

Goodrive880 Series Basic Rectifier Unit Software Manual



No.	Change description	Version	Release date
1	First release.	V1.0	July 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.

As an upgrade product of Goodrive800 series engineering VFD, Goodrive800 series engineering VFD inherits the high reliability feature of Goodrive800 platform but optimizes the upgrade, structure, and components, achieving unit modularization, flexible cabinet configuration, more compact structure, easier installation and maintenance, and optimum protection.

- 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
- CCS-compliant

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, super calender, 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.

Goodrive880-71 series is the basic rectifier unit of Goodrive880 series. If not otherwise specified, the basic rectifier unit in this manual refers to the basic rectifier unit of Goodrive800 series, that is, Goodrive800-71 series product. The rated power of a single unit is 356kW–929kW, and the max. parallel power can be 5183kW. The basic rectifier unit consists of input reactor, semi-controlled rectifier bridge and DC fuse. It is compact in structure and easy to integrate and maintain, reducing cabinet footprint.

You are reading Goodrive880 Series Basic Rectifier Unit Software Manual. 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 15 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 border="1"> <thead> <tr> <th>Basic rectifier unit model</th><th>Minimum waiting time</th></tr> </thead> <tbody> <tr> <td>400V 356kW and higher</td><td>15 minutes</td></tr> <tr> <td>690V 487kW and higher</td><td>15 minutes</td></tr> </tbody> </table>	Basic rectifier unit model	Minimum waiting time	400V 356kW and higher	15 minutes	690V 487kW and higher	15 minutes
Basic rectifier unit model	Minimum waiting time						
400V 356kW and higher	15 minutes						
690V 487kW and higher	15 minutes						
	Do not refit the Goodrive880 series product unless authorized; otherwise fire, electric shock or other injury may result.						
	The base may become hot when the Goodrive880 series product is running. Do not touch. Otherwise, you may get burnt.						
	The electrical parts and components inside the VFD are electrostatic sensitive. Take measurements to prevent electrostatic discharge when performing related operations.						

1.4.1 Delivery and installation

	- Do not install the basic rectifier unit on inflammables. In addition, prevent the basic rectifier unit from contacting or adhering to inflammables. - Do not run the basic rectifier unit if it is damaged or incomplete. - Do not contact the basic rectifier unit with damp objects or body parts. Otherwise, electric shock may result.								
Note	- Select appropriate tools for basic 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 basic 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 basic rectifier unit. - As basic 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 border="1"> <thead> <tr> <th>Power cable conductor cross-sectional area $S(\text{mm}^2)$</th><th>Grounding conductor cross-sectional area</th></tr> </thead> <tbody> <tr> <td>$S \leq 16$</td><td>S</td></tr> <tr> <td>$16 < S \leq 35$</td><td>16</td></tr> <tr> <td>$35 < S$</td><td>$S/2$</td></tr> </tbody> </table> - L1, L2, and L3 are the power input terminals, while + and - are the DC bus output	Power cable conductor cross-sectional area $S(\text{mm}^2)$	Grounding conductor cross-sectional area	$S \leq 16$	S	$16 < S \leq 35$	16	$35 < S$	$S/2$
Power cable conductor cross-sectional area $S(\text{mm}^2)$	Grounding conductor cross-sectional area								
$S \leq 16$	S								
$16 < S \leq 35$	16								
$35 < S$	$S/2$								

	terminals. Connect the input power cables and output busbars properly; otherwise, the basic rectifier unit may be damaged.
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1.4.2 Commissioning and running

	• Cut off all power supplies connected to the basic rectifier unit before terminal wiring, and wait for at least the time designated on the basic rectifier unit after disconnecting the power supplies. • Medium voltage presents inside the basic rectifier unit during running. Do not carry out any operation on the basic rectifier unit during running except for keypad setup. The control terminals of the product form extra-low voltage (ELV) 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. Disconnect the motor cable before performing any insulation and voltage withstand tests for the motor or motor cable. • Do not open the cabinet door since medium voltage presents inside the Goodrive880 series product during running.
Note	• Do not switch on or switch off the input power supplies of the basic rectifier unit frequently. • If the basic rectifier unit has been stored for a long time without use, perform checking and carry out pilot run for the basic rectifier unit before using it again. • Close the basic 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 basic rectifier unit. • Cut off all power supplies connected to the basic rectifier unit before terminal wiring, and wait for at least the time designated on the basic rectifier unit after disconnecting the power supplies. • During maintenance and component replacement, take measures to prevent screws, cables and other conductive matters from falling into the internal of the basic rectifier unit.
Note	• Use proper torque to tighten screws. • During maintenance and component replacement, keep the basic 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 basic rectifier unit, or measure the control circuits of the basic rectifier unit with a megohmmeter. • During maintenance and component replacement, take proper anti-static measures on the basic rectifier unit and its internal parts.

1.4.4 Disposal

	• The basic rectifier unit contains heavy metals. Dispose of a scrap basic rectifier unit as industrial waste.
	• Dispose of a scrap VFD 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. 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 GD880 series product or until the DC bus voltage is less than 36V.
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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 unit.
3. Whether the voltage of the grid is within the allowable input voltage range of the rectifier unit.
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 of 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 unit installation is complete.

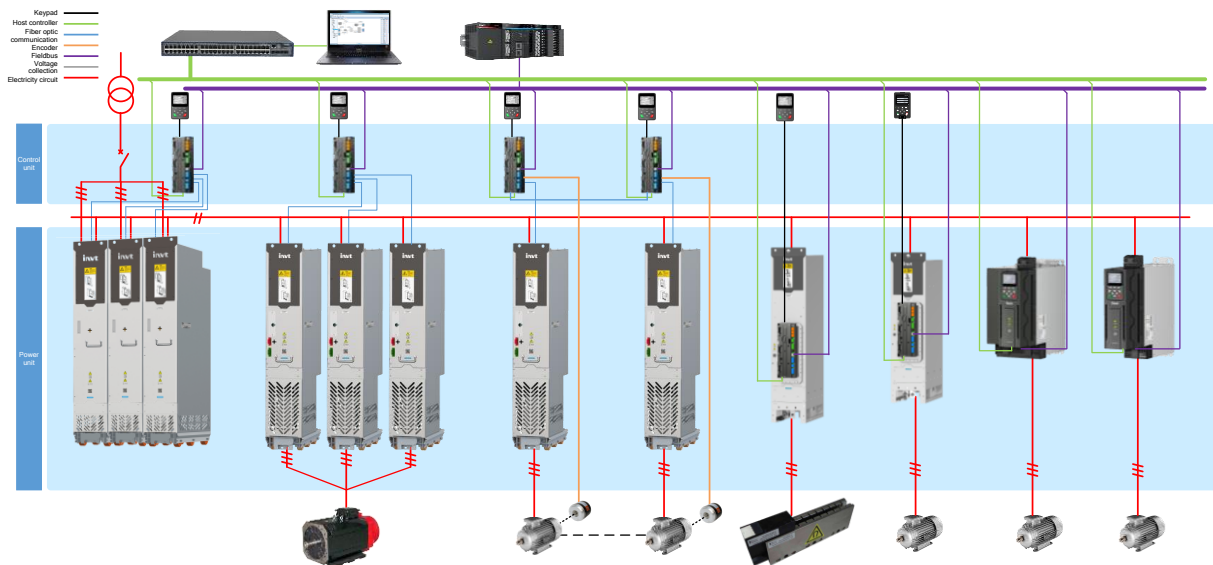
1.	Whether the input power cables and output load cables meet the current-carrying capacity requirements of the actual load.
2.	Whether correct accessories are selected for the product, the accessories are correctly and properly installed, and the installation cables meet the capacity carrying requirements 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 upper computer debugging through Ethernet.

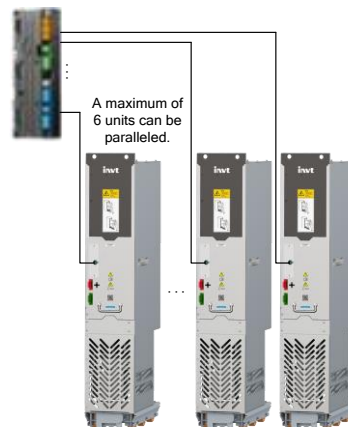
Figure 3-1 GD880 multi-drive typical topology



3.2 Parallel connection for expansion

Basic rectifier units can be paralleled through the control interface of TCU. One control unit supports a maximum of 6 basic rectifier units installed in parallel. Equipped with input reactors as standard configuration, GD880 series basic rectifier units can be used directly in parallel.

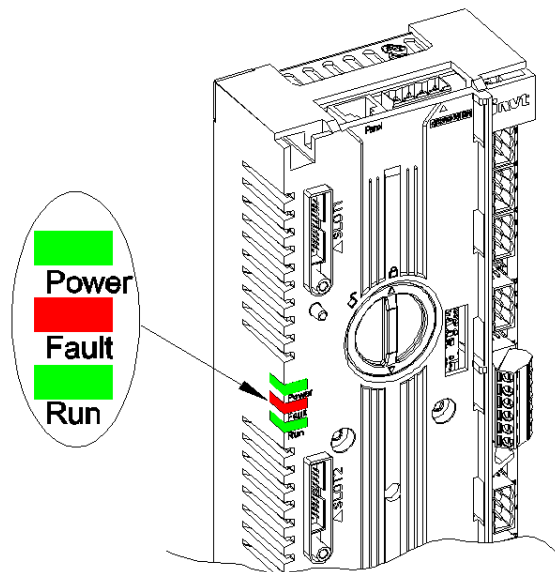
Figure 3-2 Parallel diagram of the basic rectifier units



Note: Rectifier units of different sizes cannot be used in parallel. Each winding in transformer multi-winding is equipped with a control unit.

3.3 Control unit (TCU)

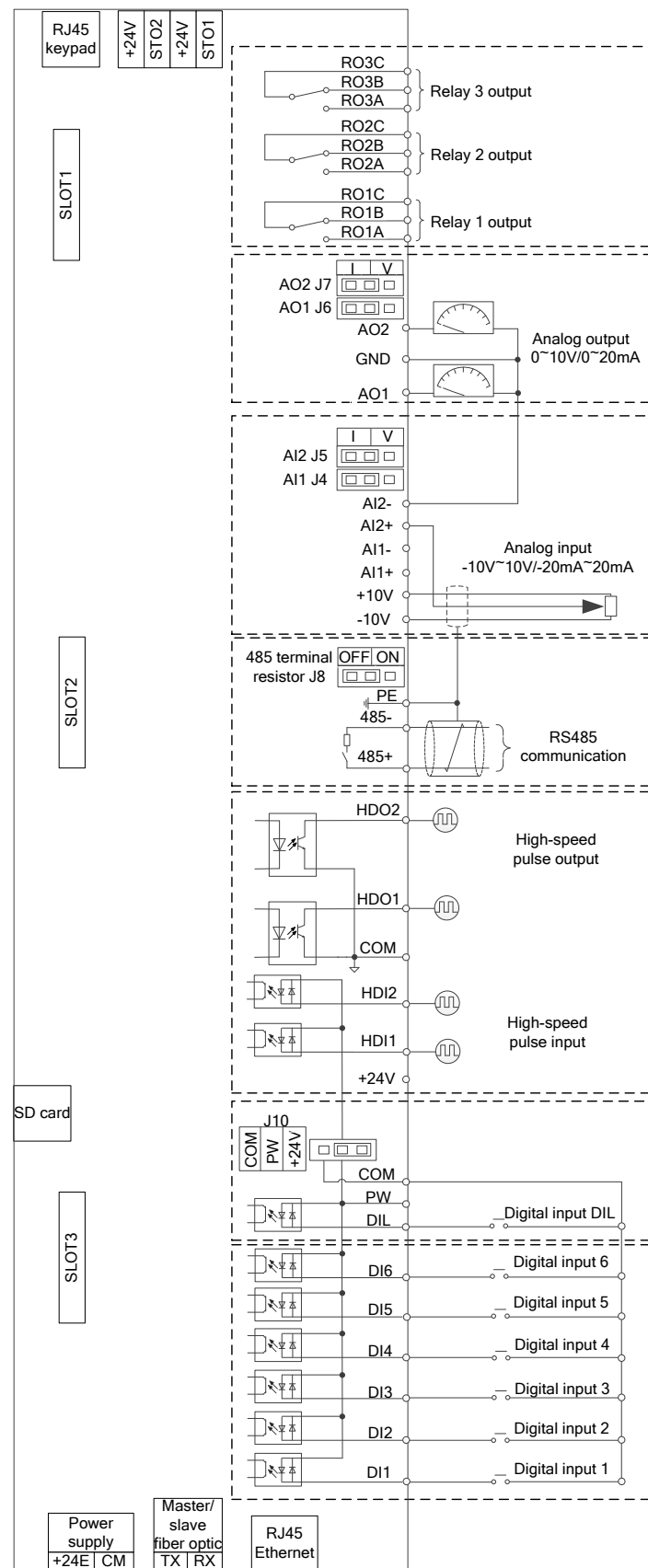
3.3.1 Indicator



No.	Name	State	Description
1	Power	ON	TCU is properly powered.
		OFF	TCU 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



Terminal	Terminal symbol	Function description	Cable specifications
Input power			
1	+24E	24Vdc±10% 2A	Two-core twisted-pair cable is recommended. Cross-sectional area: 0.5–2.5mm ²
2	CM		
DI input terminal			
1	DI1	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	Single-core wire Cross-sectional area: 0.5–2.5mm ²
2	DI2		
3	DI3		
4	DI4		
5	DI5		
6	DI6		
DIL input terminal			
1	DIL	Digital interlock. When its input is high level, all other input terminals are forced to be invalid.	Two-core twisted-pair cable is recommended. Cross-sectional area: 0.5–2.5mm ²
2	PW	Provides power supply for DIL, DI1–DI6, HDI, and HDO.	
3	COM	Digital common ground	
Jumper J10: power supply selection			
1 2 3  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.			
1 2 3  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.			
HDIO terminal			
1	+24V	Provides power supply 24V±10% 0.2A for DI, HDI and HDO	Two-core twisted-pair cable is recommended. Cross-sectional area: 0.5–2.5mm ² HDI and COM, HDO and COM use twisted-pair cables.
2	HDI1	1. Input type: PNP, NPN	
3	HDI2	2. Input frequency range: 0–50kHz 3. Input voltage range: 12–30V 4. Duty ratio: 30%–70%	
4	COM	Digital common ground	
5	HDO1	1. Output type: OC 2. Output frequency range: 0–50kHz	
6	HDO2	3. Switch capacity: 50mA/30V 4. Duty ratio: 50%	
RS485 communication terminals			
1	485+	RS485 bus, standard 5V electrical level	Two-core twisted-pair cable is recommended. Cross-sectional area: 0.5–2.5mm ²
2	485-	Terminal resistor: 120Ω	
3	PE	Max. baud rate: 115200 Max. number of nodes: 32 (without relay)	
Jumper J8: terminal resistor selection			
1 2 3  When 1 and 2 are short-circuited, the terminal resistor is disconnected.			
1 2 3  When 2 and 3 are short-circuited, the terminal resistor is connected.			
Analog input terminal			
1	-10V	±10V power supply	Cross-sectional area: 0.5–2.5mm ²
2	+10V	Max. output current: 10mA	
3	AI1+	Current input: -20mA–+20mA, Rin: 500Ω	When two AIs are used, use two

Terminal	Terminal symbol	Function description	Cable specifications
4	AI1-	Voltage input: -10V~+10V, Rin: 30kΩ Differential input range: ±30V Sampling interval: 0.1ms Resolution: 11 bit+signbit	two-core shielded twisted-pair cables. When reference voltage is used, use one four-core shielded twisted-pair cable for one AI.
5	AI2+		
6	AI2-		
Jumper J4: Selection between AI1 voltage and current signal inputs			
1 2 3 When 1 and 2 are short-circuited, AI1 current input is used.			
1 2 3 When 2 and 3 are short-circuited, AI1 voltage input is used.			
Jumper J5: Selection between AI2 voltage and current signal inputs			
1 2 3 When 1 and 2 are short-circuited, AI2 current input is used.			
1 2 3 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			
1 2 3 When 1 and 2 are short-circuited, AO1 current output is used.			
1 2 3 When 2 and 3 are short-circuited, AO1 voltage output is used.			
Jumper J7: Selection between AO2 voltage and current signal inputs			
1 2 3 When 1 and 2 are short-circuited, AO2 current output is used.			
1 2 3 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 contacts Contact parameters: 250Vac/ 30Vdc, 3A	Single-core wire Cross-sectional area: 0.5~2.5mm²
2	RO3B		
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	Rectifier 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		

Terminal	Terminal symbol	Function description	Cable specifications
RJ45 keypad			
1	RJ45	Connect the SOP-880-01 keypad	Standard shielded network cable
RJ45 Ethernet			
1	RJ45	Ethernet communication with a PC	Standard shielded network cable

3.3.3 Expansion modules

Control units can be used with expansion modules to achieve specific functions.

No.	Name	Model	Function description	Connect with TCU 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	Intelligent operation keypad	SOP-880-01	Human-machine interface keypad	RS422	74×121.5×26

 **Note:** It is recommended to install EC-TX803 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 units 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:

$$\text{Per unit value} = \text{Named unit value} / \text{Reference value}$$

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 unit 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.

Name	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 rated current of the rectifier unit as the reference value.
Output power	Uses the rated power of the rectifier unit 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 represent 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.

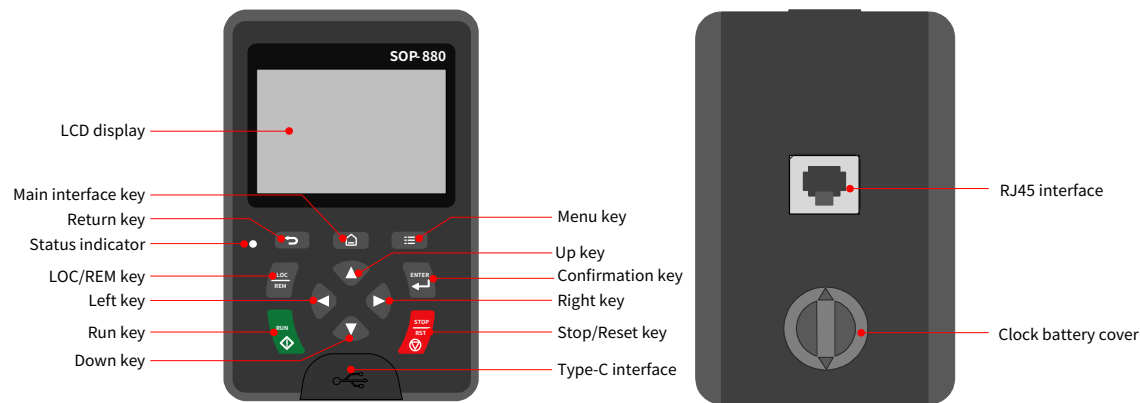
Note:

- 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 device 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 device.

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 level of 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 Up key function varies with interfaces, such as shifting up the displayed item, shifting up the selected item, and changing digits.
	Down key	The Down key function varies with interfaces, such as shifting down the displayed item, shifting down the selected item, and changing digits.
	Left key	The Left key function varies with interfaces, such as switch over the monitoring interface, shifting the cursor leftward, exiting the current menu and returning to upper-level menu.
	Right key	The Right key function varies with interfaces, such as switching the monitoring interface, shifting the cursor rightward, and entering the next-level 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 VFD 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 prealarm state.

4.1.4 LCD display screen description

The main interface of the LCD display is shown in [Figure 4-2](#). The LCD display screen 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

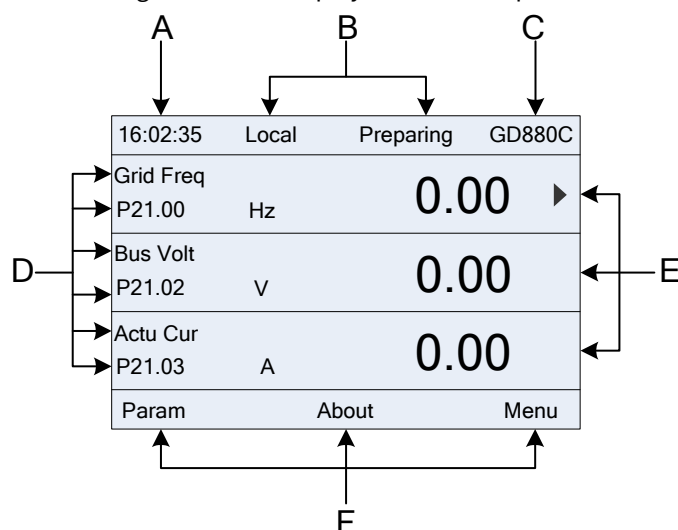


Table 4-3 LCD display screen description

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 ready to start (no fault). Pre-charge: The rectifier unit is in the pre-charge state. 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 "GD880": The present rectifier unit is GD880.
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 keys	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 control 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

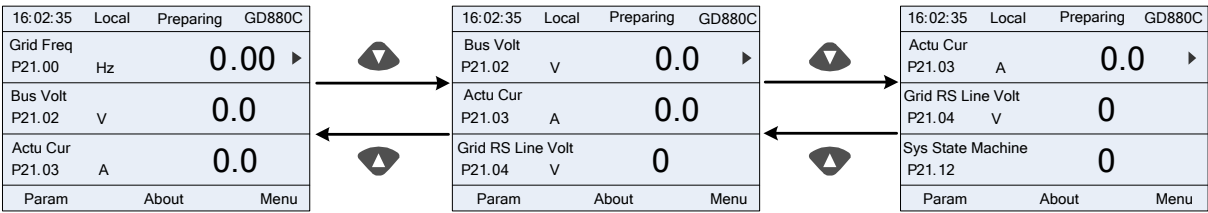
The VFD LCD keypad can display the stopped-state parameters, running-state parameters, function parameter editing status, and fault alarm state.

 **Note:** The keypad display interface will change slightly once the keypad software is updated.

4.2.1 Displaying stopped-state parameters

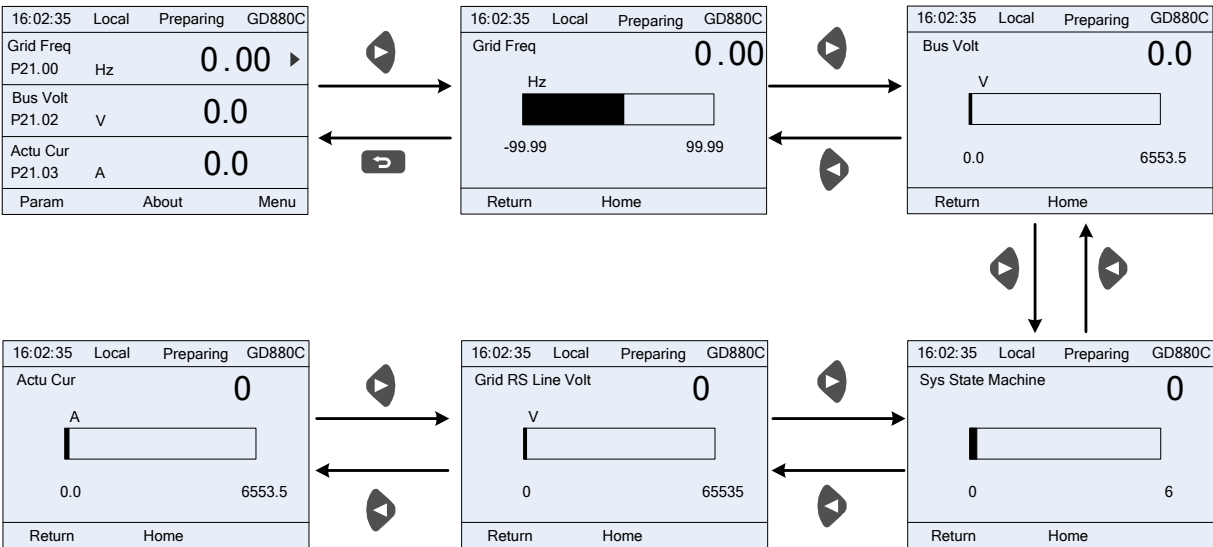
When the rectifier device is in stopped state, the keypad displays stopped-state parameters, and this interface is the main interface during power-on by default. Under stop state, parameters in various states can be displayed. Press  or  to shift the displayed parameter up or down.

Figure 4-3 Stopped-state parameter display



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

Figure 4-4 Stopped-state parameter display



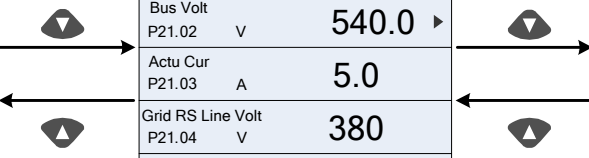
The stop display parameter list is user defined, and each state variable function code can be added to the stop display parameter list as needed. The state variable which has been added to the stop display parameter list can also be deleted or shifted.

4.2.2 Displaying running-state parameters

After receiving a valid running command, the rectifier device 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

16:02:35	Local	Run	GD880C
Grid Freq	Hz	50.00	▶
P21.00			
Bus Volt	V	540.0	
P21.02			
Actu Cur	A	5.0	
P21.03			
Param	About	Menu	



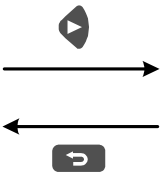
16:02:35	Local	Run	GD880C
Bus Volt	V	540.0	▶
P21.02			
Actu Cur	A	5.0	
P21.03			
Grid RS Line Volt	V	380	
P21.04			
Param	About	Menu	

16:02:35	Local	Run	GD880C
Actu Cur	A	5.0	▶
P21.03			
Grid RS Line Volt	V	380	
P21.04			
Sys State Machine		5	
P21.12			
Param	About	Menu	

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

Figure 4-6 Running-state parameter display

16:02:35	Local	Run	GD880C
Actu Cur	A	5.0	▶
P21.03			
Grid RS Line Volt	V	380	
P21.05			
Sys State Machine		5	
P21.12			
Param	About	Menu	



16:02:35	Local	Run	GD880C
Actu Cur		5.0	
Return	Home		

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 device enters the fault alarm display state once fault signal is detected, and the keypad displays the fault code and fault information with the red indicator on the keypad 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

16:02:35	Local	Minor fault	GD880C
Present fault	01/01	00:46	
Fault code		0112	
0112: Unit1-Upstream communication fault			
Home		OK	

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 Entering/Exiting menus

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

Figure 4-8 Entering/exiting level 2 and level 3 menus

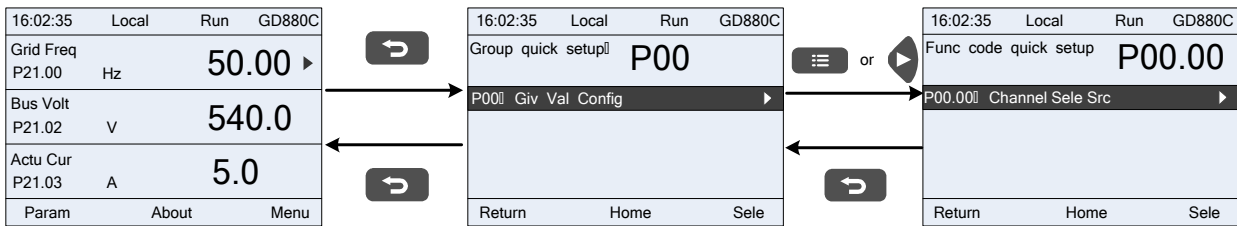
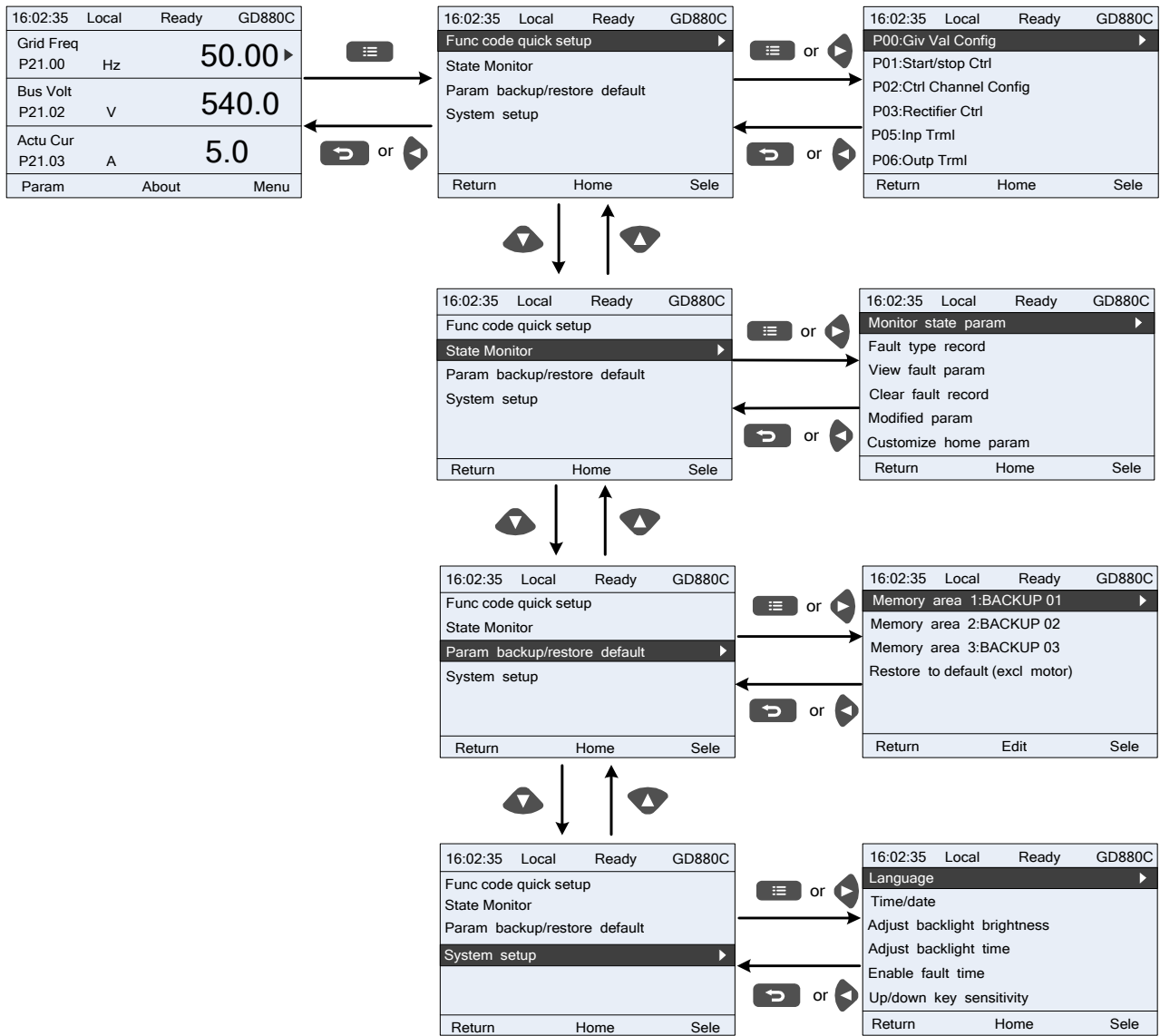


