapter module functions as a gateway. The VFD responds to the bit code information of the CW and feeds state information back to the master through an SW.

For bit code information related to the VFD, see the related VFD operation manual.

Reference value: The VFD may receive control information in multiple channels, including analog and digital input terminals, VFD control panel, and communication modules (such as RS485 and EC-TX803 communication card). To enable the control over the VFD through PROFINET, you need to set the communication module as the controller of the VFD.

Actual value: An actual value is a 16-bit word that includes information about VFD operation. The monitoring function is defined through VFD parameters. The conversion scale of an integer transmitted as an actual value from the VFD to the master depends on the set function.

Note: The VFD always checks the bytes of a CW and reference value.

Mission message (from the master station to the VFD)

Control word (CW): The first word of PZD is control word (CW) of VFD.

Control words

Control word	Bit	Value	State/Description
Control word 1	Bit0	0	OFF1 switched off
		0->1	Switched on
	Bit1	0	OFF2 emergency stop switched off
		1	Normal state
	Bit2	-	Reserved
	Bit3	0	Run prohibited
		1	Run allowing
	Bit4	-	Reserved
	Bit5	-	Reserved
	Bit6	-	Reserved
	Bit7	0	Invalid
		0->1	Fault reset
	Bit8	-	Reserved
	Bit9	-	Reserved
	Bit10	0	Remote control is invalid
		1	Remote control is valid
	Bit11	-	Reserved

Control word	Bit	Value	State/Description
	Bit12	-	Reserved
	Bit13	-	Reserved
	Bit14	0	Invalid
		1	Trigger external fault 1
	Bit15	0	Invalid
		1	Trigger external fault 2
Control word 2	Bit0	0	Invalid
		1	Trigger external alarm 1
	Bit1	0	Invalid
		1	Trigger external alarm 2
	Bit2	-	Reserved
	Bit3	-	Reserved
	Bit4	-	Reserved
	Bit5	-	Reserved
	Bit6	-	Reserved
	Bit7	-	Reserved
	Bit8	0	Trigger channel 1 (PLC needs to change the control channel through P00.00.)
		1	Trigger channel 2 (PLC needs to change the control channel through P00.00.)
	Bit9	-	Reserved
	Bit10	-	Reserved
	Bit11	-	Reserved
	Bit12	-	Reserved
	Bit13	-	Reserved
	Bit14	-	Reserved
	Bit15	-	Reserved

The following table shows the function codes for PZD received.

Function code	Name	Description	Setting range	Default
P37.82	Received PZD1 data display (PZD1)	0x0000–0xFFFF Received PZD data display = PZD physically received data with base value processed + Data with polarity processed	0x0000–0xFFFF	0x0000
P37.83	Received PZD2 data display (PZD2)		0x0000–0xFFFF	0x0000
P37.84	Received PZD3 data display (PZD3)	0x0000–0xFFFF Received PZD data display = PZD physically received data with base value processed	0x0000–0xFFFF	0x0000
P37.85	Received PZD4 data display (PZD4)		0x0000–0xFFFF	0x0000
P37.86	Received PZD5 data display (PZD5)		0x0000–0xFFFF	0x0000
P37.87	Received PZD6		0x0000–	0x0000

Function code	Name	Description	Setting range	Default
	data display (PZD6)		0xFFFF	
P37.88	Received PZD7 data display (PZD7)		0x0000–0xFFFF	0x0000
P37.89	Received PZD8 data display (PZD8)		0x0000–0xFFFF	0x0000
P37.90	Received PZD9 data display (PZD9)		0x0000–0xFFFF	0x0000
P37.91	Received PZD10 data display (PZD10)		0x0000–0xFFFF	0x0000
P37.92	Received PZD11 data display (PZD11)		0x0000–0xFFFF	0x0000
P37.93	Received PZD12 data display (PZD12)		0x0000–0xFFFF	0x0000

Response message (VFD → master station)

State word (SW): The first word of PZD response message is state word (SW) of rectifier unit, the definition of SW is as follows:

State words

State word	Bit	Value	State/Description
State word 1	Bit0	0	Lockout for startup
		1	Startup preparation state complete
	Bit1	0	No switch-on (OFF1) command received
		1	Switch-on (OFF1) command is received
	Bit2	0	Rectifier unit is not running
		1	Rectifier unit is running
	Bit3	0	No fault
		1	Fault
	Bit4	0	OFF2 active
		1	OFF2 inactive
	Bit5	0	Rectification
		1	Regenerative
	Bit6	0	Switch on is allowed
		1	Switch on is not allowed (external conditions not present or failure)
	Bit7	0	No alarm
		1	Alarm
	Bit8	-	Reserved
	Bit9	-	Reserved
	Bit10	0	Local (indicating host controller or keypad)
		1	Remote (Control channels other than the host controller or keypad)

State word	Bit	Value	State/Description
	Bit11	0	Pre-charge incompleted
		1	Charge completed
	Bit12	0	Main power supply disconnected
		1	Main power supply connected
	Bit13	0	IGBT blocked
		1	IGBT triggered
	Bit14	-	Reserved
	Bit15	-	Reserved
State word 2	Bit0	-	Reserved
	Bit1	-	Reserved
	Bit2	-	Reserved
	Bit3	0	Unit fan stop
		1	Unit fan run
	Bit4	-	Reserved
	Bit5	-	Reserved
	Bit6	0	Normal
		1	External fault 1
	Bit7	0	Normal
		1	External fault 2
	Bit8	-	Reserved
	Bit9	-	Reserved
	Bit10	-	Reserved
	Bit11	-	Reserved
	Bit12	-	Reserved
	Bit13	-	Reserved
	Bit14	-	Reserved
	Bit15	-	Reserved

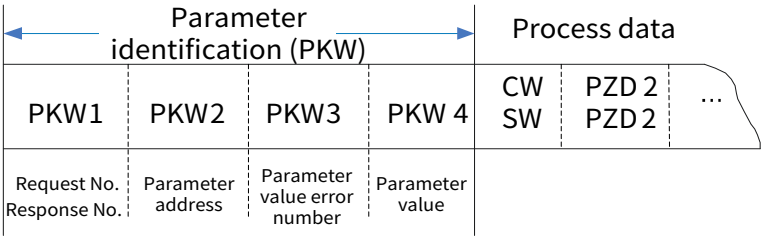
Actual value (ACT): PZD1–PZD12 in a PZD task packet can be the VFD running data feedback sources, where the default values of PZD1 is Other-C connector connected to P20.34 (SW 1) by default.

Actual state value

Word	Name	function selection
Sent PZD1 source (typically sent SW 1)	0: 0 1: Keypad (0–65535) 2: Other-C connector 3: AI1 4: AI2 5: HDI1 6: HDI2	2
Sent PZD2 source (typically sent SW 2)		2
Sent PZD3 source		0
Sent PZD4 source		0
Sent PZD5 source		0
Sent PZD6 source		0
Sent PZD7 source		0
Sent PZD8 source		0
Sent PZD9 source		0
Sent PZD10 source		0
Sent PZD11 source		0
Sent PZD12 source		0

PKW zone (parameter identification marks PKW1-value zone): PKW zone describes treatment of parameter identification interface, PKW interface is a mechanism which determine parameters transmission between two communication partners, such as reading and writing parameter values.

Structure of the PKW zone:



Parameter identification zone:

In the process of periodic PROFIBUS-DP communication, PKW zone is composed of four words (16 bit), each word is defined as follows:

The first word PKW1 (16 bit)		
Bits 15–00	Task or response ID flag	0–7
The second word PKW2 (16 bit)		
Bits 15–00	Basic parameter address	0–247
The third word PKW3 (16 bit)		
Bits 15–00	Value (most significant word) of a parameter or error code of the returned value	00
The fourth word PKW4 (16 bit)		
Bits 15–00	Value (least significant word) of a parameter	0–65535

Note: If the master requests the value of a parameter, the values in PKW3 and PKW4 of the packet that the master transmits to the VFD are no longer valid.

Task request and response: When transmitting data to a slave node, the master node uses a request number, and the slave node uses a response number to accept or reject the request.

The definition of task identification flag PKW1 is as follows:

Request No. (from the master to a slave)		Response signal	
Request No.	**Function**	**Acceptance**	**Rejection**
0	No task.	0	-
1	Requesting the value of a parameter	1, 2	3
2	Modifying a parameter value (one word) [modifying the value only on RAM]	1	3 or 4
3	Modifying a parameter value (two words) [modifying the value only on RAM]	2	3 or 4
4	Modifying a parameter value (one word) [modifying the value on both RAM and EEPROM]	1	3 or 4
5	Modifying a parameter value (two words) [modifying the value on both RAM and EEPROM]	2	3 or 4

Requests 2, 3, and 5 are not supported currently.

The definition of response identification flag PKW1 is as follows:

Response No. (from a slave to the master)	
Response No.	**Function**
0	No response
1	Transmitting the value of a parameter (one word)
2	Transmitting the value of a parameter (two words)
3	The task cannot be executed and one of the following error number is returned: 0: Invalid parameter number

Response No. (from a slave to the master)	
Response No.	**Function**
	1: Parameter value cannot be modified (read only) 2: Out of range 3: Incorrect sub-index number 4: Setting not allowed (only reset allowed) 5: Invalid data type 6: Task cannot be executed in the operating state 7: Request not supported 8: Request cannot be completed due to communication errors 9: Error in writing to the fixed storage area 10: Request failed due to timeout 11: PZD cannot be allocated to the parameter 12: No control word bit can be allocated 13: Other error
4	No parameter modifying permission

PKW examples:

Example 1: Reading the value of a parameter

You can set PKW1 to 1 and PKW2 to 4 to read a frequency set through keypad (the address of the frequency set through keypad is 4), and the value is returned in PKW4.

Request (from the master station to the VFD):

	PKW1		PKW2		PKW3		PKW4		CW		PZD2		PZD3		...	PZD12	
Request	00	01	00	04	00	00	00	00	xx	xx	xx	xx	xx	xx	...	xx	xx

0004: Parameter address

0001: Request for parameter value reading

Response (from the VFD to the master station):

	PKW1		PKW2		PKW3		PKW4		CW		PZD2		PZD3		...	PZD12	
Response	00	01	00	04	00	00	50	00	xx	xx	xx	xx	xx	xx	...	xx	xx

5000: Parameter value of address 4

0001: Response (parameter value updated)

Example 2: Modifying the value of a parameter (on both RAM and EEPROM)

You can set PKW1 to 2 and PKW2 to 4 to modify a frequency set through keypad (the address of the frequency set through keypad is 4), and the value to be modified (50.00) is in PKW4.

Request (from the master station to the VFD):

	PKW1		PKW2		PKW3		PKW4		CW		PZD2		PZD3		...	PZD12	
Request	00	02	00	04	00	00	50	00	xx	xx	xx	xx	xx	xx	...	xx	xx

5000: Parameter value of address 4

0002: Request for parameter value modifying

Response (from the VFD to the master station):

	PKW1		PKW2		PKW3		PKW4		CW		PZD2		PZD3		...	PZD12	
Response	00	01	00	04	00	00	50	00	xx	xx	xx	xx	xx	xx	...	xx	xx

0001: Response (parameter value updated)

Examples for PZD: Transmission of PZD area is achieved through VFD function code. Please see INVT VFD user manual for relevant function code.

Example 1: Reading process data of the VFD

In this example, PZD3 is set to "8: Rotating speed of the running" through the VFD parameter P15.14. This operation sets the parameter forcibly. The setting remains until the parameter is set to another option.

Request (from the master station to the VFD):

	PKW1		PKW2		PKW3		PKW4		CW		PZD2		PZD3		···	PZD12	
Request	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	00	0A	···	xx	xx

Example 2: Writing process data into the VFD

In this example, PZD3 is set to "2: PID reference" through the VFD parameter P15.03. The parameter specified in each request frame is updated with the information contained in PZD3 until another parameter is specified.

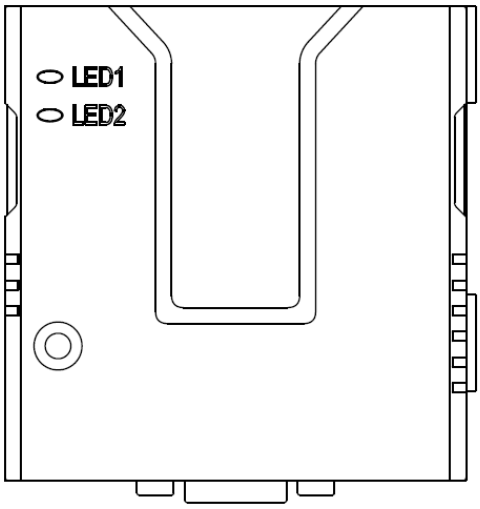
Request (from the master station to the VFD):

	PKW1		PKW2		PKW3		PKW4		CW		PZD2		PZD3		···	PZD12	
Request	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	00	00	···	xx	xx

Then the content of PZD3 is traction reference within each request frame until a parameter is reselected.

8.2.3 Fault information

An EC-TX803 communication card is equipped with two fault indicators, as shown in the following figure.



LED No.	Name	Color	Function
1	Online	Green	On: The expansion module is connecting with the control box. Blinking (On: 500ms; Off: 500ms): The expansion module is connected with the control box. Off: The expansion module is disconnected from the control box.
2	Offline/Fault	Red	On: The expansion module is offline and data exchange cannot be performed.

LED No.	Name	Color	Function
			Blinking (On: 500ms; Off: 500ms): Configuration error occurs. The length of the user parameter data set during the module initialization is different from that during the network configuration. Blinking (On: 250ms; Off: 250ms): User parameter data is incorrect, The length or content of the user parameter data set during the module initialization is different from that during the network configuration. Blinking (On: 125ms; Off: 125ms): An error occurs in the ASIC initialization of PROFIBUS communication. Off: No fault

8.2.4 Related function codes

Function code	Name	Description	Setting range	Default
P37.00	Bus adapter supporting bus type	0: None 1: PROFIBUS-DP module 2: PROFINET IO module 3: CANopen module 4: Reserved 5: Reserved 6: Reserved The setting of P37.00 must be different from that of P38.00, which is automatically processed in the software; if two identical cards are required, use a redundant bus. For example, if bus adapter A selects the DP module but multiple DP expansion cards are inserted into the card slots, the card with the smallest slot number will automatically be the valid expansion card; other types of cards comply with the same rule.	0–6	1
P37.01	Reserved	-	-	-
P37.02	Sent PZD1 source (typically sent SW)	0: 0 1: Keypad (0–65535) 2: Other-C connector 3: AI1 4: AI2 5: HDI1 6: HDI2	0–8	2
P37.03	Sent PZD2 source		0–8	0
P37.04	Sent PZD3 source		0–8	0
P37.05	Sent PZD4 source		0–8	0
P37.06	Sent PZD5 source		0–8	0
P37.07	Sent PZD6 source		0–8	0
P37.08	Sent PZD7 source		0–8	0
P37.09	Sent PZD8 source		0–8	0
P37.10	Sent PZD9 source		0–8	0
P37.11	Sent PZD10 source		0–8	0
P37.12	Sent PZD11 source		0–8	0
P37.13	Sent PZD12 source		0–8	0

Function code	Name	Description	Setting range	Default
P37.82	Received PZD1 data display (PZD1)	0x0000–0xFFFF Received PZD data display = PZD physically received data with base value processed + Data with polarity processed	0x0000–0xFFFF	0x0000
P37.83	Received PZD2 data display (PZD2)		0x0000–0xFFFF	0x0000
P37.84	Received PZD3 data display (PZD3)	0x0000–0xFFFF Received PZD data display = PZD physically received data with base value processed	0x0000–0xFFFF	0x0000
P37.85	Received PZD4 data display (PZD4)		0x0000–0xFFFF	0x0000
P37.86	Received PZD5 data display (PZD5)		0x0000–0xFFFF	0x0000
P37.87	Received PZD6 data display (PZD6)		0x0000–0xFFFF	0x0000
P37.88	Received PZD7 data display (PZD7)		0x0000–0xFFFF	0x0000
P37.89	Received PZD8 data display (PZD8)		0x0000–0xFFFF	0x0000
P37.90	Received PZD9 data display (PZD9)		0x0000–0xFFFF	0x0000
P37.91	Received PZD10 data display (PZD10)		0x0000–0xFFFF	0x0000
P37.92	Received PZD11 data display (PZD11)		0x0000–0xFFFF	0x0000
P37.93	Received PZD12 data display (PZD12)		0x0000–0xFFFF	0x0000
P37.94	Bus adapter A CW 1 source	0: 0 1: Keypad (0–65535) Other-C connector (2: P37.82)	0–2	2
P37.95	Reserved	-	-	-
P37.96	Bus adapter A received PZD1 polarity	0x0000–0xFFFF	0x0000–0xFFFF	0x0000
P37.97	Bus adapter A received PZD2 polarity	0x0000–0xFFFF	0x0000–0xFFFF	0x0000
P37.98	Communication disconnection detection delay	0: No detection 0.00–60.00s	0.00–60.00	0.00s
P37.99	Communication disconnection handling	0: Report a fault 1: Report an alarm, and keeps running	0–1	0

8.3 PROFINET protocol

8.3.1 Communication settings

The communication card can only be used as a PROFINET slave, and function codes should to be set in the VFD before communication. The procedure is as follows:

Step 1 Set the communication timeout time.

By default, the communication timeout time is 0, and communication timeout detection is disabled. You can disable communication timeout detection or set the timeout time according to the needs. Once set, timeout detection is activated.

Note: The detection is only applicable to PROFINET communication.

Step 2 Set the control method.

To enable the VFD control through PROFINET communication, set the control mode to PROFINET communication control. To be specific, set P00.01=2 and P00.02=1 to control VFD start and stop. In short, if a value needs to be set through PROFINET communication, the corresponding function code should be modified to PROFINET communication control. For related function codes, see section 9.3 Function parameters.

Step 3 GSD file

One device description file named GSD file is required for each PROFIBUS slave on the PROFIBUS bus. The GSD file is used to describe the characteristics of a PROFIBUS device. The GSD file contains all device defined parameters, including the supported information length, and input/output data quantity.

Note: If a VFD needs to be controlled, related function nodes must be set and the setting method is PROFINET communication.

8.3.2 Packet format

Table 8-1 describes the RT frame (non-synchronous) structure.

Table 8-1 RT frame structure

Data header	Ethernet type	VLAN	Ethernet type	Frame identifier	RT user data	Cycle Counter	Data State	Transmitting State	FCS
-	2 bytes	2 bytes	2 bytes	2 bytes	36–1440 bytes	2 bytes	1 byte	1 byte	4 bytes
	0x8100	-	0x8892	-	-	-	-	-	-
	VLAN flag		-	-	-	APDU status			-

Data header			
Preamble 7 bytes	Synchronous 1 byte	Source MAC address 6 bytes	Destination MAC address 6 bytes

Table 8-2 describes the IRT communication protocol and IRT frame (non-synchronous) structure.

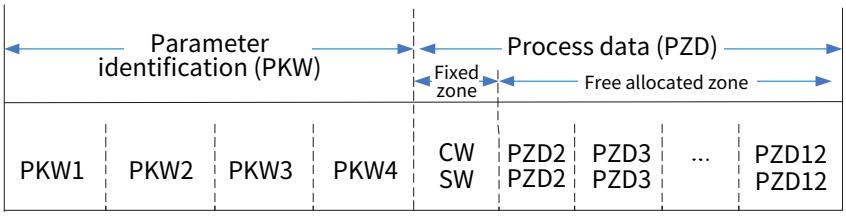
Table 8-2 IRT frame structure

Data header				Ethernet type	VLAN	Ethernet type	Frame identifier	IRT user data	FCS
Preamble 7 bytes	Synchronous 1 byte	Source MAC address 6 bytes	Destination MAC address 6 bytes	2 bytes	2 bytes	2 bytes	2 bytes	36–1440 bytes	4 bytes

8.3.3 PROFINET IO communication

The communication card supports 16-word input/output. Figure 8-1 shows the packet format for transmitting data with the VFD.

