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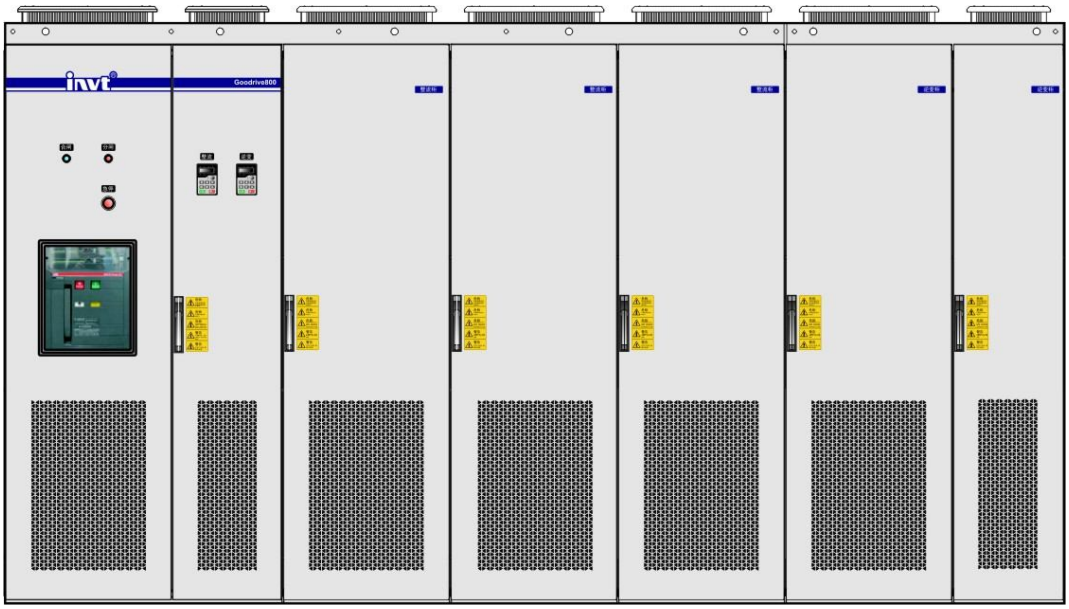
Operation Manual

Software manual of

Goodrive800 series PWM rectifier



SHENZHEN INVT ELECTRIC CO., LTD.

Preface

Thank you for purchasing our products.

Please read this manual carefully before any application.

Goodrive800 series products are developed for sophisticated applications with high overload capacity, high reliability, and continuous operations. Its rated current is designed for various heavy-load devices such as metallurgy, petroleum, petrochemical, municipal, chemical, electric power, building materials, mining, automotive, shipbuilding, paper and other industries.

Goodrive800 series products apply international module, can provide rectifier unit, IGBT or whole cabinet to meet the requirement of the end, OEM and system integrated clients. Different modules can be combined flexibly according to different requirement on the basic of standard configuration. Not only the user is satisfied, excellent reliability of Goodrive800 series product is embedded. Various solution applications are also provided to improve the convenient application.

The manual of Goodrive800 provides detailed instruction of installation and commissioning, electrical connections, parameter setting, common troubleshooting and routine maintenance. Please read corresponding manual during installation, commissioning and application to ensure proper use and long service life of the product.

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

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

The manual of Goodrive800 includes:

Hardware manual of Goodrive800 series products;

Software manual of Goodrive800 series products;

Commissioning manual of Goodrive800 series products;

Installation and maintenance manual of Goodrive800 series products and***;***

Application manual of Goodrive800 series products.

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Chapter 1 Safety precautions

Please read this manual carefully and follow all safety precautions before moving, installing, operating and servicing the inverter. If ignored, physical injury or death may occur, or damage may occur to the devices.

If any physical injury or death or damage to the devices occurs for ignoring to the safety precautions in the manual, our company will not be responsible for any damages and we are not legally bound in any manner.

1.1 Safety definition

Danger: Serious physical injury or even death may occur if not follow relevant requirements.

Warning: Physical injury or damage to the devices may occur if not follow relevant requirements.

Note: Physical hurt may occur if not follow relevant requirements.

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

1.2 Warning symbols

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

Symbols	Name	Instruction	Abbreviation
 Danger	Danger	Serious physical injury or even death may occur if not follow the relative requirements	
 Warning	Warning	Physical injury or damage to the devices may occur if not follow the relative requirements	
 Do not	Electrostatic discharge	Damage to the PCBA board may occur if not follow the relative requirements	
 Hot sides	Hot sides	Sides of the device may become hot. Do not touch.	
Note	Note	Physical hurt may occur if not follow the relative requirements	Note

1.3 Safety guidelines

✧ Only qualified electricians are allowed to operate on the inverter.

✧ Do not carry out any wiring and inspection or changing components when the power supply is applied. Ensure all input power supply is disconnected before wiring and checking and always wait for at least the time designated on the inverter or until the DC bus voltage is less than 36V. Below is the table of the waiting time:

Voltage degree of Goodrive800 series products	Minimum waiting time
400V	15 minutes
660V	

✧ Do not refit Goodrive800 series products unauthorized; otherwise fire, electric shock or other injury may occur.

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

✧ The electrical parts and components inside Goodrive800 series products are electrostatic. Take measurements to avoid electrostatic discharge during relevant operation.

1.3.1 Delivery and installation

⚠	✧ Use special tools to install and remove the unit. ✧ Use crane to install the whole machine. ✧ Do not install Goodrive800 series products on combustible materials and avoid them to contact any combustible materials. ✧ Connect the optional parts according to the wiring diagram. ✧ Prevent dumping in installation because the gravity of the unit is high. ✧ Ensure that no other objects, such as screws, cable, left in the cabinet or Goodrive800 series products after installation or maintenance, otherwise damage may occur. ✧ Do not operate if there is any damage or components loss. ✧ Do not touch Goodrive800 series products with wet items or some part of the body, electric shock may occur.

Note:

✧ Select appropriate moving and installing tools to ensure a safe and normal running of the inverter and avoid physical injury or death. For physical safety, the erector should take some mechanical protective measurements, such as wearing exposure shoes and working uniforms.

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

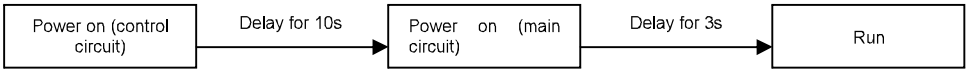
✧ Install away from children and other public places.

✧ Goodrive800 series products cannot meet the requirements of low voltage protection in IEC61800-5-1 if the sea level of installation site is above 2000m.

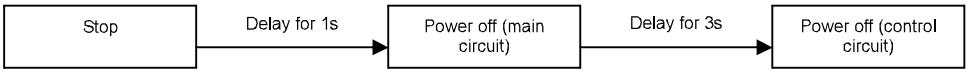
✧ The leakage current of Goodrive800 series products may be above 3.5mA during operation. Ground with proper techniques and ensure the grounding resistor is less than 10Ω. The conductivity of PE grounding conductor is the same as that of the phase conductor (with the same cross sectional area).

1.3.2 Commissioning and running

Time sequence of power on:



Time sequence of power off:



1.3.3 Commissioning and running

⚠	✧ Disconnect all power supplies applied to Goodrive800 series products before the terminal wiring and wait for at least the designated time after disconnecting the power supply. ✧ Check the connection of cable before power on. ✧ If the auxiliary control power of Goodrive800 series products is provided by external device, all power supplies are not disconnected. Check according to the diagram because voltage may be present when the device is not started, otherwise physical injury may occur. ✧ The operator can not touch the electrical parts in the cabinet directly. Pay attention when process the metal shield. ✧ Do not carry out any withstand voltage test in unit connection. Disconnect the motor cable before any isolation or withstand voltage test to the motor or motor cable. ✧ High voltage is present inside the product during running. Do not open the cabinet door.

	✧ The inverter may start up by itself when P01.21=1. Do not get close to the product and motor. ✧ Voltage is also present on the motor terminals even if the motor does not rotate. ✧ “E-stop” of the device is for the disconnection of input power supply but not for the use of “E-stop device”. ✧ The device can not be used to break the motor suddenly. A mechanical braking device should be provided. ✧ Follow below precautions: 1. All input power supplies are disconnected (including the main and control power supply). 2. Permanent magnet synchronous motor has stopped and the measured output voltage of Goodrive800 series products is less than 36V. 3. The waiting time after permanent magnet synchronous motor stopping is no less than the designated time on Goodrive800 series products and the measured voltage between (+) and (-) is less than 36V. 4. Ensure the motor does not rotate again during operation. It is recommended to install external braking devices or switch off the direct electrical connection between permanent magnet synchronous motor and Goodrive800 series products.

Note:

✧ Do not switch on or off the input power supply of Goodrive800 series products frequently.

✧ For Goodrive800 series products that have been stored for a long time, check and fix the capacitance and try to run it again before utilization (see Installation and Maintenance Manual).

✧ Cover the cabinet door before running, otherwise electric shock may occur.

1.3.4 Maintenance and replacement of components

	✧ Only qualified electricians are allowed to perform the maintenance, inspection, and components replacement of Goodrive800 series products. ✧ Disconnect all power supplies to Goodrive800 series products before the terminal wiring. Wait for at least the time designated on Goodrive800 series products after disconnection. ✧ Take measures to avoid screws, cables and other conductive matters to fall into Goodrive800 series products during maintenance and component replacement. ✧ Operating optical fiber should be very careful. Do not touch the plug fiber optic fiber, because ✧ Operate the optical fiber carefully. Do not touch the conduction-section (glass fiber) when plugging and inserting, because the fiber optic section (glass fiber) is extremely sensitive to dirt. The minimum bend radius of the optical fiber is 35 mm.

Note:

✧ Please select proper torque to tighten screws.

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

✧ Do not carry out any isolation and pressure test on the inverter and do not measure the control circuit of the inverter by megameter.

1.3.5 What to do after scrapping

	✧ There are heavy metals in Goodrive800 series products. Deal with it as industrial effluent.