Figure 4-9 Entering/exiting different menus



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

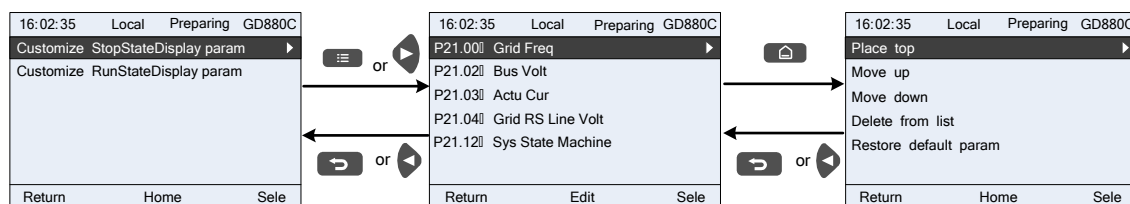
Level 1	Level 2	Level 3
	P05:Inp Trml	P05.XX
	P06:Outp Trml	P06.XX
	P07:SYS Info	P07.XX
	P08:Fault Record	P08.XX
	P11:Unit Config	P11.XX
	P13:Prot Config	P13.XX
	P20:CW and SW	P20.XX
	P21:RT Data	P21.XX
	P23:SYS Config	P23.XX
	P24:Param Disp Set	P24.XX
	P33:Blackbox Channel Config	P33.XX
	P37:BusAdapter 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:Last Alarm Code 2
		P08.14:2nd-last Alarm Code 3
		P08.15:3rd-last Alarm Code 4
		P08.16:4th-last Alarm Code 5
		P08.17:5th-last Alarm Code 6
	View fault param	P08.18: Reserved
		P08.19: Reserved
		P08.20:Grid voltage at Present Fault
		P08.21:Input Cur at Present Fault

Level 1	Level 2	Level 3
		P08.22:Bus Volt at Present Fault
		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
	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
System setup	-	Download all param from keypad
		Restore default (excl motor)
		Sure to restore to default values?
		Language
		Time/date
		Adjust backlight brightness
		Adjust backlight time
		Enable fault time
		Up/down key sensitivity

4.3.2 Editing list

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

Figure 4-10 List editing in the stopped state

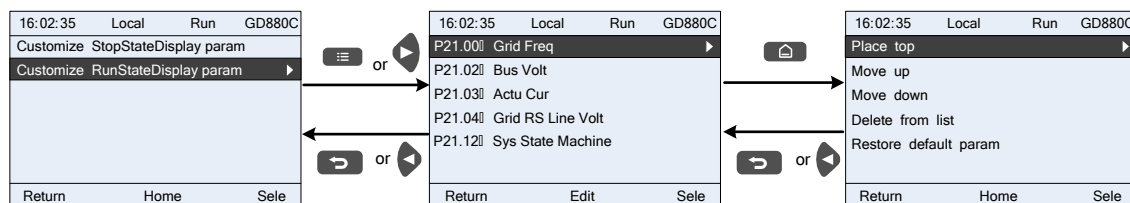


Press the key to enter the edit interface, select the operation needed, and press the key, key or key to confirm the edit operation and return to the previous menu (parameter list). The returned list is the list edited. If the key or key is pressed in the edit interface without selecting the edit operation, 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 menu of the function code in state check group), 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 interface.

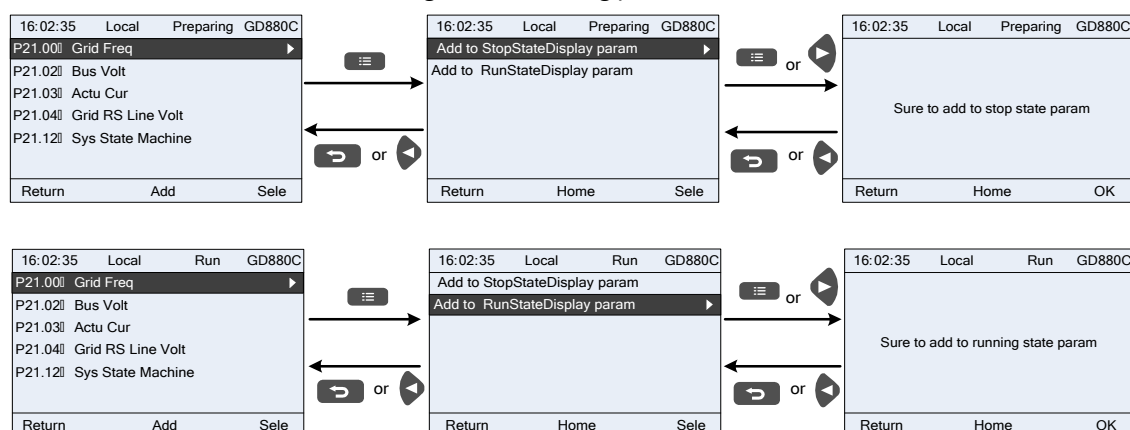
Figure 4-11 List editing in the running state



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 as follows.

Figure 4-12 Adding parameters



Press the key to enter the parameter addition interface, select the operation needed, and press the key, key or key to confirm the addition operation. If this parameter is not included in the "parameter displayed in stop state" list or "parameter displayed in running state" list, the parameter added will be at the end of the list; if the parameter is already in the "parameter displayed in stop state" list or "parameter displayed in running state" list, the addition operation will be invalid. If the key or key is

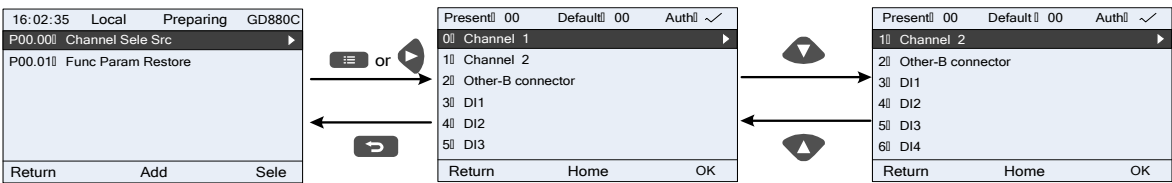
pressed without selecting the addition operation in "Addition" interface, it will return to the monitoring parameter list menu.

Note: Up to 16 monitoring parameters can be added to the "parameter displayed in stop state" list; and up to 32 monitoring parameters can be added to the "parameter displayed in running state" list.

4.3.4 Parameter selection edit interface

In the fourth-level menu of "Basic parameter" menu, press the  key,  key or  key to enter parameter selection edit interface. After entering the edit interface, the current value will be highlighted. Press  key and  key to edit current parameter value, and the corresponding parameter item of current value will be highlighted automatically. After parameter selection is done, press the  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.

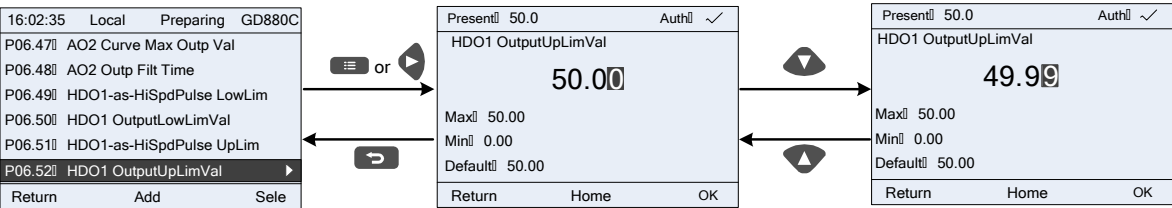
"Present" indicates the value of current option.

"Default" indicates the default value of this parameter.

4.3.5 Parameter setup edit interface

In the fourth-level menu in "Basic parameter" 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.

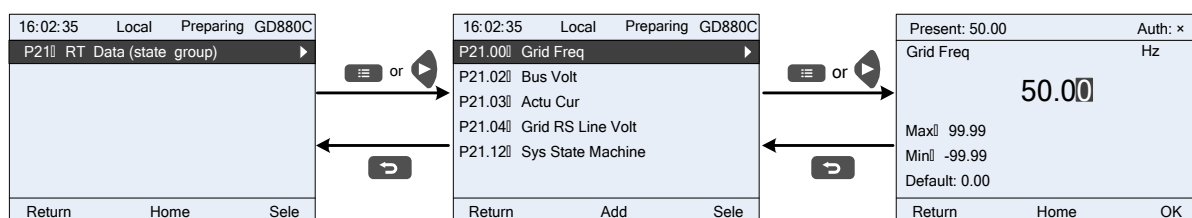
"Current value" indicates the value of current option.

"Default value" indicates the default value of this parameter.

4.3.6 State monitoring interface

In the "State monitoring" 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.

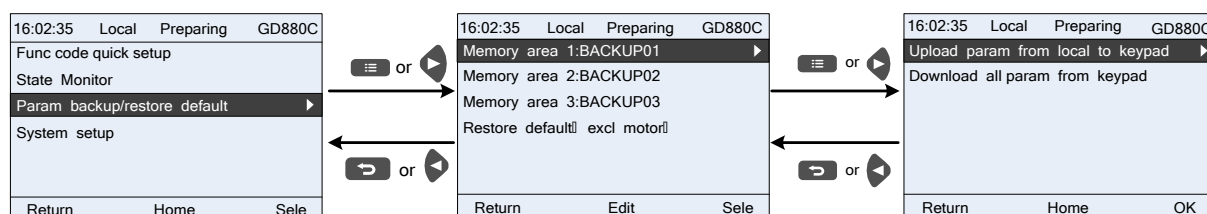
Figure 4-15 State monitoring interface



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 units in total.

Figure 4-16 Parameter backup

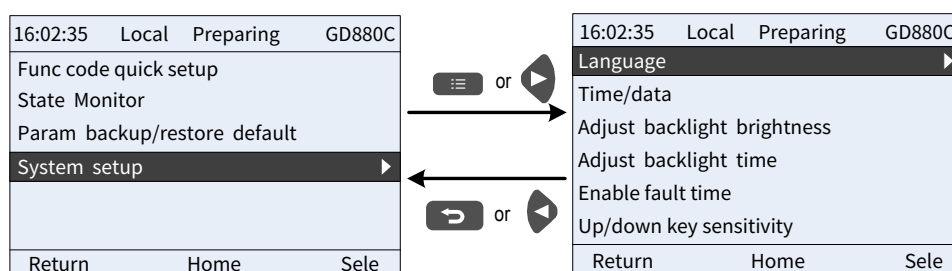


4.3.8 System setting

In the "System setup" menu, press the  key,  key or  key to enter the system setup interface to set the 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 configuration



5 Introduction to the Workshop debugging software

5.1 Workshop key features

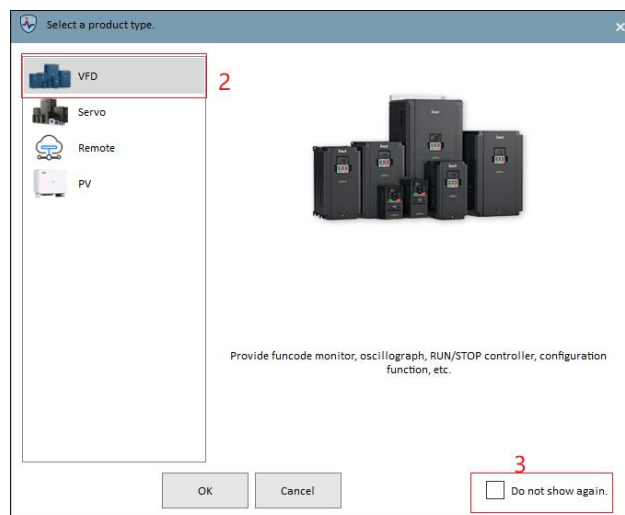
INVT Workshop is used to configure and monitor INVT medium- and low-voltage VFD and DA series servo products, in which the VFD supports serial ports, Ethernet, CAN, and LIN communication, and the servo supports USB and Ethernet communication. The software can be run on Windows XP and later, including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

The software can be used to:

- 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

1. Double-click the  icon to open the software to enter the product selection interface.
2. Select "VFD" and enter the software main interface.
3. If you select "**Do not show again**", the next time you start the software, the engineering wizard interface will not appear automatically.

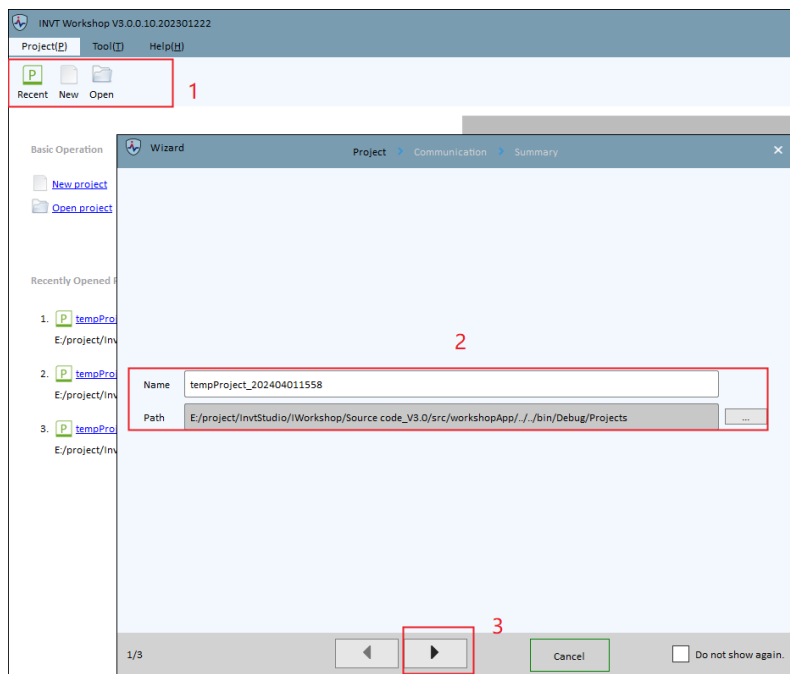


5.3 Creating a project

5.3.1 Local project

5.3.1.1 Adding a project offline

- 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.
- Name the newly created project and select the path where the project will be stored (change the default path if the creation fails).
- Click  at the bottom of the dialog box to set the communication parameters.



- Select the device GD880-71C, 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).
- Enter the device start address.
- Click **Add device** to add the device with the start address entered into the added devices 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.

Wizard Project Communication Summary

Add device offline Search device online

Device info

Model GD880-71C

Version V1.02

Name GD880-71C-V1.02-2

Industry /

Communication UDP

Start address 192 · 168 · 0 · 2

End address 192 · 168 · 0 · 2

Data port 100 OSC port 101

Add device

Added devices

No.	Name	Device type	Version	Communication	Detail	Operation
1	GD880-71C-V1.02-1	GD880-71C	V1.02	UDP	192.168.0.1	Delete

2/3 Cancel Do not show again.

7. Verify the device type, version, communication type, and communication details again.
8. Click **OK**, and the new project is completed.

Wizard Project Communication Summary

You have set the following:

--Project

Name: tempProject_202404011838

Path: E:/project/InvStudio/IWorkshop/Source code_V3.0/src/workshopApp/./bin/Debug/Projects

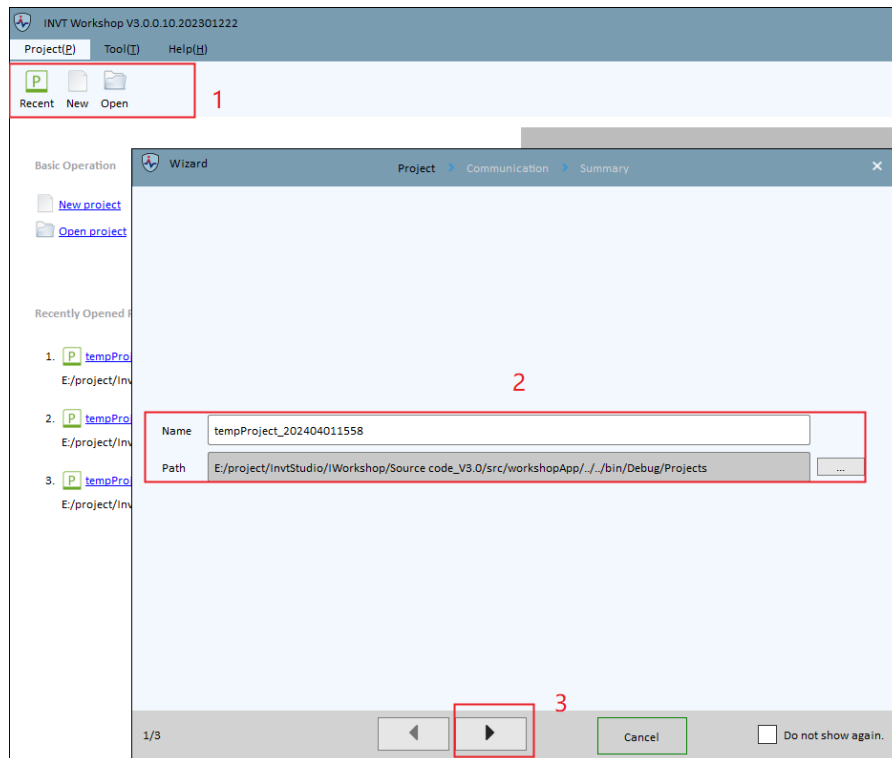
--Device info

No.	Name	Device type	Version	Communication	Detail
1	GD880-71C-V1.02-1	GD880-71C	V1.02	UDP	192.168.0.1

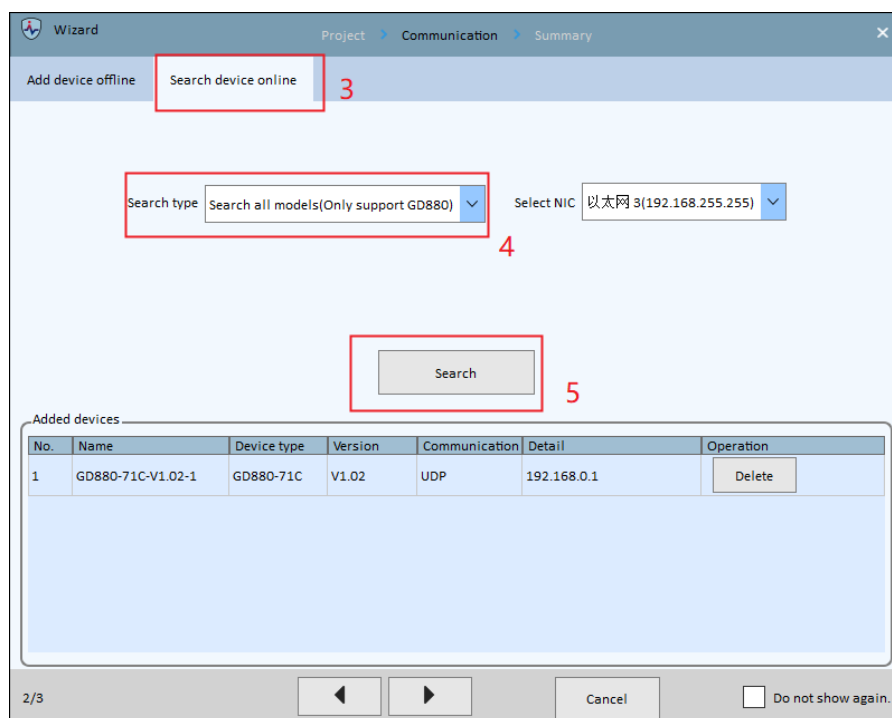
3/3 OK Cancel Do not show again.

5.3.1.2 Adding a project online

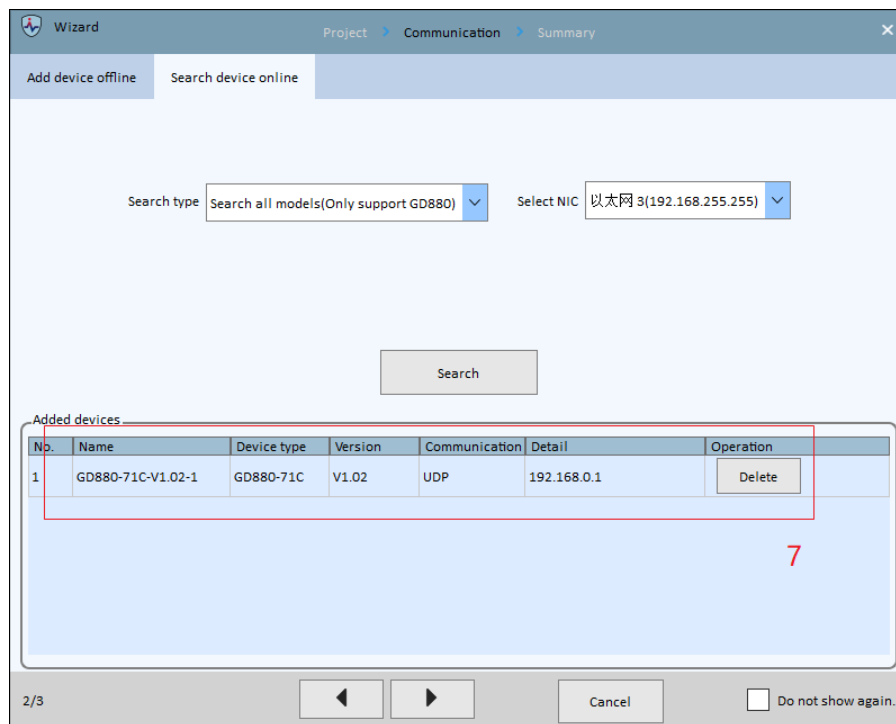
1. Name the newly created project and select the path where the project will be stored (change the default path if the creation fails).
2. Click  at the bottom of the dialog box to set the communication parameters.



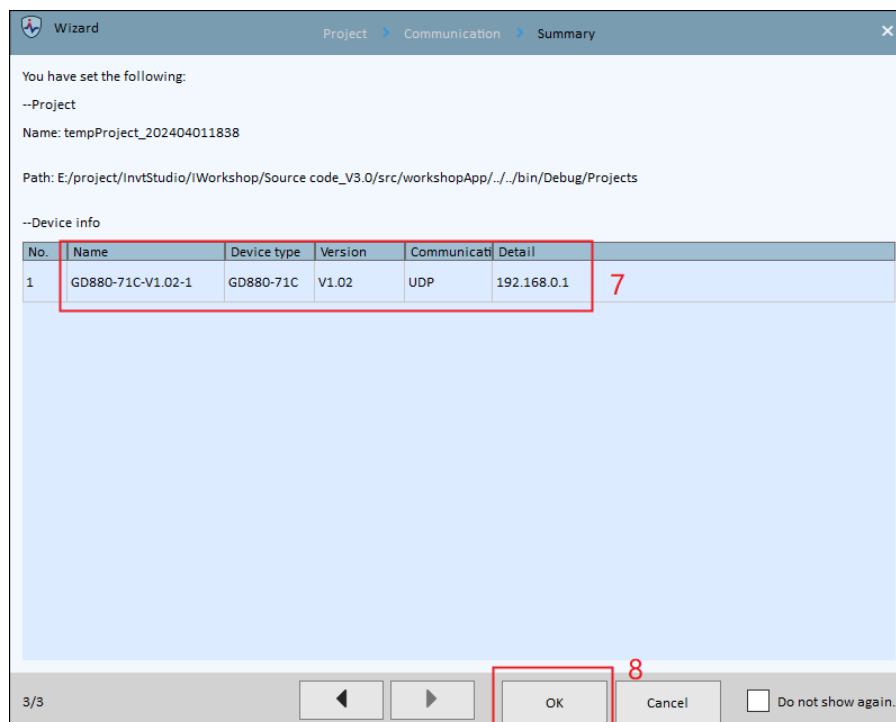
3. Click "Search device online".
4. Select "Search all models".
5. Click the **Search** button.



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



7. Verify the device type, version, communication type, and communication details again.
8. Click **OK**, and the new project is completed.

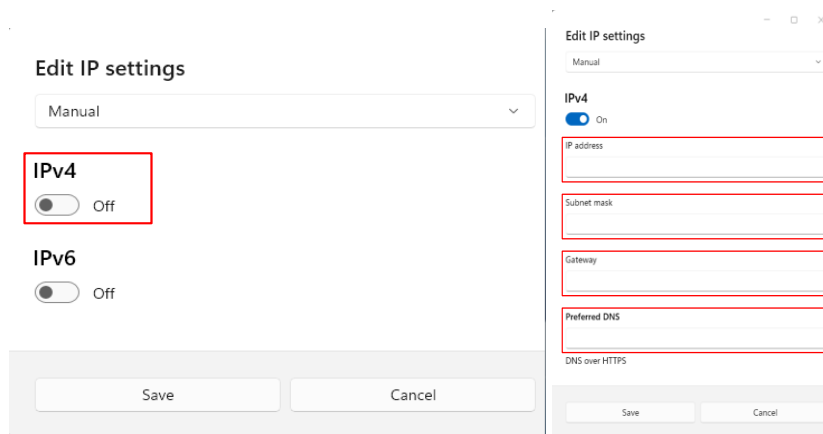
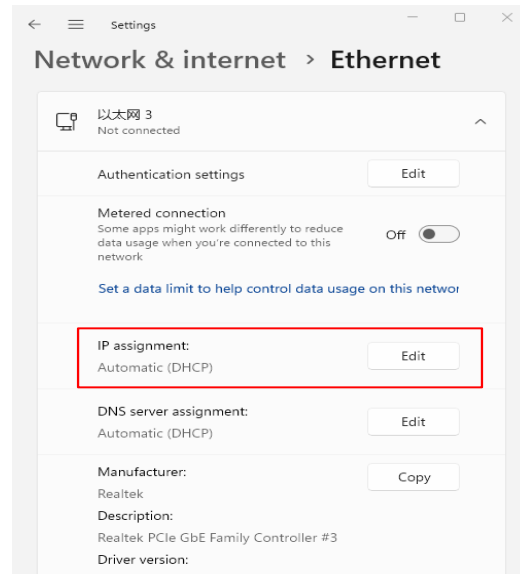


5.4 PC side connection

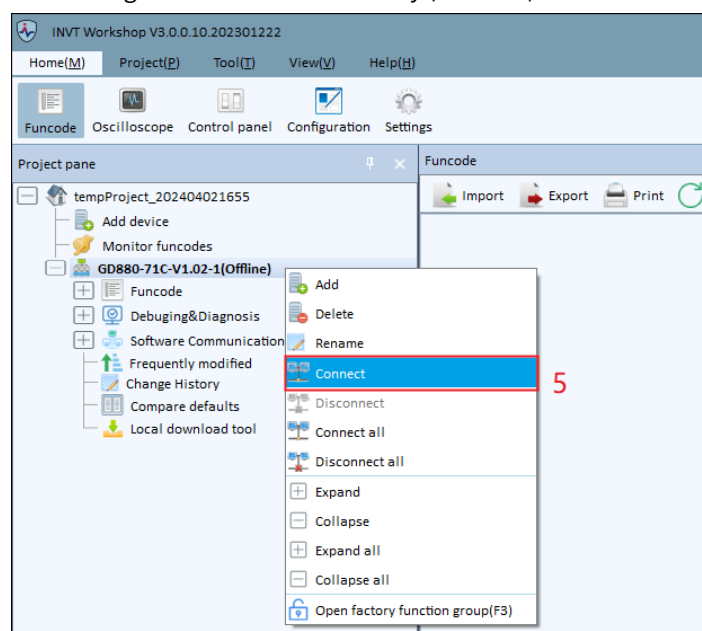
When Ethernet communication is used, connect one end of a network cable to the PC network port and the other end to the device Ethernet port, and note that the PC IP address needs to be set to be on the same network segment as the device (device IP address: 192.168.0.1). Change adapter

1. For the PC side settings, choose Network & internet > Ethernet, and click **Change adapter option**.
2. Right-click on the NIC and select **Properties**.

3. Locate Internet Protocol Version 4 and right-click **Properties**.
4. Change only the IP address and subnet mask, and note that the IP address should be different from the device IP address.