Figure 8-1 Packet structure



By using the 32 inputs/outputs, you can set the reference parameters of VFD, monitor the state values, transmit control commands, monitor the running state, and read/write the function parameters. For specific operations, see the following description.

1. Parameter zone:

PKW1–Parameter identification

PKW2–array index number

PKW3–parameter value 1

PKW4–parameter value 2

2. Process data:

CW–control word(from the master to a slave)

SW–state word(from a slave to the master)

PZD–process data (user defined)

(From master to slave output 【reference value】, from slave to master input【actual value】)

PZD zone (process data zone)

The PZD zone in a communication packet is designed for controlling and monitoring a VFD. The master and slave stations always process the received PZD with the highest priority. The processing of PZD takes priority over that of PKW, and the master and slave nodes always transmit the latest valid data on the interfaces.

3. CWs and SWs

Using CWs is the basic method of the fieldbus system to control the VFD. A CW is transmitted by the fieldbus master node to the VFD. In this case, the adapter module functions as a gateway. The VFD responds to the bit code information of the CW and feeds state information back to the master through an SW.

Reference value: The VFD may receive control information in multiple channels, including analog and digital input terminals, VFD control panel, and communication modules (such as RS485 and CH-PA01 adapter modules). To enable the control over VFD devices through PROFINET, you need to set communication cards as the controllers of the VFD devices.

Actual value: An actual value is a 16-bit word that includes information about VFD operation. The monitoring function is defined through VFD parameters. The conversion scale of an integer transmitted as an actual value from the VFD to the master depends on the set function.

Note: The VFD always checks the bytes of a CW and reference value.

8.3.4 Mission message (from the master station to the VFD)

The first word of PZD is control word (CW) of inverter. The CW definition is described as following:

Control words

Control word	Bit	Value	State/Description
Control word 1	Bit0	0	OFF1 switched off
		0->1	Switched on
	Bit1	0	Emergency stop switched off (OFF2)
		1	Normal state
	Bit2	-	Reserved
	Bit3	0	Run prohibited
		1	Run allowing
	Bit4	-	Reserved
	Bit5	-	Reserved
	Bit6	-	Reserved
	Bit7	0	Invalid
		0->1	Fault reset
	Bit8	-	Reserved
	Bit9	-	Reserved
	Bit10	0	Remote control is invalid
		1	Remote control is valid
	Bit11	-	Reserved
	Bit12	-	Reserved
	Bit13	-	Reserved
	Bit14	0	Invalid
		1	Trigger external fault 1
	Bit15	0	Invalid
		1	Trigger external fault 2
Control word 2	Bit0	0	Invalid
		1	Trigger external alarm 1
	Bit1	0	Invalid
		1	Trigger external alarm 2
	Bit2	-	Reserved
	Bit3	-	Reserved
	Bit4	-	Reserved
	Bit5	-	Reserved
	Bit6	-	Reserved
	Bit7	-	Reserved
	Bit8	0	Trigger channel 1 (PLC needs to change the control channel through P00.00.)
		1	Trigger channel 2 (PLC needs to change the control channel through P00.00.)
	Bit9	-	Reserved
	Bit10	-	Reserved
	Bit11	-	Reserved
	Bit12	-	Reserved
	Bit13	-	Reserved
	Bit14	-	Reserved
	Bit15	-	Reserved

Reference value (REF): PZD2–PZD12 in a PZD task packet can be the main reference values. When the speed

or torque source in the reference configuration P00.01 or P00.04 is set to 9 or 10 (Process data 3 of bus adapter A or B), PZD3 is used as the reference value source by default. The table below shows the function codes for received PZDs.

Function code	Name	Description	Setting range	Default
P38.82	Received PZD1 data display (PZD1)	0x0000–0xFFFF Received PZD data display = PZD physically received data with base value processed + Data with polarity processed	0x0000–0xFFFF	0x0000
P38.83	Received PZD2 data display (PZD2)		0x0000–0xFFFF	0x0000
P38.84	Received PZD3 data display (PZD3)	0x0000–0xFFFF Received PZD data display = PZD physically received data with base value processed	0x0000–0xFFFF	0x0000
P38.85	Received PZD4 data display (PZD4)		0x0000–0xFFFF	0x0000
P38.86	Received PZD5 data display (PZD5)		0x0000–0xFFFF	0x0000
P38.87	Received PZD6 data display (PZD6)		0x0000–0xFFFF	0x0000
P38.88	Received PZD7 data display (PZD7)		0x0000–0xFFFF	0x0000
P38.89	Received PZD8 data display (PZD8)		0x0000–0xFFFF	0x0000
P38.90	Received PZD9 data display (PZD9)		0x0000–0xFFFF	0x0000
P37.91	Received PZD10 data display (PZD10)		0x0000–0xFFFF	0x0000
P38.92	Received PZD11 data display (PZD11)		0x0000–0xFFFF	0x0000
P38.93	Received PZD12 data display (PZD12)		0x0000–0xFFFF	0x0000

Response message (VFD → master station)

State word (SW): The first word of PZD response message is state word (SW) of VFD, the definition of SW is as follows:

State words

State word	Bit	Value	State/Description
State word 1	Bit0	0	Lockout for startup
		1	Startup preparation state complete
	Bit1	0	No switch-on (OFF1) command received
		1	Switch-on (OFF1) command is received
	Bit2	0	Rectifier unit is not running
		1	Rectifier unit is running
	Bit3	0	No fault
		1	Fault
	Bit4	0	OFF2 active
		1	OFF2 inactive

State word	Bit	Value	State/Description
	Bit5	0	Rectification
		1	Regeneration
	Bit6	0	Switch on is allowed
		1	Switch on is not allowed (external conditions not present or failure)
	Bit7	0	No alarm
		1	Warning
	Bit8	-	Reserved
	Bit9	-	Reserved
	Bit10	0	Local (indicating host controller or keypad)
		1	Remote (Control channels other than the host controller or keypad)
	Bit11	0	Pre-charge incompleted
		1	Charge completed
	Bit12	0	Main circuit breaker switched off
		1	Main circuit breaker switched on
	Bit13	0	IGBT blocked
		1	IGBT triggered
	Bit14	-	Reserved
	Bit15	-	Reserved
State word 2	Bit0	-	Reserved
	Bit1	-	Reserved
	Bit2	-	Reserved
	Bit3	0	Unit fan stop
		1	Unit fan run
	Bit4	-	Reserved
	Bit5	-	Reserved
	Bit6	0	Normal
		1	External fault 1
	Bit7	0	Normal
		1	External fault 2
	Bit8	-	Reserved
	Bit9	-	Reserved
	Bit10	-	Reserved
	Bit11	-	Reserved
	Bit12	-	Reserved
	Bit13	-	Reserved
	Bit14	-	Reserved
	Bit15	-	Reserved

Actual value (ACT): PZD1–PZD12 in a PZD task packet can be the VFD running data feedback sources, where the default values of PZD1 is Other-C connector connected to P20.34 (SW 1) by default.

Actual state value:

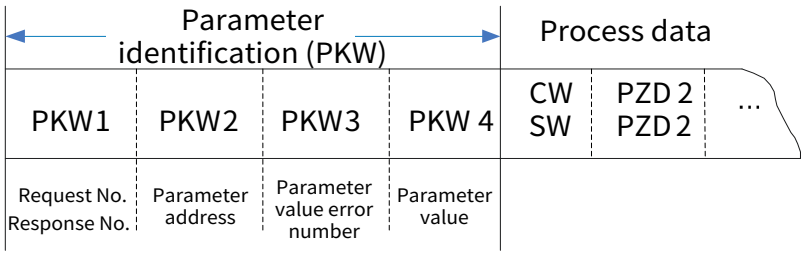
Word	Name	function selection
Sent PZD1 source (typically sent SW 1)	0: 0 1: Keypad (0–65535)	2
Sent PZD2 source (typicallysent SW 2)		2

Word	Name	function selection
Sent PZD3 source	2: Other-C connector 3: AI1 4: AI2 5: HDI1 6: HDI2	0
Sent PZD4 source		0
Sent PZD5 source		0
Sent PZD6 source		0
Sent PZD7 source		0
Sent PZD8 source		0
Sent PZD9 source		0
Sent PZD10 source		0
Sent PZD11 source		0
Sent PZD12 source		0

8.3.5 PKW zone

PKW zone (parameter identification marks PKW1–value zone): PKW zone describes treatment of parameter identification interface, PKW interface is a mechanism which determine parameters transmission between two communication partners, such as reading and writing parameter values.

Figure 8-2 PKW zone



In the process of periodic communication, PKW zone is composed of four words (16 bit), each word is defined as follows:

The first word PKW1 (16 bit)		
Bits 15–00	Task or response ID flag	0–7
The second word PKW2 (16 bit)		
Bit 15–00	Basic parameter address	0–247
The third word PKW3 (16 bit)		
Bit 15–00	Value (most significant word) of a parameter or error code of the returned value	00
The fourth word PKW4 (16 bit)		
Bit 15–00	Parameter value (LSB)	0–65535

Note: If the master requests the value of a parameter, the values in PKW3 and PKW4 of the packet that the master transmits to the VFD are no longer valid.

Task request and response: When transmitting data to a slave node, the master node uses a request number, and the slave node uses a response number to accept or reject the request.

Table 8-3 Definitions of the task identification flag PKW1

Request No. (from the master to a slave)		Response signal	
Request No.	Function	Acceptance	Rejection
0	No task.	0	-
1	Requesting the value of a parameter	1 or 2	3
2	Modifying a parameter value (one word) [modifying the	1	3 or 4

Request No. (from the master to a slave)		Response signal	
Request No.	Function	Acceptance	Rejection
	value only on RAM]		
3	Modifying a parameter value (two words) [modifying the value only on RAM]	2	3 or 4
4	Modifying a parameter value (one word) [modifying the value on both RAM and EEPROM]	1	3 or 4
5	Modifying a parameter value (two words) [modifying the value on both RAM and EEPROM]	2	3 or 4

Note: Request 2 "Modifying a parameter value (one word) [modifying the value only on RAM]", request 3 "Modifying a parameter value (two words) [modifying the value only on RAM]", and request 5"Modifying a parameter value (two words) [modifying the value on both RAM and EEPROM] are not supported currently.

Table 8-4 Definitions of the response identification flag PKW1

Response (from a slave to the master)	
Response No.	Function
0	No response
1	Transmitting the value of a parameter (one word)
2	Transmitting the value of a parameter (two words)
3	The task cannot be executed and one of the following error number is returned: 0: Invalid parameter number 1: Parameter value cannot be modified (read only) 2: Out of range 3: Incorrect sub-index number 4: Setting not allowed (only reset allowed) 5: Invalid data type 6: Task cannot be executed in the operating state 7: Request not supported 8: Request cannot be completed due to communication errors 9: Error in writing to the fixed storage area 10: Request failed due to timeout 11: PZD cannot be allocated to the parameter 12: No control word bit can be allocated 13: Other error
4	No parameter modifying permission

8.3.6 Related function codes

Function code	Name	Description	Setting range	Default
P38.00	Bus adapter supporting bus type	0: None 1: PROFIBUS-DP module 2: PROFINET IO module 3: CANopen module 4: Reserved 5: Reserved 6: Reserved The setting of P37.00 must be different from that of P38.00, which is automatically	0–6	1

Function code	Name	Description	Setting range	Default
		processed in the software; if two identical cards are required, use a redundant bus. For example, if bus adapter A selects the DP module but multiple DP expansion cards are inserted into the card slots, the card with the smallest slot number will automatically be the valid expansion card; other types of cards comply with the same rule.		
P38.01	Reserved	-	-	-
P38.02	Sent PZD1 source (typically sent SW)	0: 0 1: Keypad (0–65535) 2: Other-C connector 3: AI1 4: AI2 5: HDI1 6: HDI2	0–8	2
P38.03	Sent PZD2 source		0–8	0
P38.04	Sent PZD3 source		0–8	0
P38.05	Sent PZD4 source		0–8	0
P38.06	Sent PZD5 source		0–8	0
P38.07	Sent PZD6 source		0–8	0
P38.08	Sent PZD7 source		0–8	0
P38.09	Sent PZD8 source		0–8	0
P38.10	Sent PZD9 source		0–8	0
P38.11	Sent PZD10 source		0–8	0
P38.12	Sent PZD11 source		0–8	0
P38.13	Sent PZD12 source		0–8	0
P38.82	Received PZD1 data display	0x0000–0xFFFF Received PZD data display = PZD physically received data with base value processed + Data with polarity processed	0x0000–0xFFFF	0x0000
P38.83	Received PZD12 data display		0x0000–0xFFFF	0x0000
P38.84	Received PZD3 data display	0x0000–0xFFFF Received PZD data display = PZD physically received data with base value processed	0x0000–0xFFFF	0x0000
P38.85	Received PZD4 data display		0x0000–0xFFFF	0x0000
P38.86	Received PZD5 data display		0x0000–0xFFFF	0x0000
P38.87	Received PZD6 data display		0x0000–0xFFFF	0x0000
P37.88	Received PZD7 data display		0x0000–0xFFFF	0x0000
P38.89	Received PZD8 data display		0x0000–0xFFFF	0x0000
P38.90	Received PZD9 data display		0x0000–0xFFFF	0x0000
P38.91	Received PZD10 data display		0x0000–0xFFFF	0x0000
P38.92	Received PZD11 data display		0x0000–0xFFFF	0x0000
P38.93	Received PZD12 data display		0x0000–0xFFFF	0x0000
P38.94	Bus adapter B CW 1	0: 0	0–2	2

Function code	Name	Description	Setting range	Default
	source	1: Keypad (0–65535) 2: Other-C connector (2: P38.82)		
P38.95	Reserved	-	-	-
P38.96	Bus adapter B received PZD1 polarity	0x0000–0xFFFF	0x0000–0xFFFF	0x0000
P38.97	Bus adapter B received PZD2 polarity	0x0000–0xFFFF	0x0000–0xFFFF	0x0000
P38.98	Communication disconnection detection delay	0.00: No detection 0.00–60.00s	0.00–60.00s	0.00s
P38.99	Communication disconnection handling	0: Report a fault 1: Report an alarm, and keeps running	0–1	0

8.4 CANopen protocol

See *EC-TX805 CANopen communication card* operation manual.

Function code	Name	Description	Setting range	Default
P43.00	Module online status	Bit0: EC slot 1 module online state (0: Offline; 1: Online) Bit1: EC slot 2 module online state (0: Offline; 1: Online) Bit2: EC slot 3 module online state (0: Offline; 1: Online) Bit3: EC slot 2-1 module online state (0: Offline; 1: Online) Bit4: EC slot 2-2 module online state (0: Offline; 1: Online) Bit5: EC slot 2-3 module online state (0: Offline; 1:Online) Bit6: EC slot 3-1 module online state (0: Offline; 1: Online) Bit7: EC slot 3-2 module online state (0: Offline; 1: Online) Bit8: EC slot 3-3 module online state (0: Offline; 1: Online)	0x000–0x1FF	0x000
P43.01	CANopen module address	0–127	0–127	2
P43.02	CANopen communication baud rate (kbps)	Setting range: 0–7 0: 1000kbps 1: 800kbps 2: 500kbps 3: 250kbps 4: 125kbps	0–7	5

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Setting range</th><th>Default</th></tr>
<tr><td></td><td></td><td>5: 100kbps</td><td></td><td></td></tr>
<tr><td>P43.03–P43.09</td><td>Reserved</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>P43.10</td><td>Present effective card slot</td><td>0x0000–0xFFFF
Used to display the card slot that is currently effective. When there are two or more card slots inserted with CANopen cards, only the CANopen card at one card slot is effective, and the CANopen cards at the other card slots are used for redundancy.<table><tr><td>Bit0</td><td>EC slot 1 module effective state (0: Invalid; 1: Valid)</td></tr><tr><td>Bit1</td><td>EC slot 2 module effective state (0: Invalid; 1: Valid)</td></tr><tr><td>Bit2</td><td>EC slot 3 module effective state (0: Invalid; 1: Valid)</td></tr><tr><td>Bit3</td><td>EC slot 2-1 module effective state (0: Invalid; 1: Valid)</td></tr><tr><td>Bit4</td><td>EC slot 2-2 module effective state (0: Invalid; 1: Valid)</td></tr><tr><td>Bit5</td><td>EC slot 2-3 module effective state (0: Invalid; 1: Valid)</td></tr><tr><td>Bit6</td><td>EC slot 3-1 module effective state (0: Invalid; 1: Valid)</td></tr><tr><td>Bit7</td><td>EC slot 3-2 module effective state (0: Invalid; 1: Valid)</td></tr><tr><td>Bit8</td><td>EC slot 3-3 module effective state (0: Invalid; 1: Valid)</td></tr></table></td><td>0x0000–0xFFFF</td><td>0x0000</td></tr>
</table>

8.5 Ethernet communication

With the host computer, all parameters in the VFD can be easily set, uploaded, downloaded, while the waveforms of up to 100+ messages can be easily monitored in real time.

Goodrive880 Pro series VFD can save the waveform information of 0.2s before the last stop failure, which can be extracted by the software of the host computer for fault cause analysis.

Function code	Name	Description	Setting range	Default
P44.00–P44.01	Reserved	-	-	-
P44.02	TCP/IP address 1	0–255	0–255	192
P44.03	TCP/IP address 2	0–255	0–255	168
P44.04	TCP/IP address 3	0–255	0–255	0
P44.05	TCP/IP address 4	0–255 (you need to re-power on for the IP address change to take effect)	0–255	1
P44.06	TCP/IP subnet mask address 1	0–255	0–255	255

Function code	Name	Description	Setting range	Default
P44.07	TCP/IP subnet mask address 2	0–255	0–255	255
P44.08	TCP/IP subnet mask address 3	0–255	0–255	255
P44.09	TCP/IP subnet mask address 4	0–255	0–255	0
P44.10	TCP/IP gateway address 1	0–255	0–255	192
P44.11	TCP/IP gateway address 2	0–255	0–255	168
P44.12	TCP/IP gateway address 3	0–255	0–255	1
P44.13	TCP/IP gateway address 4	0–255	0–255	1
P44.14	Keypad monitor site number	0–255 When monitoring multiple main control boxes with a keypad, modifying this function code can complete the switchover between the main control boxes with different site numbers. (Press the PRG and DATA keys simultaneously to return to the local monitor interface and reset the function code to enter the monitored site interface again.)	0–255	1

9 Parameter list

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

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

1. The parameters adopt the decimal system (DEC) and hexadecimal system (0–F). If the hexadecimal system is adopted, all bits are mutually independent on data during parameter editing.
2. "Default" indicates the factory setting of the function parameter. If the value of the parameter is detected or recorded, the value cannot be restored to the factory setting.
3. To better protect parameters, the VFD provides the password protection function. After a password is set (that is, P07.00 is set to a non-zero value), "0. 0. 0. 0. 0." is displayed when you press the PRG/ESC key to enter the function code editing interface. You need to enter the correct user password to enter the interface. For the factory parameters, you need to enter the correct factory password to enter the interface. (You are not advised to modify the factory parameters. Incorrect parameter setting may cause operation exceptions or even damage to the VFD.) If password protection is not in locked state, you can change the password any time. You can set P07.00 to 0 to cancel the user password. When P07.00 is set to a non-zero value during power-on, parameters are prevented from being modified by using the user password function.
4. When you modify function parameters through serial communication, the user password protection function is also applicable and compliant with the same rule.