Chapter 2 Inspection before power on

2.1 Unpacking inspection

Check as followings after receiving products:

1. Check that there are no damage and humidification to the package.
2. Check the information on the type designation label on the outside of the package to verify that the drive is of the correct type.
3. Check that there are no signs of water in the package and no signs of damage or breach to the inverter.
4. Check the information on the type designation label on the outside of the package to verify that the name plate is of the correct type.
5. Check to ensure the accessories (including user's manual, control keypad and extension card) inside the device is complete.

If any problem, please contact with local dealers or INVT offices.

2.2 Application confirmation

Check the machine before beginning to use the product:

1. Check the load type to verify that there is no overload of Goodrive800 series products during work and check that whether the drive needs to modify the power degree.
2. Check the product meets the requirements of the communication mode.
3. Check the grid voltage is in the allowable input voltage range of Goodrive800 series products.
4. Check that the actual current of the motor is less than the rated current of Goodrive800 series products.

2.3 Environment

Check as followings before the actual installation and usage:

1. Check that the ambient temperature of Goodrive800 series products is below 40℃. If exceeds, derate 3% for every additional 1℃. Additionally, Goodrive800 series products can not be used if the ambient temperature is above 50℃.
2. Check that the ambient temperature of Goodrive800 series products in actual usage is above -10℃. If not, add heating facilities.
3. Check that the altitude of the actual usage site is below 1000m. If exceeds, derate1% for every additional 100m.
4. Check that the humidity of the actual usage site is below 90% and condensation is not allowed. If not, add additional protection inverters.
5. Check that the actual usage site is away from direct sunlight and foreign objects can not enter Goodrive800 series products. If not, add additional protective measures.
6. Check that there is no conductive dust or flammable gas in the actual usage site. If not, add additional protection to inverters.

2.4 Installation confirmation

Check as followings after the installation:

1. Check that the load range of the input and output cables meet the need of actual load.
2. Check that the accessories of Goodrive800 series products are correctly and properly installed. The installation cables should meet the needs of every component (including reactors, input filters, output reactors, output filters, DC reactors, braking units and braking resistors).

3. Check that Goodrive800 series product is installed on non-flammable materials and the calorific accessories (reactors and brake resistors) are away from flammable materials.
4. Check that all control cables and power cables are run separately and the routation complies with EMC requirement.
5. Check that all grounding systems are properly grounded according to the requirements of Goodrive800 series products.
6. Check that the free space during installation is sufficient according to the instructions in user's manual.
7. Check that the installation conforms to the instructions in user's manual. The drive must be installed in an upright position.
8. Check that the external connection terminals are tightly fastened and the torque is appropriate.
9. Check that there are no screws, cables and other conductive items left in Goodrive800 series products.

Chapter 3 Working principle of PWM rectifier

The main circuit of PWM rectifier unit includes the main contactor, pre-charging circuit, the LC filter circuit, input main reactor, IGBT power modules, electrolytic capacitors and other components. Dual closed-loop control structure is also applied. The outer loop is the bus voltage loop and the inner loop of the current loop. The reactive current component of the input grid current can be controlled by the voltage phase detection and coordinate transformation and regulation of PI regulator. When the controlled reactive current is 0, the power factor of the rectifier can be close to 1 and the energy can flow in both directions.

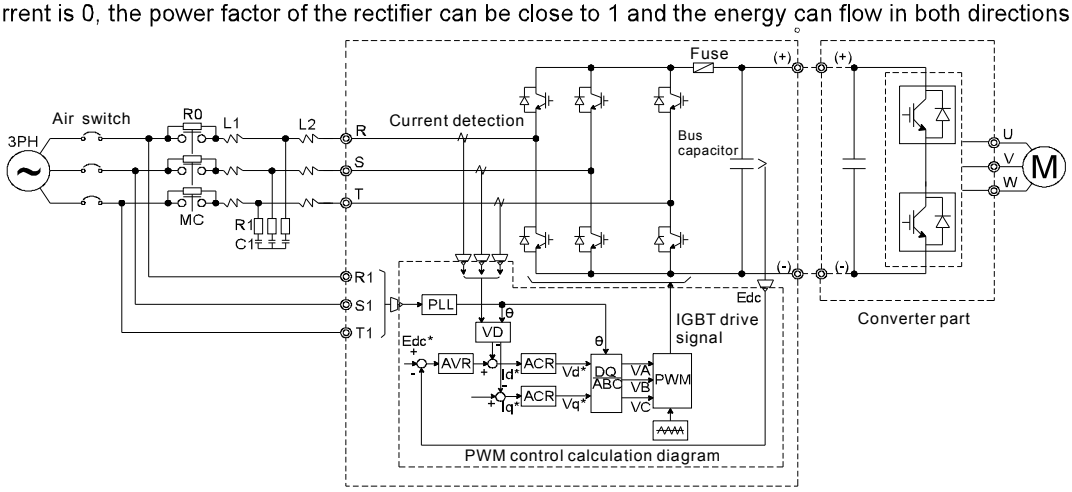


Figure 3-1 PWM rectifier

Note: AVR is the automatic voltage regulator module; ACR is the automatic current adjustment module; VD is the vector control module; PWM is the pulse width modulation; PLL is the phase-locked loop; L1, R1 and C1 are power filters; L2 is the boost inductor; R0is the power buffer resistor; MC is the power buffer contactor; Edc is the bus voltage , the value with "*" is the settings, the value without "*" is the detection value, θ is the network voltage phase angle.

PWM rectifier unit can adjust the bus voltage through AVR to maintain a stable setting value; at the same time, AVR output is the input of ACR and PWM rectifier can control the ACR output according to the detected 3-phase current. PWM rectifier detects 3-phase input voltage and calculates the real-time phase through PLL to ensure that the PWM rectifier output voltage phase synchronizes with the grid of the actual phase. ACR output is convertered into drive signal through space voltage vector modulation to control PWM rectifier.

PWM rectifier and inverter is a four-quadrant inverter. Goodrive800 series products can be used for the cases with potential load, such as elevator, traction, oil pumps, and centrifuges and so on. In some applications of big power, four-quadrant inverter is also needed to reduce the harmonic pollution of the grid. The inverter with PWM rectifier has the function of four-quadrant function, so it can meet various requirements of potential loads and converter the regenerative energy into electric power to feed back to the grid.

PWM rectifiers can converter 3-phase power into DC voltage and feed back to the DC bus. The DC circuit which connects to one or multiple IGBT, can provide power supply to the IGBT of the motor.

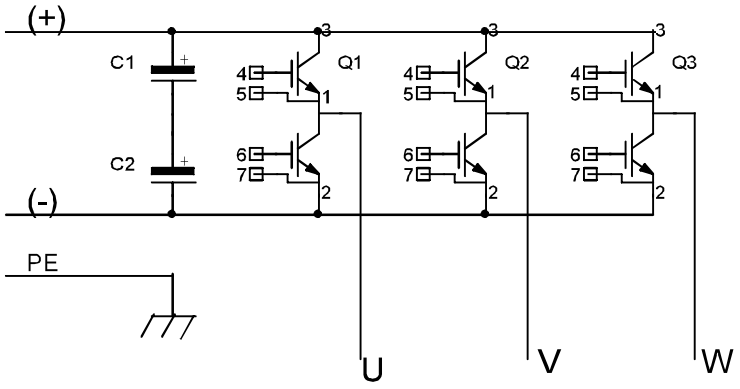


Figure 3-2 Principle diagram of power unit electric circuit

The rectifier can monitor the control power supply of AC overvoltage, phase loss, IGBT overtemperature, overcurrent, overload, pre-charging. If any fault occurs, it will lock the pulse signal and send a fault signal. The fault signal can be reset through repower the AC power supply or control power supply.

Chapter 4 Keypad operation

4.1 Keypad

The keypad is used to control Goodrive800 PWM rectifier, read state data and adjust the parameters.

Figure 4-1 Keypad

No.	Name	Description		
1	State indicators	RUN/TUNE	LED off means that PWM rectifier is in the stopping state; LED on means PWM rectifier is in the running state.	
		FWD/REV	FED/REV LED LED off means the grid is in the forward rotation state; LED on means the grid is in the reverse rotation state.	
		LOCAL/REMOT	LED for keypad operation, terminals operation and remote communication control LED off means that the keypad controls the operation state; LED blinking means that the terminal controls the operation state; LED on means the operation state is controlled by the remote control.	
		TRIP	LED for faults LED on when PWM rectifier is in the fault state; LED off in normal state; LED blinking means PWM rectifier is in the pre-alarm state.	
2	Unit indicators	Mean the unit displayed currently		
			Hz	Frequency unit
			RPM	Rotating speed unit
			A	Current unit
			%	Percentage
			V	Voltage unit
3	Digital display	5-figure LED display displays various monitoring data and alarm code such as set frequency and output frequency.		

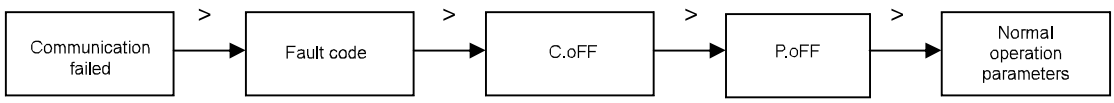
Displayed word	Corresponding word	Displayed word	Corresponding word	Displayed word	Corresponding word

No.	Name	Description					
		0	0	1	1	2	2
		3	3	4	4	5	5
		6	6	7	7	8	8
		9	9	A	A	b	B
		C	C	d	d	E	E
		F	F	H	H	I	I
		L	L	N	N	n	n
		o	o	P	P	r	r
		S	S	t	t	U	U
		v	v	.	.	-	-
4	Buttons	PRG ESC	Programming key	Enter or escape from the first level menu and remove the parameter quickly			
		DATA ENT	Entry key	Enter the menu step-by-step Confirm parameters			
		∧	UP key	Increase data or function code progressively			
		∨	DOWN key	Decrease data or function code progressively			
		SHIFT	Right-shift key	Move right to select the displaying parameter circularly in stopping and running mode. Select the parameter modifying digit during the parameter modification			
		RUN	Run key	This key is used to operate on the inverter in key operation mode			
		STOP RST	Stop/ Reset key	This key is used to stop in running state and it is limited by function code P07.04 This key is used to reset all control modes in the fault alarm state			
		QUICK JOG	Quick key	The function of this key is confirmed by function code P07.02.			