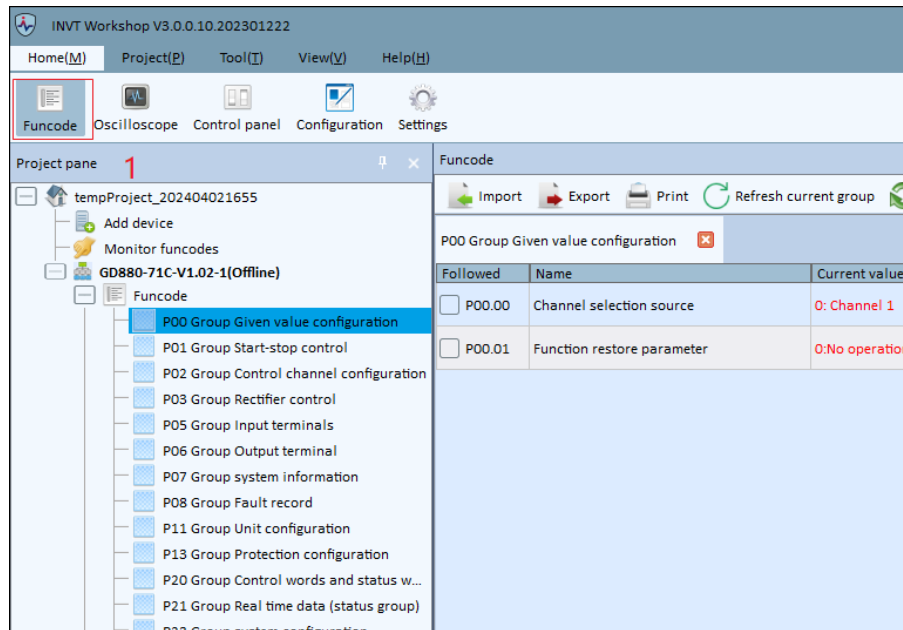
5. Right-click on the product model, and choose **Connect**. The connection is successful when the status of the active machine changes from offline to standby (or failed).



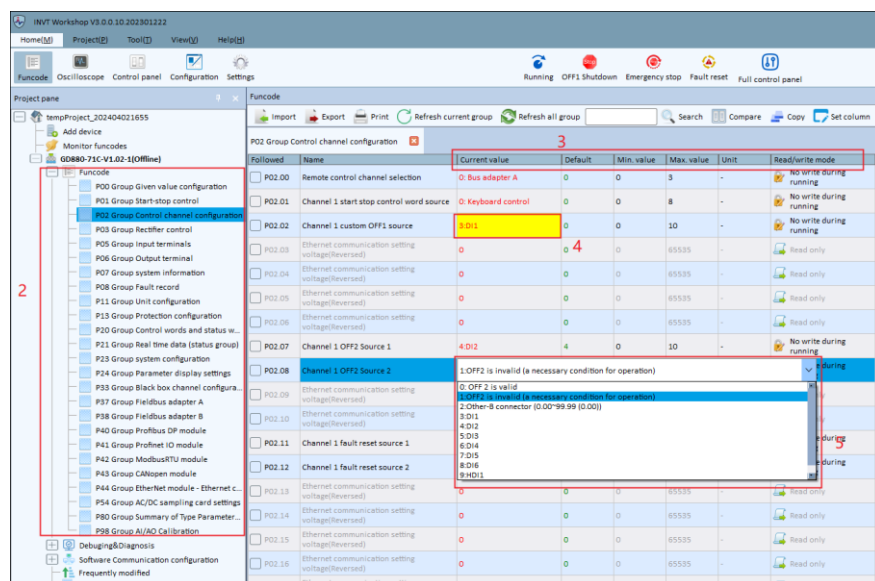
5.5 Basic functions

5.5.1 Viewing and modifying parameters

1. Select **Home->Funcode** to enter the function code interface.

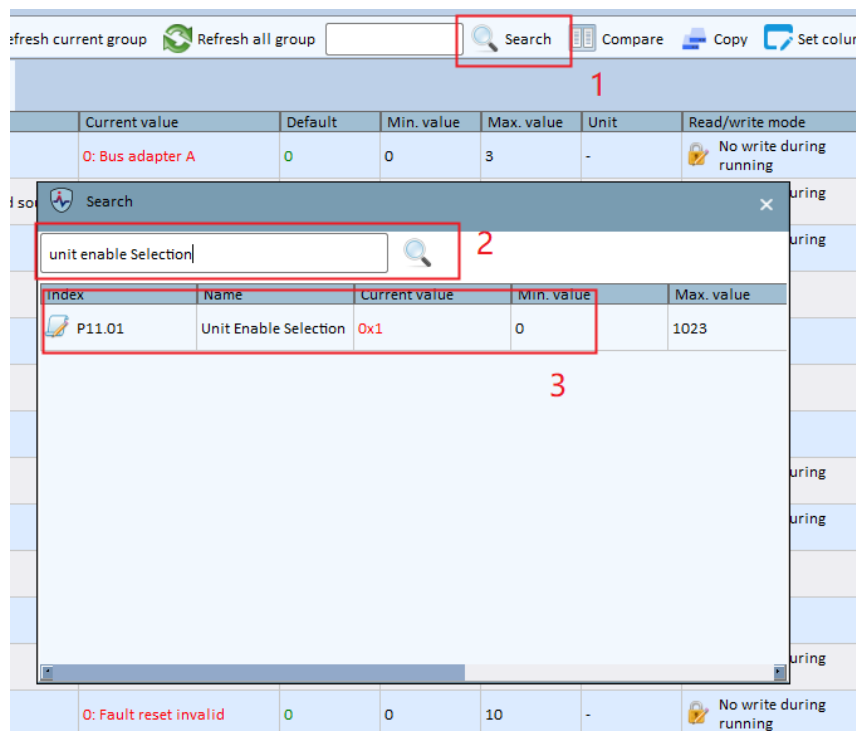


2. Click the function code group in the project tree to display the function code information. The function code groups are displayed on the left. You can switch the function code information by clicking on the function code groups on the left. Only one function code group is displayed at a time. For example, if group P01 is clicked again, group P00 is hidden and group P01 is displayed.
3. 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. You can select the check boxes before function codes to determine which are displayed. All is displayed by default.
4. When the current value does not match the default value, the current value is filled in yellow.
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.



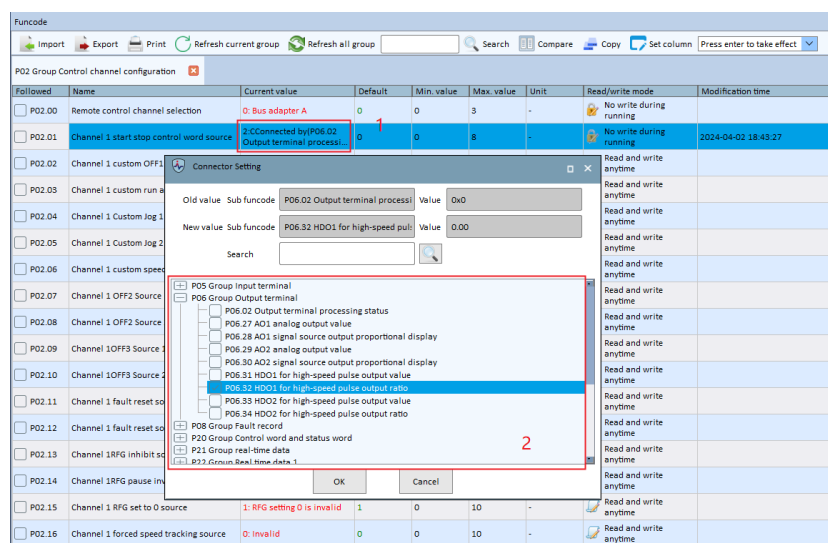
5.5.2 Searching for parameters

1. Click the **Search** button to pop up the function code search interface, which supports fuzzy query.
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.
3. Double-click the line to jump to the corresponding function code interface without closing the search interface.



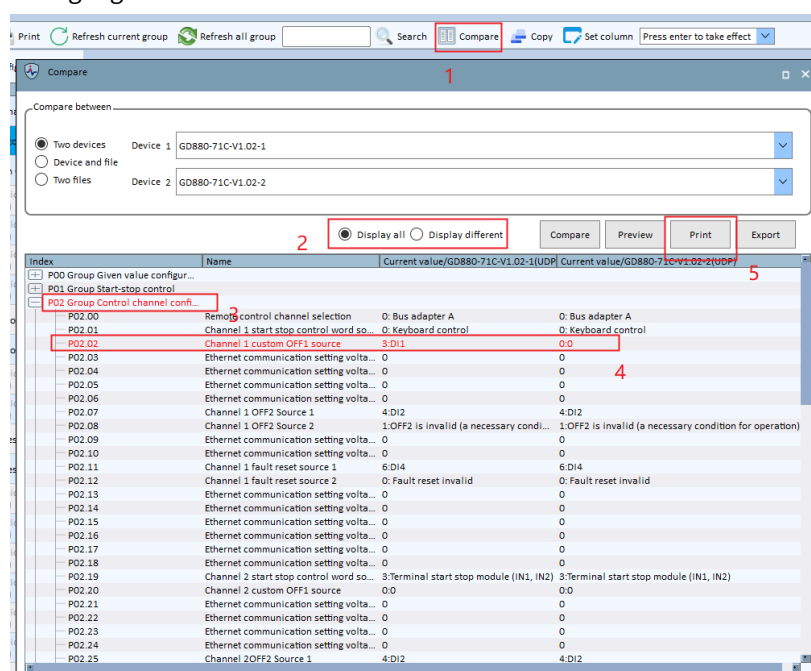
5.5.3 Parameter interconnection

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



5.5.4 Comparing parameters

1. 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.
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, and the motor will compare the 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.

GD880-71C-V1.02-1(UDP) VS GD880-71C-V1.02-2(UDP)

2024-04-19,09:56:31

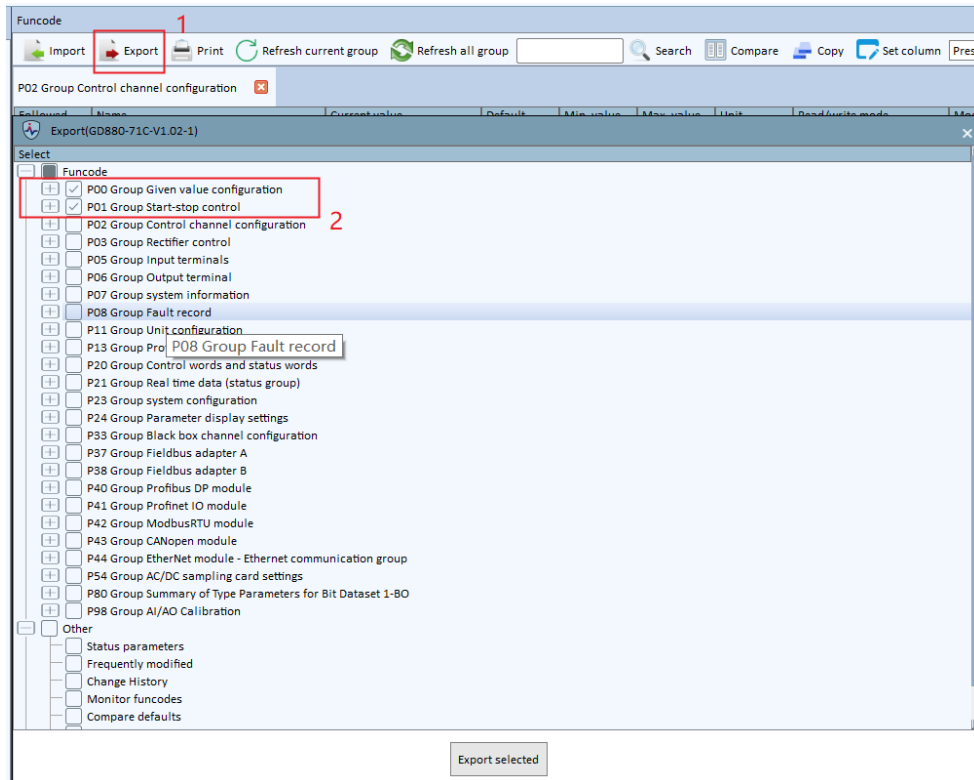
-Compare-

Index	Name	Current value/GD880-71C-V1.02-1(UDP)	Current value/GD880-71C-V1.02-2(UDP)
P01.00	Terminal running protection selection when powering on	0: Prohibit terminal restart	1: Allow terminal restart
P03.00	Phase Locked Loop Parameter Debugging Mode	1:Kp、Ki	0:bandwidth
P06.05	RO2 signal source	1: High level	7: Drive fault
P11.05	Actual effective carrier frequency	5.0	10.0
P38.00	Bus adapter bus type	4:Ethernet communication setting voltage(Reversed)	2:Profinet IO module
P40.02	DP_ ID number	0xD55	0x8045

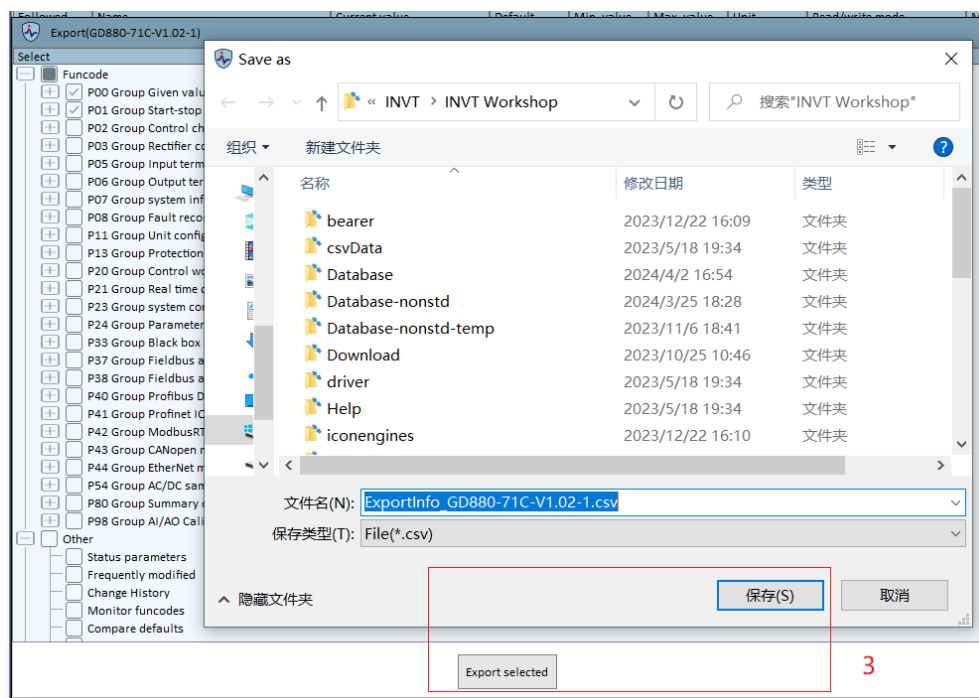
5.5.5 Backing up and downloading parameters

1. You can export function codes for easy copying of values to other devices by using the **Export** tool in the function code toolbar.

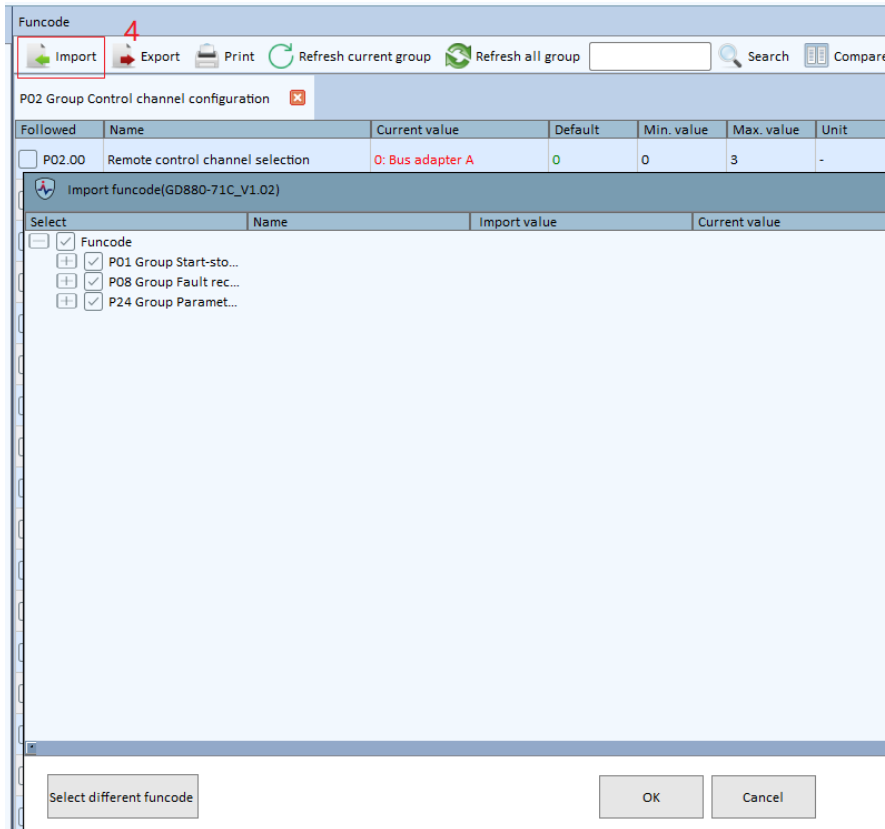
2. You can select the function codes you want to export as required.



3. Click **Export Selected**, select the storage directory, and click **Save**. The selected items are saved in a **.csv** file.

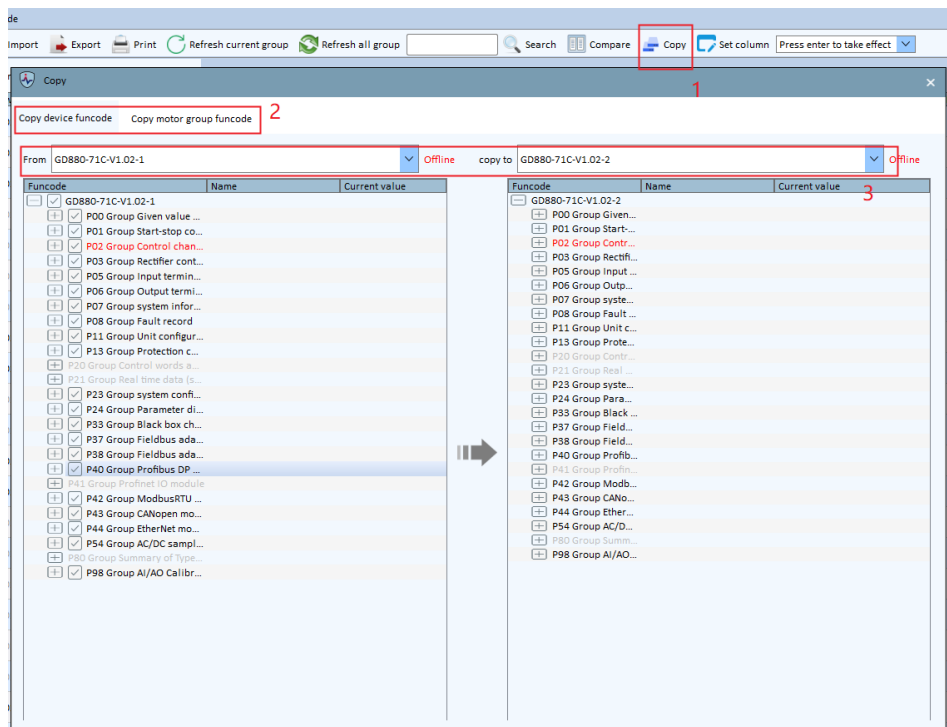


4. The exported function code database file can be imported into any device of the same model, overwriting the current values. The values that are different from the current values are marked in red. Please wait while the device is written after clicking **OK**.



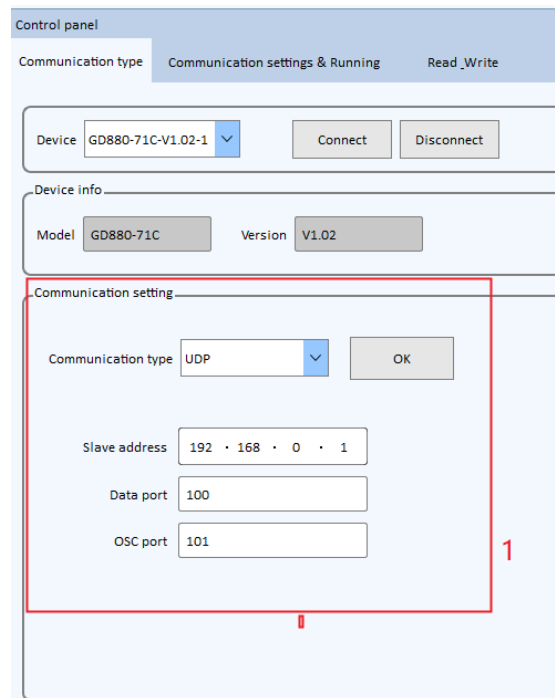
5.5.6 Copying function codes

1. Copying function codes enables you to write the function code values on one device directly to another device.
2. 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.
3. You can choose to copy device function codes.

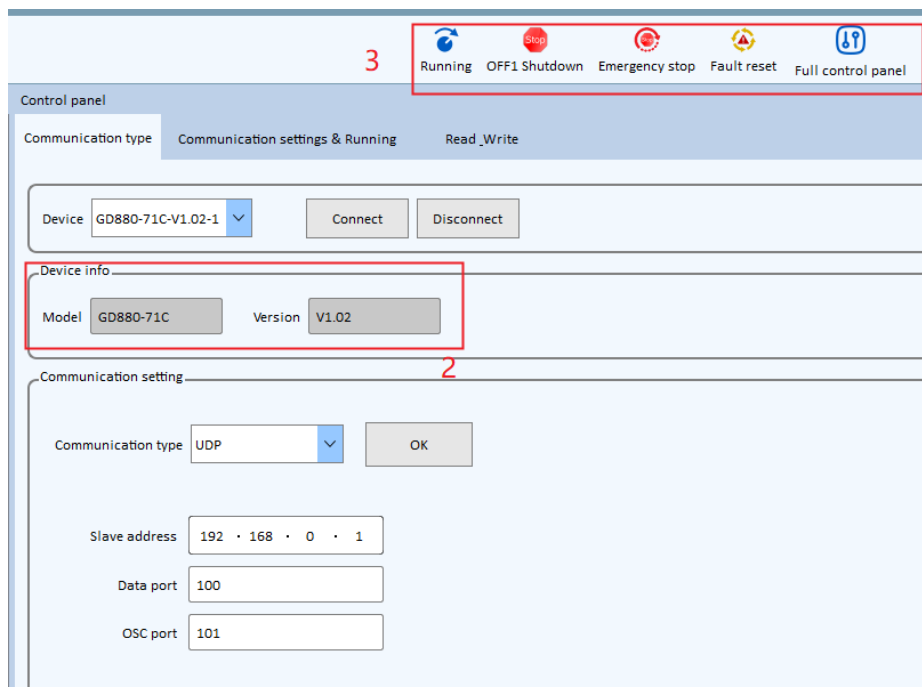


5.5.7 Control panel

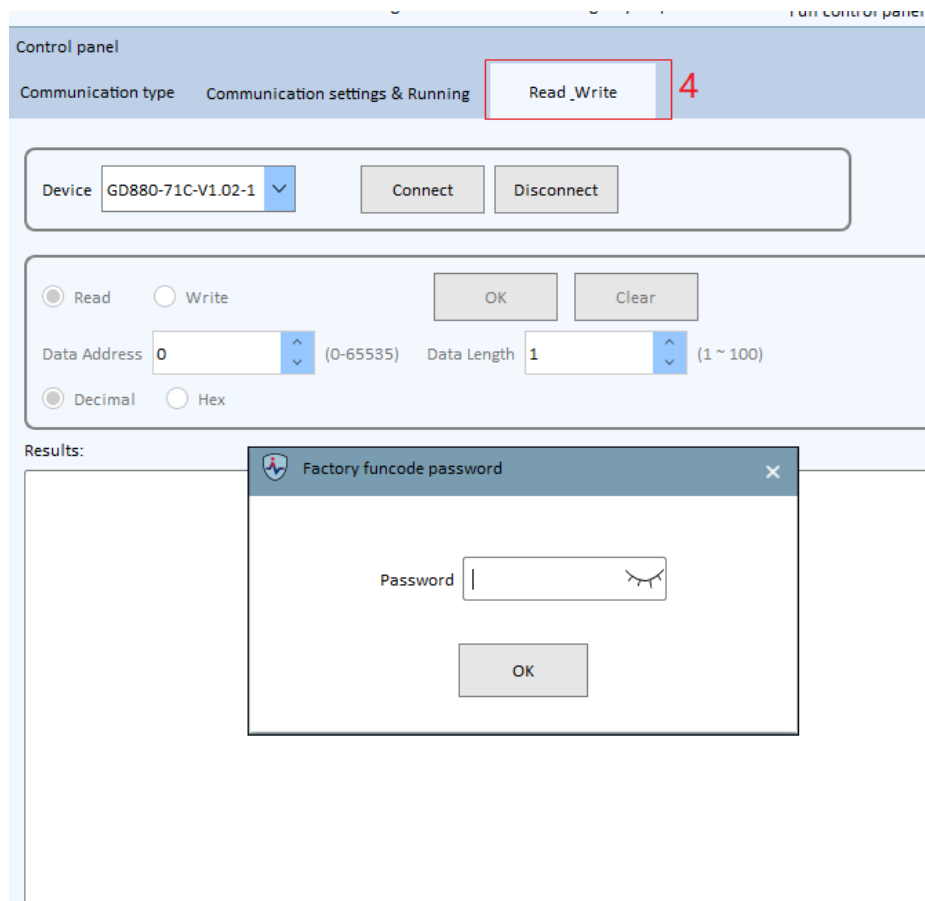
1. Choose **Home > Control Panel** to enter the control panel interface, in which you can change the communication type, data port, and oscilloscope port.



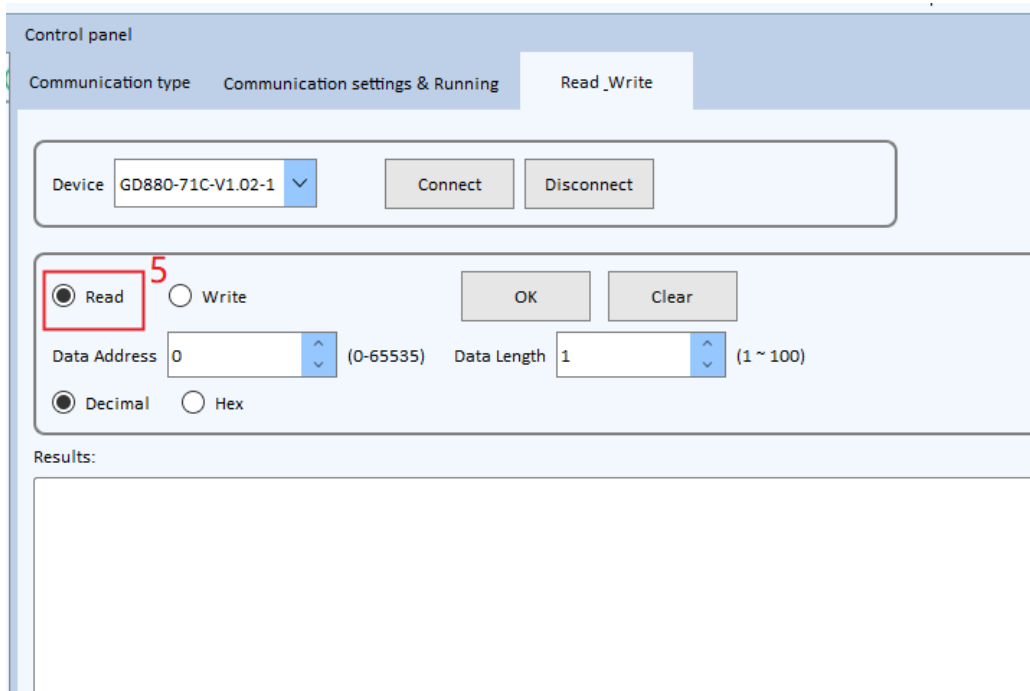
2. The function of communication parameter setting in communication reference and operation is reserved.
3. After connecting the device, you can control the operation of the selected device, including "Running", "Shutdown", "Emergency stop", and "Fault reset".



4. The read/write testing supports the operation on any device, supports the connection to or disconnection from the device, and supports clearing result records, but requiring a factory password.



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



6. 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.