9.1 Function group summary

Group number	Name	Remarks
P00	Reference value configuration	Reference value channel: function selection, function parameter restore
P01	Start/stop control	Start/stop control
P02	Control channel configuration	Command channel: terminal start/stop, channel 1, channel 2 configuration
P03	Rectifier unit control	Phase-lock loop, rectifier mode
P04	Reserved	-
P05	Input terminal	Analog, digital input terminal
P06	Output terminal	Analog, digital output terminal
P07	System information	Information about the rectifier hardware and software versions.
P08	Fault record	Alarm and fault information, recording last 6 fault records
P09	Reserved	-
P10	Reserved	-
P11	Unit configuration	All function codes related to unit control
P12	Reserved	-

Group number	Name	Remarks
P13	Protection configuration	Protection limit value setting
P14–P19	Reserved	-
P20	CWs and SWs	Rectifier CWs and SWs, read-only parameters
P21	Real time data	Basic signals for monitoring, voltage, current, power, etc.
P22	Reserved	-
P23	System configuration	System time and SD card configuration
P24	Parameter display setting	Display settings for voltage, power, current, etc.
P25–P32	Reserved	-
P33	Blackbox Channel Configuration	Channel data settings of the blackbox
P34–P36	Reserved	-
P37	Fieldbus adapter A	Fieldbus A sent/received data settings, bus data base value settings
P38	Fieldbus adapter B	Fieldbus B sent/received data settings, bus data base value settings
P39	Reserved	Reserved
P40	PROFIBUS-DP module	PROFIBUS-DP module
P41	PROFINET IO module	PROFINET IO module
P42	ModbusRTU module	ModbusRTU module
P43	CANopen module	CANopen module
P44	EtherNet module	EtherNet module
P45–P53	Reserved	-
P54	DC/AC sampling card setting	Sampling settings for DC/AC sampling card
P55–P79	Reserved	-
P80	BitDataSet 1-Summary of data of BO type	BitDataSet 1-Summary of data of BO type
P81–P97	Reserved	-
P98	AIAO calibration functions	AI and AO calibrations
P99	Factory parameters	Parameters that require a manufacturer password to be set: unit rated power, voltage, current, correction factor, etc

9.2 Fault code list

Note: The fault severity is described as follows:

0: No exception handling

1: Only alarm displayed (LED blinking)

2: Stop (minor fault)

3: Stop and switch off (major fault)

Fault No.	Fault description	Modifiable fault severity range	Default fault severity
E0100–E1000 unit fault enumeration			
E0101–E1001	Units 1–10-VCE fault (oUT) (reported for models of 45kW and above)	3	3
E0104–E1004	Units 1–10-Hardware overcurrent (HoC)	2	2

Fault No.	Fault description	Modifiable fault severity range	Default fault severity
E0105–E1005	Units 1–10-Current limit protection (LC)	1	1
E0106–E1006	Units 1–10-Zero drift fault (ItE)	2	2
E0107–E1007	Units 1–10-24V supply fault (E24)	2	2
E0108–E1008	Units 1–10-15V Power supply fault (E15)	2	2
E0109–E1009	Units 1–10-STO fault (Sto)	2	2
E0110–E1010	Units 1–10-Fan fault (FAN)	0–1	1
E0111–E1011	Units 1–10-Downstream communication fault (dn)	2	2
E0112–E1012	Units 1–10-Upstream communication fault (UP)	2	2
E0113–E1013	Units 1–10-Reactor overtemperature (roH)	2	2
E0116–E1016	Unit overvoltage (ov)	2	2
E0117–E1017	Unit undervoltage (Lv)	2	2
E0118–E1018	Unit overtemperature (U.oH)	2	2
E0119–E1019	Unit overtemperature pre-alarm (alarm)	1	1
E1100: DSP CPU1 fault enumeration			
E1101	Bus overvoltage (ov)	2	2
E1102	Bus undervoltage (Lv)	2	2
E1103	Unit current imbalance (CUnb)	2	2
E1104	Modbus communication fault (E-485)	0–2	2
E1105	Software overcurrent (SoC)	2	2
E1107	External fault 1 (EF1)	0–2	2
E1108	External fault 2 (EF2)	0–2	2
E1109	External alarm 1 (EA1)	0–1	1
E1110	External alarm 2 (EA2)	0–1	1
E1112	Factory running time arrival fault (End)	3	3
E1113	FPGA heartbeat fault (F.bEAt)	2	2
E1114	DSP handshake fault (d.bEAt)	2	2
E1116	Bus adapter A communication disconnection (E-FBA)	0–2	2
E1122	Main breaker feedback timeout (Cbov)	3	3
E1123	OFF2 is invalid in the lockout for startup state (OFF2)	3	3
E1124	Power-on precharge timeout (Pbot)	3	3
E1125	The interval between two power-on pre-charges is less than the set time.	1	1
E1128	SD card fault (Sd)	0–2	2
E1129	VFD overload (alarm)	1	1
E1130	Bus adapter B communication disconnection (E-FBB)	0–2	2
E50.00: DSP CPU2 fault enumeration			
E5001	Software overcurrent (SoC)	2	2
E5002	Hardware overcurrent (HoC)	2	2
E5003	Grid overvoltage (Gov)	0–2	2
E5004	Grid undervoltage (Glv)	0–2	2
E5005	VFD overload (oL fault)	2	2

Fault No.	Fault description	Modifiable fault severity range	Default fault severity
E5009	Phase lock failure (PLLE)	2	2
E5012	Handshake fault (HSE)	2	2
E5013	DC bus overvoltage (ov)	2	2
E5014	DC bus undervoltage (lv)	2	2
E5015	Grid overfrequency (oF)	0–2	2
E5016	Grid underfrequency (lF)	0–2	2

9.3 Function parameters

The content of the function code table is as follows:

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

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

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

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

Column 5 "Default": Initial value set in factory

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

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

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

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

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

P00 Reference value configuration

Function code	Name	Description	Setting range	Default	Modify
P00.00	Channel selection source	Used to select the channel source. 0 indicates selection of channel 1, and 1 indicates selection of channel 2) 0: Channel 1 1: Channel 2 2: Other-B connector (0.00–99.99(0.00)) 3: DI1 4: DI2 5: DI3 6: DI4 7: DI5 8: DI6 9: HDI1 10: HDI2	0–10	0	○
P00.01	Function parameter restore	0: No operation 1: Restore to default values (group P08 for fault records, and group P23 for system time cannot be restored)	0–2	0	◎

Function code	Name	Description	Setting range	Default	Modify
		2: Clear fault records (group P08 for fault records)			

P01 Start/stop control

Function code	Name	Description	Setting range	Default	Modify
P01.00	Terminal-based running command protection at power-on	0: Disable restart 1: Enable restart	0–1	1	◎
P01.01	Reserved	-	-	-	
P01.02	OFF1 switch-off delay	1.00–10.00s	1.00–10.00	1.00s	◎
P01.03	Reserved	-	-	-	
P01.04	Power-on precharge timeout time setting	5.0–30.0s	5.0–30.0	30.0s	◎
P01.05	Power-on pre-charge interval	10.0–300.0s	10.0–300.0	180.0s	◎
P01.06	Starting temperature of cooling fan	If the fan running mode is 0, the fan starts running when the unit temperature exceeds the fan startup temperature. 50.0–120.0°C	50.0–120.0	50.0°C	◎
P01.07	Cooling-fan running mode	0: Normal running (The fan will operate when the machine is running or the unit temperature exceeds the fan startup temperature. The fan will stop running with a 30s delay after the machine is stopped and the temperature is below the fan startup temperature.) 1: Permanent running after power-on 2: Speed regulation operation mode	0–2	1	◎
P01.08	Duration of this run	The timing starts after this power-on run, and when the run time is reached, the multi-function digital output terminal outputs a "run time arrival" signal. **Note:** The setting 0 indicates this function code is ineffective.	0–65535	0	○
P01.09	LOC/REM (QUICK/JOG on LED keypad)	0: No function 1: Reserved 2: Shift key to switch the display state 3: Reserved	0–6	6	○

Function code	Name	Description	Setting range	Default	Modify
	function selection	4: Reserved 5: OFF2 stop 6: Local and remote switching			

P02 Control channel configuration

Function code	Name	Description	Setting range	Default	Modify
P02.00	Remote control channel selection	Remote control channel selection 0: Bus adapter A 1: Bus adapter B 2: Modbus (addresses 0x4200, 0x4201) (For details, see section 8.1) 3: Terminal start/stop module (IN1, IN2) Local/remote command switching is primarily used for the LOC/REM key on the LCD keypad (or the QUICK/JOG key on the LED keypad), impacting the control channel; when the LOC/REM key function is selected as local/remote command switching (P01.09=6), press this key to switch between the local control channel and the remote control channel. When the local command channel is used, the control channel are forcibly set to the keypad; when the remote command channel is used, the control channel are forcibly set to the control channel specified by P02.00.	0–3	0	◎
P02.01	Channel 1 start/stop CW source	0: Keypad 1: Digital reference 2: Other-C connector 3: Terminal start/stop module (IN1, IN2) 4: Bus adapter A 5: Bus adapter B 6: PC (addresses 0x4200, 0x4201) 7: Modbus (addresses 0x4200, 0x4201) 8: Customized	0–8	0	◎
P02.02	Channel 1 customized OFF1	The rising edge is valid. 0: 0	0–10	0	◎

Function code	Name	Description	Setting range	Default	Modify
	source	1:1 2: Other-B connector (effective at 0->1) 3: DI1 4: DI2 5: DI3 6: DI4 7: DI5 8: DI6 9: HDI1 10: HDI2			
P02.03	Channel 1 customized run allowing source	0: Run prohibited 1: Run allowing 2: Other-B connector 3: DI1 4: DI2 5: DI3 6: DI4 7: DI5 8: DI6 9: HDI1 10: HDI2	0–10	0	○
P02.04–P02.06	Reserved	-	-	-	-
P02.07	Channel 1 OFF2 source 1	0: OFF2 is valid 1: OFF2 is invalid (1: Necessary conditions for running) 2: Other-B connector (0: OFF2 is valid; 1: Necessary conditions for running) 3: DI1 4: DI2 5: DI3 6: DI4 7: DI5 8: DI6 9: HDI1 10: HDI2	0–10	4	◎
P02.08	Channel 1 OFF2 source 2		0–10	1	◎
P02.09–P02.10	Reserved	-	-	-	-
P02.11	Channel 1 fault reset source 1	0: Fault reset is invalid 1: Fault reset is valid (effective at 0->1) 2: Other-B connector (0: Fault reset is invalid; 1: Fault reset is valid) 3: DI1 4: DI2	0–10	6	◎
P02.12	Channel 1 fault reset source 2		0–10	0	◎

Function code	Name	Description	Setting range	Default	Modify
		5: DI3 6: DI4 7: DI5 8: DI6 9: HDI1 10: HDI2			
P02.13–P02.18	Reserved	-	-	-	-
P02.19	Channel 2 start/stop CW source	0: Keypad-based control 1: Digital reference 2: Other-C connector 3: Terminal start/stop module (IN1, IN2) 4: Bus adapter A 5: Bus adapter B 6: PC control (addresses 0x4200,0x4201) 7: Modbus (addresses 0x4200, 0x4201) 8: Customized	0–8	3	◎
P02.20	Channel 2 customized OFF1 source	The rising edge is valid. 0: 0 1:1 2: Other-B connector (effective at 0->1) 3: DI1 4: DI2 5: DI3 6: DI4 7: DI5 8: DI6 9: HDI1 10: HDI2	0–10	0	◎
P02.21	Channel 2 customized run allowing source	0: Run prohibited 1: Run allowing 2: Other-B connector 3: DI1 4: DI2 5: DI3 6: DI4 7: DI5 8: DI6 9: HDI1 10: HDI2	0–10	0	○
P02.22–P02.24	Reserved	-	-	-	-

Function code	Name	Description	Setting range	Default	Modify
P02.25	Channel 2 OFF2 source 1	0: OFF2 is valid 1: OFF2 is invalid (1: Necessary conditions for running) 2: Other-B connector (0: OFF2 is valid; 1: Necessary conditions for running) 3: DI1 4: DI2 5: DI3 6: DI4 7: DI5 8: DI6 9: HDI1 10: HDI2	0–10	4	◎
P02.26	Channel 2 OFF2 source 2		0–10	1	◎
P02.27–P02.28	Reserved	-	-	-	-
P02.29	Channel 2 fault reset source 1	0: Fault reset is invalid 1: Fault reset is valid (effective at 0->1) 2: Other-B connector (0: Fault reset is invalid; 1: Fault reset is valid) 3: DI1 4: DI2 5: DI3 6: DI4 7: DI5 8: DI6 9: HDI1 10: HDI2	0–10	6	◎
P02.30	Channel 2 fault reset source 2		0–10	0	◎
P02.31–P02.37	Reserved	-	-	-	-
P02.38	Terminal start/stop module channel selection	0: Terminal-based start/stop command 1 1: Terminal-based start/stop command 2 2: Other-B connector 3: DI1 4: DI2 5: DI3 6: DI4 7: DI5 8: DI6 9: HDI1 10: HDI2	0–10	0	◎
P02.39	Terminal start/stop command 1	0: Level mode IN1(1) ● When input 1 is at high level, OFF1 is valid.	0–3	0	◎

Function code	Name	Description	Setting range	Default	Modify
	Mode	● When input 1 is at low level, OFF1 is invalid. 1: IN1(1), IN2(0->1) ● When input 1 is at high level and input 2 generates a rising edge change, OFF1 is 1. ● When input 1 is at low level, OFF1 is 0. 2: IN1(1), IN2(0->1 hold) ● When input 1 is at high level and input 2 generates a rising edge and remains high level, OFF1 is 1. ● Either input 1 or input 2 is at low level, OFF 1 is 0. 3: IN1(0->1), IN2(0) ● When input 2 is at low level and input 1 generates a rising edge, OFF1 is 1. ● When input 2 is at high level, OFF1 is 0.			
P02.40	Terminal start/stop command 1 input IN1 source	0: 0 1:1 2: Other-B connector 3: DI1 4: DI2 5: DI3 6: DI4 7: DI5 8: DI6 9: HDI1 10: HDI2	0–10	3	◎
P02.41	Terminal start/stop command 1 input IN2 source		0–10	0	◎
P02.42	Terminal start/stop command 1 run allowing source		0–10	5	○
P02.43	Terminal start/stop command 2 mode	0: Level mode IN1(1) 1: IN1(1), IN2(0->1) 2: IN1(1), IN2(0->1 hold) 3: IN1(0->1), IN2(0)	0–3	0	◎
P02.44	Terminal start/stop command 2 input IN1 source	0: 0 1:1 2: Other-B connector 3: DI1 4: DI2 5: DI3 6: DI4 7: DI5 8: DI6 9: HDI1 10: HDI2	0–10	0	◎
P02.45	Terminal start/stop command 2 input IN2 source		0–10	0	◎
P02.46	Terminal start/stop command 2 run allowing source		0–10	0	○

Function code	Name	Description	Setting range	Default	Modify
P02.47	Main breaker control signal	0: RO1 NO 1: RO1 NC 2: RO2 NO 3: RO2 NC 4: RO3 NO 5: RO3 NC	0–5	0	◎
P02.48	Main breaker feedback signal source	0: 0 1:1 2: Other-B connector 3: DI1 4: DI2 5: DI3 6: DI4 7: DI5 8: DI6 9: HDI1 10: HDI2	0–10	0	◎
P02.49	Main breaker feedback timeout setting	0.0–10.0s	0.0–10.0	10.0s	◎
P02.50	Auxiliary contactor control signal	0: RO1 NO 1: RO1 NC 2: RO2 NO 3: RO2 NC 4: RO3 NO 5: RO3 NC	0–5	4	◎
P02.51–P02.52	Reserved	-	-	-	-

P03 Rectifier unit control

Function code	Name	Description	Setting range	Default	Modify
P03.00	Phase-lock loop parameter commissioning mode	0: Bandwidth 2: Kp, Ki	0–1	0	◎
P03.01	Phase-lock loop bandwidth	30–60Hz	30–60	50Hz	◎
P03.02	Phase-lock loop Kp	0.00–200.00	0.00–200.00	10.00	◎
P03.03	Phase-lock loop Ki	0.00–10.00	0.00–10.00	0.20	◎
P03.04–P03.14	Reserved	-	-	-	-
P03.15	Synchronous rectifier opening angle	110°–120.0°	110–120	110°	◎

Function code	Name	Description	Setting range	Default	Modify
P03.16	Phase-lock loop working mode selection	0: SRFPLL 1: SOGI	0–1	1	●
P03.17–P03.18	Reserved	-	-	-	-
P03.19	Overload mode enabling	0: Disable 1: Enable	0–1	0	◎
P03.20	Overload mode selection	0: No overload 1: Light overload 2: Heavy overload	0–2	0	◎
P03.21	Grid rated frequency	30–60Hz	30–60	50Hz	◎

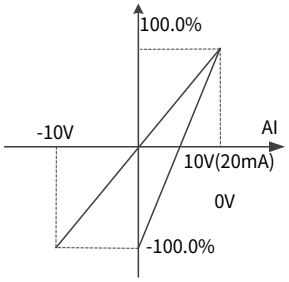
P05 Input terminal function

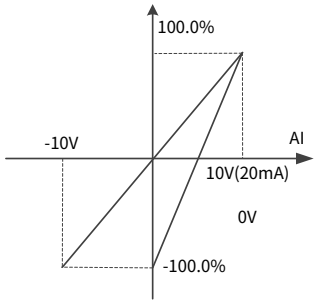
Function code	Name	Description	Setting range	Default	Modify
P05.00	HDI input type	0x00–0x11 Ones place: HDI1 input type 0: HDI1 is high-speed pulse input 1: HDI1 is digital input Tens place: HDI2 input type 0: HDI2 is high-speed pulse input 1: HDI2 is digital input	0x00–0x11	0x00	◎
P05.01	Input terminal physical state value	0x000–0x1FF When the terminal has no external signal, the hardware considers all high levels by default. Bit0 DI1 Bit1 DI2 Bit2 DI3 Bit3 DI4 Bit4 DI5 Bit5 DI6 Bit6 HDI1 Bit7 HDI2 Bit8 DIL	0x000–0x1FF	0x1FF	●
P05.02	Input terminal processed state value	0x000–0x1FF DIL is a special input terminal, when its input is high level, all other input terminals are forced invalid, namely, the states of DI1–DI6 and HDI1–HDI2 are all 0 after processing.	0x000–0x1FF	0x000	●
P05.03	Input terminal polarity selection	0x000–0x1FF	0x000–0x1FF	0x000	○
P05.04	Input terminal forced selection	0x000–0x1FF	0x000–0x1FF	0x000	○