4.2 Keypad displaying

The keypad displaying state of Goodrive800 series products is divided into stopping state parameter, running state parameter, function code parameter editing state and fault alarm state and so on.

Priority of the displaying



4.2.1 Displayed state of stopping parameter

When PWM rectifier is in the stopping state, the keypad will display stopping parameters which is shown in figure 4-2.

In the stopping state, various kinds of parameters can be displayed. Select the parameters to be displayed or not by P07.05. See the instructions of P07.05 for the detailed definition of each bit.

In the stopping state, there are 15 stopping parameters can be selected to be displayed or not. They are: DC bus voltage (V), grid frequency(Hz), input voltage(V), input current(A), input power factor, Active current component (%), re Active current component (%), (% LED blinking), state of input terminal, state of output terminal, AI1 (V), AI2 (V), AI3 (V), input apparent power(kVA), input active power (kW) and input reactive power(kVar) and so on.

》/SHIFT can shift the parameters form left to right, QUICK/JOG(P07.02=2) can shift the parameters form right to left.

4.2.2 Displayed state of running parameters

After PWM rectifier receives valid running commands, PWM rectifier will enter into the running state and the keypad will display the running parameters. RUN/TUNE LED on the keypad is on, while the FWD/REV is determined by the current running direction which is shown as figure 4-2.

In the running state, the displayed parameters are the same as those of stopping state.

4.2.3 Displayed state of fault

If PWM rectifier detects the fault signal, it will enter into the fault pre-alarm displaying state. The keypad will display the fault code by flicking. The TRIP LED on the keypad is on, and the fault reset can be operated by the STOP/RST on the keypad, control terminals or communication commands.

4.2.4 Displayed state of function codes editing

In the state of stopping, running or fault, presses PRG/ESC to enter into the editing state (if there is a password, see P07.00).The editing state is displayed on two classes of menu, and the order is: function code group/function code number→function code parameter, press DATA/ENT into the displayed state of function parameter. On this state, press DATA/ENT to save the parameters or press PRG/ESC to escape.

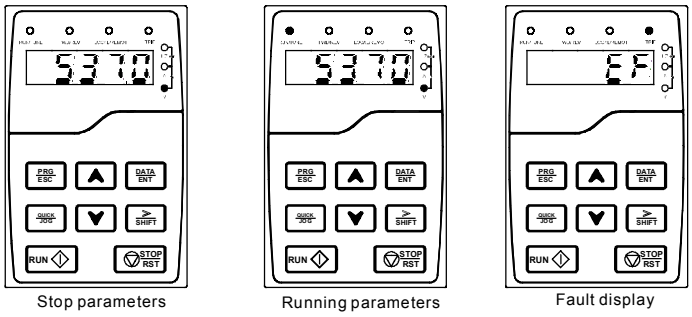


Figure 4-2 Displayed state

4.3 Keypad operation

Operate PWM rectifier via operation panel. See the detailed structure description of function codes in the brief diagram of function codes.

4.3.1 How to modify the function codes

PWM rectifier has three levels menu, which are:

1. Group number of function code (first-level menu)
2. Tab of function code (second-level menu)
3. Set value of function code (third-level menu)

Remarks: Press both the PRG/ESC and the DATA/ENT can return to the second-level menu from the

third-level menu. The difference is: pressing DATA/ENT will save the set parameters into the control panel, and then return to the second-level menu with shifting to the next function code automatically; while pressing PRG/ESC will directly return to the second-level menu without saving the parameters, and keep staying at the current function code.

Under the third-level menu, if the parameter has no flickering bit, it means the function code cannot be modified. The possible reasons could be:

1) This function code is not modifiable parameter, such as actual detected parameter, operation records and so on;

2) This function code is not modifiable in running state, but modifiable in stop state.

Example: Set function code P00.01 from 0 to 1.

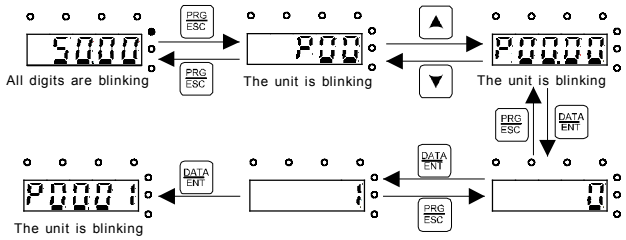


Figure 4-2 Sketch map of modifying parameters

4.3.2 How to set the password of the rectifier

Goodrive800 PWM rectifier provides password protection function to users. Set P7.00 to gain the password and the password protection becomes valid instantly after quitting from the function code editing state. Press PRG/ESC again to the function code editing state, "0.0.0.0.0" will be displayed. Unless using the correct password, the operators cannot enter it.

Set P7.00 to 0 to cancel password protection function.

The password protection becomes effective instantly after retreating form the function code editing state. Press PRG/ESC again to the function code editing state, "0.0.0.0.0" will be displayed. Unless using the correct password, the operators cannot enter it.

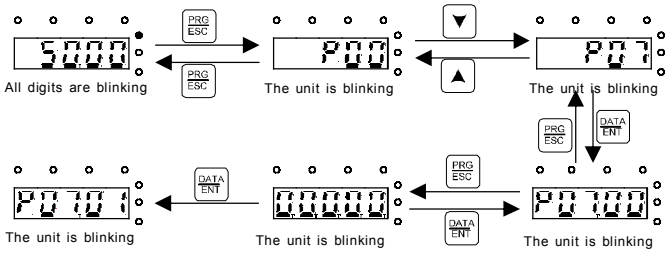


Figure 4-4 Sketch map of password setting

4.3.3 How to view the rectifier state through function codes

Goodrive800 series provide group P18 and P19 as the state inspection group. Users can enter into P18 and P19 directly to watch the state.

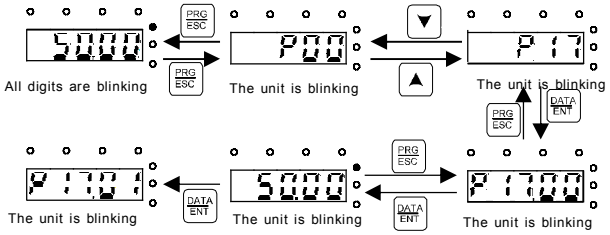


Figure 4-5 Sketch map of state viewing

Chapter 5 Detailed function description

P00 group Basic functions

Function code	Name	Description	Setting range	Default
P00.00	Operation mode	0: Rectifier mode (normal operation) 1: Converter mode (reserved)	0~1	0

The parameter is used to set the operation mode.

Function code	Name	Description	Setting range	Default
P00.01	Control command channel	0: Keypad (LED off) 1:Terminal (LED blinking) 2: Communication (LED on)	0~2	0

The parameter is used to select the control command channel of PWM rectifier.

The commands include: start, stop, and fault reset and so on.

0: Keypad ("LOCAL/REMOT" off)

RUN and STOP/RST on the keypad control the command.

1: Terminal ("LOCAL/REMOT" blinking)

Multi-function terminals control the operation commands.

2: Communication ("LOCAL/REMOT" on)

Communication controls the operation mode.

Function code	Name	Description	Setting range	Default
P00.02	Communication command channel	0:485 communication 1:PROFIBUS communication 2:Ethernet communication 3:CAN communication (reserved) 4:DEVICE_NET communication (reserved)	0~4	0

The parameter is used to select the communication command of PWM rectifier.

Note: 1, 2, 3 and 4 are extension functions, and corresponding extension card is needed.

Function code	Name	Description	Setting range	Default
P00.03	Operation channel	0:COSφ mode 1: Reactive power compensation mode 2: Current closed loop mode	0~2	0

The parameter is used to select the operation channel of PWM rectifier.

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

1: Reactive power compensation mode; reactive current is determined by the set channel.

2: Current closed loop mode; active current is determined by the set channel and reactive current is determined by the power factor.

Note: mode 0 and 1 have voltage loop and it is necessary to set P03 group, but it is not necessary to set the parameters in mode 2.

Function code	Name	Description	Settin g range	Default
P00.04	Setting mode of DC bus voltage	0:Aotumatic 1:Keypad 2:Communication	0~2	1
P00.05	DC bus voltage setting	300.0~2000.0V	300.0~2000.0	Depend on model
P00.06	Setting channel of DC bus voltage	0:485 communication 1:PROFIBUS communication 2:Ethernet communication 3:CAN communication (reserved) 4:DEVICE_NET communication (reserved)	0~4	0

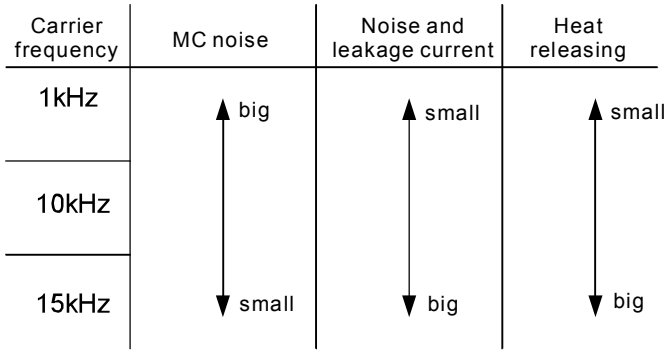
When P00.04=1, P 00.05 set DC voltage by keypad.

When P00.04=2, P00.06 select the setting channel of DC bus voltage.

The relationship between voltage and DC bus voltage:

Model	Default value of DC bus voltage (P00.05)	Overvoltage point
380V	680V	800V
660V	1050V	1200V

Function code	Name	Description	Setting range	Default
P00.07	Carrier frequency setting	2.0~8.0kHz	2.0~8.0	3.0



The advantages of high carrier frequency: optimal current waveform, low current harmonics, low motor noise;

Disadvantages of high carrier frequency: increased switching loss, increased temperature rise, affected output capacity, derated operation of PWM rectifier, increased leakage current as well as increased electromagnetic interference to the outside.