Control panel

Communication type Communication settings & Running Read_Write

Device: GD880-71C-V1.02-1 Connect Disconnect

☐ Read ☒ Write 6 OK Clear

Data Address: 0 (0-65535) Value: 0 (0-65535)

☒ Decimal ☐ Hex

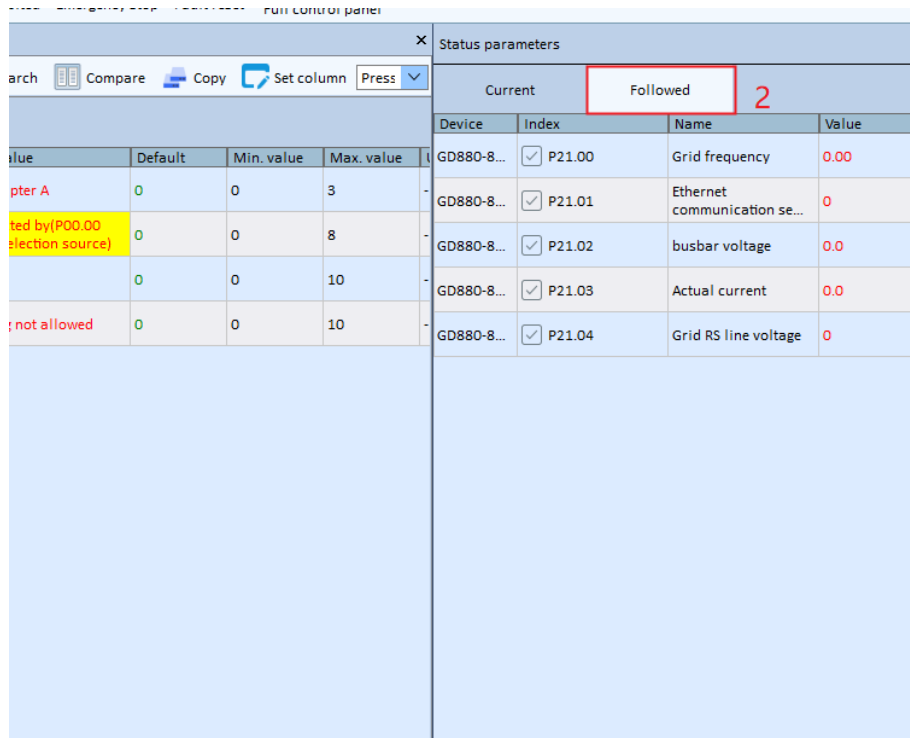
Results:

5.5.8 Status parameter

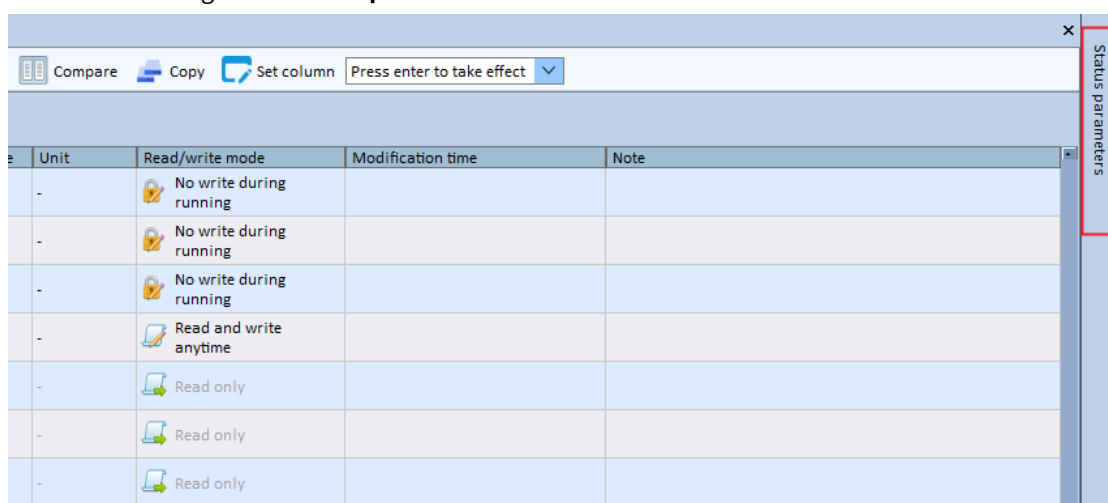
1. Status parameters are also function codes, but can only be read and cannot be modified, and the interface periodically refreshes the status parameters. When selected, the status parameters become followed status parameters; when deselected, the status parameters are removed from the followed status parameters. The followed parameters will be saved when you close the project or software, and loaded when you start the software next time. State parameter interface:

Copy Set column Press enter to take effect		Current 1 Followed	
Read/write mode	Modification time	Index	Name Value
No write during running		☐ PT	Status of inverter 0: Offline
No write during running		☐ P21.00	Grid frequency 0.00
No write during running		☐ P21.01	Ethernet communication se... 0
No write during running		☐ P21.02	busbar voltage 0.0
Read and write anytime		☐ P21.03	Actual current 0.0
Read only		☐ P21.04	Grid RS line voltage 0
Read only		☐ P21.05	ST line voltage of the power grid 0
Read only		☐ P21.06	Grid voltage 0
No write during running		☐ P21.07	Ethernet communication se... 0
No write during running		☐ P21.08	Input power 0.0
Read only		☐ P21.09	Input power factor 0.0
Read only		☐ P21.10	Ethernet communication se... 0
No write during running		☐ P21.11	Ethernet communication se... 0
No write during running		☐ P21.12	System State Machine 0
Read only		☐ P21.13	Ethernet communication se... 0
Read only		☐ P21.14	Ethernet communication se... 0
Read only		☐ P21.15	Ethernet communication se... 0
Read only		☐ P21.16	Ethernet communication se... 0
Read only		☐ P21.17	Ethernet communication se... 0
Read only		☐ P21.18	Ethernet communication se... 0

2. In the **Status parameters** interface, right-click to deselect all status parameters.



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 after choosing **View > State parameters**.



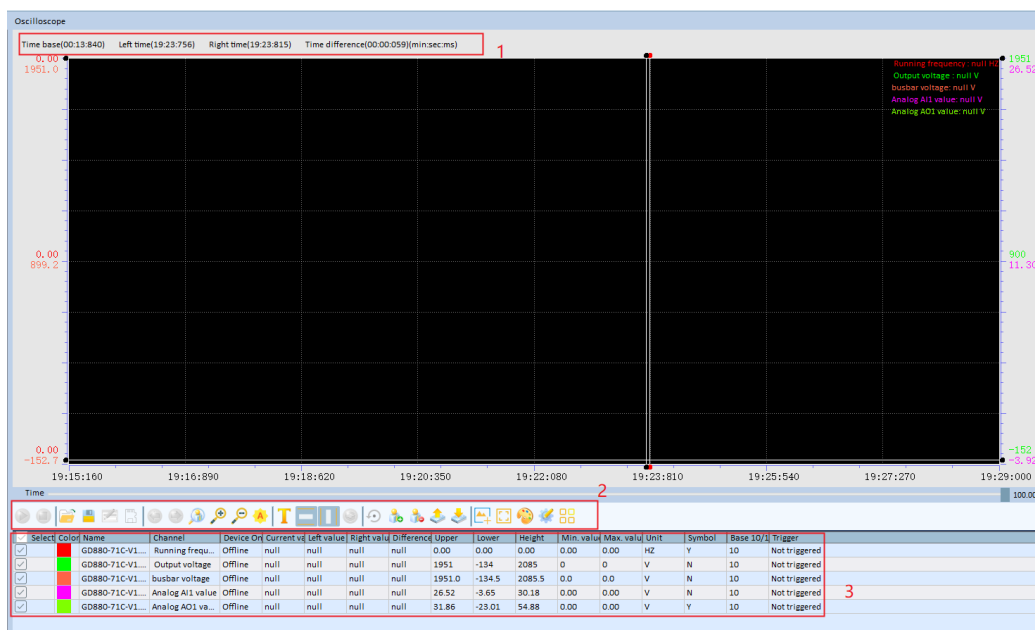
5.6 Waveform recording and analysis

5.6.1 Oscilloscope

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

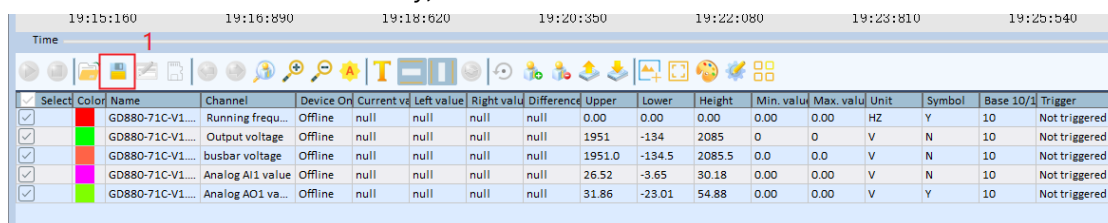
1. Plot area: Displays waveforms.
2. Toolbar: Adjusts waveforms for easy viewing, as well as the ability to save and import waveforms, allowing you to select the waveforms to be observed in the channel information.

3. Channel information: Displays the specific waveform numeric values (which you can select for observation).

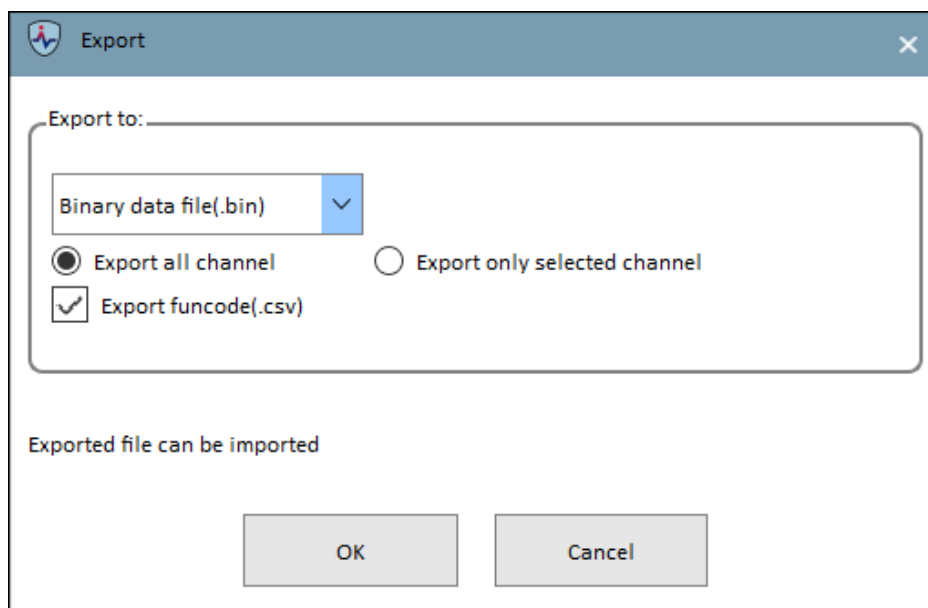


5.6.2 Waveform storage

1. To save the waveform data locally, use the **Save** button.



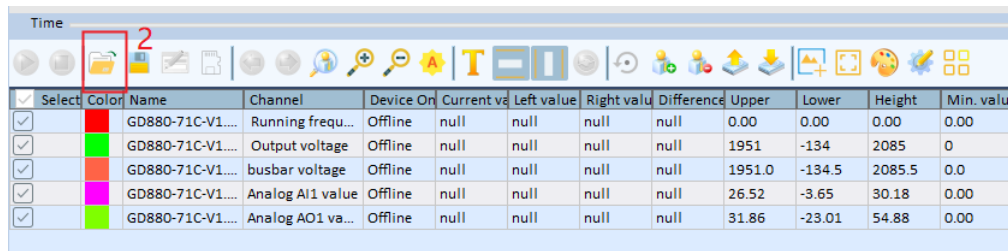
2. The following window is displayed. If you also select **Export funcodes(.csv)** at the same time, all present function code values are automatically exported as a database file (CSV file). When saving waveforms, you can select the format of file to export and channel waveforms(all channel waveforms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



3. Click **OK**. A window is displayed to ask you to enter the save name and location.

5.6.3 Waveform reading

1. Locate the button for loading hisotirical waveforms from the toolbar.

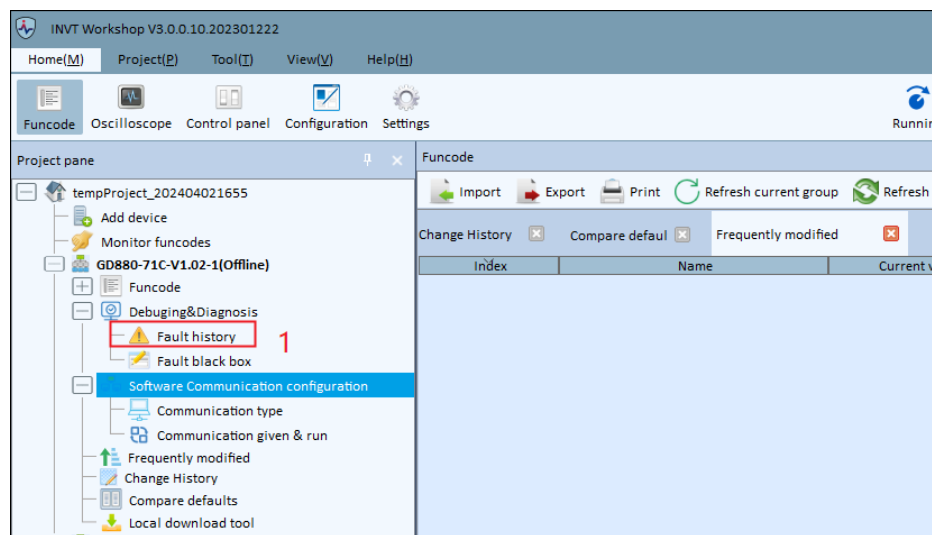


2. In the window that is displayed, select the waveform to be read, and click **Open** to import.

5.7 Fault wizard

5.7.1 Fault records

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



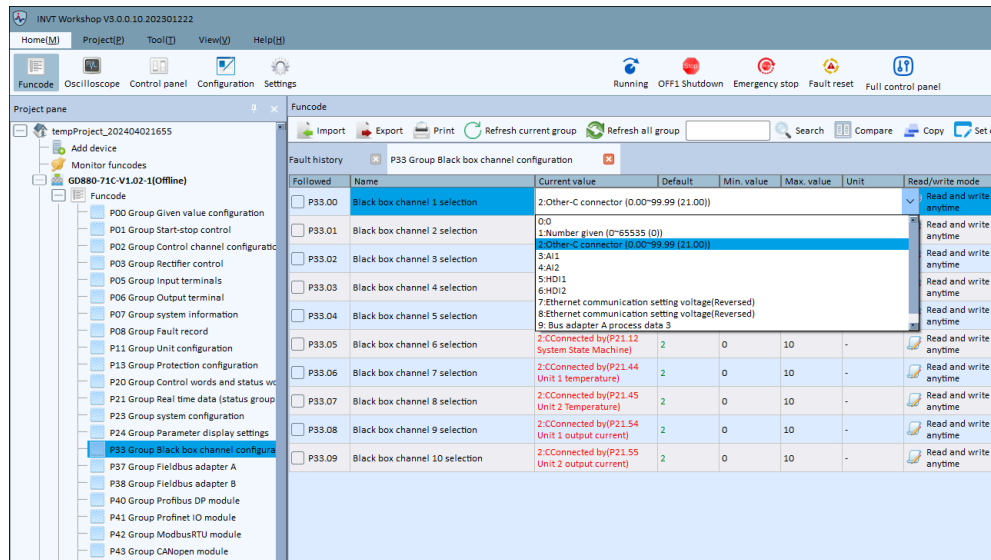
2. A window is displayed, in which you can view the parameters related to the present and historical faults.

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	°C		
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	°C		
0x0-01-01:00:00:0	P08.32	Input terminals state at the previous fault	0x0	-		

5.7.2 Fault blackbox

5.7.2.1 Host controller online fault black box

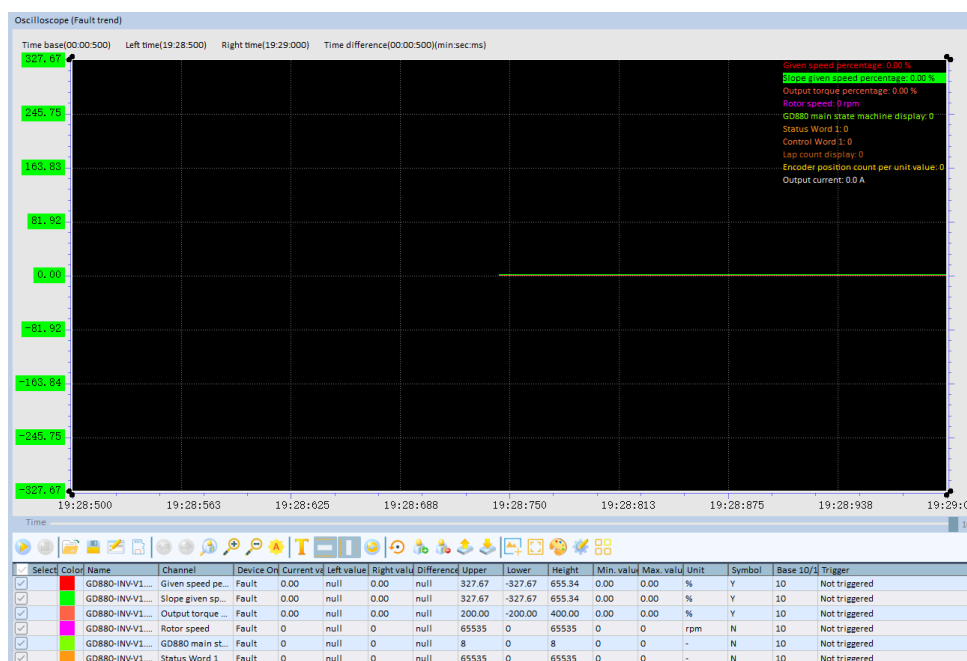
1. Set group P33 Blackbox channel configuration according to the requirements. Select the channel you want to read at the time of the fault data.



2. When a fault occurs, Read Fault Waveform button in the oscilloscope toolbar.

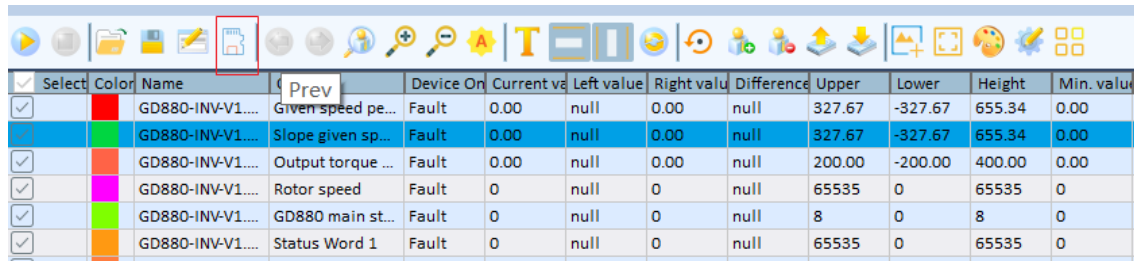
Select	Color	Name	Channel	Device On	Current value	Left value	Right value	Difference	Upper	Lower	Height	Min. value	Max
☒		GD880-INV-V1....	Given speed pe...	Fault	0.00	null	0.00	null	327.67	-327.67	655.34	0.00	0.00
☒		GD880-INV-V1....	Slope given sp...	Fault	0.00	null	0.00	null	327.67	-327.67	655.34	0.00	0.00
☒		GD880-INV-V1....	Output torque ...	Fault	0.00	null	0.00	null	200.00	-200.00	400.00	0.00	0.00
☒		GD880-INV-V1....	Rotor speed	Fault	0	null	0	null	65535	0	65535	0	0
☒		GD880-INV-V1....	GD880 main st...	Fault	0	null	0	null	8	0	8	0	0
☒		GD880-INV-V1....	Status Word 1	Fault	0	null	0	null	65535	0	65535	0	0

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

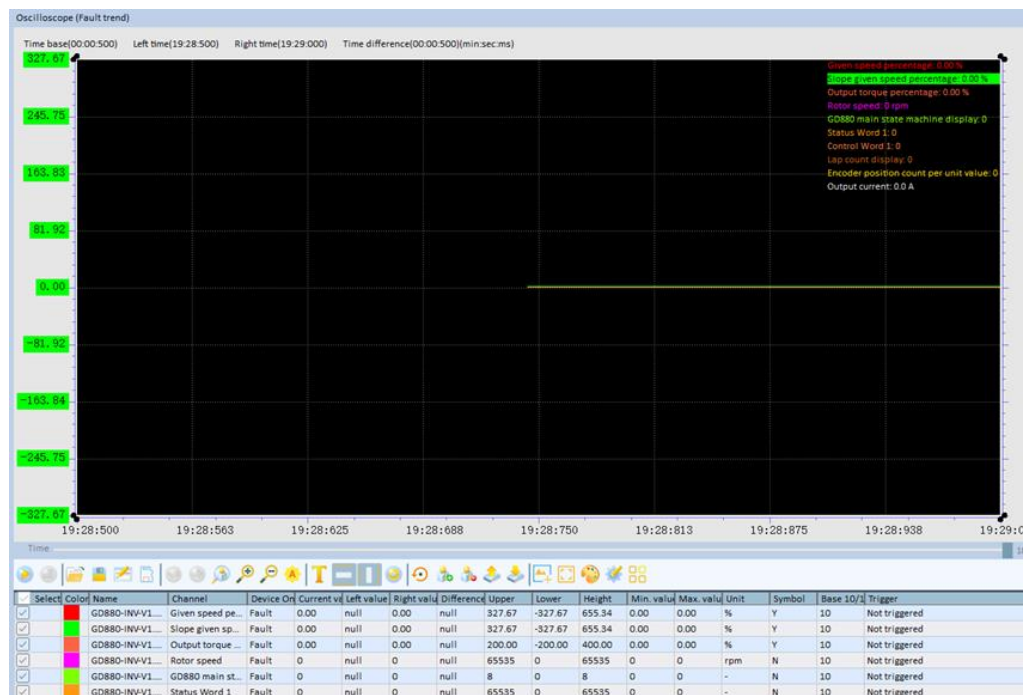


5.7.2.2 SD card fault blackbox

1. Similar to host controller fault blackbox, set group P33 Blackbox channel configuration according to the requirements, and select the channel you want to read at the time of the fault data.
2. Remember that the SD card needs to be inserted into the master controller. The SD card will automatically record the fault waveform data in the event of a fault.
3. Click the SD card oscilloscope button on the oscilloscope toolbar.

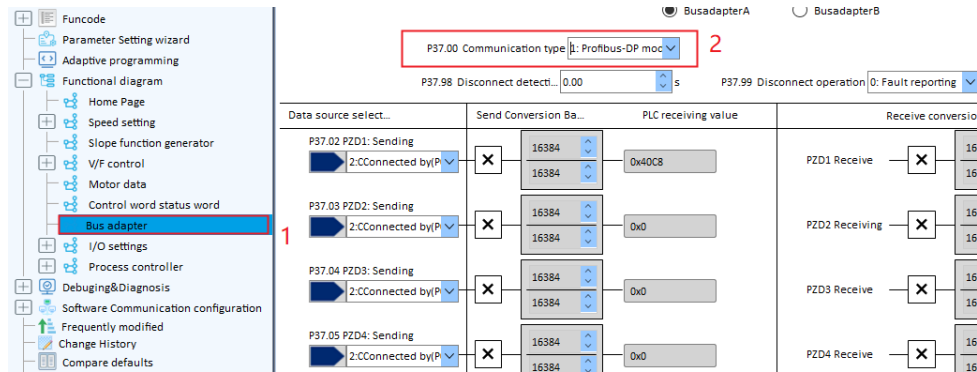


4. In the window that is displayed, select the **WaveLog** folder where the fault waveform data is stored.
5. Open the waveform data you want to view based on the recorded time. Select **Num_02.csv** if you want to open the most recent fault waveform.
6. The open waveform is the SD card fault waveform saved at the fault time, and the waveform data matches group P33.



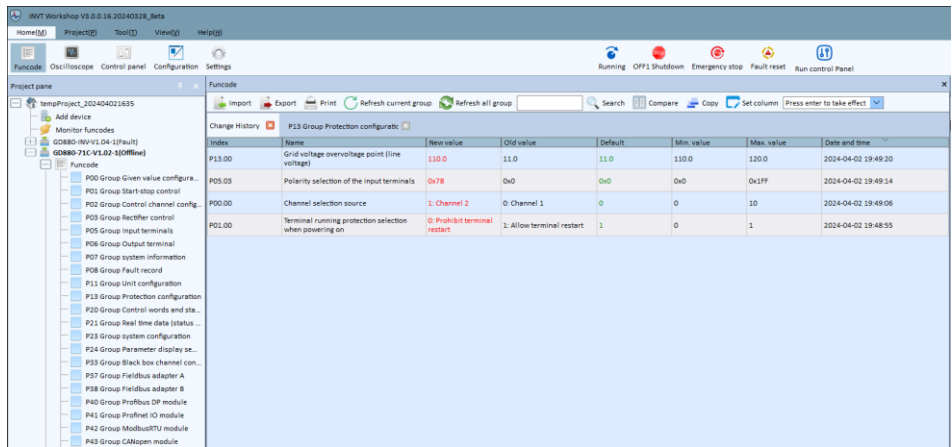
5.8 Device communication configuration

1. Different bus configurators can be selected.
2. Different 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

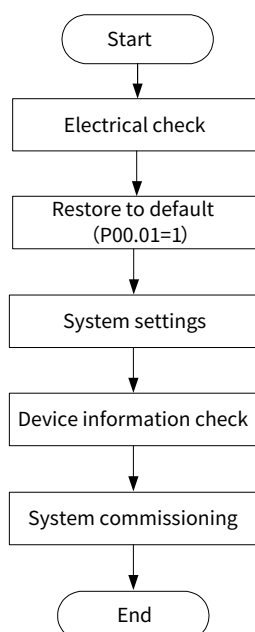
This section describes the internal function modules of the rectifier unit.



- 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 basic rectifier are shown in the following figure.



Note: If a fault occurred, find out the fault cause according to [7 Fault information](#).

6.2.1 Electrical check

No.	Item	Content	Result
1	Main circuit check	1. There is no short circuit between phases or between phases and ground in the three-phase AC incoming line of the basic rectifier module. 2. There is no short circuit between the positive and negative DC bus bars, and to-ground of the basic rectifier module. 3. The incoming phase sequences of the parallel basic rectifier modules must be consistent.	
2	Auxiliary circuit check	1. Ensure that 380V, 220V, and the 24V power supply wiring is correct. 2. Perform wiring according to the electrical schematic diagram to ensure solid wiring and reasonable routing.	

No.	Item	Content	Result
3	Grounding check	1. Ensure that all grounding wires in the cabinet are fastened to the grounding busbar. 2. Each group of cabinets needs to connect the grounding copper bars together and ensure their reliable grounding. 3. For IT systems, it is necessary to remove two grounding screws on the lightning protection plate of the base rectifier module. For details, see <i>Goodrive880 Series Basic Rectifier Unit Hardware Manual</i>.	
4	Power-on of auxiliary power supply and control power supply	1. Switch off the auxiliary power switch in sequence. 2. 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), and 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 type	Displays the current device types. Normal display 1: Basic 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, please contact technical personnel for assistance.

6.2.4 Running

The basic rectifier module does not contain the bus support capacitor and must be used with the inverter module of the same voltage level.

For the first operation of the basic rectifier module, it is recommended to use the keypad control, or use INVT Workshop control panel startup or terminal start-up. Before startup, check that the running signal is valid. After running for about 5 seconds, check if the bus voltage reaches the theoretical value, $V_{dc}=1.41 \times V_{in}$.

1. Keypad startup

Confirm the channel source for basic 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.

2. INVT Workshop control panel startup

Confirm the channel source for basic 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 the **Run** button on the control panel.

3. Terminal start-up

To use cabinet door closing start-up, 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 module. Ensure that the on-site wiring is consistent with the function code terminal start/stop module control wiring.

6.3 Startup timing

6.3.1 System switch-on state machine

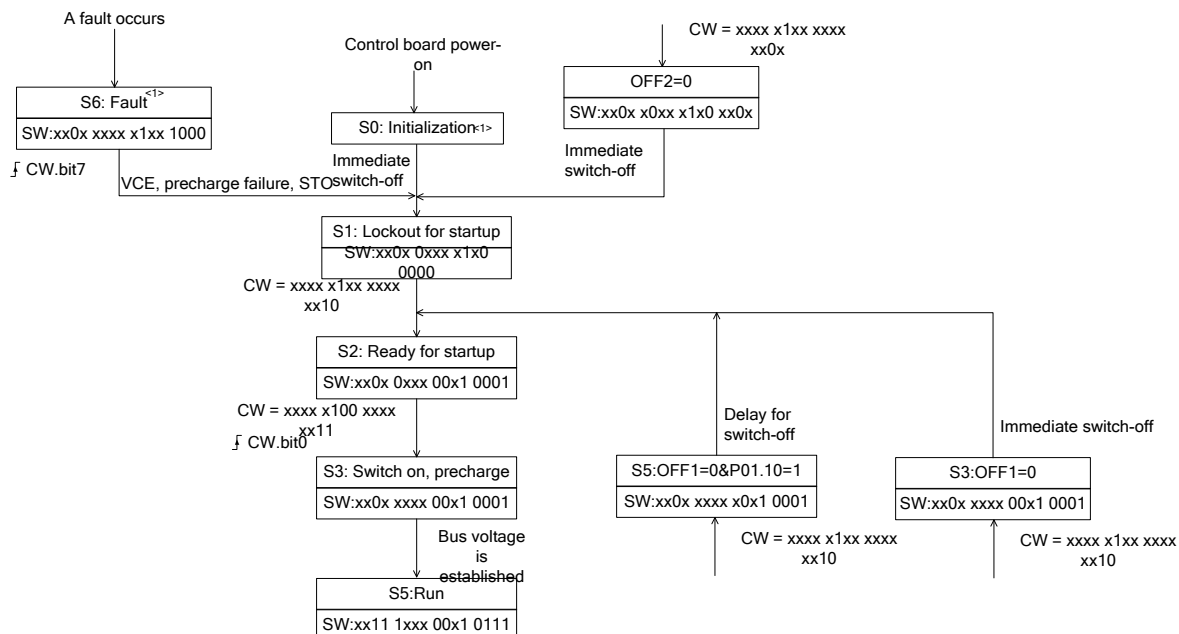
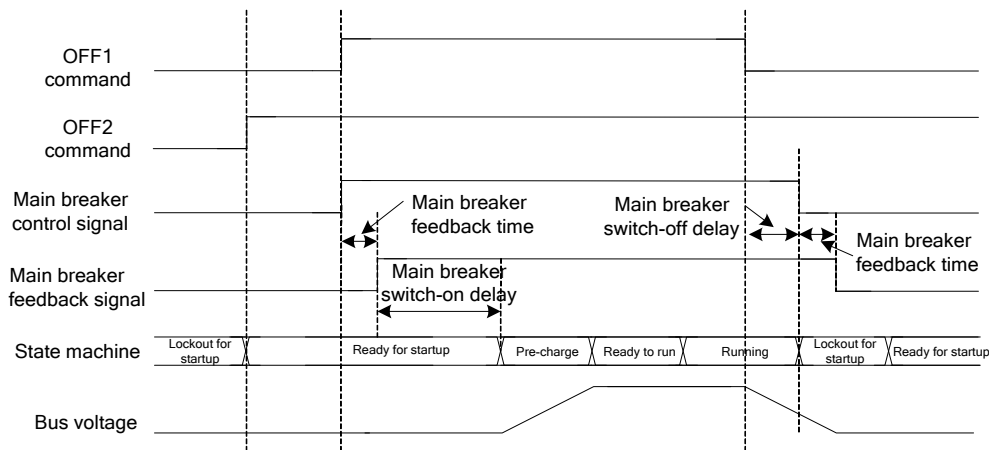


Table 6-1 System state

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	Switch on, precharge	Switch on, precharge, and the bus voltage is established.
S5	Run	After the bus voltage is established, the rectifier device runs.
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.