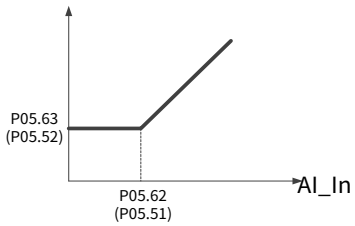
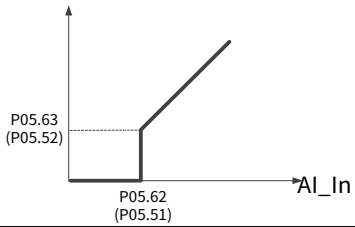
Function code	Name	Description	Setting range	Default	Modify
P05.05	Input terminal forced data	0x000–0x1FF	0x000–0x1FF	0x000	○
P05.06	DI1 filter time	0.000–1.000s	0.000–1.000	0.010s	○
P05.07	DI1 switch-on delay	0.00–360.00s	0.00–360.00	0.00s	○
P05.08	DI1 switch-off delay	0.00–360.00s	0.00–360.00	0.00s	○
P05.09	DI2 filter time	0.000–1.000s	0.000–1.000	0.010s	○
P05.10	DI2 switch-on delay	0.00–360.00s	0.00–360.00	0.00s	○
P05.11	DI2 switch-off delay	0.00–360.00s	0.00–360.00	0.00s	○
P05.12	DI3 filter time	0.000–1.000s	0.000–1.000	0.010s	○
P05.13	DI3 switch-on delay	0.00–360.00s	0.00–360.00	0.00s	○
P05.14	DI3 switch-off delay	0.00–360.00s	0.00–360.00	0.00s	○
P05.15	DI4 filter time	0.000–1.000s	0.000–1.000	0.010s	○
P05.16	DI4 switch-on delay	0.00–360.00s	0.00–360.00	0.00s	○
P05.17	DI4 switch-off delay	0.00–360.00s	0.00–360.00	0.00s	○
P05.18	DI5 filter time	0.000–1.000s	0.000–1.000	0.010s	○
P05.19	DI5 switch-on delay	0.00–360.00s	0.00–360.00	0.00s	○
P05.20	DI5 switch-off delay	0.00–360.00s	0.00–360.00	0.00s	○
P05.21	DI6 filter time	0.000–1.000s	0.000–1.000	0.010s	○
P05.22	DI6 switch-on delay	0.00–360.00s	0.00–360.00	0.00s	○
P05.23	DI6 switch-off delay	0.00–360.00s	0.00–360.00	0.00s	○
P05.24	HDI1 filter time (digital)	0.000–1.000s	0.000–1.000	0.010s	○
P05.25	HDI1 switch-on delay (digital)	0.00–360.00s	0.00–360.00	0.00s	○
P05.26	HDI1 switch-off delay (digital)	0.00–360.00s	0.00–360.00	0.00s	○
P05.27	HDI2 filter time (digital)	0.000–1.000s	0.000–1.000	0.010s	○
P05.28	HDI2 switch-on delay (digital)	0.00–360.00s	0.00–360.00	0.00s	○
P05.29	HDI2 switch-off delay (digital)	0.00–360.00s	0.00–360.00	0.00s	○
P05.30	DIL filter time (Digital)	0.000–1.000s	0.000–1.000	0.010s	○
P05.31	DIL switch-on	0.00–360.00s	0.00–360.00	0.00s	○

Function code	Name	Description	Setting range	Default	Modify
	delay (Digital)				
P05.32	DIL switch-off delay (Digital)	0.00–360.00s	0.00–360.00	0.00s	○
P05.33	HDI1 high-speed pulse input physical value	0.000–65.535kHz HDI1 high-speed pulse input physical value Displays the input frequency value.	0.000–65.535	0.000kHz	●
P05.34	HDI1 high-speed pulse input ratio	-100.00–100.00% Percentage of final input processed by the HDI module.	-100.00–100.00	0.00%	●
P05.35	HDI1 high-speed pulse lower limit frequency	0.000kHz–P05.37	0.000–P05.37	0.000kHz	○
P05.36	Corresponding setting of HDI1 lower limit frequency	-100.0%–P05.38	-100.0–P05.38	0.0%	○
P05.37	HDI1 high-speed pulse upper limit frequency	P05.35–50.000kHz	P05.35–50.000	50.000 kHz	○
P05.38	Corresponding setting of HDI1 upper limit frequency	P05.36–100.0%	P05.36–100.0	100.0%	○
P05.39	HDI1 high-speed pulse input filter time	0.000–10.000s	0.000–10.000	0.030s	○
P05.40	HDI2 high-speed pulse input physical value	0.000–65.535kHz Displays the input frequency value.	0.000–65.535	0.000kHz	●
P05.41	HDI2 high-speed pulse input ratio	-100.00–100.00% Percentage of final input processed by the HDI module.	-100.00–100.00	0.00%	●
P05.42	HDI2 high-speed pulse lower limit frequency	0.000kHz–P05.44	0.000–P05.44	0.000kHz	○
P05.43	Corresponding setting of HDI2 lower limit frequency	-100.0%–P05.45	-100.0–P05.45	0.0%	○
P05.44	HDI2 high-speed pulse upper limit frequency	P05.42–50.000kHz	P05.42–50.000	50.000 kHz	○
P05.45	Corresponding setting of HDI2	P05.43–100.0%	P05.43–100.0	100.0%	○

Function code	Name	Description	Setting range	Default	Modify
	upper limit frequency				
P05.46	HDI2 high-speed pulse input filter time	0.000–10.000s	0.000–10.000	0.030s	○
P05.47	Enabling AI1	0: Disable (AI1 input forced to 0) 1: Enable 2: Other-B connector 3: DI1 4: DI2 5: DI3 6: DI4 7: DI5 8: DI6 9: HDI1 10: HDI2	0–10	1	○
P05.48	AI1 type	Set the type of input signal for AI1 or AI2. After selecting the type, short connect the proper jumper on the hardware side of the control box. 0: Reserved 1: 0–20mA 2: Reserved 3: -10V–10V	0–3	3	◎
P05.49	AI1 input physical value	-32.76–+32.76 Displays the input analog voltage value. When the analog input is current input, 0V–10V voltage corresponds to 0mA–20mA current.	-32.76–+32.76	0.00	●
P05.50	AI1 input ratio	-655.3–655.3% The final output processed by the AI module. If AI is disabled, the value is 0.	-655.3–655.3	0.0%	●
P05.51	AI1 curve min. input value	Setting range of P05.51: -10.00–P05.53	-10.00–P05.53	0.00	○
P05.52	AI1 curve min. input rate	Setting range of P05.52: -600.0%–P05.54	-600.0–P05.54	0.0%	○
P05.53	AI1 curve max input value	Setting range of P05.53: P05.51–10.00	P05.51–10.00	10.00	○
P05.54	AI1 curve max input rate	Setting range of P05.54: P05.52–600.0% The mapping between analog input voltage and analog input current is as follows:	P05.52–600.0	100.0%	○

Function code	Name	Description	Setting range	Default	Modify
		 When the analog input is current input, 0V–10V voltage corresponds to 0mA–20mA current.			
P05.55	AI1 input filter time	0.000–10.000s	0.000–10.000	0.000s	○
P05.56	AI1 denoise threshold	0.0–20.0% Set the decnoise threshold. When AI input fluctuation is less than the set threshold, the corresponding AI rate does not change and remains at the original value.	0.0–20.0	0.0%	○
P05.57	AI1 set zero-cross threshold	0.0–1.0% The AI value is considered to be 0 when the AI input value is less than the set threshold.	0.0–1.0	0.0%	○
P05.58	Enabling AI2	0: Disable (AI2 input forced to 0) 1: Enable 2: Other-B connector 3: DI1 4: DI2 5: DI3 6: DI4 7: DI5 8: DI6 9: HDI1 10: HDI2	0–10	1	○
P05.59	AI2 Type	Set the type of input signal for AI1 or AI2. After selecting the type, short connect the proper jumper on the hardware side of the control box. 0: Reserved 1: 0–20mA 2: Reserved 3: -10V–10V	0–3	3	◎
P05.60	AI2 input physical value	-32.76–+32.76	-32.76–+32.76	0	●
P05.61	AI2 input ratio	-655.3–655.3% Value after AI2 processing. If AI is disabled, the value is 0.	-655.3–655.3	0%	●

Function code	Name	Description	Setting range	Default	Modify
P05.62	AI2 curve min. input value	Setting range of P05.62: -10.00–P05.64 Setting range of P05.63: -600.0%–P05.65 Setting range of P05.64: P05.62–10.00 Setting range of P05.65: P05.63–600.0% The mapping between analog input voltage and analog input current is as follows:  When the analog input is current input, 0V–10V voltage corresponds to 0mA–20mA current.	-10.00–P05.64	0.00	○
P05.63	AI2 curve min. input rate		-600.0–P05.65	0.0%	○
P05.64	AI2 curve max input value		P05.62–10.00	10.00	○
P05.65	AI2 curve max input rate		P05.63–600.0	100.0%	○
P05.66	AI2 input filter time	0.000–10.000s	0.000–10.000	0.000s	○
P05.67	AI2 denoise threshold	0.0–20.0%	0.0–20.0	0.0%	○
P05.68	AI2 set zero-cross threshold	0.0–1.0% The AI value is considered to be 0 when the AI input value is less than the set threshold.	0.0–1.0	0.0%	○
P05.69	Selection at AI below min. input	Ones place: Selection when AI1 is below min. input 0: Min. input rate 1: 0.0% Tens place: Selection when AI2 is below min. input 0: Min. input rate 1: 0.0% **Note:** ● 0: When the AI input is lower than the AI curve min. input value, the AI1 input rate is displayed as the AI curve min. input rate, as shown in the following figure.	0x00–0x11	0x00	○

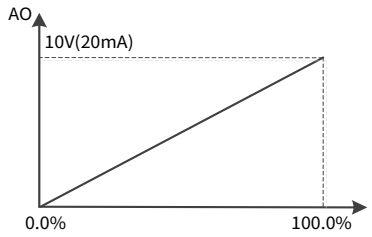
Function code	Name	Description	Setting range	Default	Modify
		AI_After_Deal  ● 1: When the AI input is lower than the AI curve min. input value, the AI1 input rate is displayed as 0, as shown in the following figure. AI_After_Deal  			
P05.70–P05.75	Reserved	-	-	-	-

P06 Output terminal

Function code	Name	Description	Setting range	Default	Modify
P06.00	HDO output type	0x00–0x11 Ones place: HDO1 output type 0: Open collector high-speed pulse output 1: Open collector output Tens place: HDO2 output type 0: Open collector high-speed pulse output 1: Open collector output	0x00–0x11	0x00	◎
P06.01	Output terminal signal source state	0x00–0x7F Bit0 RO1 Bit1 RO2 Bit2 RO3 Bit3 Reserved Bit4 Reserved Bit5 HDO1 Bit6 HDO2	0x00–0x7F	0x00	●
P06.02	Output terminal processed state value	0x00–0x7F	0x00–0x7F	0x00	●
P06.03	Output terminal polarity selection	0x00–0x7F HDO2, HDO1, Reserved, Reserved, RO3, RO2, RO1 in sequence	0x00–0x7F	0x00	○

Function code	Name	Description	Setting range	Default	Modify
P06.04	RO1 signal source	0: Low level 1: High level 2: Other-B connector 3: Startup preparation complete 4: Precharging 5: Main circuit breaker closing 6: Run 7: VFD in fault 8: VFD alarm 9: Running time reached	0–9	0	○
P06.05	RO2 signal source			7	○
P06.06	RO3 signal source			0	○
P06.07	Reserved			0	○
P06.08	Reserved			0	○
P06.09	HDO1-as-DO signal source			0	○
P06.10	HDO2-as-DO signal source			0	○
P06.11	RO1 switch-on delay	0.00–360.00s	0.00–360.00	0.00s	○
P06.12	RO1 switch-off delay	0.00–360.00s	0.00–360.00	0.00s	○
P06.13	RO2 switch-on delay	0.00–360.00s	0.00–360.00	0.00s	○
P06.14	RO2 switch-off delay	0.00–360.00s	0.00–360.00	0.00s	○
P06.15	RO3 switch-on delay	0.00–360.00s	0.00–360.00	0.00s	○
P06.16	RO3 switch-off delay	0.00–360.00s	0.00–360.00	0.00s	○
P06.17–P06.20	Reserved	-	-	-	-
P06.21	HDO1-as-DO switch-off delay	0.00–360.00s	0.00–360.00	0.00s	○
P06.22	HDO1-as-DO switch-off delay	0.00–360.00s	0.00–360.00	0.00s	○
P06.23	HDO2-as-DO switch-on delay	0.00–360.00s	0.00–360.00	0.00s	○
P06.24	HDO2-as-DO switch-off delay	0.00–360.00s	0.00–360.00	0.00s	○
P06.25	AO1 type	The setting of this function code needs to correspond to the shorting cap connection on the control board. 0: 0–10V 1: 0–20mA	0–1	0	◎
P06.26	AO2 type		0–1	0	◎
P06.27	AO1 analog output value	Displays AO1 analog voltage value. When the analog output is current output, 0.5V voltage corresponds to 1mA current. The AO1 output value is the value of the AO1 output rate after the curve transition.	0.000–65.535	0.000	●
P06.28	AO1 output rate	-999.9–999.9% Displays the percentage of the AO1 output, corresponding to the "AO1	-999.9–999.9	0.0%	●

Function code	Name	Description	Setting range	Default	Modify
		signal source". The percentage displayed is only relevant to "AO1 signal source".			
P06.29	AO2 analog output value	0.000–65.535 Displays AO2 analog voltage value. When the analog output is current output, 0.5V voltage corresponds to 1mA current. The AO2 output value is the value of the AO2 output rate after the curve transition.	0.000–65.535	0.000	●
P06.30	AO2 output rate	-999.9–999.9% Displays the AO2 output percentage, corresponding to "AO2 signal source". The percentage displayed is only relevant to "AO2 signal source".	-999.9–999.9	0.0%	●
P06.31	HDO1-as-high-speed-pulse output value	0.000–65.535kHz Displays HDO1 output value. The HDO1 output value is the value of the HDO1 output rate after the curve transition.	0.000–65.535	0.000kHz	●
P06.32	HDO1-as-high-speed-pulse output rate	0.00–655.35% Displays the percentage of the HDO1 output, corresponding to the "HDO1 signal source" (100% corresponds to 50kHz). The percentage displayed is only relevant to "HDO1 signal source".	0.00–655.35	0.00%	●
P06.33	HDO2-as-high-speed-pulse output value	0.000–65.535kHz Displays HDO2 output value. The HDO2 output value is the value of the HDO2 output rate after the curve transition.	0.000–65.535	0.000kHz	●
P06.34	HDO2-as-high-speed-pulse output rate	0.00–655.35% Displays the percentage of the HDO2 output, corresponding to the "HDO2 signal source" (100% corresponds to 50kHz). The percentage displayed is only relevant to "HDO2 signal source".	0.00–655.35	0.00%	●
P06.35	AO1 signal source	0: Disable 1: Digital (4096 indicates 100%, for example, 2048 indicates 50%) 2: Other-C connector (4096 indicates 100%, for example, 2048 indicates 50%)	0–8	5	○
P06.36	AO2 signal source			3	○
P06.37	HDO1-as-HighSpeedPulseOutput signal source			0	○
P06.38	HDO2-as-HighSpeedPulseOutput			0	○

Function code	Name	Description	Setting range	Default	Modify
	signal source	3: Actual bus voltage 4: Grid frequency 5: Grid current 6: Grid voltage 7: Input power 8: Max unit temperature			
P06.39	AO1 curve min. output rate	Setting range of P06.39: -600.0%–P06.41	-600.0–P06.41	0.0%	○
P06.40	AO1 curve min. output value	Setting range of P06.40: 0.000V–P06.42	0.000–P06.42	0.000V	○
P06.41	AO1 curve max output rate	Setting range of P06.41: P06.39–600.0%	P06.39–600.0	100.0%	○
P06.42	AO1 curve max output value	Setting range of P06.42: P06.40–10.00V When the analog output is current output, 1mA equals 0.5V. The mapping between the output value and the analog output is as follows:  	P06.40–10.000	10.000V	○
P06.43	AO1 output filter time	0.000–10.000s	0.000–10.000	0.000s	○
P06.44	AO2 curve min. output rate	-600.0%–P06.46	-600.0–P06.46	0.0%	○
P06.45	AO2 curve min. output value	0.000V–P06.47	0.000–P06.47	0.000V	○
P06.46	AO2 curve max output rate	P06.44–600.0%	P06.44–600.0	100.0%	○
P06.47	AO2 curve max output value	P06.45–10.000V	P06.45–10.000	10.000V	○
P06.48	AO2 output filter time	0.000–10.000s	0.000–10.000	0.000s	○
P06.49	HDO1-as-HighSpeedPulseOutput lower limit	-600.0%–P06.51	-600.0–P06.51	0.0%	○
P06.50	HDO1 output corresponding to lower limit	0.00–50.00kHz	0.00–50.00	0.00kHz	○
P06.51	HDO1-as-HighSpeedPulseOutput upper limit	P06.49–600.0%	P06.49–600.0	100.0%	○
P06.52	HDO1 output	0.00–50.00kHz	0.00–50.00	50.00kHz	○

Function code	Name	Description	Setting range	Default	Modify
	corresponding to upper limit				
P06.53	HDO1-as-HighSpeedPulseOutput filter time	0.000s–10.000s	0.000–10.000	0.000s	○
P06.54	HDO2-as-HighSpeedPulseOutput lower limit	-600.0%–P06.56	-600.0–P06.56	0.00%	○
P06.55	HDO2 output corresponding to lower limit	0.00kHz–P00.57	0.00–P00.57	0.00kHz	○
P06.56	HDO2-as-HighSpeedPulseOutput upper limit	P06.54–600.0%	P06.54–600.0	100.0%	○
P06.57	HDO2 output corresponding to upper limit	P06.55–50.00kHz	0.00–50.00	50.00kHz	○
P06.58	HDO2-as-HighSpeedPulseOutput filter time	0.000s–10.000s	0.000–10.000	0.000s	○

P07 System information

Function code	Name	Description	Setting range	Default	Modify
P07.00	User password	0–65535	0–65535	0	○
P07.01	Product (software) type	0: Inverter 1: Basic rectifier 2: Regenerative rectifier 3: Active rectifier 4: 3PH braking 5: DC/DC	0–5	2	●
P07.02	Working mode of control unit	0: Standalone mode 1: Parallel mode	0–1	0	●
P07.03	Controller ARM software version	Software version	0.00–655.35	0.00	●
P07.04	Controller DSP software version (CPU1)	Software version	0.00–655.35	0.00	●
P07.05	Controller DSP software version (CPU2)	Software version	0.00–655.35	0.00	●
P07.06	Controller FPGA software version	Software version	0.00–655.35	0.00	●
P07.07	Function code version	Function code version	0.00–655.35	0.00	●
P07.08	Entire machine	0–6553.5	0.4–1250.0	Model	●

Function code	Name	Description	Setting range	Default	Modify
	rated power	Depends on unit rated power and number of units		depended	
P07.09	Grid rated voltage	10–20000V	10–20000	Model depended	●
P07.10	Entire machine rated voltage	10–20000V	10–20000	Model depended	●
P07.11	Entire machine rated current	0.0–3000.0A	0.0–3000.0	Model depended	●
P07.12	Expansion card slot 1 type	0：No card 1：DP card 2：PN card 3：CANopen card 4：Reserved 5：Reserved 6：Reserved 7：Reserved 8：Reserved 9：Reserved 10: Reserved 11: Reserved 12: Reserved 13: Reserved 14: Reserved 15: Reserved	0–15	0	●
P07.13	Expansion card slot 1 software version	0.00–655.35	0.00–655.35	0.00	●
P07.14	EC slot 2 type	0.00–655.35	0.00–655.35	0.00	●
P07.15	EC slot 2 software version	0.00–655.35	0.00–655.35	0.00	●
P07.16	EC slot 3 type	0.00–655.35	0.00–655.35	0.00	●
P07.17	Expansion card slot 3 software version	0.00–655.35	0.00–655.35	0.00	●
P07.18	EC slot 4 type	0.00–655.35	0.00–655.35	0.00	●
P07.19	EC slot 4 software version	0.00–655.35	0.00–655.35	0.00	●
P07.20	EC slot 5 type	0.00–655.35	0.00–655.35	0.00	●
P07.21	EC slot 5 software version	0.00–655.35	0.00–655.35	0.00	●
P07.22	EC slot 6 type	0.00–655.35	0.00–655.35	0.00	●
P07.23	EC slot 6 software version	0.00–655.35	0.00–655.35	0.00	●
P07.24	EC slot 7 type	0.00–655.35	0.00–655.35	0.00	●
P07.25	EC slot 7 software version	0.00–655.35	0.00–655.35	0.00	●
P07.26	EC slot 8 type	0.00–655.35	0.00–655.35	0.00	●
P07.27	EC slot 8 software	0.00–655.35	0.00–655.35	0.00	●