If low carrier frequency is used, the situation will be in contrast with the above. Too low carrier frequency will cause unstable operation at low frequency, lowered torque and even oscillation.

Before shipment, the carrier frequency has been set properly. In general cases, the user needs not to modify this parameter.

Function code	Name	Description	Setting range	Default
P00.08	PWM modulation	0: Two-phase modulation	0~1	1

Function code	Name	Description	Setting range	Default
		1: Three-phase modulation		

1. Two-phase modulation has less switch loss and lower temperature-rising, but higher harmonic and more total THD.

2. Three-phase modulation has more switch loss and higher temperature-rising, but lower harmonic and less total THD.

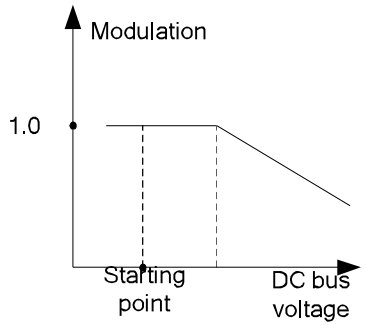
The user can select according to application site and environment. Generally, the two-phase modulation has less loss, but three-phase modulation has fewer harmonics.

Function code	Name	Description	Setting range	Default
P00.09	Overmodulation selection	0: Invalid 1: Valid	0~1	0

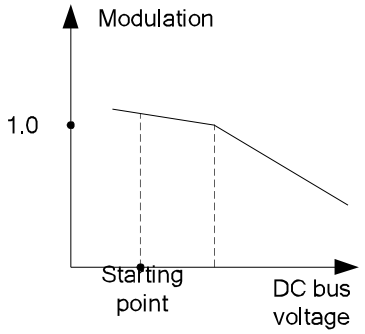
Overmodulation function is valid when the bus voltage is less than √2 of the actual input voltage.

Note: it is not recommended to use the overmodulation in normal situation.

In the beginning of PWM rectifier, overmodulation may occur because of lower DC voltage. Overmodulation operation makes some harmonic suppression sub-standard to ensure enough current fundamental. If the load is heavy in starting, it is recommended to enable the overmodulation.



A) Invalid



B) Valid

Function code	Name	Description	Setting range	Default
P00.10	Operation mode of the fan	0:Normal 1: Operate after power on	0~1	0

The parameter is used to set the operation mode of the fan.

0: Normal operation mode; after the rectifier receives the command or the detected temperature exceeds 45℃ or the module temperature is above 50% or the rated current, the fan begins to work.

1: The fan keeps running after power on (generally for the cases with high temperature and humidity)

Function code	Name	Description	Setting range	Default
P00.15	Function parameters restore	0: Disabled 1: All parameters restore default 2: Delete recent fault log 3: Clear accumulated electricity consumption	0~3	0

0: Disabled

1: All parameters restore default: restore to the default values

2: Delete recent fault log

3: Clear accumulated electricity consumption

Note: After the operation of the selected function is completed, this function code automatically recovers to 0. Password may be cleared, so please use the function with caution.

Function code	Name	Description	Setting range	Default
P00.16	Function parameters	0: For write/read 1: For read only	0~1	0

Note: if P00.16=1, other function codes are for read only except P00.16.

P01 group Power control and protection functions

Function code	Name	Description	Setting range	Default
P01.00	Valid bit control	0x00~0x3F	0x00~0x3F	0x3F

Each bit stands for a unit. If BIT0 is 1, then unit 1 is valid, but if BIT0 is 0, then unit 1 is invalid.

The parameter is used for system derating when fault occurs to the unit.

BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
Unit 6	Unit 5	Unit 4	Unit 3	Unit 2	Unit 1

The parameter is limited by P17.03, only the corresponding bit of P17.03 is 1, the corresponding setting unit is valid.

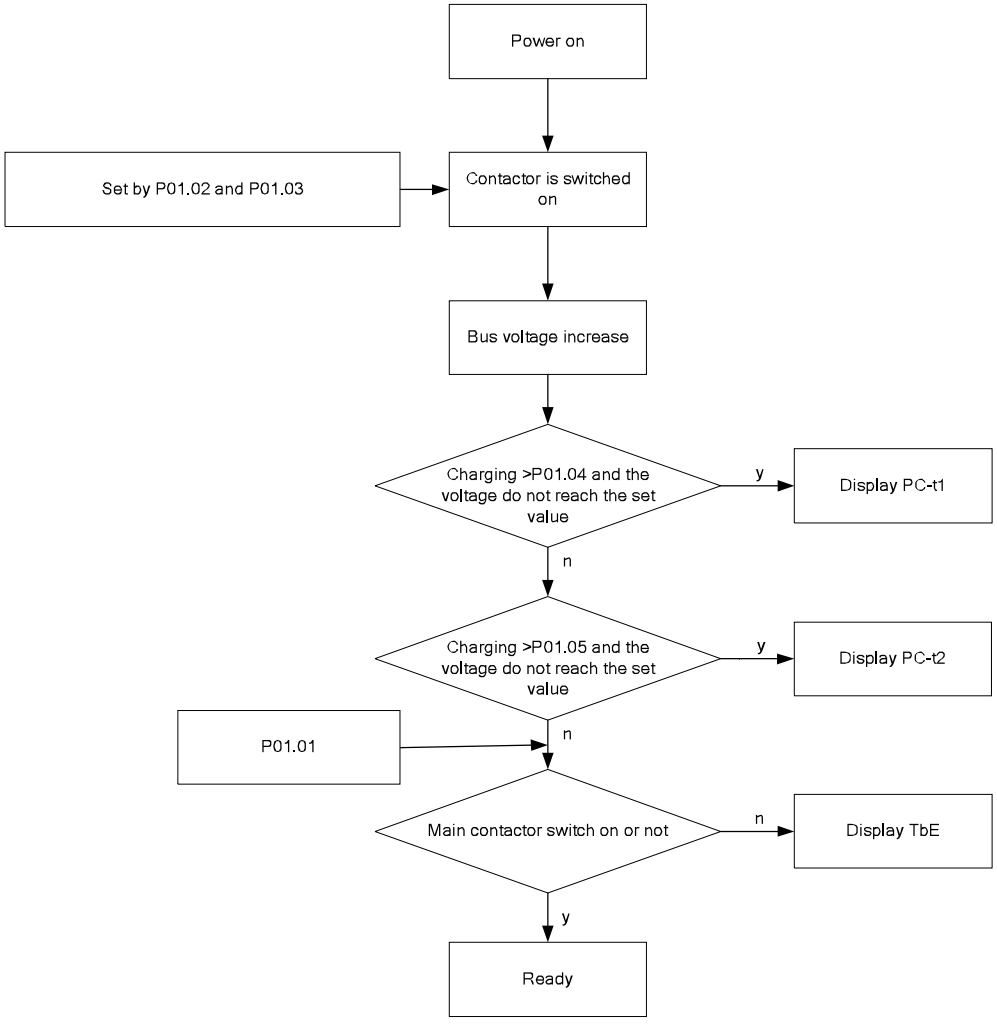
Function code	Name	Description	Setting range	Default
P01.01	Main contactor detection	0: No detection 1: Detection	0~1	1

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

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

When P01.01=0, then there is no detection.

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



Function code	Name	Description	Setting range	Default
P01.02	Power-on buffer control mode (Buffer contactor)	0:Switch on automatically after power on 1: Terminal 2: Communication	0~2	0
P01.03	Control communication channel	0:485 communication 1:PROFIBUS communication 2:Ethernet communication 3:CAN communication (reserved) 4:DEVICE_NET communication (reserved)	0~4	0

Set the control mode of power on buffer.

When P01.02=0, the buffer contactor may switch on when power on.

When P01.02=1 and 2, the buffer contactor switch on according to the commands.

Function code	Name	Description	Setting range	Default
P01.04	Timeout 1	0.01~10.00s	0.01~10.00	1.00s
P01.05	Timeout 2	0.01~10.00s	0.01~10.00	3.00s

Note: there is no power buffer in CoFF state, the system will power on when CoFF state changes into P.oFF state.

If the charging time exceeds P01.04 and the DC voltage does not reach 50% of the rated AC peak voltage, it will report PC-t1.

If the charging time exceeds P01.05 and the DC voltage does not reach 85% of the rated AC peak voltage, it will report PC-t2.

The system will buffer again if the fault resets.

Function code	Name	Description	Setting range	Default
P01.06	Waiting time of automatic operation	0~3600.0s 0.0: Invalid	0~3600.0	0.0s

The time is the waiting time between the successful detection and automatic operation before the automatic operation of the system.

When P01.06=0.0s, the automatic operation is invalid. If P01.06≠0.0s, the system will lock phase after power on in rectifying mode. The system will operate automatically if it lock phase and detects successfully.

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

Note: the diode rectifier mode is always valid and the DC bus always have voltage no mater the automatic operation is valid or not.

Function code	Name	Description	Setting range	Default
P01.07	Delay time of automatic fault reset	0.0~3600.0s	0.0~3600.0	1.0s
P01.08	Fault reset times	0~10	0~10	0

P01.07 is valid when P01.08 is not 0.

The automatic fault reset is invalid if P01.08 is 0.

When P01.08 is not 0, fault reset is enabled. And the system will operate automatically after the time of P01.07.

For following faults, fault reset is invalid.

E–ASC, E–SLE, EF, dIS, PC_T1, PC_T2, m.OUT1, m.OUT2, m.OUT3, m.OH1, m.OH2, m.EF1, m.EF2, m.EF3, m.UP-C, m.dn-C.

Note: it will report fault if continuous reset exceeds the value.