6.3.2 Startup timing

When OFF2 is invalid (OFF2 is 1) and OFF1 is invalid (OFF1 is 0), the system state machine is changed from lockout for startup to ready to start. If the basic rectifier unit receives the OFF1 switch-on starting command, it is necessary to control switch-on of the main breaker first. When the controller receives the main breaker feedback signal and the delay time (main breaker on delay) is passed, the rectifier unit starts power-on pre-charge, and the system state machine enters into the pre-charge process. After the pre-charge is complete, the bus voltage is established, the system state machine enters the run-ready state and running state in sequence. After receiving the OFF1 (or OFF2) switch-on stopping command, SCR of the basic rectifier unit stops triggering conduction, and bus voltage drops. After the main breaker switch-off delay is passed, the system state machine enters the lockout for startup state.



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
P01.01	Main breaker switch-on delay	5.00-10.00s	5.00-10.00	5.00s

Function code	Name	Description	Setting range	Default
P01.02	OFF1 switch-off delay	1.00–10.00s	1.00–10.00	1.00s
P01.03	Power-on precharge time (SCR)	5.00–20.00s	5.00–20.00	5.00s
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
P02.49	Main breaker feedback timeout setting	1.0–10.0s	1.0–10.0	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 run-ready state 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 system enters the pre-charge state. When detecting the DC bus voltage is normal, the system enters the run-ready state and running state in sequence.

If OFF1=0, an opening command is sent, and the system 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 adapter	X	X	✓	✓	✓
	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 Fault reset command

When the device stops due to a fault, the fault should be reset before restarting the device. Due to different start and stop CW sources. 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 can be selected.

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 (addresses 0x4200, 0x4201)	0–8	0

Function code	Name	Description	Setting range	Default
		7: Modbus (addresses 0x4200, 0x4201) 8: Customized		
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 (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, selecting channel 2 as the control channel and setting P02.19=3 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.

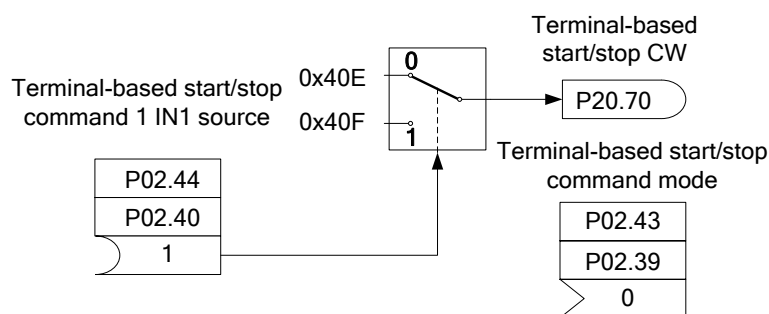
Step 4 P02.40=3, P02.41=0, selecting DI1 as the start/stop command input IN1 source, IN2 invalid.

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 unit running signal.

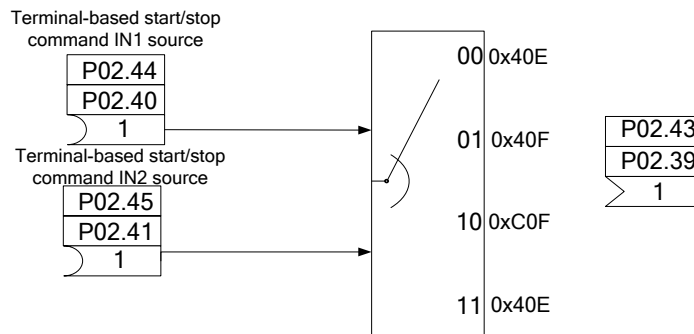
There are four terminal-based start/stop command mode.

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



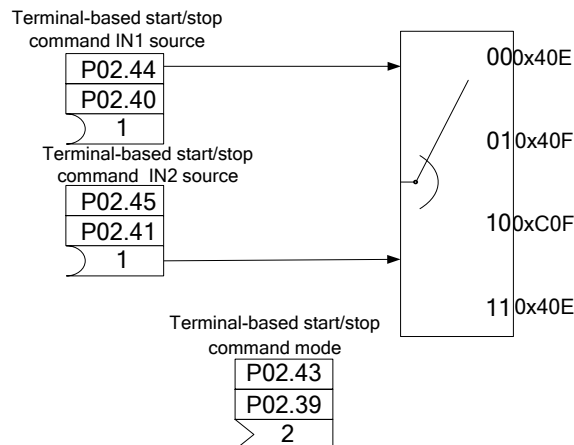
Only check IN1 (P02.40) input (0: Stop; 1: Run): when IN1 is 0, OFF1 is 0; when IN1 is 1, OFF1 is 1.

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



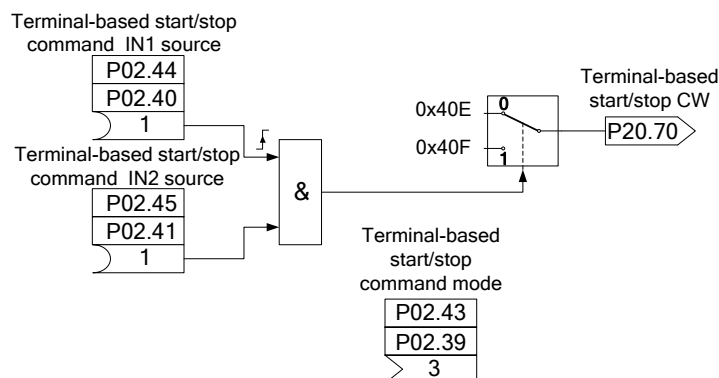
Check the inputs of IN1 (P02.40) and IN2 (P02.41): when IN1 is 1 and IN2 generates a rising edge change, OFF1 is 1; when IN1 is 0, OFF1 is 0.

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

- 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 stop switched off 0->1: Switch on to run
01	OFF2 command 0: OFF2 emergency stop switched off 1: Normal state
02	Reserved
03	Reserved
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	External
14	0: Invalid 1: Trigger external fault 1
15	0: Invalid 1: Trigger external fault 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	Meaning		R/W attribute
16896	Control command word 1 Note: It is different from the control word.	0001H: Switch on to run 0002H: Stopped (OFF1) 0003H: Emergency stop switched off 0004H: Fault reset		W
16897	CW 2	CW 2 bit0	1=Trigger external alarm 1	W
		CW 2 bit1	1=Trigger external alarm 2	
		CW 2 bit2	Reserved	
		CW 2 bit3	Reserved	
		CW 2 bit4	Reserved	
		CW 2 bit5	Reserved	
		CW 2 bit6	Reserved	
		CW 2 bit7	Reserved	
		CW 2 bit8	1=Trigger channel 2 0=Trigger channel 1 PLC needs to change the control channel through P00.00.	
		CW 2 bit9	Reserved	
		CW 2 bit10	Reserved	
		CW 2 bit11	Reserved	
		CW 2 bit12	Reserved	
		CW 2 bit13	Reserved	
CW 2 bit14	Reserved			

Address (4200H start)	Name	Meaning			R/W attribute
			CW 2 bit15	Reserved	
16898	Reserved				
16899	Reserved				
16900	Command to read fault records	Read the fault records stored in the fault black box.			W

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.

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 stop switched off	0->1: Switch on to run
01	OFF2 command	OFF2 emergency stop switched off	1: Normal state
02	Reserved		
03	Reserved		
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	

6.6 Phase-lock loop

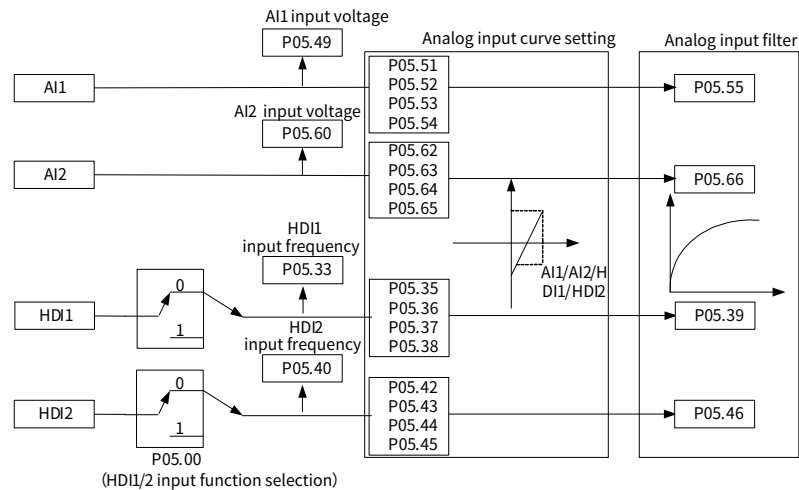
P03.16=1, using a software phase-lock loop based on a generalized second-order integrator (SOGI) by default. The default value is sufficient for most applications. This applies to situations where the grid frequency is relatively stable, and there may be imbalances or harmonics in the voltage of the 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 basic 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
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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	P05.35~50.000kHz	P05.30~50.000	50.000kHz

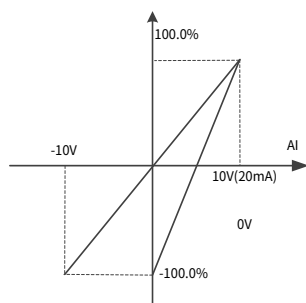
Function code	Name	Description	Setting range	Default
	frequency			
P05.38	Corresponding setting of HDI1 upper limit frequency	P05.36–100.0%	-100.0–100.0%	100.0%
P05.39	HDI1 high-speed pulse input filter time	0.000–10.000s	0.000–10.000	0.030s
P05.42	HDI2 high-speed pulse lower limit frequency	0.000kHz–P05.44	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 setting of HDI2 upper limit frequency	P05.43–100.0%	-100.0–100.0%	100.0%
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:

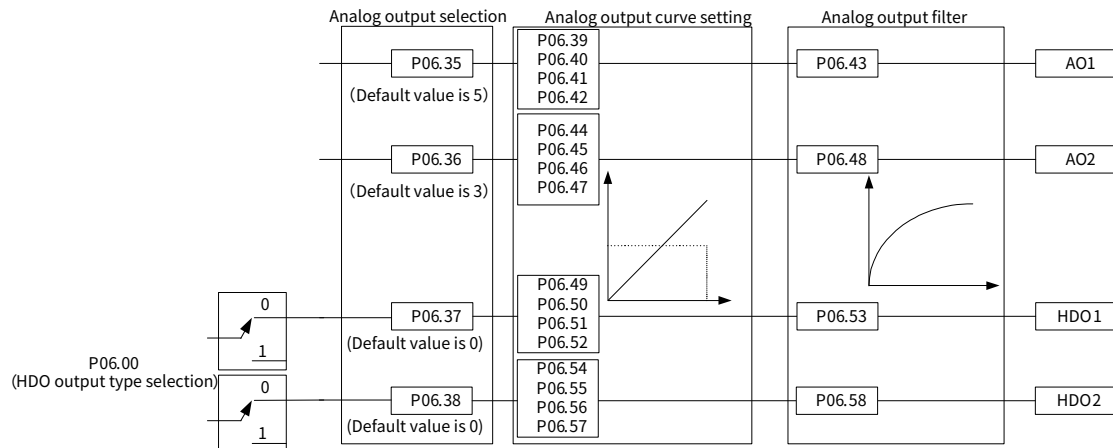


Input filter time: to adjust the sensitivity of analog input. Increasing the value properly can enhance analog input anti-interference but may reduce the sensitivity of analog input.

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

Related parameter list:

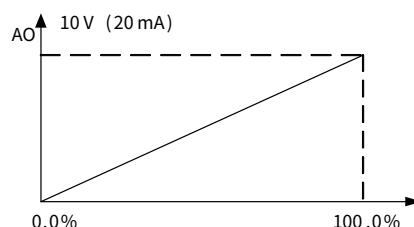
Function code	Name	Description	Setting range	Default
P06.39	AO1 curve min. output rate	-600.0%–P06.41	-600.0–600.0%	0.0%
P06.40	AO1 curve min. output value	0.000V–P06.42	0.000–10.000	0.000V
P06.41	AO1 curve max output rate	P06.39–600.0%	-600.0–600.0%	100.0%
P06.42	AO1 curve max output value	P06.40–10.000V	0.000–10.000	10.000V

Function code	Name	Description	Setting range	Default
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%
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: Invalid 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	0–8	0
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 current 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	0–2 0: 0–10V 1: 0–20mA	0–1	0

Function code	Name	Description	Setting range	Default
P06.35	AO1 signal source	0: Invalid 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 (010V), 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 AD input value).

Step 4 Set P06.25 (AO1 type) to 0 (010V), 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 (020mA), 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 P98.03 (AI1 reference voltage 1 AD value) to the read value of P98.01 (AI1 voltage AD input value).

Step 4 Set P06.25 (AO1 type) to 0 (010V), 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.

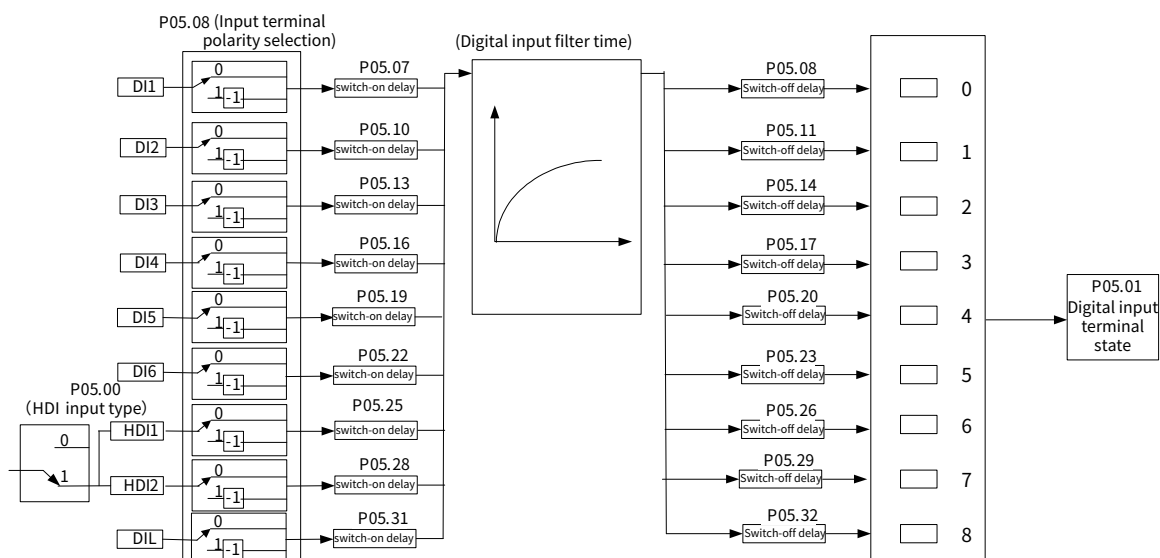
Related function parameters:

Function code	Name	Description	Setting range	Default
P05.47	Enabling AI1	0–10 0: Disable (AI1 and AI2 inputs forced to 0) 1: Enable 2: Other-B connector	0–10	0
P05.58	Enabling AI2	3: DI1 4: DI2 5: DI3 6: DI4 7: DI5 8: DI6 9: HDI1 10: HDI2		
P05.48	AI1 type	0: Reserved 1: 0–20mA	0–3	0
P05.59	AI2 Type	2: Reserved 3: -10V–10V		
P06.25	AO1 type	0: 0–10V 1: 0–20mA	0–2	0
P06.26	AO2 type	2: 4–20mA		
P06.35	AO1 signal source	0: Invalid	0–10	0
P06.36	AO2 signal source	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		
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

Function code	Name	Description	Setting range	Default
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	AO1 current at 0mA output	-2.000–25.000mA	-2.000–25.000	0.000mA
P98.24	AO1 current at 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

6.7.4 Digital input

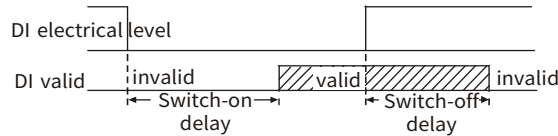
The basic rectifier control unit carries six programmable digital input terminals, two HDI input terminals, and one DIL terminal. The function of all the digital input terminals can be programmed through function codes. The HDI input terminals can be selected as either high speed pulse input terminals 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
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

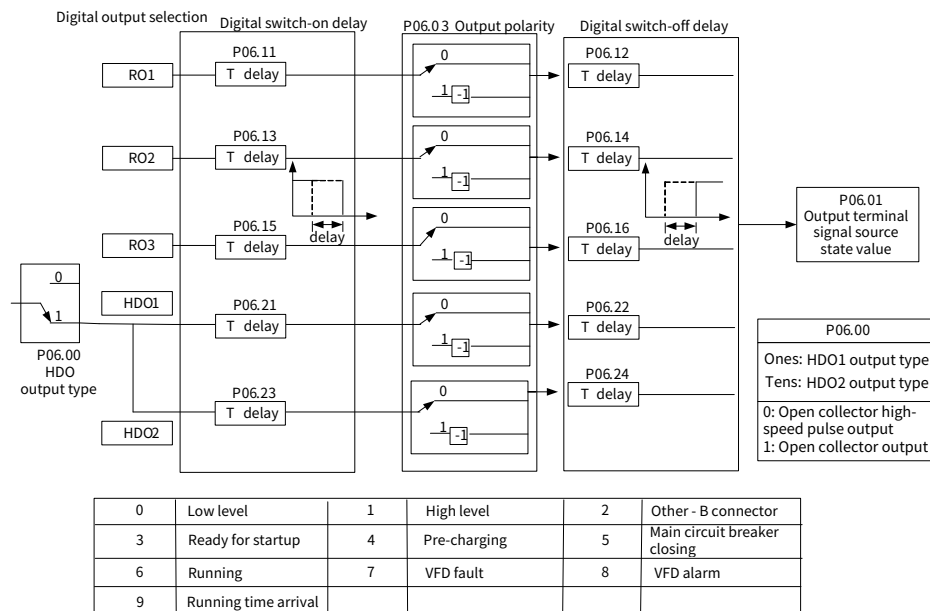
Function code	Name	Description	Setting range	Default
P05.31	DIL switch-on delay (digital)	0.00–360.00s	0.00–360.00	0.00s
P05.32	DIL switch-off delay (digital)	0.00–360.00s	0.00–360.00	0.00s

These function codes 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 basic 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.



• 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: Ready to start up 4: Reserved 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 parameter setting

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

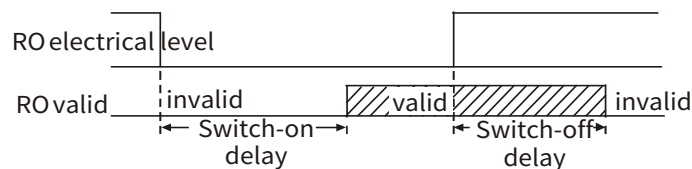
The function code is used to set the output terminal polarity.

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	RO2	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
P01.19	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.

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 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 of the LED keypad state display are as follows:

Function code	Name	Description	Setting range	Default
P24.08	Selection of parameters displayed in	0x0000–0xFFFF Bit0: Reserved Bit1: Bus voltage (V on)	0x0000–0xFFFF	0x000E

Function code	Name	Description	Setting range	Default
	stopped state	Bit2: Input voltage Bit3: Input terminal status Bit4: Output terminal state 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		
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) Bit 4: Input current (A on) Bit5: Reserved Bit6: Input power (% on) Bit7: Reserved Bit8: Reserved Bit9: Reserved Bit10: Input terminal status Bit11: Output terminal status 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–Bit15: Reserved	0x0000–0xFFFF	0x0000

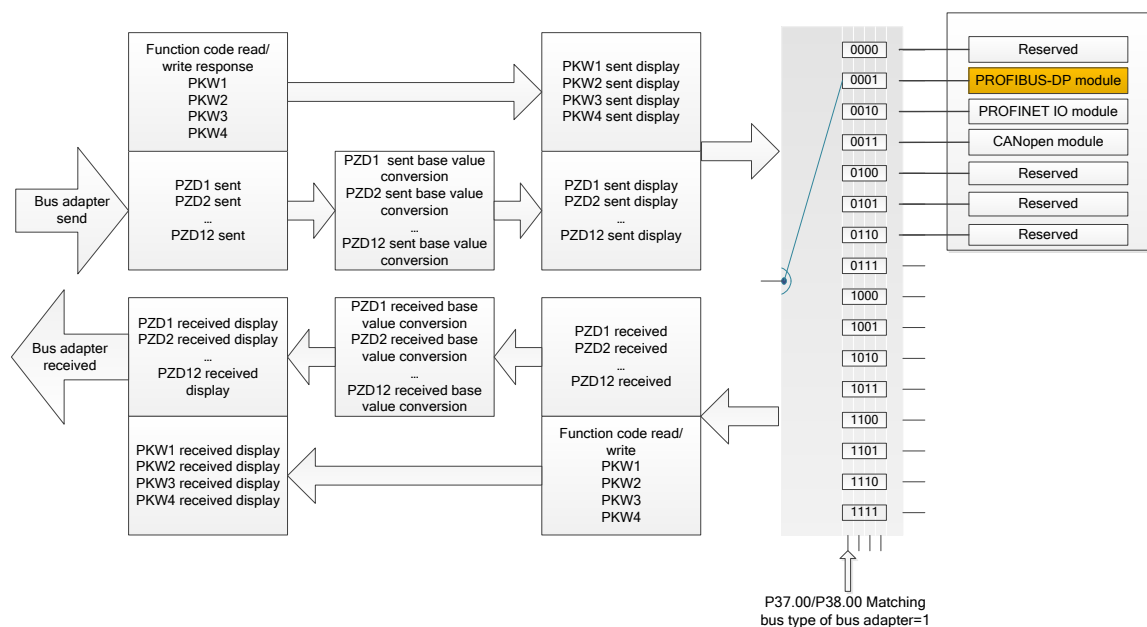
In running state, the parameter display is restricted by P24.09 and P24.10. For a 16-bit binary number, if a bit is 1, the parameter corresponding to this bit can be viewed through the **>>/SHIFT** key during running. If this bit is 0, the parameter corresponding to this bit is not displayed. When setting 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 and bus 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	0-6	1
P38.00		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/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.		2

The bus adapter data flow is shown as follows.

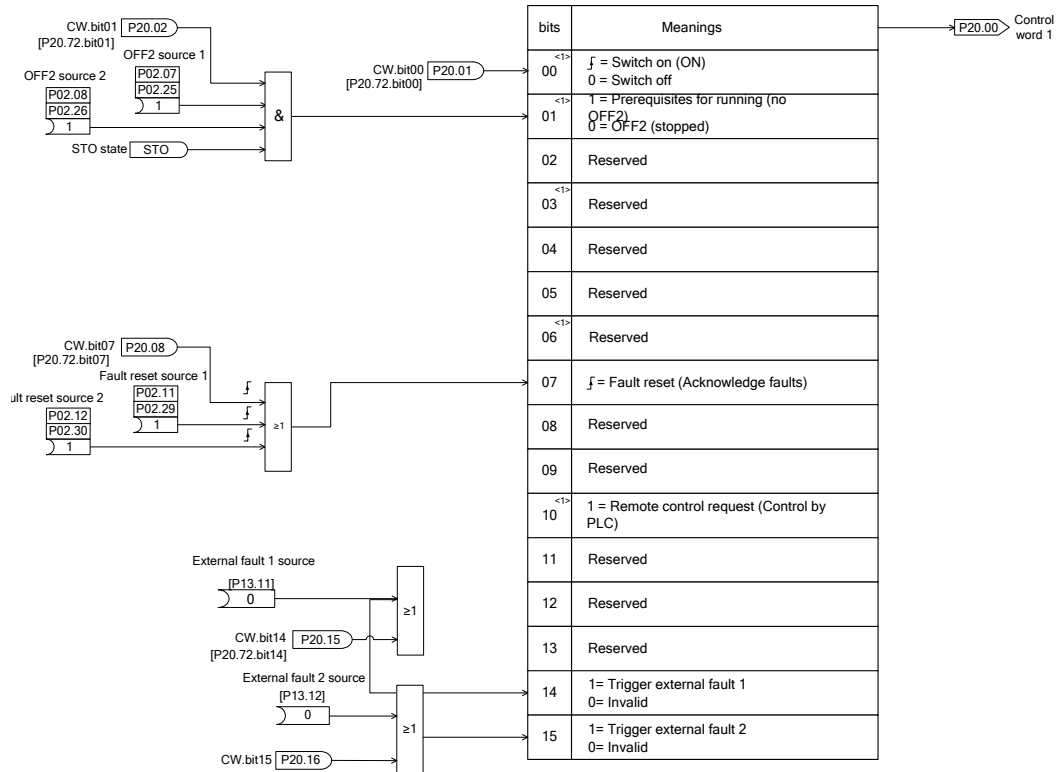


Bus adapter CW source:

Function code	Name	Description	Setting range	Default
P37.94	Bus adapter A CW 1 source	0: 0 1: Keypad (0-65535)	0-2	2

Function code	Name	Description	Setting range	Default
		2: Other-C connector (2: P37.82)		
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	0.00s: 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	0.00s: No detection 0.00–60.00s	0.00–60.00	0.00s

Function code	Name	Description	Setting range	Default
	for bus adapter B			
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 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. 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 $\text{Sent PZD} = \text{Link (Sent PZD source)} * \text{Sent PZD conversion base value numerator} / \text{Sent PZD conversion base value denominator}.$	0–65535	1
P37.15, P37.17, P37.19, P37.21, P37.23,	Conversion base value denominator of sent PZD1 – Conversion base	1–65535	1–65535	1

Function code	Name	Description	Setting range	Default
P37.25, P37.27, P37.29, P37.31, P37.33, P37.35, P37.37	value 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 +	0x0000– 0xFFFF	0x0000
P37.83	Received PZD2	Data with polarity processed	0x0000–	0x0000

Function code	Name	Description	Setting range	Default
	data display (PZD2)		0xFFFF	
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	0.00s: 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, keeping the running at the target frequency	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 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	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,	Conversion base value numerator of 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

Function code	Name	Description	Setting range	Default
P38.24, P38.26, P38.28, P38.30, P38.32, P38.34, P38.36	of sent PZD12			
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

Function code	Name	Description	Setting range	Default
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 display	0x0000–0xFFFF PKW physically received data	0x0000–0xFFFF	0x0000
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–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 A received PZD2 polarity	0x0000–0xFFFF	0x0000–0xFFFF	0x0000
P38.98	Communication disconnection detection delay	0.00s: 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 Basic Rectifier Hardware Manual*.

The rectifier device 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.

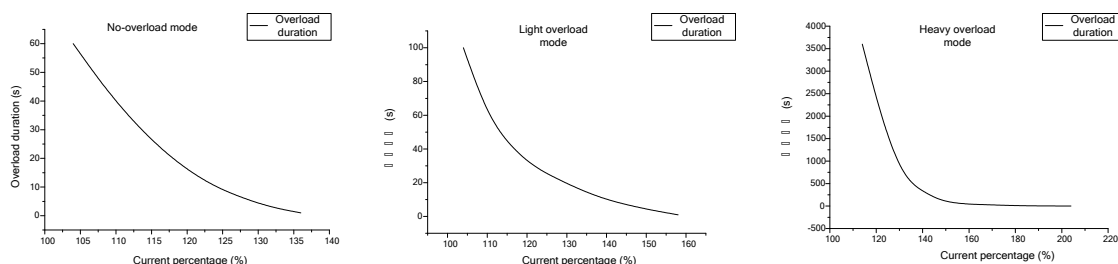
Function code	Name	Description	Setting range	Default
P03.19	Overload mode enabling	0: Disable 1: Enable	0–1	0
P03.20	Overload mode selection	0: No overload 1: Light overload 2: Heavy overload	0–2	0

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	0–6553.5 Depends on unit rated power and number of units	Model depended	0.0
P07.11	Entire machine rated current	0.0–6553.5A	Model depended	0.0

The no-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.

The overload mode current percentage and overload duration are shown in the following figure.



6.11 Fan control

The rectifier unit fan has three running modes: normal running mode, continuous running mode after power-on, and speed regulation mode.

Function code	Name	Description	Setting range	Default
P01.07	Cooling fan running mode	0: Normal running 1: The fan keeps running after power-on 2: Speed regulation mode	0–2	0

1: Normal running

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.

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

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.

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 in this chapter.



- 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 [1 Safety precautions](#).

7.1 Indications of alarms and faults

The fault is indicated by indicators. For details, see [4 Basic operation guidelines](#). When the **TRIP** indicator is on, the alarm or fault code displayed on the keypad indicates the rectifier device 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 device can be reset by pressing the keypad key **STOP/RST**, digital inputs, or by cutting off the power indicator signals. After faults are removed, the rectifier device can be started again.