Function code	Name	Description	Setting range	Default	Modify
	version				
P07.28	EC slot 9 type	0.00–655.35	0.00–655.35	0.00	●
P07.29	EC slot 9 software version	0.00–655.35	0.00–655.35	0.00	●
P07.30	FPGA software version of unit 1	0.00–655.35	0.00–655.35	0.00	●
P07.31	FPGA software version of unit 2	0.00–655.35	0.00–655.35	0.00	●
P07.32	FPGA software version of unit 3	0.00–655.35	0.00–655.35	0.00	●
P07.33	FPGA software version of unit 4	0.00–655.35	0.00–655.35	0.00	●
P07.34	FPGA software version of unit 5	0.00–655.35	0.00–655.35	0.00	●
P07.35	FPGA software version of unit 6	0.00–655.35	0.00–655.35	0.00	●
P07.36	FPGA software version of unit 7	0.00–655.35	0.00–655.35	0.00	●
P07.37	FPGA software version of unit 8	0.00–655.35	0.00–655.35	0.00	●
P07.38	FPGA software version of unit 9	0.00–655.35	0.00–655.35	0.00	●
P07.39	FPGA software version of unit 10	0.00–655.35	0.00–655.35	0.00	●
P07.40	Per-unit voltage base value	Rated voltage	0–65535	Model depended	●
P07.41	Per-unit current base value	Rated current	0.0–6553.5	Model depended	●
P07.42	Per-unit power base value	Rated power	0.0–6553.5	Model depended	●
P07.43	Grid rated frequency	0–655Hz	0–655	50Hz	●
P07.44–P07.50	Reserved	-	-	-	-
P07.51	Ethernet online state	0: Offline 1: Online	0–1	0	●
P07.52	Factory bar code 1	0–65535	0–65535	0	●
P07.53	Factory bar code 2	0–65535	0–65535	0	●
P07.54	Factory bar code 3	0–65535	0–65535	0	●
P07.55	Factory bar code 4	0–65535	0–65535	0	●
P07.56	Factory bar code 5	0–65535	0–65535	0	●
P07.57	Factory bar code 6	0–65535	0–65535	0	●

P08 Fault record

Function code	Name	Description	Setting range	Default	Modify
P08.00	Present fault code	For details, see section 9.2 Fault code list.	0.00–99.99	0.00	●
P08.01	Last fault code		0.00–99.99	0.00	●
P08.02	2nd-last fault code		0.00–99.99	0.00	●
P08.03	3rd-last fault code		0.00–99.99	0.00	●
P08.04	4th-last fault code		0.00–99.99	0.00	●
P08.05	5th-last fault code		0.00–99.99	0.00	●
P08.06	RT fault code 1	Real time (RT) faults only record fault codes, excluding the parameters at the fault time; the difference between the current fault code and the real time fault code is that if the current rectifier unit is already in the fault state, the other faults will not be logged by the current fault code and the real time fault code will still be logged.	0.00–99.99	0.00	●
P08.07	RT fault code 2		0.00–99.99	0.00	●
P08.08	RT fault code 3		0.00–99.99	0.00	●
P08.09	RT fault code 4		0.00–99.99	0.00	●
P08.10	RT fault code 5		0.00–99.99	0.00	●
P08.11	RT fault code 6		0.00–99.99	0.00	●
P08.12	Present alarm code 1	DSP–CPU2 alarm codes: A50.nn–A99.nn DSP–CPU1 alarm codes: A11.nn–A49.nn Unit alarm codes: A01.nn–A10.nn Alarm: nn=0–99	0.00–99.99	0.00	●
P08.13	Last alarm code 2		0.00–99.99	0.00	●
P08.14	2nd-last alarm code 3		0.00–99.99	0.00	●
P08.15	3rd-last alarm code 4		0.00–99.99	0.00	●
P08.16	4th-last alarm code 5		0.00–99.99	0.00	●
P08.17	5th-last alarm code 6		0.00–99.99	0.00	●
P08.18–P08.19	Reserved	-	-	-	-
P08.20	Grid voltage at present fault	-	0–1200	0V	●
P08.21	Input current at present fault	-	0.0–3000.0	0.0A	●
P08.22	Bus voltage at present fault	-	0.0–2000.0	0.0V	●
P08.23	Max. temperature at present fault	-	-20.0–120.0	0.0°C	●
P08.24	Input terminal state at present fault	-	0x0000–0xFFFF	0x0000	●
P08.25	Output terminal status at present fault	-	0x0000–0xFFFF	0x0000	●
P08.26–	Reserved	-	-	-	-

Function code	Name	Description	Setting range	Default	Modify
P08.27					
P08.28	Grid voltage at last fault	-	0–1200	0V	●
P08.29	Input current at last fault	-	0.0–3000.0	0.0A	●
P08.30	Bus voltage at last fault	-	0.0–2000.0	0.0V	●
P08.31	Max. temperature at last fault	-	-20.0–120.0	0.0°C	●
P08.32	Input terminal state at last fault	-	0x0000–0xFFFF	0x0000	●
P08.33	Output terminal state at last fault	-	0x0000–0xFFFF	0x0000	●
P08.34–P08.35	Reserved	-	-	-	-
P08.36	Grid voltage at 2nd-last fault	-	0–1200	0V	●
P08.37	Input current at 2nd-last fault	-	0.0–3000.0	0.0A	●
P08.38	Bus voltage at 2nd-last fault	-	0.0–2000.0	0.0V	●
P08.39	Max. temperature at 2nd-last fault	-	-20.0–120.0	0.0°C	●
P08.40	Input terminal status at 2nd-last fault	-	0x0000–0xFFFF	0x0000	●
P08.41	Output terminal status at 2nd-last fault	-	0x0000–0xFFFF	0x0000	●
P08.42	Fault code 1 selection	0: 0(ineffective) 1: 11.04 (Modbus communication fault) 2: 11.07 (External fault 1) 3: 11.08 (External fault 2) 4: 11.09 (External alarm 1) 5: 11.10 (External alarm 2) 6: 11.16 (Bus adapter A communication disconnection) 7: 11.28 (SD card fault) 8: 11.30 (Bus adapter B communication disconnection) 9: 50.03 (Grid overvoltage) 10: 50.04 (Grid undervoltage) 11: 50.15 (Grid overfrequency) 12: 50.16 (Grid underfrequency) 13: 01.10 (Unit 1 fan fault) 14: 02.10 (Unit 2 fan fault) 15: 03.10 (Unit 3 fan fault)	0–22	0	○

Function code	Name	Description	Setting range	Default	Modify
		16: 04.10 (Unit 4 fan fault) 17: 05.10 (Unit 5 fan fault) 18: 06.10 (Unit 6 fan fault) 19: 07.10 (Unit 7 fan fault) 20: 08.10 (Unit 8 fan fault) 21: 09.10 (Unit 9 fan fault) 22: 10.10 (Unit 10 fan fault)			
P08.43	Reserved	-	-	-	-
P08.44	Fault code 1 exception severity change	0: No exception handling 1: Only display an alarm 2: Stop	0–2	2	○
P08.45	Fault code 2 selection	0–22	0–22	0	○
P08.46	Reserved	-	-	-	-
P08.47	Fault code 2 exception severity change	0: No exception handling 1: Only display an alarm 2: Stop	0–2	2	○
P08.48	Fault code 3 selection	0–22	0–22	0	○
P08.49	Reserved	-	-	-	-
P08.50	Fault code 3 exception severity change	0: No exception handling 1: Only display an alarm 2: Stop	0–2	2	○
P08.51	Fault code 4 selection	0–22	0–22	0	○
P08.52	Reserved	-	-	-	-
P08.53	Fault code 4 exception severity change	0: No exception handling 1: Only display an alarm 2: Stop	0–2	2	○
P08.54	Fault code 5 selection	0–22	0–22	0	○
P08.55	Reserved	-	-	-	-
P08.56	Fault code 5 exception severity change	0: No exception handling 1: Only display an alarm 2: Stop	0–2	2	○
P08.57	Fault code 6 selection	0–22	0–22	0	○
P08.58	Reserved	-	-	-	-
P08.59	Fault code 6 exception severity change	0: No exception handling 1: Only display an alarm 2: Stop	0–2	2	○
P08.60	Fault code 7 selection	0–22	0–22	0	○
P08.61	Reserved	-	-	-	-
P08.62	Fault code 7 exception severity change	0: No exception handling 1: Only display an alarm 2: Stop	0–2	2	○

Function code	Name	Description	Setting range	Default	Modify
P08.63	Fault code 8 selection	0–22	0–22	0	○
P08.64	Reserved	-	-	-	-
P08.65	Fault code 8 exception severity change	0: No exception handling 1: Only display an alarm 2: Stop	0–2	2	○
P08.66	Fault code 9 selection	0–22	0–22	0	○
P08.67	Reserved	-	-	-	-
P08.68	Fault code 9 exception severity change	0: No exception handling 1: Only display an alarm 2: Stop	0–2	2	○
P08.69	Fault code 10 selection	0–22	0–22	0	○
P08.70	Reserved	-	-	-	-
P08.71	Fault code 10 exception severity change	0: No exception handling 1: Only display an alarm 2: Stop	0–2	2	○
P08.72	Auto fault reset count	0–10	0–10	0	○
P08.73	Auto fault reset interval	0.1–3600.0s	0.1–3600.0	3.0s	○
P08.74	Auto reset count display	0–36000	0–36000	0	●
P08.75	Present fault occur month.day	Records the month and date when the fault occurred.	Mon Day 01.01–12.31	01.01	●
P08.76	Present fault occur hour.minute	Records the hour and minute when the fault occurred.	Hour Min 0.00–23.59	0.00	●
P08.77	Present fault occur second	Records the second when the fault occurred.	Sec 0–59	0	●
P08.78	Last fault occur month.day	Records the month and date when the fault occurred.	Mon Day 01.01–12.31	01.01	●
P08.79	Last fault occur hour.minute	Records the hour and minute when the fault occurred.	Hour Min 0.00–23.59	0.00	●
P08.80	Last fault occur second	Records the second when the fault occurred.	Sec 0–59	0	●
P08.81	2nd-last fault occur month.day	Records the month and date when the fault occurred.	Mon Day 01.01–12.31	01.01	●
P08.82	2nd-last fault occur hour.minute	Records the hour and minute when the fault occurred.	Hour Min 0.00–23.59	0.00	●
P08.83	2nd-last Fault occur second	Records the second when the fault occurred.	Sec 0–59	0	●
P08.84	3rd-last fault occur month.day	Records the month and date when the fault occurred.	Mon Day 01.01–12.31	01.01	●
P08.85	3rd-last fault	Records the hour and minute when	Hour Min	0.00	●

Function code	Name	Description	Setting range	Default	Modify
	occur hour.minute	the fault occurred.	0.00–23.59		
P08.86	3rd-last fault occur second	Records the second when the fault occurred.	Sec 0–59	0	●
P08.87	4th-last fault occur month.day	Records the month and date when the fault occurred.	Mon Day 01.01–12.31	01.01	●
P08.88	4th-last fault occur hour.minute	Records the hour and minute when the fault occurred.	Hour Min 0.00–23.59	0.00	●
P08.89	4th-last Fault occur second	Records the second when the fault occurred.	Sec 0–59	0	●
P08.90	5th-last fault occur month.day	Records the month and date when the fault occurred.	Mon Day 01.01–12.31	01.01	●
P08.91	5th-last fault occur hour.minute	Records the hour and minute when the fault occurred.	Hour Min 0.00–23.59	0.00	●
P08.92	5th-last fault occur second	Records the second when the fault occurred.	Sec 0–59	0	●

P11 Unit configuration

Function code	Name	Description	Setting range	Default	Modify
P11.00	Parallel mode	0: Standalone 1: Paralleled	0–1	0	●
P11.01	Unit enabling selection	0x000–0x3FF Binary is used for unit enabling. A max of 10 power units can be configured.	0x000–0x3FF	0x001	◎
P11.02–P11.04	Reserved	-	-	-	-
P11.05	Main interrupt calculation frequency	1.0–10.0kHz	1.0–10.0	4.0kHz	◎
P11.06	Reserved	-	-	-	-
P11.07	Unit overtemperature alarm threshold	0.0–90.0°C	0.0–90.0	-	-
P11.08	Unit overtemperature point setting	0.0–95.0°C	0.0–95.0	95.0°C	○

P13 Protection configuration

Function code	Name	Description	Setting range	Default	Modify
P13.00	Grid voltage overvoltage point (line voltage)	110.0–130.0%	110.0–130.0	400V: 125.0% 690V:	◎

Function code	Name	Description	Setting range	Default	Modify
	setting			110.0%	
P13.01	Grid voltage undervoltage point (line voltage) setting	80.0–84.0%	80.0–84.0	80.0%	◎
P13.02	Protection point of high grid frequency	3–6Hz	3–6	3Hz	◎
P13.03	Protection point of low grid frequency	3–6Hz	3–6	3Hz	◎
P13.04	Reserved	-	-	-	-
P13.05	Software bus overvoltage point	-4 models: 800.0V -6 models: 1200.0V	0–2000.0	800.0V	◎
P13.06	Software bus undervoltage point	-4 models: 200.0V -6 models: 550.0V	0–1000.0	200.0V	◎
P13.07	Software overcurrent point	No-overload upper limit: 130.0% (default is 128%) Light-overload upper limit: 150.0% (default is 133%) Heavy-overload upper limit: 200.0% (default is 170%)	50.0–200.0	128.0%	◎
P13.08	Reserved	-	-	-	-
P13.09	Current limit detection time	0.000–20.000s	0.000–20.000	0.100s	◎
P13.10	Hardware current limit point (unit current limit point)	No-overload upper limit: 130.0% (default is 101.0%) Light-overload upper limit: 150.0% (default is 105.0%) Heavy-overload upper limit: 200.0% (default is 140.0%)	50.0–200.0	101.0%	◎
P13.11	External fault 1 source	0: Invalid 1: Fault occurred 2: Other-B connector 3: DI1 4: DI2 5: DI3 6: DI4 7: DI5 8: DI6 9: HDI1 10: HDI2	0–10	0	○
P13.12	External fault 2 source		0–10	0	○
P13.13	External alarm 1 source	0: Invalid 1: Fault occurred 2: Other-B connector 3: DI1	0–10	0	○

Function code	Name	Description	Setting range	Default	Modify
		4: DI2 5: DI3 6: DI4 7: DI5 8: DI6 9: HDI1 10: HDI2			
P13.14	External alarm 2 source	0: Invalid 1: Fault occurred 2: Other-B connector 3: DI1 4: DI2 5: DI3 6: DI4 7: DI5 8: DI6 9: HDI1 10: HDI2	0–10	0	○

P20 CW and SW

Function code	Name	Description	Setting range	Default	Modify
P20.00	Control word 1	Combination of P20.01–P20.16	0x0000–0xFFFF	0x0000	●
P20.01	Bit0 of control word 1	0 =OFF1 is switched off to enter the lockout for startup state. 0->1 = At the rising edge, go through Ready to start->Power-on detection->Pre-charge->Ready to run	0–1	0	●
P20.02	Bit1 of control word 1	0= Block IGBT; OFF2 emergency stop switched off 1=Normal	0–1	0	●
P20.03	Bit2 of control word 1	-	-	-	●
P20.04	Bit3 of control word 1	0=Stop 1=Run	0–1	0	●
P20.05–P20.07	Reserved	-	-	-	-
P20.08	Bit7 of control word 1	0 =Invalid, no fault reset command 0->1 =At the rising edge, fault reset is valid	0–1	0	●
P20.09–P20.10	Reserved	-	-	-	-
P20.11	Bit10 of control word 1	Remote control 0=Disable 1=Enable	0–1	0	●
P20.12–	Reserved	-	-	-	-

Function code	Name	Description	Setting range	Default	Modify
P20.14					
P20.15	Bit14 of control word 1	0=Invalid, do not trigger external fault 1=Trigger external fault 1	0–1	0	●
P20.16	Bit15 of control word 1	0=Invalid, do not trigger external fault 1=Trigger external fault 2	0–1	0	●
P20.17	Control word 2	Combination of P20.18–P20.33	0x0000–0xFFFF	0x0000	●
P20.18	Bit0 of control word 2	0=Invalid, do not trigger external fault 1=Trigger external alarm 1	0–1	0	●
P20.19	Bit1 of control word 2	0=Invalid, do not trigger external fault 1=Trigger external alarm 2	0–1	0	●
P20.20–P20.25	Reserved	-	-	-	-
P20.26	Bit8 of control word 2	0=Trigger channel 1 1=Trigger channel 2	0–1	0	●
P20.27–P20.33	Reserved	-	-	-	-
P20.34	State word 1	Combination of P20.35–P20.50	0x0000–0xFFFF	0x0000	●
P20.35	Bit0 of state word 1 (Ready to start)	0 = Lockout for startup 1 = Ready to connect	0–1	0	●
P20.36	Bit1 of status word 1 (Ready to run)	0 = Switch-on command (OFF1) is not received 1 = Switch-on command (OFF1) is received	0–1	0	●
P20.37	Bit2 of status word 1 (Start)	0 = Rectifier unit is not running 1= Rectifier unit is running	0–1	0	●
P20.38	Bit3 of status word 1 (Fault activated)	0 = No fault 1= Fault	0–1	0	●
P20.39	Bit4 of status word 1 (Block output activated)	0 = OFF2 activated 1= OFF2 not activated	0–1	0	●
P20.40	Bit5 of status word 1	Reserved	0–1	0	●
P20.41	Bit6 of status word 1 (Lockout for startup/Disable brake closing)	0 = Normal 1 = External conditions not present or failure	0–1	0	●
P20.42	Bit7 of status word 1 (Alarm)	0 = No alarm 1 = Alarm activated	0–1	0	●
P20.43–P20.44	Reserved	-	-	-	-
P20.45	Bit10 of status word 1 (Remote control operation)	0 = Local (indicating host controller or keypad) 1 = Remote (Control channels other	0–1	0	●

Function code	Name	Description	Setting range	Default	Modify
		than the host controller or keypad)			
P20.46	Bit11 of state word 1	0 = Pre-charge incompleted 1= Pre-charge completed	0–1	0	●
P20.47	Bit12 of state word 1	0 = Main power supply disconnected 1 = Main power supply connected	0–1	0	●
P20.48	Bit13 of status word 1 (IGBT operation)	0 = IGBT blocked 1 = IGBT triggered	0–1	0	●
P20.49–P20.50	Reserved	-	-	-	-
P20.51	Status word 2	Combination of P20.52–P20.67	0–1	0	●
P20.52–P20.54	Reserved	-	-	-	-
P20.55	Bit3 of state word 2	0: Unit fan stop 1: Unit fan run	0–1	0	●
P20.56–P20.57	Reserved	-	-	-	-
P20.58	Bit6 of state word 2	External fault 1	0–1	0	●
P20.59	Bit7 of state word 2	External fault 2	0–1	0	●
P20.60–P20.67	Reserved	-	-	-	-
P20.68	Panel start/stop CW	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●
P20.69	PC start/stop CW	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●
P20.70	Terminal-based start/stop CW	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●
P20.71	Customized start/stop CW	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●
P20.72	Actual start/stop CW	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●
P20.73	Modbus start/stop CW	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●