P02 group Master-slave control

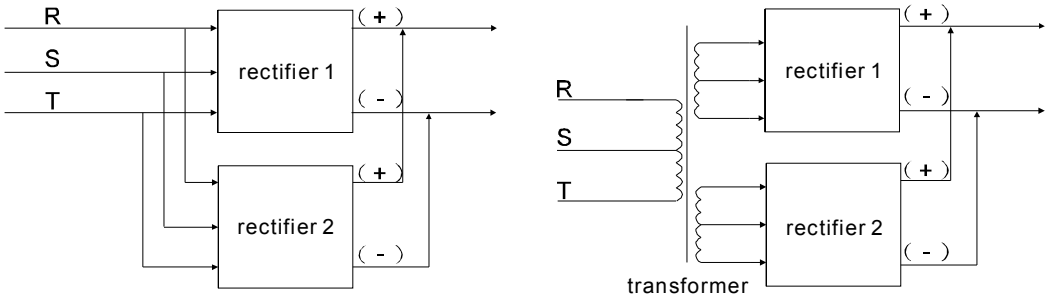
Function code	Name	Description	Setting range	Default
P02.00	Rectifier control mode	0: Single machine mode 1: Master-slave control 1 (PWM synchronous mode) 2: Master-slave control 2 (Control word mode)	0~2	0

Select the rectifier control mode.

Single machine mode: Master-slave invalid

Master-slave control 1: For the application without input isolation transformer (only fiber)

Master-slave control 2: For the application with input isolation transformer



Function code	Name	Description	Setting range	Default
P02.01	Master-slave mode selection	0: Master 1: Slave	0~1	0

When P02.00 is not 0, set the local as the master or salve.

Function code	Name	Description	Setting range	Default
P02.02	Master-slave communication mode selection	0: Optical fiber communication 1:485 communication 2:PROFIBUS communication 2:Ethernet communication 4:CAN communication (reserved) 5:DEVICE_NET communication (reserved)	0~5	0

Select the master-slave communication mode.

Note: mode 1 can only applies optical fiber communication (the master send PWM signal to the slave). Communication 0~5 are applied to mode 2 (the master sends control signal to the slave).

Note: the communication 2~5 needs extension cards.

Function code	Name	Description	Setting range	Default
P02.03	Partition coefficient of the active current	0.0%~200.0%	0~200.0	100.0%

When P02.00=2, the setting value of active current=setting value of master active current*P02.03.

Function code	Name	Description	Setting range	Default
P02.04	Slave operation command	0: The local 1: The master	0~1	0

The operation, stopping and resetting of the slave can be controlled by the master or by itself. If it is controlled by the master, the operation mode of the slave is synchronous with the master (in mode 1, the function of reset can not be synchronous).

Note: when P02.04=1 and the master is in the stopping and fault state, the salve can not operate.

Function code	Name	Description	Setting range	Default
P02.05	Fault processing of the slave	0: Stopping 1: Keep running	0~1	0

Only valid for the master in mode 2.

When fault occurs to the slave, the master acts. The master stops or not when it receives the fault information of the slave.

Note: the slave will stop when the master stops.

Function code	Name	Description	Setting range	Default
P02.06	Slave bypass	0: Disable 1: Enable	0~1	0

Only valid for the master in mode 2.

If one slave reports fault but can not reset in multiple-slave system, the slave can be bypassed to ensure the normal operation of the whole system.

Function code	Name	Description	Setting range	Default
P02.07	Slave number display	0~16	0~16	0

In master-slave mode 2, the function code is used to display the slave number controlled by the master.

P03 group Control parameters

Function code	Name	Description	Setting range	Default
P03.00	Setting channel of active current	0: Keypad 1:AI1 2:AI2 3:AI3 4: Communication	0~4	0

P00.03=2, select the setting channel of active current.

Function code	Name	Description	Setting range	Default
P03.01	Keyboard setting of active current	-150.0%~150.0%(rated current of the rectifier)	-150.0~150.0	0.0%

When P00.03=2 and P03.00=0, the active current is set by the keypad.

Function code	Name	Description	Setting range	Default
P03.02	Reference channel of active current commendation	0:485 communication 1:PROFIBUS 2:Ethernet communication 3:CAN communication (reserved) 4:DEVICE_NET communication (reserved)	0~4	0

When P00.03=2 and P03.00=4, select the communication channel of active current.

Function code	Name	Description	Setting range	Default
P03.03	Setting channel of reactive current	0:Keypad 1:AI1 2:AI2 3:AI3 4:Communication	0~4	0

P00.03=1, select the setting channel of reactive current.

Function code	Name	Description	Setting range	Default
P03.04	Keyboard setting of reactive current	-150.0%~150.0%(rated current of the rectifier)	-150.0~150.0	0.0%

When P00.03=1and P03.03=0, the reactive current is set by the keypad. The reactive current setting is used for reactive compensation.

Function code	Name	Description	Setting range	Default
P03.05	Reference channel of reactive current commendation	0:485 communication 1:PROFIBUS 2:Ethernet communication 3:CAN communication (reserved) 4:DEVICE_NET communication (reserved)	0~4	0

When P00.03=1 and P03.03=4, select the communication channel of reactive current.

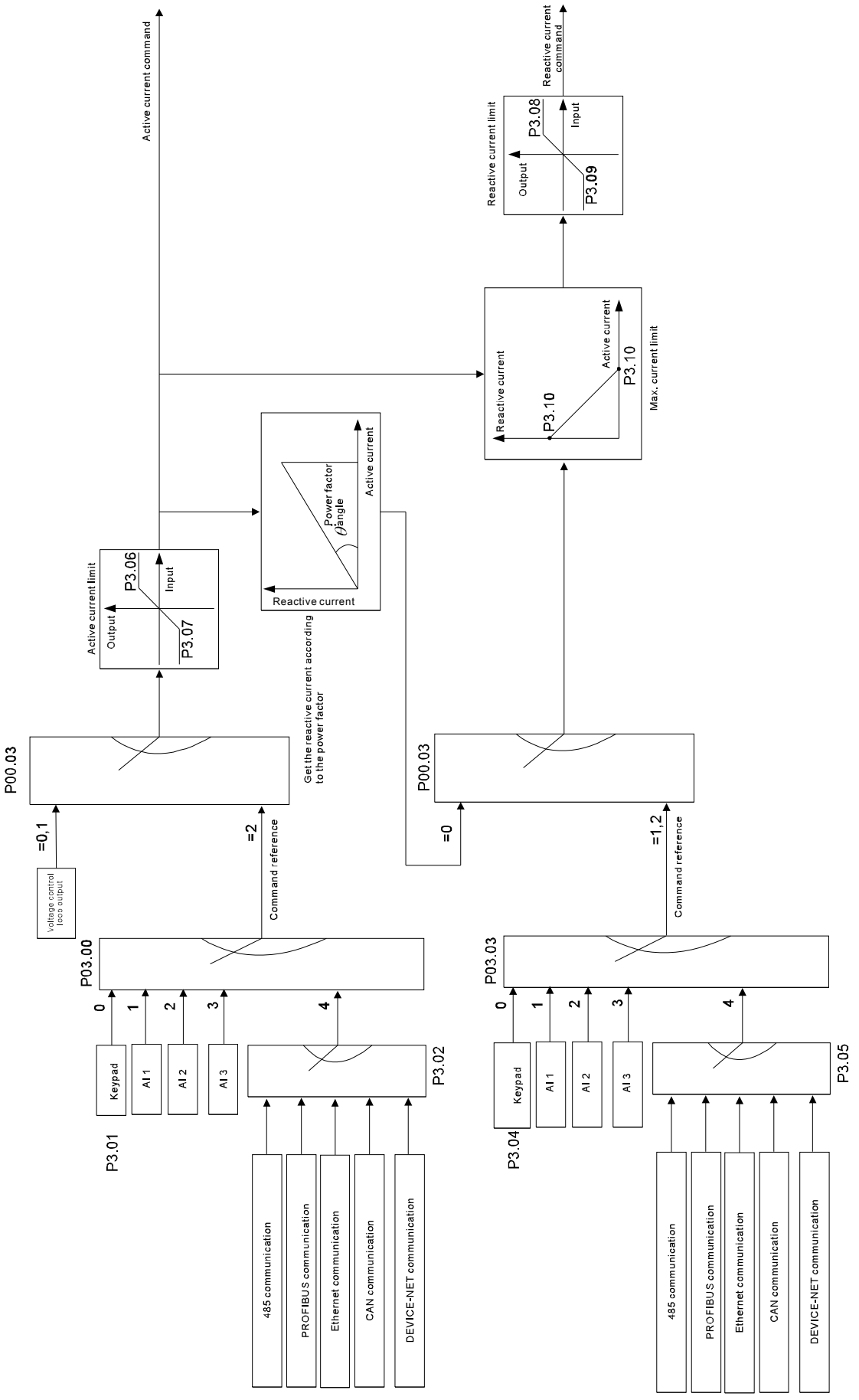
Function code	Name	Description	Setting range	Default
P03.06	Positive limit amplitude of active current	0.0~200.0%(rated current of the rectifier)	0.0~200.0	150.0%
P03.07	Negative limit amplitude of active current	0.0~200.0%(rated current of the rectifier)	0.0~200.0	150.0%
P03.08	Positive limit amplitude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

P03.06 is the Max. active current at rectifier output.

P03.07 is the Max. active current at energy feedback.

P03.08 is the Max. reactive current at rectifier output.

P03.09 is the Max. reactive current at energy feedback.



WhenP00.03=0 or 1, if the combination current of reactive and active current exceeds the set value, the system will reduce the active current component to ensure that the current is in the range.

Function code	Name	Description	Setting range	Default
P03.11	Proportional coefficient of voltage loop 1	0.001~30.000	0.001~30.000	1.000
P03.12	Integral coefficient of voltage loop 1	0.01~300.00	0.01~300.00	1.50
P03.13	Proportional coefficient of voltage loop 2	0.001~30.000	0.001~30.000	5.000
P03.14	Integral coefficient of voltage loop 2	0.01~300.00	0.01~300.00	1.50
P03.15	Switching voltage of PI parameters	0.01~30.00V	0.01~30.00	10.00V

The absolute value of the difference between the setting value and feedback value of DC voltage is Δ. When Δ is less than P03.15, it will apply PI parameter 1; When Δ is more than P03.15, it will apply PI parameter 2.