7.3 Fault history

The function codes P08.00–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	For details, 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	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

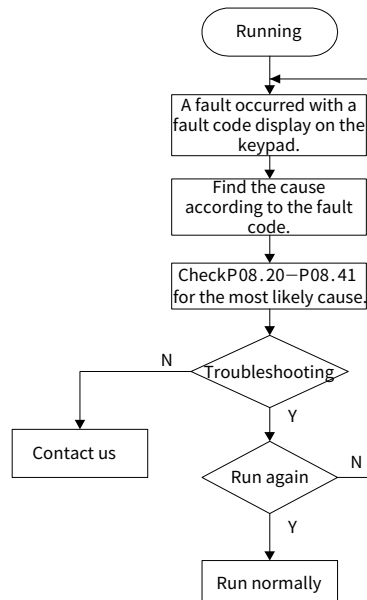
Function code	Name	Description	Setting range	Default
P08.11	RT fault code 6	already in the fault state, the other faults will not be logged by the current fault code and the real time fault code will still be logged.	0.00–99.99	0.00
P08.12	Present alarm code 1	DSP-CPU2 alarm codes: A50.nn–A99.nn DSP-CPU1 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	Reserved	-	-	-
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 state	0x0000–0xFFFF	0x0000–0xFFFF	0x0000
P08.25	Output terminal state at present fault state	0x0000–0xFFFF	0x0000–0xFFFF	0x0000
P08.26	Reserved	-	-	-
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 state at last fault	0x0000–0xFFFF	0x0000–0xFFFF	0x0000

Function code	Name	Description	Setting range	Default
P08.33	Output terminal status at last fault	0x0000–0xFFFF	0x0000–0xFFFF	0x0000
P08.34	Reserved	-	-	-
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 state 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 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 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	Records the hour and minute when the fault occurred.	Hour Min 00.00–23.59	00.00

Function code	Name	Description	Setting range	Default
	hour.minute			
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

This section describes troubleshooting information to make it easier for you to locate and solve faults.



When a fault occurred, handle the fault as follows:

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

Step 2 If keypad works properly, check the function codes in P08 group to confirm the corresponding fault record parameters, and determine the real state when current fault occurred through parameters.

Step 3 Check the following table for the exception and solution.

Step 4 Rule out the faults or ask for help from professionals.

Step 5 After confirming the fault is removed, perform fault reset, and start running.

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	- The voltage of the grid is too low. - Software bus undervoltage point is set too large.	- Check the grid input power. - Check P13.06.
E1103	CUnb	Unit current imbalance	Unit model inconsistency	Replace the unit.
E1104	E-485	RS485 communication fault	- Incorrect baud rate - Communication line fault. - Incorrect communication address. - Communication suffers from strong interference.	- Set a proper baud rate. - Check the communication port cable. - Set the communication address correctly. - Replace or change the wiring to enhance the anti-interference capacity.
E1105	SoC	Software overcurrent	- The voltage of the grid is too low. - Rectifier device power is too small. - Load transient or exception occurred. - To-ground short circuit or output phase loss occurred. - There is strong external interference.	- 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 if there is strong interference.
E1106	Reserved	-	-	-
E1107	EF1	External fault 1	SI external fault input terminal acts.	Check external device input.
E1108	EF2	External fault 2		
E1109	EA1	External alarm 1		
E1110	EA2	External alarm 2		
E1111	Reserved	-	-	-
E1112	End	Running time reached	The actual running time is longer than the set time.	Ask the supplier to adjust the preset running time.

Fault No.	Fault code	Fault type	Possible cause	Solution
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.
E1115	Reserved	-	-	-
E1116	E-FbA	Communication disconnection handling for bus adapter A	- PROFIBUS communication fault: Communication address is not correct. The matching resistance is not set well. The master GSD file is not set up. - The peripheral interference is too large. - CANopen communication fault: Line contact is poor. The matching resistor is not switched on. Communication baud rates do not match. - The peripheral interference is too large.	- PROFIBUS communication fault: Check the related settings. - Check the surrounding environment, and eliminate interference effects. - CANopen communication fault: Check the lines and remove the build-out resistor. - Set the same baud rate. - Check the surrounding environment, and eliminate interference effects.
E1117–E1121	Reserved	-	-	-
E1122	Cbov	Main breaker feedback timeout	No main circuit breaker signal is received.	Check whether P02.49 is set properly.
E1123	OFF2	OFF2 is invalid in the lockout for startup state	The state of OFF2 is abnormal.	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.

Fault No.	Fault code	Fault type	Possible cause	Solution
E1126	Reserved	-	-	-
E1127	Reserved	-	-	-
E1128	Sd	SD card fault	The SD card is not inserted or has poor contact.	Check the SD card insertion status.
E1129	-	Rectifier device overload	Rectifier device model is selected improperly.	Replace the rectifier device.
E1130	E-FbB	Bus adapter B communication disconnection	- PROFIBUS communication fault: Communication address is not correct. The matching resistance is not set well. The master GSD file is not set up. - The peripheral interference is too large. - CANopen communication fault: Line contact is poor. The matching resistor is not switched on. Communication baud rates do not match. - The peripheral interference is too large.	- PROFIBUS communication fault: Check the related settings. - Check the surrounding environment, and eliminate interference effects. - CANopen communication fault: Check the lines and remove the build-out resistor. - Set the same baud rate. - Check the surrounding environment, and eliminate interference effects.
E5001	SoC	Software overcurrent	- The voltage of the grid is too low. - Rectifier device power is too small.	- 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 if there is strong interference.
E5002	HoC	Hardware overcurrent	- Load transient or exception occurred. - To-ground short circuit or output phase loss occurred. - There is strong external interference.	
E5003	Gov	Grid overvoltage	- Exception occurred to input grid voltage. - Overvoltage point for grid voltage is abnormal.	- Check the input power. - Check P13.00.
E5004	GLv	Grid undervoltage	- Exception occurred to input grid voltage. - Undervoltage point for	- Check the input power. - Check P13.01.

Fault No.	Fault code	Fault type	Possible cause	Solution
			grid voltage is abnormal.	
E5005	oL	Rectifier device overload	- Grid voltage is too low. - Rated current is set incorrectly. - Sudden change of load is too large.	- Check the grid voltage. - Reset the rated current of the rectifier device. - Check the load.
E5006	SPR	Grid phase-R loss	Unreliable grid connection	Check the motor wiring.
E5007	SPS	Grid phase-S loss		
E5008	SPT	Grid phase-T loss		
E5009	PLLE	Phase-locked failed	- Unreliable grid wiring. - Exception occurred to input grid frequency.	- Check the motor wiring. - Check the input grid frequency.
E5010	Reserved	-	-	-
E5011	Reserved	-	-	-
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	- The voltage of the grid is 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
E0100–E1000	Reserved	-	-	-

Fault No.	Fault code	Fault type	Possible cause	Solution
E0101–E1001	Reserved	-	-	-
E0102–E1002	Reserved	-	-	-
E0103–E1003	Reserved	-	-	-
E0104–E1004	m. HoC	Unit-m hardware overcurrent fault	- The IGBT inside the unit is damaged. - A short circuit occurs on the output side of the unit.	- Ask for technical support. - Check the external circuit and eliminate the short-circuit fault.
E0105–E1005	Reserved	-	-	-
E0106–E1006	m.ltE	Unit-m zero drift fault	- The current detection component of the unit is damaged. - Interference	- 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.	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 is blocked or fan is damaged. - Ambient temperature is too high. - Control board cable or add-on loosened.	- See solutions for overcurrent. - Re-wiring. - Ventilate the air duct or replace the fan. - Lower the ambient temperature. - Ask for technical support.
E0114–E1014	Reserved	-	-	-

Fault No.	Fault code	Fault type	Possible cause	Solution
E0115–E1015	Reserved	-	-	-
E0116–E1016	m.ov	Unit bus overvoltage fault	Grid voltage too high.	Check the input power.
E0117–E1017	m.Lv	Unit bus undervoltage fault	Grid voltage too low.	Check the input power.
E0118–E1018	m.U.oH	Unit-m overtemperature	- Instantaneous overcurrent occurred to the rectifier. - Air duct is blocked or fan is damaged. - Ambient temperature is too high. - Control board cable or add-on loosened.	- See solutions for overcurrent. - Re-wiring. - Ventilate the air duct or replace the fan. - Lower the ambient temperature. - 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 broadcast 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".

On the VFD terminal block, the 485+ terminal 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 120 Ω 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)

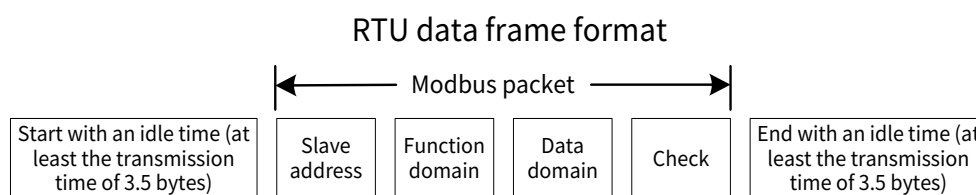
Start bit	Bit1	Bit2	Bit3	Bit4	Bit5	Bit6	Bit7	Bit8	Check bit	Stop bit
-----------	------	------	------	------	------	------	------	------	-----------	----------

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 stop bit are used to facilitate the transmission of the data bits to the destination device. In practical applications, you must set the data bits, parity check bits, and stop bits consistently.

In RTU mode, 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 sent 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 length of 3.5 bytes) is used to indicate that the frame transmission ends. Then, the transmission of a new frame starts.



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

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

START (frame header)	T1-T2-T3-T4 (time gap with a min. length of 3.5 bytes)
ADDR (slave address domain)	Communication address: 0–247 (decimal system) (0 is the broadcast address)

CMD (function domain)	03H: read slave parameters 06H: write slave parameters
Data domain DATA (N-1) ... DATA (0)	Data of 2*N bytes, main content of the communication as well as the core of data exchanging.
CRC CHK LSB	Detection value: CRC (16 bits)
CRC CHK MSB	
END (frame tail)	T1-T2-T3-T4 (time gap with a min. length of 3.5 bytes)

(2) RTU communication frame error check modes

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 (transmission time of 3.5 bytes)

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

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

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

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

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

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

RTU slave response (from the VFD to the master)

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

The 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 VFD response to the 03H command from the master for reading data. The CMD information occupies one byte.

"Number of bytes" indicates the number of bytes between a byte (not included) and the CRC byte (not included). The value "04" indicates that there are four bytes of data between "Number of bytes" and "CRC 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)

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

RTU slave response (from the VFD to the master)

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

Note: The sections [8.1.3.1](#) 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 high-order byte on the left and low-order byte on the right. The MSB ranges from 00 to ffH, and the LSB also ranges from 00 to ffH. The MSB is the hexadecimal form of the group number before the dot mark, and LSB is that of the number behind the dot mark. Take P05.06 as an example: The group number is 05, that is, the MSB of the parameter address is the hexadecimal form of 05; and the number behind the dot mark is 06, that is, the LSB is the hexadecimal form of 06. Therefore, the function code address is 0506H in the hexadecimal form. For P13.01, the parameter address is 0D01H.

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:** P99 group is the factory parameters which cannot be read or changed. Some parameters cannot be changed when the VFD is in the running state and some parameters cannot be changed in any state. The setting range, unit and related descriptions should be paid attention to when modifying the function codes.

- **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 characteristics
4000H	VFD state 1	0001H: Running	R
		0002H: Reserved	R
		0003H: Reserved	R

Address definition	Function	Data description	R/W characteristics
		0004H: Faulty	R
		0005H: VFD in POFF state	R
		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 state 2	-	R
4002H	VFD state 3	-	R
4003H	VFD state 4	-	R
4004H	Device code	880	R
4005H	Remote-local state	0: Local state	R
		1: Remote-local state	R
4006H	Variable-frequency ready state	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

Address definition	Function	Data description	R/W characteristics
4021H	A5 unit bus	0~1400V	R
4022H	A6 unit bus	0~1400V	R
4023H	A7 unit bus	0~1400V	R
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	Group P08: Fault record parameters	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 status at present fault		R

Address definition	Function	Data description		R/W characteristics
4043H	Output terminal status at present fault			R
4044H	Running voltage at last fault			R
4045H	Reserved			-
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
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			-
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: Switch on to run		W
		0002H: Stop switched off		
		0003H: Emergency stop switched off		
		0004H: Fault reset		
4201H	Control word 1	CW 1 bit0	0: OFF1 stop switched off 0->1: Switch on to run (It is effective at the rising edge.)	W
		CW 1 bit1	0: OFF2 emergency stop switched off 1: In normal state	W
		CW 1 bit2 (Reserved)	-	W

Address definition	Function	Data description		R/W characteristics
		CW 1 bit3 (Reserved)	-	W
		CW 1 bit4 (Reserved)	-	W
		CW 1 bit5 (Reserved)	-	W
		CW 1 bit6 (Reserved)	-	W
		CW 1 bit7	0: Invalid 0->1: Fault reset	W
		CW 1 bit8 (Reserved)	-	W
		CW 1 bit9 (Reserved)	-	W
		CW 1 bit10	0: Remote control is invalid 1: Remote control is valid	W
		CW 1 bit11 (Reserved)	-	W
		CW 1 bit12 (Reserved)	-	W
		CW 1 bit13 (Reserved)	-	W
		CW 1 bit14	0: Invalid 1: Trigger external fault 1	W
		CW 1 bit15	0: Invalid 1: Trigger external fault 2	W
4202H	Control word 2	CW 2 bit0	0: Invalid 1: Trigger external alarm 1	W
		CW 2 bit1	0: Invalid 1: Trigger external alarm 2	
		CW 2 bit2	Reserved	W
		CW 2 bit3	Reserved	
		CW 2 bit4	Reserved	W
		CW 2 bit5	Reserved	
		CW 2 bit6	Reserved	
		CW 2 bit7	Reserved	
		CW 2 bit8	0: Trigger channel 1 1: Trigger channel 2 PLC needs to change the control channel through P00.00.	W

Address definition	Function	Data description		R/W characteristics
		CW 2 bit9	Reserved	W
		CW 2 bit10	Reserved	
		CW 2 bit11	Reserved	
		CW 2 bit12	Reserved	
		CW 2 bit13	Reserved	
		CW 2 bit14	Reserved	W
		CW 2 bit15	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 sampling frequency of the oscilloscope.		W
		0: 2k, 0.5ms once		
		1: 1k, 1ms once		
		2: 0.5k, 2ms once		
		3: 0.25k, 4ms once		
		4: 0.125k, 8ms once		
		Once the ARM reaches 64 points, all channels are uploaded uniformly.		

The Read/Write (R/W) characteristics indicate whether a function code 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 (for example, 1) decimal places in the value, the fieldbus scale m (then $m=10$) is the result of 10 to the power of n.

Function code	Name	Description	Setting range	Default
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

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 upper computer is 50, "Delay of auto fault reset" of the rectifier is 5.0 ($5.0=50/10$).

To set "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 Write Parameter Parameter CRC
address command address data

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

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

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

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 upper computer is not allowed to be executed. The possible causes are as follows: The function code is applicable only on new devices and is not implemented on this device. The slave is in the faulty state when processing this request.
02H	Invalid data address	For the VFD, the data address in the request of the 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

Code	Name	Definition
		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	Password error	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 upper computer 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 upper computer is a read-only parameter.
08H	Parameter cannot be modified in running	The parameter to be modified in the write operation of the upper computer cannot be modified during the running of the VFD.
09H	Password protection	If the upper computer 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 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 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:

<u>01</u>	<u>06</u>	<u>02 01</u>	<u>00 08</u>	<u>D8 74</u>
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:

<u>01</u>	<u>86</u>	<u>03</u>	<u>99 CD</u>
VFD address	Exception response code	Error code	CRC

The exception response code 86H (generated based on the MSB "1" of the write command 06H) indicates that it is an exception response to the write command (06H). The error code is 03H that indicates the error "Invalid data value", which means "The received data domain contains a value that is not allowed".

8.1.3.7 Read/Write operation examples

For the formats of the read and write commands, see sections 8.1.3.1 and 8.1.3.2.

(1) Example of reading command 03H

Example 1: Read state word 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:

<u>01</u>	<u>03</u>	<u>A3 54</u>	<u>00 01</u>	<u>E7 9E</u>
VFD address	Read command	Parameter address	Parameter data	CRC

Assume that the following response is returned:

<u>01</u>	<u>03</u>	<u>02</u>	<u>00 04</u>	<u>B9 87</u>
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:

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

Assume that the following response is returned:

<u>03</u>	<u>03</u>	<u>0C</u>	<u>00 70</u>	<u>00 00</u>	<u>00 00</u>	<u>00 00</u>	<u>00 00</u>	<u>00 00</u>	<u>00 00</u>	<u>BB B0</u>
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

From the returned data, we can see that all the fault types are 0070H, that is, 112 in the decimal form, which means unit 1 upstream communication fault (E0112).

(2) Example of writing command 06H

Example 1: Set the VFD whose address is 03H to be running. According to the other function parameter table, the address of "Communication-based control command" is 4200H, and 0001H indicates running.

Function	Address	Data description	R/W characteristics
Communication-based control command	4200H	0001H: Switch on to run	W
		0002H: Stop	
		0003H: Emergency stop switched off	
		0004H: Fault reset	

The command sent from the master is as follows:

<u>03</u>	<u>06</u>	<u>A8 60</u>	<u>00 01</u>	<u>69 96</u>
VFD address	Write command	Parameter address	Forward running	CRC

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

<u>03</u>	<u>06</u>	<u>A8 60</u>	<u>00 01</u>	<u>69 96</u>
VFD address	Write command	Parameter address	Forward running	CRC

Example 2: Set the main breaker switch-on delay to 10.00s for the VFD with the address of 03H.

Function code	Name	Description	Setting range	Default	Modify
P01.01	Main breaker switch-on delay	5.00–10.00s	5.00–10.00	5.00s	⊙

See the figures behind the radix point, the fieldbus ratio value of main breaker switch-on delay (P01.01) is 100. Multiply 10.00 by 100. The value 1000 is obtained, and it is 2710H in the hexadecimal form.

The command sent from the master is as follows:

<u>03</u>	<u>06</u>	<u>01 01</u>	<u>27 10</u>	<u>C2 28</u>
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:

<u>03</u>	<u>06</u>	<u>01 01</u>	<u>27 10</u>	<u>C2 28</u>
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 upper computer commissioning software is the serial port commissioning assistant Commix, which can be downloaded from the Internet. Download a version that can automatically execute the CRC check function. The following figure shows the interface of Commix.



First, set the serial port to **COM1**. Then, set the baud rate consistently with 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 is as follows:

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

 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:

1. The serial port is set incorrectly. For example, the adapter uses the serial port COM1, but COM2 is selected for the communication.
2. The settings of the baud rates, data bits, end bits, and check bits are inconsistent with those set on the VFD.
3. 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
P42.00	Module online status	Reserved	0–3	0
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	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

Function code	Name	Description	Setting range	Default
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	0–1	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**

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

Each PROFIBUS subsidiary station on the PROFIBUS bus need to have "device description document" named GSD file which used to describe the characteristics of PROFIBUS-DP devices. 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	Name	Optional setting	Default	Remarks
0	Module type	Read only	PROFIBUS-DP	This parameter shows communication module type detected by the VFD. You cannot modify the value of this parameter. If this parameter is not defined,

Parameter number	Name	Optional setting	Default	Remarks
				communication between the communication card and VFD cannot be established.
1	Node address	0-99	2	In PROFIBUS, each device corresponds to a unique node address. If the selection switch of the node address is used to define the node address, the parameter cannot be modified and can be only used to display the node address.
2	Baud rate setting	0: 9.6kbps 1: 19.2kbps 2: 45.45kbps 3: 93.75kbps 4: 187.5kbps 5: 500kbps 6: 1.5Mbps 7: 3Mbps 8: 6Mbps 9: 9Mbps 10: 12Mbps	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 PROFIBUS network, each device corresponds to a unique node address, you can use the node address selection switch to define node address (switch isn't at 0) and the parameter is only used to display the node address. If node address selection switch is 0, this parameter can define node address.

In PROFIBUS, each device corresponds to a unique node address. If the selection switch of the node address is used to define the node address, the parameter cannot be modified and can be only used to display the node address.

- **GSD file**

Each PROFIBUS subsidiary station on the PROFIBUS bus need to have "device description document" named GSD file which used to describe the characteristics of PROFIBUS-DP devices. The GSD file contains all defined parameters of the device, such as the supported baud rate, information length, and input and output data count, and diagnosis data meaning.

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

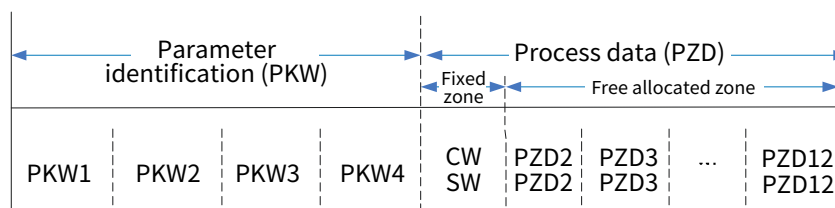
PROFIBUS-DP is a distributed input/output (I/O) system. It enables a master to use a large number of peripheral modules and on-site devices. Data transmission is periodic: The master reads information input by a slave and transmits a feedback signal to the slave. EC-TX803 communication card supports PROFIBUS-DP protocol.

● Service access point

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

● PROFIBUS -DP information frame data structure

PROFIBUS-DP bus mode allows rapid data exchange between master station and VFD. For VFD devices, data is always read and written in the master/slave mode. The VFD devices always function as slave stations, and one address is clearly defined for each slave station. 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-status 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 status 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 CH-PA01 adapter modules). 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.

Task packet (master station → VFD)

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

VFD CWs

Control word	Bit	Value	State/Description
Control word 1	Bit0	0	OFF1 stop switched off
		0->1	Switch on to run
	Bit1	0	OFF2 emergency stop switched off
		1	In normal state
	Bit2	-	Reserved
	Bit3	-	Reserved
	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
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.)

Control word	Bit	Value	State/Description
		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 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

Function code	Name	Description	Setting range	Default
P37.93	Received PZD12 data display (PZD12)		0x0000–0xFFFF	0x0000

Response message (VFD → master station)

State word (SW): The first word in a PZD response packet is the state word (SW) of rectifier unit by default. The rectifier unit SW definition is as follows.

VFD SWs

State word	Bit	Value	State/Description
State Word 1	Bit0	0	Lockout for startup
		1	Ready to connect (closing is allowed)
	Bit1	-	Reserved
		0	Rectifier device not running
		1	Rectifier device running
	Bit2	0	No fault
		1	Fault
	Bit3	0	OFF2 activated
		1	OFF2 not activated
	Bit4	-	Reserved
		0	Switch on is allowed
		1	Switch on is not allowed
	Bit5	0	Neither an alarm nor a minor fault
		1	Alarm and minor fault activated
	Bit6	-	Reserved
		-	Reserved
	Bit7	0	Local (indicating host controller or keypad)
		1	Remote (Control channels other than the host controller or keypad)
	Bit8	0	Pre-charge incompleted
		1	Charge completed
State Word 2	Bit9	0	Main breaker disconnected
		1	Main breaker connected
	Bit10	0	SCR blocked
		1	SCR triggered
	Bit11	-	Reserved
		-	Reserved
	Bit12	0	Unit fan stop
		1	Unit fan run
	Bit13	-	Reserved
		-	Reserved
	Bit14	0	No external fault 1
		1	External fault 1
	Bit15	0	No external fault 2

State word	Bit	Value	State/Description
		1	External fault 2
	Bit8	-	Reserved
	Bit9	-	Reserved
	Bit10	-	Reserved
	Bit11	-	Reserved
	Bit12	-	Reserved
	Bit13	-	Reserved
	Bit14	-	Reserved
	Bit15	-	Reserved

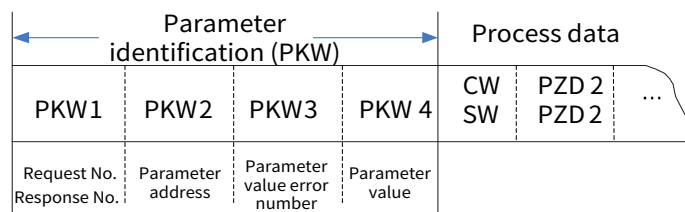
Actual value (ACT): The 12 words in a PZD task packet are the main setting actual value, where PZD1 Other-C connector maps to P20.34 (SW 1) by default.

VFD actual state value

Word	Name	function selection
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
PZD2 source (typically sent SW 2)		2
PZD3 source		0
PZD4 source		0
PZD5 source		0
PZD6 source		0
PZD7 source		0
PZD8 source		0
PZD9 source		0
PZD10 source		0
PZD11 source		0
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)		
Bit 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 node requests the value of a parameter, the values in PKW3 and PKW4 of the packet that the master node transmits to the VFD are no longer valid.

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

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 command 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 (master station -> 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 (VFD -> 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 (master station -> 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 (VFD -> 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)

PZD examples: The transmission of the PZD zone is implemented through VFD function code settings. For details about related function codes, see the INVT VFD operation manual.

Example 1: Reading the process data of VFD

In the example, PZD3 is set to "8: Running rotation speed" by setting P21.14 to 8. This operation is forcible. The setting remains until the parameter is set to another option.

Request (master station -> 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 to a VFD device

In this example, "2: PID reference" is taken from PZD3 by setting P21.03 to 2. The parameter specified in each request frame is updated with the information contained in PZD3 until another parameter is specified.

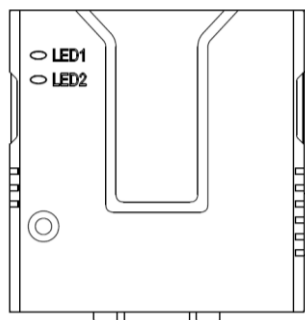
Request (master station -> VFD)

	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

EC-TX803 communication card provides two state indicators, as shown in the following figure.



LED No.	State	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. 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-DP 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	0-6	1

Function code	Name	Description	Setting range	Default
		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
P37.03	PZD2 source			0
P37.04	PZD3 source			0
P37.05	PZD4 source			0
P37.06	PZD5 source			0
P37.07	PZD6 source			0
P37.08	PZD7 source			0
P37.09	PZD8 source			0
P37.10	PZD9 source			0
P37.11	PZD10 source			0
P37.12	PZD11 source			0
P37.13	PZD12 source			0
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)			
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)			
P37.86	Received PZD5 data display (PZD5)			
P37.87	Received PZD6 data display (PZD6)			
P37.88	Received PZD7 data display (PZD7)			
P37.89	Received PZD8 data display (PZD8)			
P37.90	Received PZD9 data display (PZD9)			
P37.91	Received PZD10 data display (PZD10)			

Function code	Name	Description	Setting range	Default
P37.92	Received PZD11 data display (PZD11)			
P37.93	Received PZD12 data display (PZD12)			
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 Storage time	0.00s: 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, keeping the running at the target frequency	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 be set in the VFD before communication.

- 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.

- 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 [9 Parameter list](#).

- 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
See the following table.	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 byte	Destination MAC address 6 byte

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

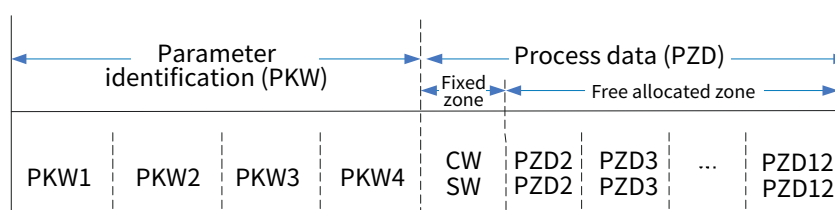
Table 8-2 IRT frame structure

Data header				Ethernet type	VLAN	Ethernet type	Frame identifier	IRT user data	FCS
Preamble 7 byte	Synchronous 1 byte	Source MAC address 6 byte	Destination MAC address 6 byte	2 byte	2 byte	2 byte	2 byte	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-status word(from a slave to the master)

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.

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 1 (CW1) of basic inverter. The CW definition is described as following:

VFD CWs

Control word	Bit	Value	State/Description
Control word 1	Bit0	0	OFF1: Stop switched off
		0->1	Switch on to run
	Bit1	0	Emergency stop switched off (OFF2)
		1	In normal state
	Bit2	-	Reserved
	Bit3	-	Reserved
	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

Control word	Bit	Value	State/Description
	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): The 3rd to 12th words of the PZD task message are reference values. You can connect to the data connector to PZD input to receive related function codes for setting. 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)			
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)			
P38.86	Received PZD5 data display (PZD5)			
P38.87	Received PZD6 data display (PZD6)			
P38.88	Received PZD7 data display (PZD7)			
P38.89	Received PZD8 data display (PZD8)			
P38.90	Received PZD9			

Function code	Name	Description	Setting range	Default
	data display (PZD9)			
P38.91	Received PZD10 data display (PZD10)			
P38.92	Received PZD11 data display (PZD11)			
P38.93	Received PZD12 data display (PZD12)			

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:

VFD SWs

Status word	Bit	Value	State/Description
State word 1	Bit0	0	Lockout for startup
		1	Ready to connect (closing is allowed)
	Bit1	-	Reserved
	Bit2	0	Rectifier device not running
		1	Rectifier device running
	Bit3	0	No fault
		1	Fault
	Bit4	0	OFF2 activated
		1	OFF2 not activated
	Bit5	-	Reserved
	Bit6	0	Switch on is allowed
		1	Switch on is not allowed
	Bit7	0	Neither an alarm nor a minor fault
		1	Alarm and minor fault activated
	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 incompleting
		1	Charge completed
State word 2	Bit12	0	Main breaker disconnected
		1	Main breaker connected
	Bit13	0	SCR blocked
		1	SCR triggered
State word 2	Bit14	-	Reserved
	Bit15	-	Reserved
State word 2	Bit0	-	Reserved
	Bit1	-	Reserved

Status word	Bit	Value	State/Description
	Bit2	-	Reserved
	Bit3	0	Unit fan stop
		1	Unit fan run
	Bit4	-	Reserved
	Bit5	-	Reserved
	Bit6	0	No external fault 1
		1	External fault 1
	Bit7	0	No external fault 2
		1	External fault 2
	Bit8	-	Reserved
	Bit9	-	Reserved
	Bit10	-	Reserved
	Bit11	-	Reserved
	Bit12	-	Reserved
	Bit13	-	Reserved
	Bit14	-	Reserved
	Bit15	-	Reserved

Actual value (ACT): The 12 words in a PZD task packet are the main setting actual value, where PZD1 Other-C connector maps to P20.34 (SW 1) by default.