P21 RT Data

Function code	Name	Description	Setting range	Default	Modify
P21.00	Grid frequency	-99.99–99.99Hz	-99.99–99.99	0.00Hz	●
P21.01	Reserved	-	-	-	-
P21.02	Bus voltage	0.0–6553.5V	0.0–6553.5	0.0V	●
P21.03	Actual current	0.0–6553.5A	0.0–6553.5	0.0A	●
P21.04	Grid RS line voltage	0–65535V	0–65535	0V	●

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Setting range</th><th>Default</th><th>Modify</th></tr>
<tr><td>P21.05</td><td>Grid ST line voltage</td><td>0–65535V</td><td>0–65535</td><td>0V</td><td>●</td></tr>
<tr><td>P21.06–P21.07</td><td>Grid voltage</td><td>0–65535V</td><td>0–65535</td><td>0V</td><td>●</td></tr>
<tr><td>P21.08</td><td>Input power</td><td>0.0–6553.5kW</td><td>0.0–6553.5</td><td>0.0kW</td><td>●</td></tr>
<tr><td>P21.09</td><td>Input power factor</td><td>-100.0–100.0</td><td>-100.0–100.0</td><td>0.0</td><td>●</td></tr>
<tr><td>P21.10–P21.11</td><td>Reserved</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>P21.12</td><td>System state machine</td><td>0–6
0: Invalid
1: Lockout for startup
1: Ready for startup
3: Power-on precharge
4: Ready to run
5: Running
6: Fault state</td><td>0–6</td><td>0</td><td>●</td></tr>
<tr><td>P21.13–P21.21</td><td>Reserved</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>P21.22</td><td>Main control board temperature</td><td>-</td><td>-40.0–125.0</td><td>0°C</td><td>●</td></tr>
<tr><td>P21.23</td><td>Max unit temperature</td><td>-</td><td>-20.0–120.0</td><td>0°C</td><td>●</td></tr>
<tr><td>P21.24–P21.26</td><td>Reserved</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>P21.27</td><td>Input terminal status</td><td><table><tr><td>Bit0</td><td>DI1</td></tr><tr><td>Bit1</td><td>DI2</td></tr><tr><td>Bit2</td><td>DI3</td></tr><tr><td>Bit3</td><td>DI4</td></tr><tr><td>Bit4</td><td>DI5</td></tr><tr><td>Bit5</td><td>DI6</td></tr><tr><td>Bit6</td><td>HDI1</td></tr><tr><td>Bit7</td><td>HDI2</td></tr></table></td><td>0x00–0xFF</td><td>0x00</td><td>●</td></tr>
<tr><td>P21.28</td><td>Output terminal status</td><td><table><tr><td>Bit0</td><td>RO1</td></tr><tr><td>Bit1</td><td>RO2</td></tr><tr><td>Bit2</td><td>RO3</td></tr><tr><td>Bit3</td><td>DO1</td></tr><tr><td>Bit4</td><td>DO2</td></tr><tr><td>Bit5</td><td>HDO1</td></tr><tr><td>Bit6</td><td>HDO2</td></tr></table></td><td>0x00–0xFF</td><td>0x00</td><td>●</td></tr>
<tr><td>P21.29</td><td>AI1 display(%)</td><td>-655.3–655.3%
The final output processed by the AI module. If AI is disabled, the value is 0.</td><td>-655.3–655.3</td><td>0.0%</td><td>●</td></tr>
<tr><td>P21.30</td><td>AI2 display(%)</td><td>-655.3–655.3%</td><td>-655.3–</td><td>0.0%</td><td>●</td></tr>
</table>

Function code	Name	Description	Setting range	Default	Modify
		The final output processed by the AI module. If AI is disabled, the value is 0.	655.3		
P21.31	Reserved	-	-	-	-
P21.32	HDI1 display(kHz)	0.000–65.000kHz Displays the input frequency value.	0.000–65.000	0.000kHz	●
P21.33	HDI2 display(kHz)	0.000–65.000kHz Displays the input frequency value.	0.000–65.000	0.000kHz	●
P21.34	AO1(%)	-999.9–999.9% Displays the AO1 output percentage, corresponding to "AO1 signal source".	-999.9–999.9	0.0%	●
P21.35	AO2(%)	-999.9–999.9% Displays the AO2 output percentage, corresponding to "AO2 signal source".	-999.9–999.9	0%	●
P21.36	HDO1(kHz)	0.000–65.535kHz Display the HDO1 output value.	0.000–65.535	0.000kHz	●
P21.37	HDO2(kHz)	0.000–65.535kHz Display the HDO2 output value.	0.000–65.535	0.000kHz	●
P21.38–P21.41	Reserved	-	-	-	-
P21.42	Local accumulative running time	0–65535h	0–65535	0h	●
P21.43	Unit online status	0x000–0x3FF Binary is used for indicating the unit online state. A max of 10 power units can be configured.	0x000–0x3FF	0x000	●
P21.44	Temperature of unit 1	-20.0–120.0°C	-20.0–120.0	0.0°C	●
P21.45	Temperature of unit 2	-20.0–120.0°C	-20.0–120.0	0.0°C	●
P21.46	Temperature of unit 3	-20.0–120.0°C	-20.0–120.0	0.0°C	●
P21.47	Temperature of unit 4	-20.0–120.0°C	-20.0–120.0	0.0°C	●
P21.48	Temperature of unit 5	-20.0–120.0°C	-20.0–120.0	0.0°C	●
P21.49	Temperature of unit 6	-20.0–120.0°C	-20.0–120.0	0.0°C	●
P21.50	Temperature of unit 7	-20.0–120.0°C	-20.0–120.0	0.0°C	●
P21.51	Temperature of unit 8	-20.0–120.0°C	-20.0–120.0	0.0°C	●
P21.52	Temperature of unit 9	-20.0–120.0°C	-20.0–120.0	0.0°C	●
P21.53	Temperature of unit 10	-20.0–120.0°C	-20.0–120.0	0.0°C	●
P21.54	Current of unit 1	0.0–6553.5A	0.0–6553.5	0.0A	●

Function code	Name	Description	Setting range	Default	Modify
P21.55	Current of unit 2	0.0–6553.5A	0.0–6553.5	0.0A	●
P21.56	Current of unit 3	0.0–6553.5A	0.0–6553.5	0.0A	●
P21.57	Current of unit 4	0.0–6553.5A	0.0–6553.5	0.0A	●
P21.58	Current of unit 5	0.0–6553.5A	0.0–6553.5	0.0A	●
P21.59	Current of unit 6	0.0–6553.5A	0.0–6553.5	0.0A	●
P21.60	Current of unit 7	0.0–6553.5A	0.0–6553.5	0.0A	●
P21.61	Current of unit 8	0.0–6553.5A	0.0–6553.5	0.0A	●
P21.62	Current of unit 9	0.0–6553.5A	0.0–6553.5	0.0A	●
P21.63	Current of unit 10	0.0–6553.5A	0.0–6553.5	0.0A	●
P21.64	State of unit 1	Bit0: Unit ready Bit1: Running Bit2: Fault Bit3: Wave generation	0x0000–0xFFFF	0x0000	●
P21.65	State of unit 2		0x0000–0xFFFF	0x0000	●
P21.66	State of unit 3		0x0000–0xFFFF	0x0000	●
P21.67	State of unit 4		0x0000–0xFFFF	0x0000	●
P21.68	State of unit 5		0x0000–0xFFFF	0x0000	●
P21.69	State of unit 6		0x0000–0xFFFF	0x0000	●
P21.70	State of unit 7		0x0000–0xFFFF	0x0000	●
P21.71	State of unit 8		0x0000–0xFFFF	0x0000	●
P21.72	State of unit 9		0x0000–0xFFFF	0x0000	●
P21.73	State of unit 10		0x0000–0xFFFF	0x0000	●
P21.74	System time (year)	2022–2099	2022–2099	2022	●
P21.75	System time (month.date)	01.01–12.31	01.01–12.31	01.01	●
P21.76	System time (hour.minute)	00.00–23.59	00.00–23.59	00.00	●

P23 System configuration

Function code	Name	Description	Setting range	Default	Modify
P23.00	RTC_Year	These function codes can be used to set the system time. The system always accumulates time from the present value, and the real-time time of the system can be viewed through group P21.	Year 2022–2099	2022	○
P23.01	RTC_Month. RTC_Day		Mon Day 01.01–12.31	01.01	○
P23.02	RTC_Hour. RTC_Min		Hour Min 00.00–23.59	00.00	○
P23.03	RTC_Sec		Sec	0	○

Function code	Name	Description	Setting range	Default	Modify
			0–59		
P23.04	RTC reset enabling	After setting the RTC time through P23.00– P23.03, you can use this function code to generate a rising edge to allow the reset system time to take effect. Set the function code to 0 and then 1 to create a rising edge.	0–1	0	○
P23.05	Run parameter record SD card save period	This function code specifies the saving period for the running-related parameters, including bus voltage (V), grid voltage (V), input current (A), and input power (%). 0.0–5.0min	0.0–5.0	0.5min	○
P23.06	SD card fault storage mode	0–1 0: Disable 1: Trigger storage mode	0–1	0	○
P23.07	Saving SD card function codes to	0: Function code file 0 1: Function code file 1 2: Function code file 2 When the SD card function parameter copy function code is set to 1, the function codes are saved to the file specified by this function code.	0–2	0	○
P23.08	Restoring SD card function codes from	0: Function code file 0 1: Function code file 1 2: Function code file 2 When the SD card function parameter copy function code is set to 1, the function codes are saved to the file specified by this function code.	0–2	0	○
P23.09	SD card function parameter copy	0: No operation 1: Local function parameters (P00–P99 and connector parameters) are uploaded to the SD card. After the upload is complete, the SD card will generate a parameter file (unreadable) and a report file (.csv). After the function code is set to 1, the SD card will save the function code configuration file (number of function code groups, number of function codes, and other information) and then the function code file. 2: Download parameters from the SD card to the local address **Note:** After any operation among 1–2 is complete, the parameter restores	0–2	0	◎

Function code	Name	Description	Setting range	Default	Modify
		to 0. The download function is not applicable to group P99.			
P23.10	Enabling no-SD-card insertion alarm	0: Disable No alarm when no SD card inserted. 1: Enable Alarm when no SD card is inserted.	0–1	0	○
P23.11	SD card state feedback	SD card state feedback Bit0: When the system powers up, if the SD card is not inserted or the SD card is invalid, the value is 1. Bit1: SD card initialization successful, waiting for SD card operation Bit2: SD card reading failed Bit3: SD card writing failed Bit4: File opening failed Bit5: File First creation failed Bit6: SD card last operation successful Bit7: Less than 2G of space left Bit8: Save function code configuration file - end of execution Bit9: Save function code configuration file - disallow saving the configuration file Bit10: Save function code to SD card - end of execution Bit11: Save function code to SD card - state of disabling parameter copy Bit12: Restore function code from SD card - end of execution Bit12: Restore function code from SD card - state of disabling function code restoring	0x0000–0x3FFF	0x0000	●

P24 Parameter display setting

Function code	Name	Description	Setting range	Default	Modify
P24.00	Input current filter time	0.000–10.000s	0.000–10.000	0.005s	○
P24.01	Reserved	-	-	-	-
P24.02	Input power filter time	0.000–10.000s	0.000–10.000	0.005s	○
P24.03	Bus voltage filter time	0.000–10.000s	0.000–10.000	0.005s	○
P24.04	Output voltage filter time	0.000–10.000s	0.000–10.000	0.005s	○
P24.05–P24.07	Reserved	-	-	-	-
P24.08	Selection of	0x0000–0xFFFF	0x0000–	0x000E	○

Function code	Name	Description	Setting range	Default	Modify
	parameters to be displayed in the stop state	Bit0: Reserved Bit1: Bus voltage (V on) Bit2: Input voltage Bit3: Input terminal state Bit4: Output terminal status Bit5: Reserved Bit6: Reserved Bit7: Reserved Bit8: AI1 (V on) Bit9: AI2 (V on) Bit10: High-speed pulse HDI1 frequency Bit11: High-speed pulse HDI2 frequency Bit12: Reserved Bit13–Bit15: Reserved	0xFFFF		
P24.09	Selection 1 of parameters to be displayed in the running state	0x0000–0xFFFF Bit0: Reserved Bit1: Reserved Bit2: Bus voltage (V on) Bit3: Input voltage (V on) Bit4: Input current (A on) Bit5: Reserved Bit6: Input power (% on) Bit 7: Reserved Bit8: Reserved Bit9: Reserved Bit10: Input terminal status Bit11: Output terminal state Bit12: Reserved Bit13: Reserved Bit14: Reserved Bit15: Reserved	0x0000–0xFFFF	0x001C	○
P24.10	Selection 2 of parameters to be displayed in the running state	0x0000–0xFFFF Bit0: AI1 (V on) Bit 1: AI2 value (V on) Bit 2: High-speed pulse HDI1 frequency Bit 3: High-speed pulse HDI2 frequency Bit4: Reserved Bit5: VFD overload percentage (% on) Bit6: Reserved Bit7: Reserved Bit8–15: Reserved	0x0000–0xFFFF	0x0000	○

P33 Blackbox channel configuration

Function code	Name	Description	Setting range	Default	Modify

Function code	Name	Description	Setting range	Default	Modify
P33.00	Blackbox customized channel 1 selection	Customize additional data that is required in the event of a fault. Up to 512 data records can be saved to the SD card and FLASH at a 0.5ms cycle. If you select the option of reading fault oscilloscope on the host computer oscilloscope page, the channel is set to so that the data stored on the SD card can be displayed in waveform on the host controller. The host controller oscilloscope channel name can be dynamically obtained through the set index of the function code. 0：0 1：Reserved 2：Other-C connector 3：AI1 4：AI2 5：HDI1 6：HDI2 7：Reserved 8：Reserved 9：Process data 3 of bus adapter A (P37.84) 10: Process data 3 of bus adapter B (P38.84)	0–10	2(P21.00)	○
P33.01	Blackbox customized channel 2 selection		0–10	2(P21.02)	○
P33.02	Blackbox customized channel 3 selection		0–10	2(P21.03)	○
P33.03	Blackbox customized channel 4 selection		0–10	2(P21.04)	○
P33.04	Blackbox customized channel 5 selection		0–10	2(P21.05)	○
P33.05	Blackbox customized channel 6 selection		0–10	2(P21.12)	○
P33.06	Blackbox customized channel 7 selection		0–10	2(P21.44)	○
P33.07	Blackbox customized channel 8 selection		0–10	2(P21.45)	○
P33.08	Blackbox customized channel 9 selection		0–10	2(P21.54)	○
P33.09	Blackbox customized channel 10 selection		0–10	2(P21.55)	○

P37 Fieldbus adapter A

Function code	Name	Description	Setting range	Default	Modify
P37.00	Bus adapter supporting bus type	0：None 1：PROFIBUS-DP module 2：PROFINET IO module 3：CANopen module 4：Reserved	0–6	1	◎

Function code	Name	Description	Setting range	Default	Modify
		5：Reserved 6：Reserved The setting of P37.00 must be different from that of P38.00, which is automatically processed in the software; if two identical cards are required, use a redundant bus. For example, if bus adapter A selects the DP module but multiple DP expansion cards are inserted into the card slots, the card with the smallest slot number will automatically be the valid expansion card; other types of cards comply with the same rule.			
P37.01	Reserved	-	-	-	-
P37.02	PZD1 source (typically sent SW)	0: 0 1: Keypad (0–65535) 2: Other-C connector 3: AI1 4: AI2 5: HDI1 6:HDI2	0–6	2(P20.34)	○
P37.03	Sent PZD2 source		0–6	0	○
P37.04	Sent PZD3 source		0–6	0	○
P37.05	Sent PZD4 source		0–6	0	○
P37.06	Sent PZD5 source		0–6	0	○
P37.07	Sent PZD6 source		0–6	0	○
P37.08	Sent PZD7 source		0–6	0	○
P37.09	Sent PZD8 source		0–6	0	○
P37.10	Sent PZD9 source		0–6	0	○
P37.11	Sent PZD10 source		0–6	0	○
P37.12	Sent PZD11 source		0–6	0	○
P37.13	Sent PZD12 source		0–6	0	○
P37.14	Sent PZD1 conversion base value numerator	0–65535 Sent PZD = Link (Sent PZD source) * Sent PZD conversion base value numerator / Sent PZD conversion base value denominator.	0–65535	1	○
P37.15	Sent PZD1 conversion base value denominator	1–65535	1–65535	1	○
P37.16	Sent PZD2 conversion base value numerator	0–65535 Sent PZD = Link (Sent PZD source) * Sent PZD conversion base value numerator / Sent PZD conversion base value denominator.	0–65535	1	○
P37.17	Sent PZD2 conversion base value	1–65535	1–65535	1	○

Function code	Name	Description	Setting range	Default	Modify
	denominator				
P37.18	Sent PZD3 conversion base value numerator	0–65535 Sent PZD = Link (Sent PZD source) * Sent PZD conversion base value numerator / Sent PZD conversion base value denominator.	0–65535	1	○
P37.19	Sent PZD3 conversion base value denominator	1–65535	1–65535	1	○
P37.20	Sent PZD4 conversion base value numerator	0–65535 Sent PZD = Link (Sent PZD source) * Sent PZD conversion base value numerator / Sent PZD conversion base value denominator.	0–65535	1	○
P37.21	Sent PZD4 conversion base value denominator	1–65535	1–65535	1	○
P37.22	Sent PZD5 conversion base value numerator	0–65535 Sent PZD = Link (Sent PZD source) * Sent PZD conversion base value numerator / Sent PZD conversion base value denominator.	0–65535	1	○
P37.23	Sent PZD5 conversion base value denominator	1–65535	1–65535	1	○
P37.24	Sent PZD6 conversion base value numerator	0–65535 Sent PZD = Link (Sent PZD source) * Sent PZD conversion base value numerator / Sent PZD conversion base value denominator.	0–65535	1	○
P37.25	Sent PZD6 conversion base value denominator	1–65535	1–65535	1	○
P37.26	Sent PZD7 conversion base value numerator	0–65535 Sent PZD = Link (Sent PZD source) * Sent PZD conversion base value numerator / Sent PZD conversion base value denominator.	0–65535	1	○
P37.27	Sent PZD7 conversion base value denominator	1–65535	1–65535	1	○
P37.28	Sent PZD8 conversion base	0–65535 Sent PZD = Link (Sent PZD source) *	0–65535	1	○

Function code	Name	Description	Setting range	Default	Modify
	value numerator	Sent PZD conversion base value numerator / Sent PZD conversion base value denominator.			
P37.29	Sent PZD8 conversion base value denominator	1–65535	1–65535	1	○
P37.30	Sent PZD9 conversion base value numerator	0–65535 Sent PZD = Link (Sent PZD source) * Sent PZD conversion base value numerator / Sent PZD conversion base value denominator.	0–65535	1	○
P37.31	Sent PZD9 conversion base value denominator	1–65535	1–65535	1	○
P37.32	Sent PZD10 conversion base value numerator	0–65535 Sent PZD = Link (Sent PZD source) * Sent PZD conversion base value numerator / Sent PZD conversion base value denominator.	0–65535	1	○
P37.33	Sent PZD10 conversion base value denominator	1–65535	1–65535	1	○
P37.34	Sent PZD11 conversion base value numerator	0–65535 Sent PZD = Link (Sent PZD source) * Sent PZD conversion base value numerator / Sent PZD conversion base value denominator.	0–65535	1	○
P37.35	Sent PZD11 conversion base value denominator	1–65535	1–65535	1	○
P37.36	Sent PZD12 conversion base value numerator	0–65535 Sent PZD = Link (Sent PZD source) * Sent PZD conversion base value numerator / Sent PZD conversion base value denominator.	0–65535	1	○
P37.37	Sent PZD12 conversion base value denominator	1–65535	1–65535	1	○
P37.38	Received PZD1 conversion base value numerator	0–65535 Received PZD data display = Received PZD * Received PZD conversion base value numerator / Received PZD conversion base value denominator.	0–65535	1	○