Function code	Name	Description	Setting range	Default
P03.16	Output filter time of voltage loop	0.000~1.000s	0.000~1.000	0

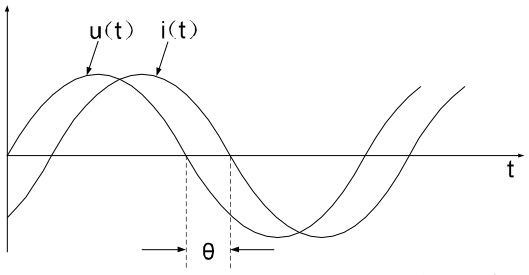
Function code	Name	Description	Setting range	Default
P03.17	Current loop proportional coefficient P	0.001~30.000	0.001~30.000	1.000
P03.18	Current loop integral coefficient I	0.01~300.00	0.01~300.00	0.50

Note: these parameters affect the dynamic response and control accuracy. Generally the user can not modify.

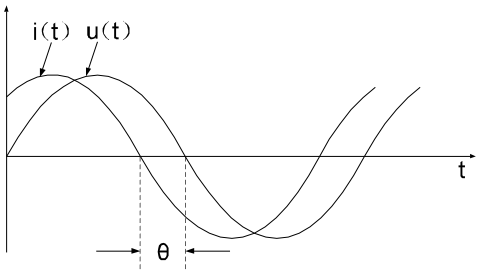
Function code	Name	Description	Setting range	Default
P03.19	Power factor setting	0:Angle setting 1: Power factor set directly	0~1	0
P03.20	Rectifier power factor angle (COS)	-90.0°~90.0° The positive means inductive and the negative means capacitive.	-90.0~90.0	0.0°
P03.21	Feedback power factor angle (COS)	-90.0°~90.0° The positive means inductive and the negative means capacitive.		0.0°
P03.22	Rectification power factor	-100.0~100.0% (the positive means inductive and the negative means capacitive)	-100.0~100.0%	100.0%
P03.23	Feedback power factor			100.0%

Note: the setting value of power factor is only valid in COSφ operation mode and current close-loop operation mode.

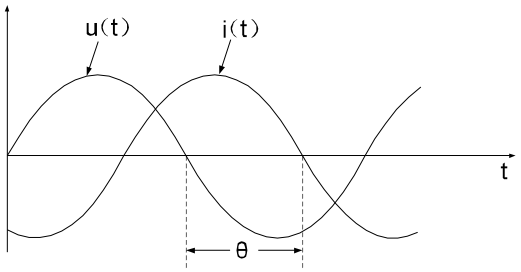
When the system is in COSφ mode, P03.19~P03.23 are used to set the power factor in the mode. The angle between power factor and voltage and current is as below. The parameter set by the function code is θ or cosθ in the figure.



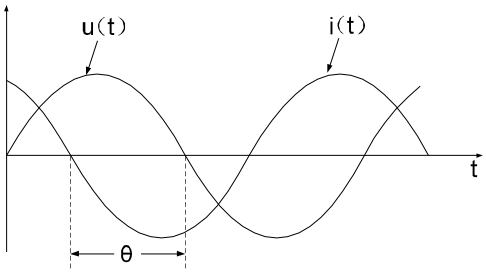
(1)The current lags behind the voltage θ（θ<90°）



(2)The current lags behind the voltage θ（θ<90°）



(3)The current lags behind the voltage θ（θ>90°）



(4)The current lags behind the voltage θ（θ>90°）

Figure (1) and (3) corresponds to inductive and figure (2) and (4) corresponds to capacitive.

1. When P03.19=0, rectifier power factor is cos (P03.22), feedback power factor is cos (P03.21).
   If P03.20>=0, then it corresponds to figure (1) and the value is θ in figure (1);
   If P03.20<0, then it corresponds to figure (2), the negative in P03.20 means capacitive and the value is θ in figure (2);
   If P03.21>=0, then it corresponds to figure (3) and the value is θ in figure (3);
   If P03.21<0, then it corresponds to figure (4), the negative in P03.21 means capacitive and the value is θ in figure (4);
2. When P03.19=1, rectifier power factor is P03.22, feedback power factor is P03.23.
   If P03.22>=0, then it corresponds to figure (1) and the value is cosθ in figure (1);
   If P03.22<0, then it corresponds to figure (2), the negative in P03.22 means capacitive and the value is cosθ in figure (2);
   If P03.23>=0, then it corresponds to figure (3) and the value is cosθ in figure (3);
   If P03.23<0, then it corresponds to figure (4), the negative in P03.21 means capacitive and the value is cosθ in figure (4).

P04 group Reserved

P05 group Input terminals

Function code	Name	Description	Setting range	Default
P05.01	S1 terminal function selection	0: No function 1: Run 2: Fault reset 3: External fault 4: Slave fault 5: Run enabling 6: Switch between master and slave 7: Reserved 8: Reserved 9: Power on buffer control 10: Switch to the keypad operation 11: Switch to the terminal operation 12: Switch to the communication operation 13: Total electricity consumption cleared 14: Cumulative power maintain 15: Reserved	0~15	1
P05.02	S2 terminal function selection		0~15	2
P05.03	S3 terminal function selection		0~15	5
P05.04	S4 terminal function selection		0~15	0
P05.05	S5 terminal function selection		0~15	0
P05.06	S6 terminal function selection		0~15	0
P05.07	S7 terminal function selection		0~15	0
P05.08	S8 terminal function selection		0~15	0

Terminal description:

Setting value	Function	Description
0	No function	PWM rectifier does not act even though there is signal. Set the unused terminal as non-function to avoid misaction.
1	Run	Control the operation through external terminals.
2	Fault reset	External fault reset, same as the function of STOP/RST.Remote fault reset is available buy the function.
3	External fault	PWM rectifier reports fault and stops when external fault signal is sent to the rectifier. The main contactor does not switch off and the diode rectifier works normally.
4	Slave fault	
5	Run enabling	PWM works after the enabling terminal is valid.
6	Switch between master and slave	Master and slave can be switched if the terminal is valid. Refer to P02.01.
7	Reserved	
8	Reserved	
9	Power on buffer control	The terminal is valid whenP01.02=1.
10	Switch to the keypad operation	The operation command is switched to keypad control if the terminal is valid. The operation channel will restore if the terminal is invalid.
11	Switch to the terminal	The operation command is switched to terminal control if

Setting value	Function	Description
	operation	the terminal is valid. The operation channel will restore if the terminal is invalid.
12	Switch to the communication operation	The operation command is switched to communication control if the terminal is valid. The operation channel will restore if the terminal is invalid.
13	Total electricity consumption cleared	Total electricity consumption is cleared if the command is valid (P07.13 and P07.14).
14	Cumulative power maintain	The current operation does affect the cumulative power if the command is valid.
15	Reserved	

Function code	Name	Description	Setting range	Default
P05.09	Polarity selection of digital input terminals	0x00~0xFF	0x00~0xFF	0x00

Set the polarity of digital input terminals

If set the bit as 0, the input terminal is positive, and when set the bit as 1, the input terminal is negative.

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

Function code	Name	Description	Setting range	Default
P05.10	Digital input filtering time	0.000~1.000s	0.000~1.000	0

Set the filtering time for S1~S8 terminal sampling. In the case of high interference, this parameter should be increased to avoid malfunction.

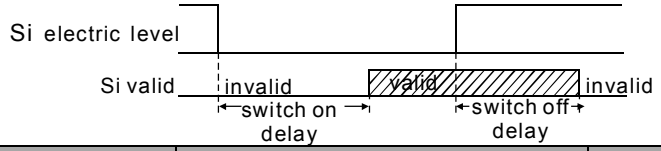
Function code	Name	Description	Setting range	Default
P05.11	Virtual input terminal setting	0: Virtual terminal is invalid 1:MODBUS communication virtual terminal valid 2:PROFIBUS communication virtual terminal valid 3~10: Reserved	0~10	0

Enable the virtual input terminals at communication mode.

Function code	Name	Description	Setting range	Default
P.05.13	Delay time of S1 switching-on	0.000~60.000s	0.000~60.000	0.000s
P05.14	Delay time of S1 switching-off	0.000~60.000s	0.000~60.000	0.000s
P05.15	Delay time of S2 switching-on	0.000~60.000s	0.000~60.000	0.000s

Function code	Name	Description	Setting range	Default
P05.16	Delay time of S2 switching-off	0.000~60.000s	0.000~60.000	0.000s
P05.17	Delay time of S3 switching-on	0.000~60.000s	0.000~60.000	0.000s
P05.18	Delay time of S3 switching-off	0.000~60.000s	0.000~60.000	0.000s
P05.19	Delay time of S4 switching-on	0.000~60.000s	0.000~60.000	0.000s
P05.20	Delay time of S4 switching-off	0.000~60.000s	0.000~60.000	0.000s
P05.21	Delay time of S5 switching-on	0.000~60.000s	0.000~60.000	0.000s
P05.22	Delay time of S5 switching-off	0.000~60.000s	0.000~60.000	0.000s
P05.23	Delay time of S6 switching-on	0.000~60.000s	0.000~60.000	0.000s
P05.24	Delay time of S6 switching-off	0.000~60.000s	0.000~60.000	0.000s
P05.25	Delay time of S7 switching-on	0.000~60.000s	0.000~60.000	0.000s
P05.26	Delay time of S7 switching-off	0.000~60.000s	0.000~60.000	0.000s
P05.27	Delay time of S8 switching-on	0.000~60.000s	0.000~60.000	0.000s
P05.28	Delay time of S8 switching-off	0.000~60.000s	0.000~60.000	0.000s

The function codes are used to set the delay time when electric level changes.