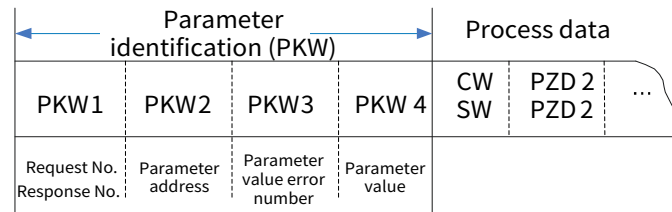
VFD actual state value

Word	Name	function selection
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
PZD2 source (typically sent SW 2)		2
PZD3 source		0
PZD4 source		0
PZD5 source		0
PZD6 source		0
PZD7 source		0
PZD8 source		0
PZD9 source		0
PZD10 source		0
PZD11 source		0
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)		
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 node requests the value of a parameter, the values in PKW3 and PKW4 of the packet that the master node transmits to the VFD are no longer valid.

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

Table 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 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

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)

Response (from a slave to the master)	
Response No.	Function
3	The task cannot be executed and one of the following error number is returned: 0: Invalid command 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 4-6: 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
P38.01	Reserved	-	-	-
P38.02	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
P38.03	PZD2 source		0-6	0
P38.04	PZD3 source		0-6	0
P38.05	PZD4 source		0-6	0
P38.06	PZD5 source		0-6	0
P38.07	PZD6 source		0-6	0
P38.08	PZD7 source		0-6	0

Function code	Name	Description	Setting range	Default
P38.09	PZD8 source		0–6	0
P38.10	PZD9 source		0–6	0
P38.11	PZD10 source		0–6	0
P38.12	PZD11 source		0–6	0
P38.13	PZD12 source		0–6	0
P38.82	Received PZD1 data display (PZD1)	0x0000–0xFFFF Input PZD data display = PZD physically input data with base value processed + Data with polarity processed	0x0000–0xFFFF	0x0000
P38.83	Received PZD2 data display (PZD2)			
P38.84	Received PZD3 data display (PZD3)	0x0000–0xFFFF Input PZD data display = PZD physically input data with base value processed	0x0000–0xFFFF	0x0000
P38.85	Received PZD4 data display (PZD4)			
P38.86	Received PZD5 data display (PZD5)			
P38.87	Received PZD6 data display (PZD6)			
P38.88	Received PZD7 data display (PZD7)			
P38.89	Received PZD8 data display (PZD8)			
P38.90	Received PZD9 data display (PZD9)			
P38.91	Received PZD10 data display (PZD10)			
P38.92	Received PZD11 data display (PZD11)			
P38.93	Received PZD12 data display (PZD12)			
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	0x0000–0xFFFF	0x0000–0xFFFF	0x0000

Function code	Name	Description	Setting range	Default
	polarity			
P38.98	Communication disconnection detection delay	0.00s: 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

8.4 CANopen protocol

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

Function code	Name	Description	Setting range	Default
P43.00	Module online status	0x000–0x1FF	0x000–0x1FF	0x000
		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)		
P43.01	CANopen communication address	0–127	0–127	2
P43.02	CANopen communication baud rate (kbps)	Setting range: 0–5 0: 1000kbps 1: 800kbps 2: 500kbps 3: 250kbps	0–5	3

Function code	Name	Description	Setting range	Default
		4: 125kbps 5: 100kbps		
P43.03– P43.09	Reserved	-	-	-
P43.10	Present effective card slot	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.	0x0000–0xFFFF	0x0000
		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		

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.

The VFD provides the "black box" function. The VFD can save the waveform information generated within 0.2s before the most recent fault that causes its stop. You can obtain the waveform information from the upper computer and analyze fault causes.

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
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. (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 P99 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 content of the function code table is as follows:

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

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

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

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

Column 5 "Default": Initial value set in factory

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

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

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

"●" indicates that the value of the parameter is detected and recorded, and cannot be modified (The VFD automatically checks and constrains the modification of parameters, which helps prevent incorrect modifications).

2. The parameters adopt the decimal system (DEC) and hexadecimal system (0-F). If the hexadecimal system is adopted, all bits are mutually independent on data during parameter editing.

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

4. 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.

5. 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

Group number	Name	Remarks
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
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
P11	Unit configuration	All function codes related to unit control
P13	Protection configuration	Protection limit value setting
P20	CWs and SWs	Rectifier CWs and SWs, read-only parameters
P21	Real time data	Basic signals for monitoring, voltage, current, power, etc.
P23	System configuration	System time, and SD card configuration
P24	Parameter display setting	Display settings for voltage, power, current, etc.
P33	Blackbox channel configuration	Channel data settings of the blackbox
P37	Fieldbus adapter A	Fieldbus A input/output data settings, bus data base value settings
P38	Fieldbus adapter B	Fieldbus A input/output data settings, bus data base value settings
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
P54	DC/AC sampling card setting (reserved)	-

Group number	Name	Remarks
P80	BitDataSet 1-Summary of data of BO type	BitDataSet 1-Summary of data of BO type
P98	AI/AO CalibraFunc	AI and AO calibrations
P99	Factory functions	Parameters that require a manufacturer password to be set: unit rated power, voltage, current, correction factor, etc

9.2 Fault code list

Fault No.	Fault description	Modifiable fault severity range	Default fault severity
		0: No exception handling 1: Only display an alarm (LED blinking) 2: Minor fault (displaying fault codes) 3: Stop (opening)	
E0100–E1000 unit fault enumeration			
E0101–E1001	Reserved	-	-
E0102–E1002	Reserved	-	-
E0103–E1003	Reserved	-	
E0104–E1004	Units 1–10-Hardware overcurrent (HoC)	3	3
E0105–E1005	Reserved	-	-
E0106–E1006	Units 1–10-Zero drift fault (ItE)	3	3
E0107–E1007	Units 1–10-24V supply fault (E24)	3	3
E0108–E1008	Units 1–10-15V fault (E15)	3	3
E0109–E1009	Units 1–10-STO fault (Sto)	3	3
E0110–E1010	Units 1–10-Fan fault (FAn)	0–2	2
E0111–E1011	Units 1–10-Downstream communication fault (dn)	3	3
E0112–E1012	Units 1–10-Upstream communication fault (UP)	3	3
E0113–E1013	Reactor overtemperature fault (roH)	3	3
E0114–E1014	Reserved	-	-
E0115–E1015	Reserved	-	-
E0116–E1016	Unit overvoltage (ov)	3	3

Fault No.	Fault description	Modifiable fault severity range	Default fault severity
		0: No exception handling 1: Only display an alarm (LED blinking) 2: Minor fault (displaying fault codes) 3: Stop (opening)	
E0117-E1017	Unit undervoltage (Lv)	3	3
E0118-E1018	Unit overtemperature (U.oH)	3	3
E0119-E1019	Unit overtemperature pre-alarm	1	1
E1100: DSP CPU1 fault enumeration			
E1101	Bus overvoltage (ov)	3	3
E1102	Bus undervoltage (Lv)	3	3
E1103	Unit current imbalance (CUnb)	2	2
E1104	Modbus communication fault (E-485)	0-2	2
E1105	Software overcurrent (SoC)	3	3
E1106	Reserved	-	-
E1107	External fault 1 (EF1)	0-3	3
E1108	External fault 2 (EF2)	0-3	3
E1109	External alarm 1 (EA1)	0-2	1
E1110	External alarm 2 (EA2)	0-2	1
E1111	Reserved	-	-
E1112	Factory running time arrival fault (End)	3	3
E1113	FPGA heartbeat fault (F.bEAt)	3	3
E1114	DSP handshake fault (d.bEAt)	3	3
E1115	Reserved	-	-
E1116	Bus adapter A communication disconnection (E-FbA)	0-2	2
E1117-E1121	Reserved	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

Fault No.	Fault description	Modifiable fault severity range	Default fault severity
		0: No exception handling 1: Only display an alarm (LED blinking) 2: Minor fault (displaying fault codes) 3: Stop (opening)	
E1125	The interval between two power-on pre-charges is less than the set time.	1	1
E1126	Reserved	-	-
E1127	Reserved	-	-
E1128	SD card fault (Sd)	0-2	2
E1129	VFD overload	1	1
E1130	Bus adapter B communication disconnection (E-FBB)	0-2	2
E1200-E1203	Reserved	-	-
E1300-E1310	Reserved	-	-
E5000: DSP CPU2 fault enumeration			
E5001	Software overcurrent (SoC)	3	3
E5002	Hardware overcurrent (HoC)	3	3
E5003	Grid overvoltage (Gov)	3	3
E5004	Grid undervoltage (GLv)	3	3
E5005	VFD overload (oL)	3	3
E5006	Grid phase-R loss (SPR)	3	3
E5007	Grid phase-S loss (SPS)	3	3
E5008	Grid phase-T loss (SPT)	3	3
E5009	Phase lock failure (PLLE)	3	3
E5010	Reserved	-	-
E5011	Reserved	-	-
E5012	Handshake fault (HSE)	3	3
E5013	DC bus overvoltage (ov)	3	3
E5014	DC bus undervoltage (Lv)	3	3
E5015	Grid overfrequency (oF)	0-3	3
E5016	Grid underfrequency (LF)	0-3	3

9.3 Function parameter list

Group P00 Reference value configuration

Function code	Name	Parameter description	Setting range	Default	Modify
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	○
P00.01	Function parameter restoration	0: No operation 1: Restore to default values (group P08 for fault records, and group P23 for system time cannot be restored) 2: Clear fault records(group P08 for fault records) 3: Clear electric meter records	0–3	0	◎

Group P01 Start/stop control

Function code	Name	Parameter 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	Main breaker switch-on delay	5.00–10.00s	5.00–10.00	5.00s	◎
P01.02	OFF1 switch-off delay	1.00–10.00s	1.00–10.00	1.00s	◎
P01.03	Power-on precharge time (SCR)	5.00–20.00s	5.00–20.00	5.00s	◎
P01.04	Power-on precharge timeout time setting	5.0–30.0s	5.0–30.0	30.0s	◎

Function code	Name	Parameter description	Setting range	Default	Modify
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	50.0°C	☉
P01.07	Running mode of cooling fan	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: The fan keeps running after power-on 2: Speed regulation operation mode	0–2	0	☉
P01.08	Local running time	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	0min	○
P01.09	LOC/REM (QUICK/JOG on LED keypad) function selection	0: No function 1: Reserved 2: Shift the display state by the shifting key 3: Reserved 4: Reserved 5: OFF2 stop 6: Local and remote switching function	0–6	6	○
P01.10	Whether to enable OFF1 main switch breaking	0: Disable OFF1 main switch breaking 1: Enable OFF1 main switch breaking	0–1	0	☉

Group P02 Control channel configuration

Function code	Name	Parameter 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) 3: Terminal start/stop module (IN1,	0–3	0	☉

Function code	Name	Parameter description	Setting range	Default	Modify
		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 (P01.56=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 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.			
P02.01	Channel 1 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	0	⊙
P02.02	Channel 1 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	⊙
P02.03-P02.06	Reserved	-	-	-	-
P02.07	Channel 1 OFF2 source 1	0: OFF2 is valid 1: OFF2 is invalid (Necessary conditions	0-10	4	⊙

Function code	Name	Parameter description	Setting range	Default	Modify
P02.08	Channel 1 OFF2 source 2	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	1	⊙
P02.09	Reserved	-	-	-	-
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)	0-10	6	⊙
P02.12	Channel 1 fault reset source 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	⊙
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	0-10	0	⊙

Function code	Name	Parameter description	Setting range	Default	Modify
		10: HDI2			
P02.21–P02.24	Reserved	-	-	-	-
P02.25	Channel 2 OFF2 source 1	0: OFF2 is valid 1: OFF2 is invalid (Necessary conditions for running) 2: Other-B connector (0: OFF2 is valid; 1: Necessary conditions for running)	0–10	4	⊙
P02.26	Channel 2 OFF2 source 2	3: DI1 4: DI2 5: DI3 6: DI4 7: DI5 8: DI6 9: HDI1 10: HDI2	0–10	1	⊙
P02.27	Reserved	-	-	-	-
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 (0.00–99.99(0.00)) 3: DI1 4: DI2	0–10	6	⊙
P02.30	Channel 2 fault reset source 2	5: DI3 6: DI4 7: DI5 8: DI6 9: HDI1 10: HDI2	0–10	0	⊙
P02.31–P02.37	Reserved	-	-	-	-
P02.38	Terminal start/stop module channel selection	0: Terminal start/stop command 1 1: Terminal 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	⊙

Function code	Name	Parameter description	Setting range	Default	Modify
P02.39	0: Terminal start/stop command 1 mode	0: Level mode IN1(1) When input 1 is at high level, OFF1 is valid. 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, OFF1 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.	0-3	0	⊙
P02.40	Terminal start/stop command 1 input IN1 source	0: 0 1: 1 2: Other-B connector 3: DI1	0-10	3	⊙
P02.41	Terminal start/stop command 1 input IN2 source	4: DI2 5: DI3 6: DI4 7: DI5 8: DI6 9: HDI1 10: HDI2	0-10	0	⊙
P02.42	Reserved	-	-	-	-
P02.43	0: Terminal start/stop command 2 mode	0: Level mode 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	0-10	0	⊙
P02.45	Terminal start/stop command 2 input IN2 source	5: DI3 6: DI4 7: DI5 8: DI6 9: HDI1 10: HDI2	0-10	0	⊙
P02.46	Reserved	-	-	-	-
P02.47	Main breaker control signal	0: RO1 is NO. 1: RO1 is NC.	0-5	0	⊙

Function code	Name	Parameter description	Setting range	Default	Modify
		2: RO2 is NO. 3: RO2 is NC. 4: RO3 is NO. 5: RO3 is NC.			
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	1.0s	⊙
P02.50–P02.52	Reserved	-	-	-	-

Group P03 Rectifier control

Function code	Name	Parameter description	Setting range	Default	Modify
P03.00	Phase-lock loop parameter commissioning Mode	0: Bandwidth 1: 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	Basic rectifier conduction angle	90.0°–120.0°	90.0–120.0	120.0°	⊙
P03.16	Phase-lock loop working mode selection	0: SRFPLL (broadband phase-lock loop) 1: SOGI (Generalized second-order phase-lock loop)	0–1	1	⊙
P03.17	Reserved	-	-	-	-
P03.18	Reserved	-	-	-	-
P03.19	Overload mode enabling	0: Disable 1: Enable	0–1	0	⊙

Function code	Name	Parameter description	Setting range	Default	Modify
P03.20	Overload mode selection	0: No overload 1: Light overload 2: Heavy overload	0–2	0	⊙
P03.21	Grid rated frequency setting	30–60Hz	30–60	50Hz	⊙

Group P05 Input terminals

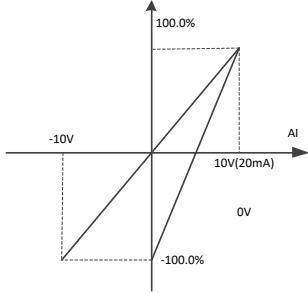
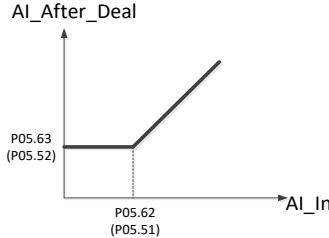
Function code	Name	Parameter description	Setting range	Default	Modify																		
P05.00	HDI input type	0x00–0x11 Ones place: HDI1 input type 0: HDI1 is high-speed pulse input 1: HDI1 is digital input Tens place: HDI2 input type 0: HDI2 is high-speed pulse input 1: HDI2 is digital input	0x00–0x11	0x00	⊙																		
P05.01	Input terminal physical state value	0x00–0x1FF When the terminal has no external signal, the hardware considers all high levels by default. <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><tr><td>Bit8</td><td>DIL</td></tr></table>	Bit0	DI1	Bit1	DI2	Bit2	DI3	Bit3	DI4	Bit4	DI5	Bit5	DI6	Bit6	HDI1	Bit7	HDI2	Bit8	DIL	0x00–0x1FF	0x1FF	●
Bit0	DI1																						
Bit1	DI2																						
Bit2	DI3																						
Bit3	DI4																						
Bit4	DI5																						
Bit5	DI6																						
Bit6	HDI1																						
Bit7	HDI2																						
Bit8	DIL																						
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	○																		
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	0.00–360.00s	0.00–360.00	0.00s	○																		

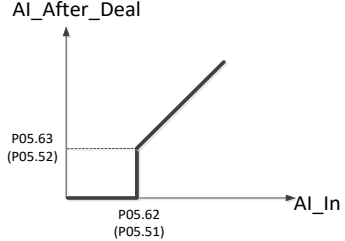
Function code	Name	Parameter description	Setting range	Default	Modify
	delay				
P05.09	DI2 filter time	0.000–1.000s	0.000–1.000	0.010s	○
P05.10	DI2 switch-on delay	0.00–360.00s	0.00–360.00	0.00s	○
P05.11	DI2 switch-off delay	0.00–360.00s	0.00–360.00	0.00s	○
P05.12	DI3 filter time	0.000–1.000s	0.000–1.000	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 delay (Digital)	0.00–360.00s	0.00–360.00	0.00s	○

Function code	Name	Parameter description	Setting range	Default	Modify
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	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	0.000 kHz	☐
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	Displays the input frequency value..	0.000–65.535	0.000kHz	☒
P05.41	HDI2 high-speed pulse input ratio	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 upper limit frequency Setting	P05.43–100.0%	P05.43–100.0%	100.0%	☐

Function code	Name	Parameter description	Setting range	Default	Modify
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 Setting range of P05.52: -600.0–P05.54	-10.00–P05.53	0.00	○
P05.52	AI1 curve min. input rate	Setting range of P05.53: P05.51–10.00 Setting range of P05.54: P05.52–600.0%	-600.0%–P05.54	0.0%	○
P05.53	AI1 curve max input value	600.0% The mapping between analog input voltage and analog input current is as follows:	P05.51–10.00	10.00	○
P05.54	AI1 curve max input rate	When the analog input is current input, 0V–10V voltage corresponds to 0mA–20mA current.	P05.52–600.0%	100.0%	○

Function code	Name	Parameter description	Setting range	Default	Modify
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 denoise 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: 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	0.00	☒
P05.61	AI2 input ratio	-655.3–655.3% If AI is disabled, the value is 0, value after AI2 processing	-655.3–655.3%	0.0%	☒
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	-10.00–P05.64	0.00	☐
P05.63	AI2 curve min. input rate	P05.65 Setting range of P05.64: P05.62–10.00	-600.0%–P05.65	0.0%	☐

Function code	Name	Parameter description	Setting range	Default	Modify
P05.64	AI2 curve max input value	Setting range of P05.65: P05.63–600.0%	P05.62–10.00	10.00	☐
P05.65	AI2 curve max input rate	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. 	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% 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.  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	0x00–0x11	0x00	☐

Function code	Name	Parameter description	Setting range	Default	Modify
		following figure. 			
P05.70–P05.75	Reserved	-	-	-	-

Group P06 Output terminals

Function code	Name	Parameter 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	0x0000–0xFFFF <table border="1"><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>Reserved</td></tr><tr><td>Bit4</td><td>Reserved</td></tr><tr><td>Bit5</td><td>HDO1</td></tr><tr><td>Bit6</td><td>HDO2</td></tr></table>	Bit0	RO1	Bit1	RO2	Bit2	RO3	Bit3	Reserved	Bit4	Reserved	Bit5	HDO1	Bit6	HDO2	0x0000–0xFFFF	0x0000	●
Bit0	RO1																		
Bit1	RO2																		
Bit2	RO3																		
Bit3	Reserved																		
Bit4	Reserved																		
Bit5	HDO1																		
Bit6	HDO2																		
P06.02	Output terminal processed state value	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●														
P06.03	Output terminal polarity selection	0x00–0x7F HDO2, HDO1, DO2, DO1, RO3, RO2, RO1 in sequence	0x00–0x7F	0x00	○														
P06.04	RO1 signal source	0: Low level 1: High level	0–9	0	○														
P06.05	RO2 signal source	2: Other-B connector 3: Ready to start up		7	○														
P06.06	RO3 signal source	4: Reserved 5: Main circuit breaker closing		0	○														
P06.07	Reserved	6: Running		0	○														

Function code	Name	Parameter description	Setting range	Default	Modify
P06.08	Reserved	7: VFD fault		0	○
P06.09	HDO1-as-DO signal source	8: VFD alarm		0	○
P06.10	HDO2-as-DO signal source	9: Running time reached		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 signal source". The percentage	-999.9–999.9%	0.0	●

Function code	Name	Parameter description	Setting range	Default	Modify
		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 percentage of the AO2 output, corresponding to the "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	0.000 kHz	●
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	0kHz	●
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: Invalid 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	0–8	5	○
P06.36	AO2 signal source			3	○
P06.37	HDO1-as-High SpeedPulseOutput signal source			0	○
P06.38	HDO2-as-High SpeedPulseOutput signal source			0	○

Function code	Name	Parameter description	Setting range	Default	Modify
	source				
P06.39	AO1 curve min. output rate	Setting range of P06.39: -600.0%–P06.41	-600.0%–P06.41	0	○
P06.40	AO1 curve min. output value	Setting range of P06.40: 0.000–P06.42 Setting range of P06.41: P06.39–600.0% Setting range of P06.42: P06.40–10.000	0.000–P06.42	0.000V	○
P06.41	AO1 curve max output rate	When the analog output is current output, 1mA equals 0.5V. The mapping between the output value and the analog output is as follows:	P06.39–600.0%	100.0%	○
P06.42	AO1 curve max output value		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	0.000V–P06.47	0.0V	○
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	P06.45–10.000V	10.000V	○
P06.48	AO2 output filter time	0.000–10.000s	0.000–10.000	0.000s	○
P06.49	HDO1-as-High SpeedPulseOutput 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-High SpeedPulseOutput 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-High SpeedPulseOutput filter time	0.000s–10.000s	0.000–10.000	0.000s	○

Function code	Name	Parameter description	Setting range	Default	Modify
P06.54	HDO2-as-High SpeedPulseOutput lower limit	-600.0%~P06.56	-600.0%~P06.56	0.00%	☐
P06.55	HDO2 output corresponding to lower limit	0.00~P00.57	0.00~P00.57	0.00kHz	☐
P06.56	HDO2-as-High SpeedPulseOutput 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-High SpeedPulseOutput filter time	0.000s~10.000s	0.000~10.000	0.000s	☐

Group P07 System information

Function code	Name	Parameter 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: DC/DC	0~4	1	☒
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 rated power	0~6553.5 Depends on unit rated power and number of units	0.0~6553.5	Model depended	☒
P07.09	Grid rated voltage	10~20000V	10~20000	Model depended	☒

Function code	Name	Parameter description	Setting range	Default	Modify
P07.10	Entire machine rated voltage	10–20000V	10–20000	Model depended	●
P07.11	Entire machine rated current	0.0–6553.5A	0.0–6553.5	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	0–65535	0	●
P07.13	Expansion card slot 1 software Version		0.00–655.35	0.00	●
P07.14	Expansion card slot 2 type		0–65535	0	●
P07.15	Expansion card slot 2 software Version		0.00–655.35	0.00	●
P07.16	Expansion card slot 3 type		0–65535	0	●
P07.17	Expansion card slot 3 software Version		0.00–655.35	0.00	●
P07.18	Expansion card slot 4 type		0–65535	0	
P07.19	Expansion card slot 4 software Version		0.00–655.35	0.00	●
P07.20	Expansion card slot 5 type		0–65535	0	●
P07.21	Expansion card slot 5 software Version		0.00–655.35	0.00	●
P07.22	Expansion card slot 6 type		0–65535	0	●
P07.23	Expansion card slot 6 software Version		0.00–655.35	0.00	●
P07.24	Expansion card slot 7 type		0–65535	0	●
P07.25	Expansion card slot 7 software Version		0.00–655.35	0.00	●
P07.26	Expansion card slot 8 type		0–65535	0	●
P07.27	Expansion card slot 8 software Version		0.00–655.35	0.00	●
P07.28	Expansion card slot 9 type		0–65535	0	●

Function code	Name	Parameter description	Setting range	Default	Modify
P07.29	Expansion card slot 9 software Version		0.00–655.35	0.00	●
P07.30	FPGA version of unit 1	-	0.00–655.35	-	●
P07.31	FPGA version of unit 2	-	0.00–655.35	-	●
P07.32	FPGA version of unit 3	-	0.00–655.35	-	●
P07.33	FPGA version of unit 4	-	0.00–655.35	-	●
P07.34	FPGA version of unit 5	-	0.00–655.35	-	●
P07.35	FPGA version of unit 6	-	0.00–655.35	-	●
P07.36	FPGA version of unit 7	-	0.00–655.35	-	●
P07.37	FPGA software version of unit 8	-	0.00–655.35	-	●
P07.38	FPGA version of unit 9	-	0.00–655.35	-	●
P07.39	FPGA version of unit 10	-	0.00–655.35	-	●
P07.40	Per-unit voltage base value	Rated voltage: 0–65535V	0–65535	Model depended	●
P07.41	Per-unit current base value	Rated current: 0.0–6553.5A	0.0–6553.5	Model depended	●
P07.42	Per-unit power base value	Rated power: 0.0–6553.5kW	0.0–6553.5	Model depended	●
P07.43	Grid rated frequency	0–65535Hz	0–65535	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	●

Group P08 Fault records

Function code	Name	Parameter description	Setting range	Default	Modify
P08.00	Present fault code	For details, 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. The difference between the present fault code and the real-time fault code is as follows: if the inverter is already in a fault state, the present fault code will not record other faults, while the real-time fault code will still record.	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	Reserved	-	-	-	-
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	●

Function code	Name	Parameter description	Setting range	Default	Modify
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 status at present fault	-	0x0000–0xFFFF	0x0000	●
P08.25	Output terminal status at present fault	-	0x0000–0xFFFF	0x0000	●
P08.26	Reserved	-	-	-	-
P08.27	Reserved	-	-	-	-
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	Reserved	-	-	-	-
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	0–23 0: 00.00 (invalid) 1: 11.04 (Modbus communication fault) 2: 11.07 (External fault 1)	0–23	0	○

Function code	Name	Parameter description	Setting range	Default	Modify
		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: 50.09 (Phase lock failure) 12: 50.15 (Grid overfrequency) 13: 50.16 (Grid underfrequency) 14: 01.10 (Unit 1 fan fault) 15: 02.10 (Unit 2 fan fault) 16: 03.10 (Unit 3 fan fault) 17: 04.10 (Unit 4 fan fault) 18: 05.10 (Unit 5 fan fault) 19: 06.10 (Unit 6 fan fault) 20: 07.10 (Unit 7 fan fault) 21: 08.10 (Unit 8 fan fault) 22: 09.10 (Unit 9 fan fault) 23: 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: Minor fault 3: Stop	0-3	3	○
P08.45	Fault code 2 selection	0-23	0-23	0	○
P08.46	Reserved	-	-	-	-
P08.47	Fault code 2 exception severity change	0: No exception handling 1: Only display an alarm 2: Minor fault Stop	0-3	3	○
P08.48	Fault code 3 selection	0-23	0-23	0	○
P08.49	Reserved	-	-	-	-
P08.50	Fault code 3 exception severity change	0: No exception handling 1: Only display an alarm 2: Minor fault 3: Stop	0-3	3	○
P08.51	Fault code 4 selection	0-23	0-23	0	○
P08.52	Reserved	-	-	-	-
P08.53	Fault code 4 exception	0: No exception handling 1: Only display an alarm	0-3	3	○

Function code	Name	Parameter description	Setting range	Default	Modify
	severity change	2: Minor fault 3: Stop			
P08.54	Fault code 5 selection	0-23	0-23	0	○
P08.55	Reserved	-	-	-	-
P08.56	Fault code 5 exception severity change	0: No exception handling 1: Only display an alarm 2: Minor fault 3: Stop	0-3	3	○
P08.57	Fault code 6 selection	0-23	0-23	0	○
P08.58	Reserved	-	-	-	-
P08.59	Fault code 6 exception severity change	0: No exception handling 1: Only display an alarm 2: Minor fault 3: Stop	0-3	3	○
P08.60	Fault code 7 selection	0-23	0-23	0	○
P08.61	Reserved	-	-	-	-
P08.62	Fault code 7 exception severity change	0: No exception handling 1: Only display an alarm 2: Minor fault 3: Stop	0-3	3	○
P08.63	Fault code 8 selection	0-23	0-23	0	○
P08.64	Reserved	-	-	-	-
P08.65	Fault code 8 exception severity change	0: No exception handling 1: Only display an alarm 2: Minor fault 3: Stop	0-3	3	○
P08.66	Fault code 9 selection	0-23	0-23	0	○
P08.67	Reserved	-	-	-	-
P08.68	Fault code 9 exception severity change	0: No exception handling 1: Only display an alarm 2: Minor fault 3: Stop	0-3	3	○
P08.69	Fault code 10 selection	0-23	0-23	0	○
P08.70	Reserved	-	-	-	-
P08.71	Fault code 10 exception severity change	0: No exception handling 1: Only display an alarm 2: Minor fault 3: Stop	0-3	3	○
P08.72	Auto fault reset count	-	0-10	0	○