Function code	Name	Description	Setting range	Default	Modify
P37.39	Received PZD1 conversion base value denominator	1–65535	1–65535	1	○
P37.40	Received PZD2 conversion base value numerator	0–65535 Received PZD data display = Received PZD * Received PZD conversion base value numerator / Received PZD conversion base value denominator.	0–65535	1	○
P37.41	Received PZD2 conversion base value denominator	1–65535	1–65535	1	○
P37.42	Received PZD3 conversion base value numerator	0–65535 Received PZD data display = Received PZD * Received PZD conversion base value numerator / Received PZD conversion base value denominator.	0–65535	1	○
P37.43	Received PZD3 conversion base value denominator	1–65535	1–65535	1	○
P37.44	Received PZD4 conversion base value numerator	0–65535 Received PZD data display = Received PZD * Received PZD conversion base value numerator / Received PZD conversion base value denominator.	0–65535	1	○
P37.45	Received PZD4 conversion base value denominator	1–65535	1–65535	1	○
P37.46	Received PZD5 conversion base value numerator	0–65535 Received PZD data display = Received PZD * Received PZD conversion base value numerator / Received PZD conversion base value denominator.	0–65535	1	○
P37.47	Received PZD5 conversion base value denominator	1–65535	1–65535	1	○
P37.48	Received PZD6 conversion base value numerator	0–65535 Received PZD data display = Received PZD * Received PZD conversion base value numerator / Received PZD conversion base value denominator.	0–65535	1	○
P37.49	Received PZD6 conversion base value	1–65535	1–65535	1	○

Function code	Name	Description	Setting range	Default	Modify
	denominator				
P37.50	Received PZD7 conversion base value numerator	0–65535 Received PZD data display = Received PZD * Received PZD conversion base value numerator / Received PZD conversion base value denominator.	0–65535	1	○
P37.51	Received PZD7 conversion base value denominator	1–65535	1–65535	1	○
P37.52	Received PZD8 conversion base value numerator	0–65535 Received PZD data display = Received PZD * Received PZD conversion base value numerator / Received PZD conversion base value denominator.	0–65535	1	○
P37.53	Received PZD8 conversion base value denominator	1–65535	1–65535	1	○
P37.54	Received PZD9 conversion base value numerator	0–65535 Received PZD data display = Received PZD * Received PZD conversion base value numerator / Received PZD conversion base value denominator.	0–65535	1	○
P37.55	Received PZD9 conversion base value denominator	1–65535	1–65535	1	○
P37.56	Received PZD10 conversion base value numerator	0–65535 Received PZD data display = Received PZD * Received PZD conversion base value numerator / Received PZD conversion base value denominator.	0–65535	1	○
P37.57	Received PZD10 conversion base value denominator	1–65535	1–65535	1	○
P37.58	Received PZD11 conversion base value numerator	0–65535 Received PZD data display = Received PZD * Received PZD conversion base value numerator / Received PZD conversion base value denominator.	0–65535	1	○
P37.59	Received PZD11 conversion base value denominator	1–65535	1–65535	1	○
P37.60	Received PZD12 conversion base	0–65535 Received PZD data display = Received	0–65535	1	○

Function code	Name	Description	Setting range	Default	Modify
	value numerator	PZD * Received PZD conversion base value numerator / Received PZD conversion base value denominator.			
P37.61	Conversion base value denominator of received PZD12	1–65535	1–65535	1	○
P37.62	Sent PKW1 data display	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●
P37.63	Sent PKW2 data display	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●
P37.64	Sent PKW3 data display	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●
P37.65	Sent PKW4 data display	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●
P37.66	Sent PZD1 data display	0x0000–0xFFFF Sent PZD data display = Link (Sent PZD source) * Sent PZD conversion base value numerator / Sent PZD conversion base value denominator.	0x0000–0xFFFF	0x0000	●
P37.67	Sent PZD2 data display	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●
P37.68	Sent PZD3 data display	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●
P37.69	Sent PZD4 data display	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●
P37.70	Sent PZD5 data display	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●
P37.71	Sent PZD6 data display	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●
P37.72	Sent PZD7 data display	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●
P37.73	Sent PZD8 data display	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●
P37.74	Sent PZD9 data display	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●
P37.75	Sent PZD10 data display	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●
P37.76	Sent PZD11 data display	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●
P37.77	Sent PZD12 data display	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●
P37.78	Received PKW1 data display	0x0000–0xFFFF PKW physically received data	0x0000–0xFFFF	0x0000	●
P37.79	Received PKW2 data display	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●
P37.80	Received PKW3	0x0000–0xFFFF	0x0000–	0x0000	●

Function code	Name	Description	Setting range	Default	Modify
	data display		0xFFFF		
P37.81	Received PKW4 data display	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●
P37.82	Received PZD1 data display	0x0000–0xFFFF Received PZD data display = PZD physically received data with base value processed + Data with polarity processed	0x0000–0xFFFF	0x0000	●
P37.83	Received PZD12 data display	0x0000–0xFFFF Received PZD data display = PZD physically received data with base value processed + Data with polarity processed	0x0000–0xFFFF	0x0000	●
P37.84	Received PZD3 data display	0x0000–0xFFFF Received PZD data display = PZD physically received data with base value processed	0x0000–0xFFFF	0x0000	●
P37.85	Received PZD4 data display	0x0000–0xFFFF Received PZD data display = PZD physically received data with base value processed	0x0000–0xFFFF	0x0000	●
P37.86	Received PZD5 data display	0x0000–0xFFFF Received PZD data display = PZD physically received data with base value processed	0x0000–0xFFFF	0x0000	●
P37.87	Received PZD6 data display	0x0000–0xFFFF Received PZD data display = PZD physically received data with base value processed	0x0000–0xFFFF	0x0000	●
P37.88	Received PZD7 data display	0x0000–0xFFFF Received PZD data display = PZD physically received data with base value processed	0x0000–0xFFFF	0x0000	●
P37.89	Received PZD8 data display	0x0000–0xFFFF Received PZD data display = PZD physically received data with base value processed	0x0000–0xFFFF	0x0000	●
P37.90	Received PZD9 data display	0x0000–0xFFFF Received PZD data display = PZD physically received data with base value processed	0x0000–0xFFFF	0x0000	●
P37.91	Received PZD10 data display	0x0000–0xFFFF Received PZD data display = PZD physically received data with base value processed	0x0000–0xFFFF	0x0000	●
P37.92	Received PZD11 data display	0x0000–0xFFFF Received PZD data display = PZD physically received data with base	0x0000–0xFFFF	0x0000	●

Function code	Name	Description	Setting range	Default	Modify
		value processed			
P37.93	Received PZD12 data display	0x0000–0xFFFF Received PZD data display = PZD physically received data with base value processed	0x0000–0xFFFF	0x0000	●
P37.94	Bus adapter A CW 1 source	0: 0 1: Keypad (0–65535) 2: Other-C connector (2: P37.82)	0–2	2	◎
P37.95	Reserved	-	-	-	-
P37.96	Bus adapter A received PZD1 polarity	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	○
P37.97	Bus adapter A received PZD2 polarity	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	○
P37.98	Communication disconnection detection delay	0.00–60.00s 0.00s: No detection	0.00–60.00	0.00s	○
P37.99	Communication disconnection handling	0: Report a fault 1: Report an alarm	0–1	0	○

P38 Fieldbus adapter B

Function code	Name	Description	Setting range	Default	Modify
P38.00	Bus adapter supporting bus type	0：None 1：PROFIBUS-DP module 2：PROFINET IO module 3：CANopen module 4：Reserved 5：Reserved 6：Reserved The setting of P37.00 must be different from that of P38.00, which is automatically processed in the software; if two identical cards are required, use a redundant bus. For example, if fieldbus adapter B selects the DP module but multiple DP expansion cards are inserted into the card slots, the card with the smallest slot number will automatically be the valid expansion card; other types of cards comply with the same rule.	0–6	2	◎
P38.01	Reserved	-	-	-	-
P38.02	PZD1 source	0: 0	0–8	2(P20.34)	○

Function code	Name	Description	Setting range	Default	Modify
	(typically sent SW)	1: Keypad (0–65535) 2: Other-C connector			
P38.03	Sent PZD2 source	3: AI1	0–6	0	○
P38.04	Sent PZD3 source	4: AI2	0–6	0	○
P38.05	Sent PZD4 source	5: HDI1	0–6	0	○
P38.06	Sent PZD5 source	6: HDI2	0–6	0	○
P38.07	Sent PZD6 source		0–6	0	○
P38.08	Sent PZD7 source		0–6	0	○
P38.09	Sent PZD8 source		0–6	0	○
P38.10	Sent PZD9 source		0–6	0	○
P38.11	Sent PZD10 source		0–6	0	○
P38.12	Sent PZD11 source		0–6	0	○
P38.13	Sent PZD12 source		0–6	0	○
P38.14	Sent PZD1 conversion base value numerator	0–65535 Sent PZD = Link (Sent PZD source) * Sent PZD conversion base value numerator / Sent PZD conversion base value denominator.	0–65535	1	○
P38.15	Sent PZD1 conversion base value denominator	1–65535	1–65535	1	○
P38.16	Sent PZD2 conversion base value numerator	0–65535 Sent PZD = Link (Sent PZD source) * Sent PZD conversion base value numerator / Sent PZD conversion base value denominator.	0–65535	1	○
P38.17	Sent PZD2 conversion base value denominator	1–65535	1–65535	1	○
P38.18	Sent PZD3 conversion base value numerator	0–65535 Sent PZD = Link (Sent PZD source) * Sent PZD conversion base value numerator / Sent PZD conversion base value denominator.	0–65535	1	○
P38.19	Sent PZD3 conversion base value denominator	1–65535	1–65535	1	○
P38.20	Sent PZD4 conversion base value numerator	0–65535 Sent PZD = Link (Sent PZD source) * Sent PZD conversion base value numerator / Sent PZD conversion base value denominator.	0–65535	1	○

Function code	Name	Description	Setting range	Default	Modify
P38.21	Sent PZD4 conversion base value denominator	1–65535	1–65535	1	○
P38.22	Sent PZD5 conversion base value numerator	0–65535 Sent PZD = Link (Sent PZD source) * Sent PZD conversion base value numerator / Sent PZD conversion base value denominator.	0–65535	1	○
P38.23	Sent PZD5 conversion base value denominator	1–65535	1–65535	1	○
P38.24	Sent PZD6 conversion base value numerator	0–65535 Sent PZD = Link (Sent PZD source) * Sent PZD conversion base value numerator / Sent PZD conversion base value denominator.	0–65535	1	○
P38.25	Sent PZD6 conversion base value denominator	1–65535	1–65535	1	○
P38.26	Sent PZD7 conversion base value numerator	0–65535 Sent PZD = Link (Sent PZD source) * Sent PZD conversion base value numerator / Sent PZD conversion base value denominator.	0–65535	1	○
P38.27	Sent PZD7 conversion base value denominator	1–65535	1–65535	1	○
P38.28	Sent PZD8 conversion base value numerator	0–65535 Sent PZD = Link (Sent PZD source) * Sent PZD conversion base value numerator / Sent PZD conversion base value denominator.	0–65535	1	○
P38.29	Sent PZD8 conversion base value denominator	1–65535	1–65535	1	○
P38.30	Sent PZD9 conversion base value numerator	0–65535 Sent PZD = Link (Sent PZD source) * Sent PZD conversion base value numerator / Sent PZD conversion base value denominator.	0–65535	1	○
P38.31	Sent PZD9 conversion base value	1–65535	1–65535	1	○

Function code	Name	Description	Setting range	Default	Modify
	denominator				
P38.32	Sent PZD10 conversion base value numerator	0–65535 Sent PZD = Link (Sent PZD source) * Sent PZD conversion base value numerator / Sent PZD conversion base value denominator.	0–65535	1	○
P38.33	Sent PZD10 conversion base value denominator	1–65535	1–65535	1	○
P38.34	Sent PZD11 conversion base value numerator	0–65535 Sent PZD = Link (Sent PZD source) * Sent PZD conversion base value numerator / Sent PZD conversion base value denominator.	0–65535	1	○
P38.35	Sent PZD11 conversion base value denominator	1–65535	1–65535	1	○
P38.36	Sent PZD12 conversion base value numerator	0–65535 Sent PZD = Link (Sent PZD source) * Sent PZD conversion base value numerator / Sent PZD conversion base value denominator.	0–65535	1	○
P38.37	Sent PZD12 conversion base value denominator	1–65535	1–65535	1	○
P38.38	Received PZD1 conversion base value numerator	0–65535 Received PZD data display = Received PZD * Received PZD conversion base value numerator / Received PZD conversion base value denominator.	0–65535	1	○
P38.39	Received PZD1 conversion base value denominator	1–65535	1–65535	1	○
P38.40	Received PZD2 conversion base value numerator	0–65535 Received PZD data display = Received PZD * Received PZD conversion base value numerator / Received PZD conversion base value denominator.	0–65535	1	○
P38.41	Received PZD2 conversion base value denominator	1–65535	1–65535	1	○
P38.42	Received PZD3 conversion base	0–65535 Received PZD data display = Received	0–65535	1	○

Function code	Name	Description	Setting range	Default	Modify
	value numerator	PZD * Received PZD conversion base value numerator / Received PZD conversion base value denominator.			
P38.43	Received PZD3 conversion base value denominator	1–65535	1–65535	1	○
P38.44	Received PZD4 conversion base value numerator	0–65535 Received PZD data display = Received PZD * Received PZD conversion base value numerator / Received PZD conversion base value denominator.	0–65535	1	○
P38.45	Received PZD4 conversion base value denominator	1–65535	1–65535	1	○
P38.46	Received PZD5 conversion base value numerator	0–65535 Received PZD data display = Received PZD * Received PZD conversion base value numerator / Received PZD conversion base value denominator.	0–65535	1	○
P38.47	Received PZD5 conversion base value denominator	1–65535	1–65535	1	○
P38.48	Received PZD6 conversion base value numerator	0–65535 Received PZD data display = Received PZD * Received PZD conversion base value numerator / Received PZD conversion base value denominator.	0–65535	1	○
P38.49	Received PZD6 conversion base value denominator	1–65535	1–65535	1	○
P38.50	Received PZD7 conversion base value numerator	0–65535 Received PZD data display = Received PZD * Received PZD conversion base value numerator / Received PZD conversion base value denominator.	0–65535	1	○
P38.51	Received PZD7 conversion base value denominator	1–65535	1–65535	1	○
P38.52	Received PZD8 conversion base value numerator	0–65535 Received PZD data display = Received PZD * Received PZD conversion base value numerator / Received PZD conversion base value denominator.	0–65535	1	○
P38.53	Received PZD8	1–65535	1–65535	1	○

Function code	Name	Description	Setting range	Default	Modify
	conversion base value denominator				
P38.54	Received PZD9 conversion base value numerator	0–65535 Received PZD data display = Received PZD * Received PZD conversion base value numerator / Received PZD conversion base value denominator.	0–65535	1	○
P38.55	Received PZD9 conversion base value denominator	1–65535	1–65535	1	○
P38.56	Received PZD10 conversion base value numerator	0–65535 Received PZD data display = Received PZD * Received PZD conversion base value numerator / Received PZD conversion base value denominator.	0–65535	1	○
P38.57	Received PZD10 conversion base value denominator	1–65535	1–65535	1	○
P38.58	Received PZD11 conversion base value numerator	0–65535 Received PZD data display = Received PZD * Received PZD conversion base value numerator / Received PZD conversion base value denominator.	0–65535	1	○
P38.59	Received PZD11 conversion base value denominator	1–65535	1–65535	1	○
P38.60	Received PZD12 conversion base value numerator	0–65535 Received PZD data display = Received PZD * Received PZD conversion base value numerator / Received PZD conversion base value denominator.	0–65535	1	○
P38.61	Conversion base value denominator of received PZD12	1–65535	1–65535	1	○
P38.62	Sent PKW1 data display	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●
P38.63	Sent PKW2 data display	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●
P38.64	Sent PKW3 data display	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●
P38.65	Sent PKW4 data display	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●
P38.66	Sent PZD1 data	0x0000–0xFFFF	0x0000–	0x0000	●

Function code	Name	Description	Setting range	Default	Modify
	display	Sent PZD data display = Link (Sent PZD source) * Sent PZD conversion base value numerator / Sent PZD conversion base value denominator.	0xFFFF		
P38.67	Sent PZD2 data display	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●
P38.68	Sent PZD3 data display	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●
P38.69	Sent PZD4 data display	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●
P38.70	Sent PZD5 data display	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●
P38.71	Sent PZD6 data display	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●
P38.72	Sent PZD7 data display	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●
P38.73	Sent PZD8 data display	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●
P38.74	Sent PZD9 data display	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●
P38.75	Sent PZD10 data display	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●
P38.76	Sent PZD11 data display	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●
P38.77	Sent PZD12 data display	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●
P38.78	Received PKW1 data display	0x0000–0xFFFF Displays physically received data.	0x0000–0xFFFF	0x0000	●
P38.79	Received PKW2 data display	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●
P38.80	Received PKW3 data display	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●
P38.81	Received PKW4 data display	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●
P38.82	Received PZD1 data display	0x0000–0xFFFF Received PZD data display = PZD physically received data with base value processed + Data with polarity processed	0x0000–0xFFFF	0x0000	●
P38.83	Received PZD12 data display		0x0000–0xFFFF	0x0000	●
P38.84	Received PZD3 data display	0x0000–0xFFFF Received PZD data display = PZD physically received data with base value processed	0x0000–0xFFFF	0x0000	●
P38.85	Received PZD4 data display		0x0000–0xFFFF	0x0000	●
P38.86	Received PZD5 data display		0x0000–0xFFFF	0x0000	●
P38.87	Received PZD6 data display		0x0000–0xFFFF	0x0000	●
P38.88	Received PZD7		0x0000–	0x0000	●

Function code	Name	Description	Setting range	Default	Modify
	data display		0xFFFF		
P38.89	Received PZD8 data display		0x0000–0xFFFF	0x0000	●
P38.90	Received PZD9 data display		0x0000–0xFFFF	0x0000	●
P38.91	Received PZD10 data display		0x0000–0xFFFF	0x0000	●
P38.92	Received PZD11 data display		0x0000–0xFFFF	0x0000	●
P38.93	Received PZD12 data display		0x0000–0xFFFF	0x0000	●
P38.94	Bus adapter B CW 1 source	0: 0 1: Keypad (0–65535) 2: Other-C connector (2: P38.82)	0–2	2	○
P38.95	Reserved	-	-	-	-
P38.96	Bus adapter B received PZD1 polarity	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	○
P38.97	Bus adapter B received PZD2 polarity	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	○
P38.98	Communication disconnection detection delay	0.00–60.00s 0.00s: No detection	0.00–60.00	0.00s	○
P38.99	Communication disconnection handling	0: Report a fault 1: Report an alarm	0–1	0	○

P40 PROFIBUS-DP module

Function code	Name	Description	Setting range	Default	Modify
P40.00	Module online status	0x000–0x1FF Bit0: EC slot 1 module online state (0: Offline; 1: Online) Bit1: EC slot 2 module online state (0: Offline; 1: Online) Bit2: EC slot 3 module online state (0: Offline; 1: Online) Bit3: EC slot 2-1 module online state (0: Offline; 1: Online) Bit4: EC slot 2-2 module online state (0: Offline; 1: Online) Bit5: EC slot 2-3 module online state (0: Offline; 1:Online) Bit6: EC slot 3-1 module online state (0: Offline; 1: Online)	0x000–0x1FF	0x000	●