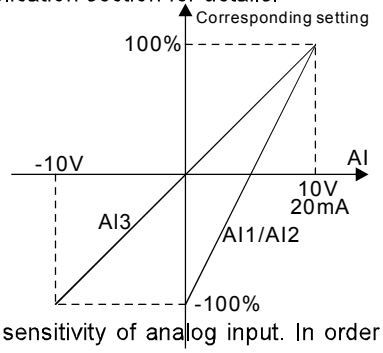
Function code	Name	Description	Setting range	Default
P05.29	AI1 lower limit	0.00V~P05.31	0.00~P05.31	0.00V
P05.30	AI 1 lower limit corresponding setting	-100.0%~P05.32	-100.0~P05.32	0.0%
P05.31	AI1 upper limit	P05.29~10.00V	P05.29~10.00	10.00V
P05.32	AI 1 upper limit corresponding setting	P05.30~100.0%	P05.30~100.0	100.0%
P05.33	AI1 input filtering time	0.00s~10.000s	0.00~10.000	0.100s
P05.34	AI2 lower limit	0.00V~P05.36	0.00~P05.36	0.00V

Function code	Name	Description	Setting range	Default
P05.35	AI2 lower limit corresponding setting	-100.0%~P05.37	-100.0~P05.37	0.0%
P05.36	AI2 upper limit	P05.34~10.00V	P05.34~10.00	10.00V
P05.37	AI2 upper limit corresponding setting	P05.35~100.0%	P05.35~100.0	100.0%
P05.38	AI2 input filtering time	0.00s~10.000s	0.00~10.000	0.100s
P05.39	AI32 lower limit	-10.00V~P05.41	-10.00~P05.41	-10.00V
P05.40	AI3 lower limit corresponding setting	-100.0%~P05.42	-100.0`P05.42	-100.0%
P05.41	AI3 upper limit	P05.39~P05.43	P05.39~P05.43	0.00V
P05.42	AI3 upper limit corresponding setting	P05.40~P05.44	P05.40~P05.44	0.0%
P05.43	AI3 input filtering time	P05.41~10.00V	P05.41~10.00	10.00V
P05.44	AI3 lower limit	P05.42~100.0%	P05.42~100.0	100.0%
P05.45	AI3 lower limit corresponding setting	0.000s~10.000s	0.000~10.000	0.100s

The above function codes define the relationship between the analog input voltage and its corresponding setting. When the analog input voltage goes beyond the range between the set upper limit and lower limit, it will be calculated with the upper limit or lower limit.

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

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



Input filtering time: determines the sensitivity of analog input. In order to avoid malfunction caused by interfered analog input, you can increase this parameter. This can improve the anti-interference ability but reduce the sensitivity of analog input.

Note: AI1 and AI2 can support 0~10V/0~20mA input and when AI1 and AI2 selects 0~20mA input, the corresponding voltage of 20mA is 10V; AI3 supports -10~+10V input.

P06 group Output terminals

Function code	Name	Description	Setting range	Default
P06.00	Reserved	0: No output 1: Ready to run 2: In running 3: Fault output 4: Master mode 5: Slave mode 6: Buffer contactor state 7: Main contactor state 8:MODBUS communication virtual terminal output 9:PROFIBUS communication virtual terminal output 10~31: Reserved		
P06.01	Y1 output selection		0~31	0
P06.02	Y2 output selection		0~31	0
P06.03	Relay 1 output selection		0~31	1
P06.04	Relay 2 output selection		0~31	2
P06.05	Relay 3 output selection		0~31	3
P06.06	Relay 4 output selection (STO)		0~31	0

Above parameters can select following functions:

Setting value	Function	Description
0	No output	No output
1	Ready to run	The rectifier unit is ready
2	In running	The output is valid when PWM rectifier operates
3	Fault output	The output is valid when fault occurs to the rectifier unit
4	Master mode	The output is valid if it is the master in master-slave mode
5	Slave mode	The output is valid if it is the slave in master-slave mode
6	Buffer contactor state	The output is valid if the control command of the buffer contactor is valid
7	Main contactor state	The output is valid if the feedback signal of the main contactor is valid
8	MODBUS communication virtual terminal output	Output corresponding signal according to MODBUS setting The output is valid if the setting value is 1 The output is invalid if the setting value is 0
9	PROFIBUS communication virtual terminal output	Output corresponding signal according to PROFIBUS setting The output is valid if the setting value is 1 The output is invalid if the setting value is 0
10~31	Reserved	

Function code	Name	Description	Setting range	Default
P06.07	polarity selection of digital output terminal	0x00~0x3F	0x00~0x3F	0x00

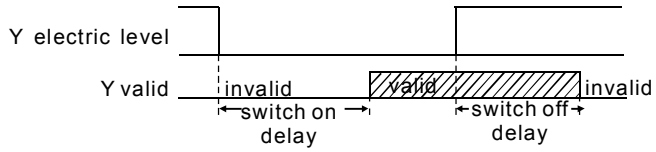
Set the polarity of digital output terminals

If set the bit as 0, the output terminal is positive, and when set the bit as 1, the output terminal is negative.

BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
RO4	RO3	RO2	RO1	Y2	Y1

Function code	Name	Description	Setting range	Default
P06.08	Delay time of Y1 switching-on	0.000~60.000s	0.000~60.000	0.000s
P06.09	Delay time of Y1 switching-off	0.000~60.000s	0.000~60.000	0.000s
P06.10	Delay time of Y2 switching-on	0.000~60.000s	0.000~60.000	0.000s
P06.11	Delay time of Y2 switching-off	0.000~60.000s	0.000~60.000	0.000s
P06.12	Delay time of RO1 switching-on	0.000~60.000s	0.000~60.000	0.000s
P06.13	Delay time of RO1 switching-off	0.000~60.000s	0.000~60.000	0.000s
P06.14	Delay time of RO2 switching-on	0.000~60.000s	0.000~60.000	0.000s
P06.15	Delay time of RO2 switching-off	0.000~60.000s	0.000~60.000	0.000s
P06.16	Delay time of RO3 switching-on	0.000~60.000s	0.000~60.000	0.000s
P06.17	Delay time of RO3 switching-off	0.000~60.000s	0.000~60.000	0.000s
P06.18	Delay time of RO4 switching-on	0.000~60.000s	0.000~60.000	0.000s
P06.19	Delay time of RO4 switching-off	0.000~60.000s	0.000~60.000	0.000s

The function codes are used to set the delay time when electric level changes.



Function code	Name	Description	Setting range	Default
P06.20	AO1 output selection	0: Null 1: The set value of the DC voltage	0~20	0
P06.21	AO2 output selection	2: The actual value of the DC voltage 3: Valid value of input voltage 4: Valid value of input current 5: Input power 6: Input power factor 7: Grid frequency value	0~20	0

Function code	Name	Description	Setting range	Default
		8: Active current reference 9: Active current feedback 10: Reactive current reference 11: Reactive current feedback 12: MODBUS communication setting 1 13: MODBUS communication setting 2 14: PROFIBUS communication setting 1 15: PROFIBUS communication setting 2 16: AI1 17: AI2 18: AI3 19~20: Reserved		

Output description:

Setting value	Function	Description
0	Null	
1	The set value of the DC voltage	380V:100% corresponds to 1000V; 660V:100% corresponds to 1500V
2	The actual value of the DC voltage	380V:100% corresponds to 1000V; 660V:100% corresponds to 1500V
3	Valid value of input voltage	100% corresponds to 2 times of the rated voltage of the rectifier
4	Valid value of input current	100% corresponds to 2 times of the rated current of the rectifier
5	Input power	100% corresponds to 2 times of the rated power of the rectifier
6	Input power factor	100% corresponds to 100.0% of the power factor
7	Grid frequency value	100% corresponds to 100Hz, -100% corresponds to -100Hz The value is positive in positive sequence input The value is negative in negative sequence input
8	Active current reference	100% corresponds to 2 times of the rated current of the rectifier
9	Active current feedback	100% corresponds to 2 times of the rated current of the rectifier
10	Reactive current reference	100% corresponds to 2 times of the rated current of the rectifier
11	Reactive current feedback	100%v2 times of the rated current of the rectifier
12	MODBUS communication	1000 corresponds to 100.0%

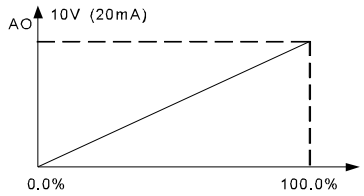
Setting value	Function	Description
	setting 1	
13	MODBUS communication setting 2	1000 corresponds to 100.0%
14	PROFIBUS communication setting 1	1000 corresponds to 100.0%
15	PROFIBUS communication setting 2	1000 corresponds to 100.0%
16	AI1	0~10V/0~20mA
17	AI2	0~10V0~20mA
18	AI3	-10~10V
19~20	Reserved	

Function code	Name	Description	Setting range	Default
P06.23	Lower output limit 1	0.0%~P06.25	0.0~P06.25	0.0%
P06.24	Lower limit corresponding AO1 output	0.00~P06.26 V	0.00~P06.26	0.00V
P06.25	Upper output limit 1	P06.25~100.0%	P06.25~100.0	100.0%
P06.26	Upper limit corresponding AO1 output	P06.24~10.00V	P06.24~10.00	10.00V
P06.27	AO1 output filtering time	0.000~10.000s	0.000~10.000	0.000s
P06.28	Lower output limit 2	-100.0%~P06.30	-100.0~P06.30	0.0%
P06.29	Lower limit corresponding AO2 output	-10.00~P06.31 V	-10.00~P06.31	0.00V
P06.30	Upper output limit 2	P06.28~100.0%	P06.28~100.0	100.0%
P06.31	Upper limit corresponding AO2 output	P06.29~10.00V	P06.29~10.00	10.00V
P06.32	AO2 output filtering time	0.000~10.000s	0.000~10.000	0.000s

The function code defines the relationship between the output value and analog output. When the output exceeds the range, it will be calculated at the upper limit or lower limit value.

If the analog output is the current output, the function of 1mA is the same as the function of 0.5V.

In different applications, 100% of the output value corresponds to different analog output.



P07 group Human machine interface

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

The password protection function will be valid when set to be any non-zero data.

00000: user's password set before will be cleared and the password protection function will be disabled.

After the password has been set and becomes valid, the user can not access menu if the user's password is not correct. Only when a correct user's password is input, the user can see and modify the parameters. Please keep user's password in mind.

Function code	Name	Description	Setting range	Default
P07.01	Parameter copy	0: Invalid 1: Upload parameters to the local 2: Download parameters from the local	0~2	0

Note: When upload or download operation completes, the parameter will be set to 0 automatically.