Function code	Name	Parameter description	Setting range	Default	Modify
P08.73	Auto fault reset interval	-	0.1-3600.0	3.0s	○
P08.74	Auto reset count display	-	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 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	●

Group P11 Unit configuration

Function code	Name	Parameter 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	Actual effective carrier frequency	1.0-10.0kHz	1.0-10.0	10.0kHz	●
P11.06- P11.07	Reserved	-	-	-	-
P11.08	Unit overtemperature point setting	0-120.0°C	0-120.0	80.0°C	○

Group P13 Protection configuration

Function code	Name	Parameter description	Setting range	Default	Modify
P13.00	Grid voltage overvoltage point (line voltage) setting	110.0-130.0%	110.0-130.0	125.0%	⊙
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 setting	0-2000.0V	0-2000.0	800.0V	⊙
P13.06	Software bus undervoltage point setting	0-1000.0V	0-1000.0	200.0V	⊙
P13.07	Software overcurrent point	No-overload upper limit: 130.0% Light overload upper limit: 150.0% Heavy overload upper limit: 200.0%	50.0-200.0	120.0%	⊙
P13.08	Reserved	-	-	-	-

Function code	Name	Parameter description	Setting range	Default	Modify
P13.09	Reserved	-	-	-	-
P13.10	Hardware current limit point (unit current limit point)	No-overload: 180.0% Light overload: 187.5% Heavy overload: 250.0%	180.0–250.0	180.0%	●
P13.11	External fault 1 source	0: Invalid 1: Fault 2: Other-B connector 3: DI1 4: DI2 5: DI3	0–10	0	○
P13.12	External fault 2 source	6: DI4 7: DI5 8: DI6 9: HDI1 10: HDI2	0–10	0	○
P13.13	External alarm 1 source	0: Invalid 1: Fault 2: Other-B connector 3: DI1 4: DI2 5: DI3 6: DI4 7: DI5 8: DI6 9: HDI1 10: HDI2	0–10	0	○
P13.14	External alarm 2 source	0: Invalid 1: Fault 2: Other-B connector 3: DI1 4: DI2 5: DI3 6: DI4 7: DI5 8: DI6 9: HDI1 10: HDI2	0–10	0	○
P13.15	Reserved	-	-	-	-

Group P20 CWs and SWs

Function code	Name	Parameter description	Setting range	Default	Modify
P20.00	Control word 1	Combination of P20.01–P20.16	0x0000–0xFFFF	0x0000	●
P20.01	CW 1 bit0	0 = Stop switched off: The rectifier unit enters the start-up ready state in	0–1	0	●

Function code	Name	Parameter description	Setting range	Default	Modify
		the specified OFF1 stop mode 0->1: Switch on to run (It is effective at the rising edge.)			
P20.02	CW 1 bit1	0 = OFF2 emergency stop switched off 1 = In normal state	0-1	0	●
P20.03	CW 1 bit2	Reserved	-	-	●
P20.04	CW 1 bit3	Reserved	-	-	●
P20.05	CW 1 bit4	Reserved	-	-	●
P20.06	CW 1 bit5	Reserved	-	-	●
P20.07	CW 1 bit6	Reserved	-	-	●
P20.08	CW 1 bit7	0 = Invalid 0->1 = At the rising edge, fault reset is valid	0-1	0	●
P20.09	CW 1 bit8	Reserved	-	-	●
P20.10	CW 1 bit9	Reserved	-	0	●
P20.11	CW 1 bit10	Remote control 0 = Invalid 1 = Valid	0-1	0	●
P20.12	CW 1 bit11	Reserved	-	-	●
P20.13	CW 1 bit12	Reserved	-	-	●
P20.14	CW 1 bit13		-	-	●
P20.15	CW 1 bit14	1 = Trigger external fault 1	0-1	0	●
P20.16	CW 1 bit15	1 = External fault 2	0-1	0	●
P20.17	Control word 2	Combination of P20.18-P20.33	0x0000-0xFFFF	0x0000	●
P20.18	CW 2 bit0	1=Trigger external alarm 1	0-1	0	●
P20.19	CW 2 bit1	1=Trigger external alarm 2	0-1	0	●
P20.20	CW 2 bit2	Reserved	-	-	●
P20.21	CW 2 bit3	Reserved	-	-	●
P20.22	CW 2 bit4	Reserved	-	-	●
P20.23	CW 2 bit5	Reserved	-	-	●
P20.24	CW 2 bit6	Reserved	-	-	●
P20.25	CW 2 bit7	Reserved	-	-	●
P20.26	CW 2 bit8	0=Trigger channel 1 1=Trigger channel 2 PLC needs to change the channel through P00.00.	0-1	0	●
P20.27	CW 2 bit9	Reserved	-	-	●
P20.28	CW 2 bit10	Reserved	-	-	●
P20.29	CW 2 bit11	Reserved	-	-	●
P20.30	CW 2 bit12	Reserved	-	-	●
P20.31	CW 2 bit13	Reserved	-	-	●
P20.32	CW 2 bit14	Reserved	-	-	●
P20.33	CW 2 bit15	Reserved	-	-	●
P20.34	SW 1	Combination of P20.35-P20.50	0x0000-0xFFFF	0x0000	●

Function code	Name	Parameter description	Setting range	Default	Modify
P20.35	SW 1 bit0 (Ready to start)	1 = Startup preparation complete 0 = Lockout for startup	0-1	0	●
P20.36	SW 1 bit1	Reserved	0-1	0	●
P20.37	SW 1 bit2	Reserved	0-1	0	●
P20.38	SW 1 bit3 (Fault activated)	1 = Fault 0 = No fault	0-1	0	●
P20.39	SW 1 bit4 (Block output activated)	1= OFF2 not activated 0 = OFF2 activated	0-1	0	●
P20.40	SW 1 bit5	Reserved	-	-	●
P20.41	SW 1 bit6 (Lockout for startup/Disable brake closing)	1 = External conditions not present or failure 0 = Normal	0-1	0	●
P20.42	SW 1 bit7 (Alarm)	1 = Alarm activated 0 = No alarm	0-1	0	●
P20.43	SW 1 bit8	Reserved	-	-	●
P20.44	SW 1 bit9	Reserved	-	-	●
P20.45	SW 1 bit10 (Remote control operation)	1 = Remote (Control channels other than the host controller or keypad) 0 = Local (indicating host controller or keypad)	-	-	●
P20.46	SW 1 bit11	1= Pre-charge completed 0 = Pre-charge incompleted	0-1	0	●
P20.47	SW 1 bit12	1 = Main power supply connected 0 = Main power supply disconnected	0-1	0	●
P20.48	SW 1 bit13 (Pulse triggering)	1 = SCR triggered 0 = SCR blocked	0-1	0	●
P20.49	SW 1 bit14	Reserved	-	-	●
P20.50	SW 1 bit15	Reserved	-	-	●
P20.51	SW 2	Combination of P20.52-P20.67	0-1	0	●
P20.52	SW 2 bit0	Reserved	-	-	●
P20.53	SW 2 bit1	Reserved	-	-	●
P20.54	SW 2 bit2	Reserved	-	-	●
P20.55	SW 2 bit3	1: Unit fan run 0: Unit fan stop	0-1	0	●
P20.56	SW 2 bit4	Reserved	-	-	-
P20.57	SW 2 bit5	Reserved	-	-	-
P20.58	SW 2 bit6	External fault 1	-	-	-
P20.59	SW 2 bit7	External fault 2	-	-	-
P20.60	SW 2 bit8	Reserved	-	-	-
P20.61	CW 2 bit9	Reserved	-	-	-
P20.62	SW 2 bit10	Reserved	-	-	-
P20.63	SW 2 bit11	Reserved	-	-	-
P20.64	SW 2 bit12	Reserved	-	-	-
P20.65	SW 2 bit13	Reserved	-	-	-
P20.66	SW 2 bit14	Reserved	-	-	-
P20.67	SW 2 bit15	Reserved	-	-	-

Function code	Name	Parameter description	Setting range	Default	Modify
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	●

Group P21 RT Data

Function code	Name	Parameter 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	●
P21.05	Grid ST line voltage	0–65535V	0–65535	0V	●
P21.06–P21.07	Reserved	-	-	-	-
P21.08	Input power	0–6553.5kW	0.0–6553.5	0.0	●
P21.09	Input power factor	0.00–100.00%	0.00–100.00%	0.00%	●
P21.10–P21.11	Reserved	-	-	-	-
P21.12	System state machine	CPU1 state machine	0–6	0	●
P21.13–P21.21	Reserved	-	-	-	-
P21.22	Main control board temperature	-40.0–125.0°C	-40.0–125.0	0.0°C	●
P21.23–P21.26	Reserved	-	-	-	-

Function code	Name	Parameter description		Setting range	Default	Modify
P21.27	Input terminal status	Bit0	S1	0x00–0xFF	0x00	●
		Bit1	S2			
		Bit2	S3			
		Bit3	S4			
		Bit4	S			
		Bit5	S6			
		Bit6	HDI1			
		Bit7	HDI2			
P21.28	Output terminal status	Bit0	RO1	0x00–0xFF	0x00	●
		Bit1	RO2			
		Bit2	RO3			
		Bit3	Reserved			
		Bit4	Reserved			
		Bit5	HDO1			
		Bit6	HDO2			
P21.29	AI1 display (%)	-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%	●
P21.30	AI2 display (%)			-655.3–655.3%	0.0%	●
P21.31	Reserved			-	-	
P21.32	HDI1 display(kHz)	0.000–50.000kHz Displays the input frequency value.		0.000–50.000	0.000 kHz	●
P21.33	HDI2 display(kHz)	0.000–50.000kHz Displays the input frequency value.		0.000–50.000	0.000 kHz	●
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%	0.0%	●
P21.36	HDO1(kHz)	0.000–65.535kHz Displays the HDO1 output value.		0.000–65.535	0.000 kHz	●
P21.37	HDO2(kHz)	0.000–65.535kHz Displays the HDO2 output value.		0.000–65.535kHz	0.000 kHz	●
P21.38	Reserved	-		-	-	-
P21.39	Reserved	-		-	-	-
P21.40	Electricity consumption high-order bits	0–59999kWh		0–59999	0kWh	●
P21.41	Electricity consumption low-order bits	0.0–999.9kWh		0.0–999.9	0.0kWh	●
P21.42	Local accumulative	0–65535h		0–65535	0h	●

Function code	Name	Parameter description	Setting range	Default	Modify
	running time				
P21.43	Unit online state	0x0000–0x03FF Binary is used for indicating the unit online state. A max of 10 power units can be configured.	0x0000–0x03FF	0x0000	●
P21.44	Unit 1 temperature	-20.0–120.0°C	-20.0–120.0	0.0°C	●
P21.45	Unit 2 temperature	-20.0–120.0°C	-20.0–120.0	0.0°C	●
P21.46	Unit 3 temperature	-20.0–120.0°C	-20.0–120.0	0.0°C	●
P21.47	Unit 4 temperature	-20.0–120.0°C	-20.0–120.0	0.0°C	●
P21.48	Unit 5 temperature	-20.0–120.0°C	-20.0–120.0	0.0°C	●
P21.49	Unit 6 temperature	-20.0–120.0°C	-20.0–120.0	0.0°C	●
P21.50	Unit 7 temperature	-20.0–120.0°C	-20.0–120.0	0.0°C	●
P21.51	Unit 8 temperature	-20.0–120.0°C	-20.0–120.0	0.0°C	●
P21.52	Unit 9 temperature	-20.0–120.0°C	-20.0–120.0	0.0°C	●
P21.53	Unit 10 temperature	-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	●
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	Unit 1 state	Bit0: Unit ready Bit1: Run Bit2: Fault Bit3: Wave generation	0x0000–0xFFFF	0x0000	●
P21.65	Unit 2 state		0x0000–0xFFFF	0x0000	●
P21.66	Unit 3 state		0x0000–0xFFFF	0x0000	●
P21.67	Unit 4 state		0x0000–0xFFFF	0x0000	●
P21.68	Unit 5 state		0x0000–0xFFFF	0x0000	●
P21.69	Unit 6 state		0x0000–0xFFFF	0x0000	●
P21.70	Unit 7 state		0x0000–0xFFFF	0x0000	●

Function code	Name	Parameter description	Setting range	Default	Modify
P21.71	Unit 8 state		0x0000–0xFFFF	0x0000	●
P21.72	Unit 9 state		0x0000–0xFFFF	0x0000	●
P21.73	Unit 10 state		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	●
P21.77–P21.81	Reserved	-	-	-	-

Group P23 System configuration

Function code	Name	Parameter 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 1.01–12.31	101	○
P23.02	RTC_Hour. RTC_Min		Hour Min 0.00–23.59	0.00	○
P23.03	RTC_Sec		Sec 0–59	0	○
P23.04	Enabling RTC reset	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 (%).	0.0–5.0	0.5min	○
P23.06	SD card fault storage mode	0: Disable 1: Trigger the storage mode	0–1	0	○
P23.07	Saving SD card function codes to	0: Save function codes to the file 0 1: Save function codes to the file 1 2: Save function codes to the 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	○

Function code	Name	Parameter description	Setting range	Default	Modify
P23.08	Restoring SD card function codes from	0: Restore function codes from the function code parameter file 0 1: Restore function codes from the function code parameter file 1 2: Restore function codes from the function code parameter 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) 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 to 0. The download function is not applicable to group P99.	0-2	0	◎
P23.10	Enabling no-SD-card insertion alarm	0: Disable (No alarm when no SD card is 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 creation failed Bit6: SD card last operation successful Bit7: Less than 2G of space left Bit8: Save function code configuration file - end of execution	0x0000-0x3FFFF	0x0000	●

Function code	Name	Parameter description	Setting range	Default	Modify
		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			

Group P24 Parameter display setting

Function code	Name	Parameter 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 parameters displayed in stopped state	0x0000–0xFFFF Bit0: Reserved Bit1: Bus voltage (V on) Bit2: Input voltage Bit3: Input terminal status Bit4: Output terminal state 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	0x0000–0xFFFF	0x000E	○
P24.09	Selection 1 of parameters to be displayed in the	0x0000–0xFFFF Bit0: Reserved Bit1: Reserved	0x0000–0xFFFF	0x001C	○

Function code	Name	Parameter description	Setting range	Default	Modify
	running state	Bit2: Bus voltage (V on) Bit3: Input voltage (V on) Bit 4: Input current (A on) Bit5: Reserved Bit6: Input power (% on) Bit7: Reserved Bit8: Reserved Bit9: Reserved Bit10: Input terminal status Bit11: Output terminal status Bit12: Reserved Bit13: Reserved Bit14: Reserved 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 Bit8: VFD overload percentage (% on) Bit6–Bit15: Reserved	0x0000–0xFFFF	0x0000	○
P24.11–P24.13	Reserved	-	-	-	-

Group P33 Blackbox channel configuration

Function code	Name	Parameter 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.	0–10	2(P21.00)	○
P33.01	Blackbox customized channel 2 selection	If you select the option of reading fault oscilloscope on the upper computer oscilloscope page, the channel is set to so that the data stored on the SD card can be displayed in waveform on the upper computer. The upper computer oscilloscope channel name can be dynamically obtained through the set index of the function code.	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: 0 1: Reserved	0–10	2(P21.04)	○

Function code	Name	Parameter description	Setting range	Default	Modify
P33.04	Blackbox customized channel 5 selection	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(P21.05)	○
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 (21.54)	○
P33.09	Blackbox customized channel 10 selection		0-10	2 (21.55)	○

Group P37 Fieldbus adapter A

Function code	Name	Parameter 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 5: Res 6: Res 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. 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	◎

Function code	Name	Parameter description	Setting range	Default	Modify
P37.01	Reserved	-	-	-	-
P37.02	Sent PZD1 (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 denominator	1-65535	1-65535	1	○
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	○

Function code	Name	Parameter description	Setting range	Default	Modify
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 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	☐
P37.29	Sent PZD8 conversion base value denominator	1-65535	1-65535	1	☐

Function code	Name	Parameter description	Setting range	Default	Modify
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	○
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	0-65535	1	○

Function code	Name	Parameter description	Setting range	Default	Modify
		conversion base value numerator / Received PZD conversion base value denominator			
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 denominator	1-65535	1-65535	1	○
P37.50	Received PZD7 conversion base	0-65535 Received PZD data display =	0-65535	1	○

Function code	Name	Parameter description	Setting range	Default	Modify
	value numerator	Received PZD * Received PZD conversion base value numerator / Received PZD conversion base value denominator			
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	○

Function code	Name	Parameter description	Setting range	Default	Modify
P37.60	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	○
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	●

Function code	Name	Parameter description	Setting range	Default	Modify
P37.79	Received PKW2 data display	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●
P37.80	Received PKW3 data display	0x0000–0xFFFF	0x0000–0xFFFF	0x0000	●
P37.81	Received PKW4 data display	0x0000–0xFFFF	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	0x0000	●
P37.84	Received PZD3 data display (PZD3)		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) 2: Other-C connector (2: P37.82)	0–2	2	⊙
P37.95	Reserved	-	-	-	-
P37.96	Bus adapter A received PZD1	0x0000–0xFFFF	0x0000–0xFFFF	0	○

Function code	Name	Parameter description	Setting range	Default	Modify
	polarity				
P37.97	Bus adapter A received PZD2 polarity	0x0000–0xFFFF	0x0000–0xFFFF	0	○
P37.98	Communication disconnection detection delay	0.00s: 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	0–1	0	○

Group P38 Bus adapter B

Function code	Name	Parameter 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 4–6: 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 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	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(P20.34)	○
P38.03	Sent PZD2 source		0–6	0	○
P38.04	Sent PZD3 source		0–6	0	○
P38.05	Sent PZD4 source		0–6	0	○
P38.06	Sent PZD5 source		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	○

Function code	Name	Parameter description	Setting range	Default	Modify
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	○
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	1-65535	1-65535	1	○

Function code	Name	Parameter description	Setting range	Default	Modify
	value denominator				
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 denominator	1-65535	1-65535	1	○
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	0-65535	1	○

Function code	Name	Parameter description	Setting range	Default	Modify
		base value denominator			
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 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	○
P38.43	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	○

Function code	Name	Parameter description	Setting range	Default	Modify
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 conversion base value denominator	1-65535	1-65535	1	☐
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	☐

Function code	Name	Parameter description	Setting range	Default	Modify
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	Received PZD12 conversion base value denominator	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 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	●
P38.67	Sent PZD2 data display	0x0000-0xFFFF	0x0000-0xFFFF	0x0000	●
P38.68	Sent PZD3 data display	0x0000-0xFFFF	0x0000-0xFFFF	0x0000	●

Function code	Name	Parameter description	Setting range	Default	Modify
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 (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	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	●

Function code	Name	Parameter description	Setting range	Default	Modify
P38.90	Received PZD9 data display (PZD9)		0x0000–0xFFFF	0x0000	●
P38.91	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	●
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	0.00s: 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	0–1	0	○

Group P40 PROFIBUS-DP module

Function code	Name	Parameter description	Setting range	Default	Modify
P40.00	Module online status	0x00–0x1FF	0x00–0x1FF	0x00	●
		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			

Function code	Name	Parameter description		Setting range	Default	Modify
			(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)			
P40.01	EC site No.	1-127		1-127	1	⊙
P40.02	DP_ID number	0x0000-0xFFFF INVT: 0x0D55 Siemens: 0x8045 ABB: 0x0812		0x0000-0xFFFF	0x0D55	○
P40.03- P40.09	Reserved	-		-	-	-
P40.10	Present effective card slot	0x0000-0xFFFF 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.		0x0000-0xFFFF	0x0000	●
		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			

Function code	Name	Parameter description	Setting range	Default	Modify
		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			

Group P41 PROFINET IO module

Function code	Name	Parameter 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 1 at the same time. See the following:	0x000–0x1FF	0x000	
		Bit0EC slot 1 module online state (0: Offline; 1: Online)			
		Bit1EC slot 2 module online state (0: Offline; 1: Online)			
		Bit2EC slot 3 module online state (0: Offline; 1: Online)			
		Bit3EC slot 2-1 module online state (0: Offline; 1: Online)			
		Bit4EC slot 2-2 module online state (0: Offline; 1: Online)			
		Bit5EC slot 2-3 module online state (0: Offline; 1:Online)			
		Bit6EC slot 3-1 module online state (0: Offline; 1: Online)			
		Bit7EC slot 3-2 module online state (0: Offline; 1: Online)			
		Bit8EC slot 3-3 module online state (0: Offline; 1: Online)			
P41.01	PROFINET slave station number	1–127 This variable is automatically	1–127	1	

Function code	Name	Parameter description	Setting range	Default	Modify
		assigned by the PLC.			
P41.02–P41.09	Reserved	-	-	-	-
P41.10	Present effective card slot	0x0000–0xFFFF 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.	0x0000–0xFFFF	0x0000	
		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			

Group P42 ModbusRTU Module

Function code	Name	Parameter 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 rectifier unit completes receiving data to the time when it sends response data to the upper computer. If the response delay is shorter than the system processing time, the system sends response data to the upper computer after processing data. If the delay is longer than the system processing time, the system does not send response data to the upper computer 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 error handling	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	0-1	0	○
P42.07-P42.10	Reserved	-	-	-	-

Group P43 CANopen module

Function code	Name	Parameter description	Setting range	Default	Modify
P43.00	Module online status	0x000–0x1FF	0x000–0x1FF	0x000	●
		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)			
P43.01	CANopen communication address	0–127	0–127	2	○
P43.02	CANopen communication baud rate (kbps)	0: 1000kbps 1: 800kbps 2: 500kbps 3: 250kbps 4: 125kbps 5: 100kbps	0–5	3	○
P43.03–P43.09	Reserved	-	-	-	-

Function code	Name	Parameter description	Setting range	Default	Modify
P43.10	Present effective card slot	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.	0x0000–0xFFFF	0x0000	●
		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			

Group P44 EtherNet module (Ethernet communication group)

Function code	Name	Parameter 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 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. (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	⊙

Group P54 DC/AC sampling card setting (reserved)

Function code	Name	Parameter description	Setting range	Default	Modify
P54.00	Module slot selection	The system supports two methods: 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.	Unsettable	0	●

Function code	Name	Parameter description	Setting range	Default	Modify														
		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. Method 2: Supports up to one AC card + one DC sampling module.																	
P54.01	Module product type	0: One-expand-three expansion modules (Reserved) 1: DC/AC voltage sampling module	0-1	1	⊙														
P54.02	Module online status	<table><tr><td colspan="2">0x00-0x3F</td></tr><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 4 module online state (0: Offline; 1: Online)</td></tr><tr><td>Bit4</td><td>EC slot 5 module online state (0: Offline; 1: Online)</td></tr><tr><td>Bit5</td><td>EC slot 6 module online state (0: Offline; 1: Online)</td></tr></table>	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	●
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)																		
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: AC690V 1: AC100V	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	0: 20K sampling frequency 1: 40K sampling frequency 2: 80K sampling frequency	0-3	3	⊙														

Function code	Name	Parameter description	Setting range	Default	Modify
	sampling mode	3: 160K sampling frequency (AC sampling card)			
P54.08	EC slot 2 module: AC sampling card voltage class	0: AC690V 1: AC100V	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: AC690V 1: AC100V	0-1	0	⊙
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	⊙

Function code	Name	Parameter description	Setting range	Default	Modify
P54.20	EC slot 6 module: AC sampling card voltage level	0: AC 690V 1: AC 100V	0-1	0	⊙

Group P80 Bit data set 1-Summary of data of BO type

Function code	Name	Parameter description	Setting range	Default	Modify
P80.00	Logic 0	0-1	0-1	0	●
P80.01	Logic 1	0-1	0-1	0	●
P80.02	DI1	0-1	0-1	0	●
P80.03	DI2	0-1	0-1	0	●
P80.04	DI3	0-1	0-1	0	●
P80.05	DI4	0-1	0-1	0	●
P80.06	DI5	0-1	0-1	0	●
P80.07	DI6	0-1	0-1	0	●
P80.08	HDI1	0-1	0-1	0	●
P80.09	HDI2	0-1	0-1	0	●
P80.10	RO1	0-1	0-1	0	●
P80.11	RO2	0-1	0-1	0	●
P80.12	RO3	0-1	0-1	0	●
P80.13	HDO1	0-1	0-1	0	●
P80.14	HDO2	0-1	0-1	0	●
P80.15	Received PZD1.0	0-1	0-1	0	●
P80.16	Received PZD1.1	0-1	0-1	0	●
P80.17	Received PZD1.2	0-1	0-1	0	●
P80.18	Received PZD1.3	0-1	0-1	0	●
P80.19	Received PZD1.4	0-1	0-1	0	●
P80.20	Received PZD1.5	0-1	0-1	0	●
P80.21	Received PZD1.6	0-1	0-1	0	●
P80.22	Received PZD1.7	0-1	0-1	0	●
P80.23	Received PZD1.8	0-1	0-1	0	●
P80.24	Received PZD1.9	0-1	0-1	0	●
P80.25	Received PZD1.10	0-1	0-1	0	●
P80.26	Received PZD1.11	0-1	0-1	0	●
P80.27	Received PZD1.12	0-1	0-1	0	●
P80.28	Received PZD1.13	0-1	0-1	0	●
P80.29	Received PZD1.14	0-1	0-1	0	●
P80.30	Received PZD1.15	0-1	0-1	0	●
P80.31	Received PZD2.0	0-1	0-1	0	●

Function code	Name	Parameter description	Setting range	Default	Modify
P80.32	Received PZD2.1	0-1	0-1	0	●
P80.33	Received PZD2.2	0-1	0-1	0	●
P80.34	Received PZD2.3	0-1	0-1	0	●
P80.35	Received PZD2.4	0-1	0-1	0	●
P80.36	Received PZD2.5	0-1	0-1	0	●
P80.37	Received PZD2.6	0-1	0-1	0	●
P80.38	Received PZD2.7	0-1	0-1	0	●
P80.39	Received PZD2.8	0-1	0-1	0	●
P80.40	Received PZD2.9	0-1	0-1	0	●
P80.41	Received PZD2.10	0-1	0-1	0	●
P80.42	Received PZD2.11	0-1	0-1	0	●
P80.43	Received PZD2.12	0-1	0-1	0	●
P80.44	Received PZD2.13	0-1	0-1	0	●
P80.45	Received PZD2.14	0-1	0-1	0	●
P80.46	Received PZD2.15	0-1	0-1	0	●
P80.47	PC/Modbus CW 2.0	0-1	0-1	0	●
P80.48	PC/Modbus CW 2.1	0-1	0-1	0	●
P80.49	PC/Modbus CW 2.2	0-1	0-1	0	●
P80.50	PC/Modbus CW 2.3	0-1	0-1	0	●
P80.51	PC/Modbus CW 2.4	0-1	0-1	0	●
P80.52	PC/Modbus CW 2.5	0-1	0-1	0	●
P80.53	PC/Modbus CW 2.6	0-1	0-1	0	●
P80.54	PC/Modbus CW 2.7	0-1	0-1	0	●
P80.55	PC/Modbus CW 2.8	0-1	0-1	0	●
P80.56	PC/Modbus CW 2.9	0-1	0-1	0	●
P80.57	PC/Modbus CW 2.10	0-1	0-1	0	●
P80.58	PC/Modbus CW 2.11	0-1	0-1	0	●
P80.59	PC/Modbus CW 2.12	0-1	0-1	0	●

Function code	Name	Parameter description	Setting range	Default	Modify
P80.60	PC/Modbus CW 2.13	0-1	0-1	0	●
P80.61	PC/Modbus CW 2.14	0-1	0-1	0	●
P80.62	PC/Modbus CW 2.15	0-1	0-1	0	●

Group P98 AIAO calibration functions

Function code	Name	Parameter description	Setting range	Default	Modify
P98.00	Calibration parameter group password	00000	0-65535	0	○
P98.01	AD sampling value of AI1 voltage input	0-4095	0-4095	0	●
P98.02	AI1 reference voltage 1	Input of 0V -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	Input of 10V 6.00-10.50V (Only voltages in this range are calibrated.)	6.00-10.50	10.00V	○
P98.05	AD sampling value corresponding to AI1 reference voltage 2	AD sampling value of AI1 at 10V input 0-4095	0-4095	4095	○
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	0-4095	0-4095	4095	○

Function code	Name	Parameter description	Setting range	Default	Modify
	AI1 reference current 2				
P98.11	AD sampling value of AI2 voltage input	0–4095	0–4095	0	●
P98.12	AI2 reference voltage 1	Input of 0V -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	Input of 10V 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	○
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	○

Function code	Name	Parameter description	Setting range	Default	Modify
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	○
P98.29–P98.86	Reserved	-	-	-	-

Goup P99 Factory parameters

Function code	Name	Parameter 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 rectifier unit. This affects the unit rated power and current. P99.03=400V 0: 718A 1: 980A 2: 1336A 3: 1822A 4: 2734A 5: 3645A 6: 4556A 7: 5476A P99.03=690V 0: 570A 1: 815A 2: 1061A 3: 1515A 4: 2273A 5: 3031A 6: 3788A 7: 4546A	0–7	Model depended	◎

Function code	Name	Parameter description	Setting range	Default	Modify
P99.02	Entire machine rated power (No overload)	0-6553.5kW	0-6553.5	Model depended	●
P99.03	Unit rated voltage class	0-1 0: -4 model 1: -6 model	0-1	Model depended	◎
P99.04	Entire machine rated current (No overload)	0.0-6553.5A	0.0-6553.5	Model depended	●
P99.05- P99.12	Reserved	-	-	-	-

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Shenzhen INVT Electric Co., Ltd.

Address: INVT Guangming Technology Building, Songbai Road, Matian,
Guangming District, Shenzhen, China

INVT Power Electronics (Suzhou) Co., Ltd.

Address: No. 1 Kunlun Mountain Road, Science & Technology Town,
Gaoxin District, Suzhou, Jiangsu, China

Website: www.invt.com



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