Function code	Name	Description	Setting range	Default	Modify
		Bit7 EC slot 3-2 module online state (0: Offline; 1: Online) Bit8 EC slot 3-3 module online state (0: Offline; 1: Online)			
P40.01	EC site No.	1–127	1–127	1	◎
P40.02	DP_ID	0x0000–0xFFFF INVT: 0x0D55 Siemens: 0x8045 ABB: 0x0812	0x0000–0xFFFF	0x8045	○
P40.03–P40.09	Reserved	-	-	-	-
P40.10	Present effective card slot	0x000–0x1FF Used to display the card slot that is currently effective. When there are two or more card slots inserted with DP cards, only the DP card at one card slot is effective, and the DP cards at the other card slots are used for redundancy. Bit0 EC slot 1 module effective state (0: Invalid; 1: Valid) Bit1 EC slot 2 module effective state (0: Invalid; 1: Valid) Bit2 EC slot 3 module online state (0: Invalid; 1: Valid) Bit3 EC slot 2-1 module effective state (0: Invalid; 1: Valid) Bit4 EC slot 2-2 module effective state (0: Invalid; 1: Valid) Bit5 EC slot 2-3 module effective state (0: Invalid; 1: Valid) Bit6 EC slot 3-1 module effective state (0: Invalid; 1: Valid) Bit7 EC slot 3-2 module effective state (0: Invalid; 1: Valid) Bit8 EC slot 3-3 module effective state (0: Invalid; 1: Valid)	0x000–0x1FF	0x000	●

P41 PROFINET IO module

Function code	Name	Description	Setting range	Default	Modify
P41.00	Module online status	The function code shows the online status of the module, each bit represents the online status of an expansion slot. If multiple PN cards are online, there are multiple bits are set to	0x000–0x1FF	0x000	●

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Setting range</th><th>Default</th><th>Modify</th></tr>
<tr><td></td><td></td><td>1 at the same time. See the following:<table><tr><td>Bit0</td><td>EC slot 1 module online state (0: Offline; 1: Online)</td></tr><tr><td>Bit1</td><td>EC slot 2 module online state (0: Offline; 1: Online)</td></tr><tr><td>Bit2</td><td>EC slot 3 module online state (0: Offline; 1: Online)</td></tr><tr><td>Bit3</td><td>EC slot 2-1 module online state (0: Offline; 1: Online)</td></tr><tr><td>Bit4</td><td>EC slot 2-2 module online state (0: Offline; 1: Online)</td></tr><tr><td>Bit5</td><td>EC slot 2-3 module online state (0: Offline; 1:Online)</td></tr><tr><td>Bit6</td><td>EC slot 3-1 module online state (0: Offline; 1: Online)</td></tr><tr><td>Bit7</td><td>EC slot 3-2 module online state (0: Offline; 1: Online)</td></tr><tr><td>Bit8</td><td>EC slot 3-3 module online state (0: Offline; 1: Online)</td></tr></table></td><td></td><td></td><td></td></tr>
<tr><td>P41.01</td><td>PROFINET slave station number</td><td>1–127
This variable is automatically assigned by the PLC.</td><td>1–127</td><td>1</td><td>●</td></tr>
<tr><td>P41.02–P41.09</td><td>Reserved</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>P41.10</td><td>Present effective card slot</td><td>0x000–0x1FF
Used to display the card slot that is currently effective. When there are two or more card slots inserted with PN cards, only the PN card at one card slot is effective, and the PN cards at the other card slots are used for redundancy.<table><tr><td>Bit0</td><td>EC slot 1 module effective state (0: Invalid; 1: Valid)</td></tr><tr><td>Bit1</td><td>EC slot 2 module effective state (0: Invalid; 1: Valid)</td></tr><tr><td>Bit2</td><td>EC slot 3 module effective state (0: Invalid; 1: Valid)</td></tr><tr><td>Bit3</td><td>EC slot 2-1 module effective state (0: Invalid; 1: Valid)</td></tr><tr><td>Bit4</td><td>EC slot 2-2 module effective state (0: Invalid; 1: Valid)</td></tr><tr><td>Bit5</td><td>EC slot 2-3 module effective state (0: Invalid; 1: Valid)</td></tr><tr><td>Bit6</td><td>EC slot 3-1 module effective state (0: Invalid; 1: Valid)</td></tr><tr><td>Bit7</td><td>EC slot 3-2 module effective state (0: Invalid; 1: Valid)</td></tr></table></td><td>0x000–0x1FF</td><td>0x000</td><td>●</td></tr>
</table>

Function code	Name	Description	Setting range	Default	Modify
		Bit8 EC slot 3-3 module effective state (0: Invalid; 1: Valid)			

P42 ModbusRTU module

Function code	Name	Description	Setting range	Default	Modify
P42.00	Reserved	-	-	-	-
P42.01	Modbus baud rate	0: 1200bps 1: 2400bps 2: 4800bps 3: 9600bps 4: 19200bps 5: 38400bps 6: 57600bps 7: 115200bps	0–7	4	○
P42.02	Modbus data format	0: No check (N, 8, 1) for RTU 1: Even check (E, 8, 1) for RTU 2: Odd check (O, 8, 1) for RTU 3: No check (N, 8, 2) for RTU 4: Even check (E, 8, 2) for RTU 5: Odd check (O, 8, 2) for RTU	0–5	1	○
P42.03	Local Modbus address	1–247	1–247	1	○
P42.04	Modbus response delay	0–200ms The function code indicates the communication response delay, that is, the interval from the time when the VFD completes receiving data to the time when it sends response data to the host controller. If the response delay is shorter than the system processing time, the system sends response data to the host controller after processing data. If the delay is longer than the system processing time, the system does not send response data to the host controller until the delay is reached although data has been processed.	0–200	5ms	○
P42.05	Modbus communication timeout	0.0–60.0s 0.0s: Invalid It is set to invalid usually. When continuous communication is required, you can set the function code to monitor communication status.	0.0–60.0	0.0s	○
P42.06	Modbus transmission	0: Faulty (do not switch off) or report an alarm (fault severity can be changed	0–1	0	○

Function code	Name	Description	Setting range	Default	Modify
	error handling	through the group 08) 1: Keep running without reporting an alarm			
P42.07–P42.10	Reserved	-	-	-	-

P43 CANopen module

Function code	Name	Description	Setting range	Default	Modify
P43.00	Module online status	0x000–0x1FF Bit0: EC slot 1 module online state (0: Offline; 1: Online) Bit1: EC slot 2 module online state (0: Offline; 1: Online) Bit2: EC slot 3 module online state (0: Offline; 1: Online) Bit3: EC slot 2-1 module online state (0: Offline; 1: Online) Bit4: EC slot 2-2 module online state (0: Offline; 1: Online) Bit5: EC slot 2-3 module online state (0: Offline; 1:Online) Bit6: EC slot 3-1 module online state (0: Offline; 1: Online) Bit7: EC slot 3-2 module online state (0: Offline; 1: Online) Bit8: EC slot 3-3 module online state (0: Offline; 1: Online)	0x000–0x1FF	0x000	●
P43.01	CANopen communication address	0–127	0–127	2	○
P43.02	CANopen communication baud rate (kbps)	Setting range: 0–7 0: 1000kbps 1: 800kbps 2: 500kbps 3: 250kbps 4: 125kbps 5: 100kbps	0–5	3	○
P43.03–P43.09	Reserved	-	-	-	-
P43.10	Present effective card slot	0x000–0x1FF Used to display the card slot that is currently effective. When there are two or more card slots inserted with CANopen cards, only the CANopen card at one card slot is effective, and the	0x000–0x1FF	0x000	●

Function code	Name	Description	Setting range	Default	Modify
		CANopen cards at the other card slots are used for redundancy. Bit0: EC slot 1 module effective state (0: Invalid; 1: Valid) Bit1: EC slot 2 module effective state (0: Invalid; 1: Valid) Bit2: EC slot 3 module effective state (0: Invalid; 1: Valid) Bit3: EC slot 2-1 module effective state (0: Invalid; 1: Valid) Bit4: EC slot 2-2 module effective state (0: Invalid; 1: Valid) Bit5: EC slot 2-3 module effective state (0: Invalid; 1: Valid) Bit6: EC slot 3-1 module effective state (0: Invalid; 1: Valid) Bit7: EC slot 3-2 module effective state (0: Invalid; 1: Valid) Bit8: EC slot 3-3 module effective state (0: Invalid; 1: Valid)			

P44 EtherNet module (Ethernet communication group)

Function code	Name	Description	Setting range	Default	Modify
P44.00–P44.01	Reserved	-	-	-	-
P44.02	TCP/IP address 1	0–255	0–255	192	◎
P44.03	TCP/IP address 2	0–255	0–255	168	◎
P44.04	TCP/IP address 3	0–255	0–255	0	◎
P44.05	TCP/IP address 4	0–255 (you need to re-power on for the IP address change to take effect)	0–255	1	◎
P44.06	TCP/IP subnet mask address 1	0–255	0–255	255	◎
P44.07	TCP/IP subnet mask address 2	0–255	0–255	255	◎
P44.08	TCP/IP subnet mask address 3	0–255	0–255	255	◎
P44.09	TCP/IP subnet mask address 4	0–255	0–255	0	◎
P44.10	TCP/IP gateway address 1	0–255	0–255	192	◎
P44.11	TCP/IP gateway address 2	0–255	0–255	168	◎
P44.12	TCP/IP gateway address 3	0–255	0–255	1	◎
P44.13	TCP/IP gateway	0–255	0–255	1	◎

Function code	Name	Description	Setting range	Default	Modify
	address 4				
P44.14	Keypad monitor site number	0–255 When monitoring multiple main control boxes with a keypad, modifying this function code can complete the switchover between the main control boxes with different site numbers. (Press the PRG and DATA keys simultaneously to return to the local monitor interface and reset the function code to enter the monitored site interface again.)	0–255	1	◎

P54 DC/AC sampling card setting

Function code	Name	Description	Setting range	Default	Modify
P54.00	Module slot selection	The system supports two methods: 0: Method 1 Supports up to two AC sampling modules, in which the position with a smaller slot number is used for grid voltage phase locking, and the one with a larger slot number is used for expansion. The system will automatically recognize the modules, so users only need to pay attention to the number. If only one AC sampling module is used, it can be inserted arbitrarily without considering the position number. 1: Method 2 Supports up to one AC card + one DC sampling module.	0–1	0	●
P54.01	Module product type	0: Reserved 1: DC/AC voltage sampling module	0–1	1	◎
P54.02	Module online status	0x00–0x3F Bit0: EC slot 1 module online state (0: Offline; 1: Online) Bit1: EC slot 2 module online state (0: Offline; 1: Online) Bit2: EC slot 3 module online state (0: Offline; 1: Online) Bit3: EC slot 4 module online state (0: Offline; 1: Online) Bit4: EC slot 5 module online state (0: Offline; 1: Online) Bit5: EC slot 6 module online state (0: Offline; 1: Online)	0x00–0x3F	0x00	●

Function code	Name	Description	Setting range	Default	Modify
P54.03	EC slot 1 module: sampling mode	0: Synchronous sampling 1: Fast sampling	0–1	0	◎
P54.04	EC slot 1 module: sampling frequency of fast sampling mode	0: 20K sampling frequency 1: 40K sampling frequency 2: 80K sampling frequency 3: 160K sampling frequency (AC sampling card)	0–3	3	◎
P54.05	EC slot 1 module: AC sampling card voltage class	0: AC 690V 1: AC 100V	0–1	0	◎
P54.06	EC slot 1 module: sampling mode	0: Synchronous sampling 1: Fast sampling	0–1	0	◎
P54.07	EC slot 2 module: sampling frequency of fast sampling mode	0: 20K sampling frequency 1: 40K sampling frequency 2: 80K sampling frequency 3: 160K sampling frequency (AC sampling card)	0–3	3	◎
P54.08	EC slot 2 module: AC sampling card voltage class	0: AC 690V 1: AC 100V	0–1	0	◎
P54.09	EC slot 2 module: sampling mode	0: Synchronous sampling 1: Fast sampling	0–1	0	◎
P54.10	EC slot 3 module: sampling frequency of fast sampling mode	0: 20K sampling frequency 1: 40K sampling frequency 2: 80K sampling frequency 3: 160K sampling frequency (AC sampling card)	0–3	3	◎
P54.11	EC slot 3 module: AC sampling card voltage class	0: AC 690V 1: AC 100V	0–1	0	◎
P54.12	EC slot 4 module: sampling mode	0: Synchronous sampling 1: Fast sampling	0–1	0	◎
P54.13	EC slot 4 module: sampling frequency of fast sampling mode	0: 20K sampling frequency 1: 40K sampling frequency 2: 80K sampling frequency 3: 160K sampling frequency (AC sampling card)	0–3	3	◎
P54.14	EC slot 4 module: AC sampling card voltage class	0: AC 690V 1: AC 100V	0–1	0	◎

Function code	Name	Description	Setting range	Default	Modify
P54.15	EC slot 5 module: sampling mode	0: Synchronous sampling 1: Fast sampling	0–1	0	◎
P54.16	EC slot 5 module: sampling frequency of fast sampling mode	0: 20K sampling frequency 1: 40K sampling frequency 2: 80K sampling frequency 3: 160K sampling frequency (AC sampling card)	0–3	3	◎
P54.17	EC slot 5 module: AC sampling card voltage class	0: AC 690V 1: AC 100V	0–1	0	◎
P54.18	EC slot 6 module: sampling mode	0: Synchronous sampling 1: Fast sampling	0–1	0	◎
P54.19	EC slot 6 module: sampling frequency of fast sampling mode	0: 20K sampling frequency 1: 40K sampling frequency 2: 80K sampling frequency 3: 160K sampling frequency (AC sampling card)	0–3	3	◎
P54.20	EC slot 6 module: AC sampling card voltage class	0: AC 690V 1: AC 100V	0–1	0	◎

P98 AIAO calibration functions

Function code	Name	Description	Setting range	Default	Modify
P98.00	Calibration parameter group password	0–65535	0–65535	0	○
P98.01	AD sampling value of AI1 voltage input	0–4095	0–4095	0	●
P98.02	AI1 reference voltage 1	0V input -0.50–4.00V (Only voltages in this range are calibrated.)	-0.50–4.00	0.00V	○
P98.03	AD sampling value corresponding to AI1 reference voltage 1	AD sampling value of AI1 at 0V input. 0–4095	0–4095	2048	○
P98.04	AI1 reference voltage 2	10V input 6.00–10.50V (Only voltages in this range are calibrated.)	6.00–10.50	10.00V	○
P98.05	AD sampling value corresponding	AD sampling value of AI1 at 10V input 0–4095	0–4095	4095	○

Function code	Name	Description	Setting range	Default	Modify
	to AI1 reference voltage 2				
P98.06	AD sampling value of AI1 current input	0–4095	0–4095	0	●
P98.07	AI1 reference current 1	-1.00–8.00mA (Only current in this range are calibrated.)	-1.00–8.00	0.00mA	○
P98.08	AD sampling value corresponding to AI1 reference current 1	0–4095	0–4095	2048	○
P98.09	AI1 reference current 2	12.00–21.00mA (Only current in this range are calibrated.)	12.00–21.00	20.00mA	○
P98.10	AD sampling value corresponding to AI1 reference current 2	0–4095	0–4095	4095	○
P98.11	AD sampling value of AI2 voltage input	0–4095	0–4095	0	●
P98.12	AI2 reference voltage 1	0V input -0.50–4.00V (Only voltages in this range are calibrated.)	-0.50–4.00	0.00V	○
P98.13	AD sampling value corresponding to AI2 reference voltage 1	AD sampling value of AI2 at 0V input 0–4095	0–4095	2048	○
P98.14	AI2 reference voltage 2	10V input 6.00–10.50V (Only voltages in this range are calibrated.)	6.00–10.50	10.00V	○
P98.15	AD sampling value corresponding to AI2 reference voltage 2	AD sampling value of AI2 at 10V input 0–4095	0–4095	4095	○
P98.16	AD sampling value of AI2 current input	0–4095	0–4095	0	●
P98.17	AI2 reference current 1	-1.00–8.00mA (Only current in this range are calibrated.)	-1.00–8.00	0.00mA	○
P98.18	AD sampling value corresponding to AI2 reference current 1	0–4095	0–4095	2048	○

Function code	Name	Description	Setting range	Default	Modify
P98.19	AI2 reference current 2	12.00–21.00mA (Only current in this range are calibrated.)	12.00–21.00	20.00mA	○
P98.20	AD sampling value corresponding to AI2 reference current 2	0–4095	0–4095	4095	○
P98.21	Actual voltage value of AO1 for 0V	-1.000–12.500V	-1.000–12.500	0.000V	○
P98.22	Actual voltage value of AO1 for 10V	-1.000–12.500V	-1.000–12.500	10.000V	○
P98.23	Actual current value of AO1 for 0mA output	-2.000–25.000mA	-2.000–25.000	0.000mA	○
P98.24	Actual current value of AO1 for 20mA output	-2.000–25.000mA	-2.000–25.000	20.000mA	○
P98.25	Actual voltage value of AO2 for 0V	-1.000–12.500V	-1.000–12.500	0.000V	○
P98.26	Actual voltage value of AO2 for 10V	-1.000–12.500V	-1.000–12.500	10.000V	○
P98.27	Actual current value of AO2 for 0mA output	-2.000–25.000mA	-2.000–25.000	0.000mA	○
P98.28	Actual current value of AO2 for 20mA output	-2.000–25.000mA	-2.000–25.000	20.000mA	○

P99 Factory parameters

Function code	Name	Description	Setting range	Default	Modify
P99.00	Factory password	Factory password	0–65535	0	●
P99.01	Unit model	Each number represents a power class and relates to the data calibration for the VFD. This affects the unit rated power and current. **P99.03=400V** 0: 116A 1: 149A 2: 183A 3: 245A 4: 299A 5: 349A	0–15	Model depended	◎

Function code	Name	Description	Setting range	Default	Modify
		6: 395A 7: 516A 8: 640A 9: 757A 10: 900A 11: 1180A 12: 1770A 13: 2360A 14: 3540A 15: 5310A **P99.03=690V** 0: 600A 1: 900A 2: 1180A 3: 1770A 4: 2360A 5: 3540A 6–15: 5310A			
P99.02	Entire machine rated power (No overload)	-	0–6553.5	Model depended	●
P99.03	Unit rated voltage	-	10–2000	Model depended	◎
P99.04	Entire machine rated current (No overload)	-	0.0–6553.5	Model depended	●
P99.05	Reserved	-	-	-	-
P99.06	DC bus voltage calibration coefficient	-	50.0–150.0	100.0%	◎
P99.07	Bus voltage setting in low-voltage commissioning mode	-	0.0–6553.6	540.0V	○
P99.08	Phase/line voltage setting in low-voltage commissioning mode	-	0.0–6553.6	380.0V	○
P99.09	Input current calibration coefficient	-	30.0–200.0	100.0%	○
P99.10	Input voltage calibration coefficient	-	50.0–150.0	100.0%	○
P99.11	Running mode	-	0–1	0	○
P99.12	Factory running time setting	-	0–65535	0h	○

10 Derating

10.1 Capacity

Choose a rectifier unit model based on the rated input current and power. The rated output current of the rectifier unit must be larger than or equal to the input current of the inverter, and the rated power of the rectifier unit must be higher than or equal to that of the inverter.

Note: The rated capacity is the capacity at the ambient temperature of 40°C.

10.2 Derating

If the ambient temperature at the rectifier device installation site exceeds 40°C, the rectifier device installation site altitude exceeds 1000m, a cover with heat dissipation vents is used, or the carrier frequency is higher than the recommended frequency in the manual, the product needs to be derated. For details, contact us.

Your Trusted Industry Automation Solution Provider

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