Function code	Name	Description	Setting range	Default
P07.02	QUICK/JOG function selection	0:No function 1: Press QUICK/JOG to switch the displayed function code 2: Press QUICK/JOG to switch the command mode 3: Quick debugging	0~3	0

Set the function of QUICK/JOG

Function code	Name	Description	Setting range	Default
P07.03	Switching sequence of operation channel	0:Keypad→terminal→communciation 1: Keypad←→terminal 2: Keypad←→communciation 3: Terminal←→communciation	0~3	0

When P07.02=2, set the switching sequence of operation command.

Function code	Name	Description	Setting range	Default
P07.04	STOP/RST function selection	0: Valid when keypad control 1: Valid when keypad or terminal control 2: Valid when keypad or communication control 3: Always valid	0~3	3

The function of STOP/RST is always valid.

Function code	Name	Description	Setting range	Default
P07.05	Parameter display selection in rectifier state	0x0000~0xFFFF	0~0xFFFF	0x000F

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

Parameter display is affected by the function code. If some bit is 1, then the corresponding parameter can be viewed in operation by >>/SHIFT. If the bit is 0, then the corresponding parameter will not display. When setting P2.03, decimal number needs to be changed into hex and input into the function code.

BIT15	BIT14	BIT13	BIT12	BIT11	BIT10	BIT9	BIT8
Reserved	Input reactive power	Input active power	Input apparent power	AI3	AI2	AI1	Output terminal state
BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
Input terminal state	Reactive current component	Active current component	Input power factor	Input current	Input voltage	Grid frequency	DC bus voltage

Function code	Name	Description	Setting range	Default
P07.06	Reserved	0x0000~0xFFFF	0~0xFFFF	0x000F

Function code	Name	Description	Setting range	Default
P07.07	Factory barcode 1	0x0000~0xFFFF		
P07.08	Factory barcode 2	0x0000~0xFFFF		
P07.09	Factory barcode 3	0x0000~0xFFFF		
P07.10	Factory barcode 4	0x0000~0xFFFF		
P07.11	Factory barcode 5	0x0000~0xFFFF		
P07.12	Factory barcode 6	0x0000~0xFFFF		
P07.17	Accumulated high electricity consumption	0~65535°	0~65535	0°
P07.18	Accumulated low electricity consumption	0.0~999.9°	0.0~999.9	0.0°

Accumulated low electricity consumption =P07.17*1000+P07.18。

Function code	Name	Description	Setting range	Default
P07.19	Software version (DSP)	1.00~655.35	1.00~655.35	The actual value
P07.20	Software version (FPGA)	1.00~655.35	1.00~655.35	The actual value
P07.21	Local cumulative operation time	0~65535h	0~65535	The actual value

P17 group System information

The function codes are used to view the system information.

Function code	Name	Description	Setting range	Default
P17.00	Rated power of the rectifier	4~6000kW	4~6000	Depend on model
P17.01	Rated current of the rectifier	0.0~6000.0A	0.0~6000.0	Depend on model
P17.02	Valid unit number	Determined by P02.00 and P17.03.	0~6	Depend on model and unit
P17.03	Valid unit bit set by the factory	BIT5 BIT4 BIT3 BIT2 BIT1 BIT0 Unit 6 Unit 5 Unit 4 Unit 3 Unit 2 Unit 1 If some bit is 1, then the corresponding unit is valid, if the bit is 0, then the corresponding unit does not work. The function code is only for view. 0x00~0x3F	0x00~0x3F	0x3F
P17.04	Valid unit display	0x00~0x3F	0x00~0x3F	0x00
P17.05	DC voltage	0.0~2000.0V	0.0~2000.0	0.0V
P17.06	Grid frequency	0.00~120.0Hz	0.00~120.0	0.0Hz
P17.07	Grid voltage	0.0~2000.0V	0.0~2000.0	0.0V
P17.08	Grid input current	0.0~6000.0A	0.0~6000.0	0.0A
P17.09	Power factor	-1.00~1.00	-1.00~1.00	0.00
P17.10	Percentage of active current	-200.0~200.0%	-200.0~200.0	0.0%
P17.11	Percentage of reactive current	-200.0~200.0%	-200.0~200.0	0.0%
P17.12	Digital input terminal state	0x00~0xFF	0x00~0xFF	0x00
P17.13	Digital output terminal state	0x00~0xFF	0x00~0xFF	0x00
P17.14	AI1 input voltage	0.00~10.00V	0.00~10.00	0.00V
P17.15	AI2 input voltage	0.00~10.00V	0.00~10.00	0.00V
P17.16	AI3 input voltage	-10.00V ~10.00V	-10.00V~10.00	0.00V
P17.17	Input apparent power	0~6000.0kVA	0~6000.0	0 .0kVA
P17.18	Input active power	0~6000.0kW	0~6000.0	0 .0kW
P17.19	Input reactive power	0~6000.0kVar	0~6000.0	0 .0kVar
P17.20	Unbalance factor of three-phase voltage	1.00~10.00	1.00~10.00	0.00
P17.21	Bridge rectifier module temperature	-20.0~120.0℃	-20.0~120.0℃	0.0℃
P17.22	IGBT module	-20.0~120.0℃	-20.0~120.0℃	0.0℃

Function code	Name	Description	Setting range	Default
	temperature			

P18 group Unit information

The function codes are used to view the unit information.

Function code	Name	Description	Setting range	Default
P18.00	The display current value of unit 1	0~6000.0A	0~6000.0	0.0A
P18.01	The sample DC voltage of unit 1	0.0~2000.0V	0.0~2000.0	0.0V
P18.02	Display temperature value of unit 1 rectifier bridge	-20.0~120.0℃	-20.0~120.0	0.0℃
P18.03	Display temperature value of unit 1 IGBT	-20.0~120.0℃	-20.0~120.0	0.0℃
P18.05	Fault code of unit 1 Line voltage of unit 1 (reserved)	0x0000~0xFFFF	0x0000~0xFFFF	0
P18.08	DSP software version of unit 1	0.00~655.35	0.00~655.35	0.00
P18.09	FPGA software version of unit 1	0.00~655.35	0.00~655.35	0.00

Display the information of unit 1.

Function code	Name	Description	Setting range	Default
P18.10	The display current value of unit 2	0~6000.0A	0~6000.0	0.0A
P18.11	The sample DC voltage of unit 2	0.0~2000.0V	0.0~2000.0	0.0V
P18.12	Display temperature value of unit 2 rectifier bridge	-20.0~120.0℃	-20.0~120.0	0.0℃
P18.13	Display temperature value of unit 2 IGBT	-20.0~120.0℃	-20.0~120.0	0.0℃
P18.15	Fault code of unit 2	0x0000~0xFFFF	0x0000~0xFFFF	0
P18.18	DSP software version of unit 2	0.00~655.35	0.00~655.35	0.00
P18.19	FPGA software version of unit 2	0.00~655.35	0.00~655.35	0.00

Display the information of unit 2.

Function code	Name	Description	Setting range	Default
P18.20	The display current value of unit 3	0~6000.0A	0~6000.0	0.0A
P18.21	The sample DC voltage of unit 3	0.0~2000.0V	0.0~2000.0	0.0V
P18.22	Display temperature	-20.0~120.0℃	-20.0~120.0	0.0℃

Function code	Name	Description	Setting range	Default
	value of unit 3 rectifier bridge			
P18.23	Display temperature value of unit 3 IGBT	-20.0~120.0℃	-20.0~120.0	0.0℃
P18.25	Fault code of unit 3	0x0000~0xFFFF	0x0000~0xFFFF	0
P18.28	DSP software version of unit 3	0.00~655.35	0.00~655.35	0.00
P18.29	FPGA software version of unit 3	0.00~655.35	0.00~655.35	0.00

Display the information of unit 3.

Function code	Name	Description	Setting range	Default
P18.30	The display current value of unit 4	0~6000.0A	0~6000.0	0.0A
P18.31	The sample DC voltage of unit 4	0.0~2000.0V	0.0~2000.0	0.0V
P18.32	Display temperature value of unit 4 rectifier bridge	-20.0~120.0℃	-20.0~120.0	0.0℃
P18.33	Display temperature value of unit 4 IGBT	-20.0~120.0℃	-20.0~120.0	0.0℃
P18.35	Fault code of unit 4	0x0000~0xFFFF	0x0000~0xFFFF	0
P18.38	DSP software version of unit 4	0.00~655.35	0.00~655.35	0.00
P18.39	FPGA software version of unit 4	0.00~655.35	0.00~655.35	0.00

Display the information of unit 4.

Function code	Name	Description	Setting range	Default
P18.40	The display current value of unit 5	0~6000.0A	0~6000.0	0.0A
P18.41	The sample DC voltage of unit 5	0.0~2000.0V	0.0~2000.0	0.0V
P18.42	Display temperature value of unit 5 rectifier bridge	-20.0~120.0℃	-20.0~120.0	0.0℃
P18.43	Display temperature value of unit 5 IGBT	-20.0~120.0℃	-20.0~120.0	0.0℃
P18.45	Fault code of unit 5	0x0000~0xFFFF	0x0000~0xFFFF	0
P18.48	DSP software version of unit 5	0.00~655.35	0.00~655.35	0.00
P18.49	FPGA software version of unit 5	0.00~655.35	0.00~655.35	0.00

Display the information of unit 5.

Function code	Name	Description	Setting range	Default
P18.50	The display current value of unit 6	0~6000.0A	0~6000.0	0.0A
P18.51	The sample DC voltage of unit 6	0.0~2000.0V	0.0~2000.0	0.0V
P18.52	Display temperature value of unit 6 rectifier bridge	-20.0~120.0℃	-20.0~120.0	0.0℃
P18.53	Display temperature value of unit 6 IGBT	-20.0~120.0℃	-20.0~120.0	0.0℃
P18.55	Fault code of unit 6	0x0000~0xFFFF	0x0000~0xFFFF	0
P18.58	DSP software version of unit 6	0.00~655.35	0.00~655.35	0.00
P18.59	FPGA software version of unit 6	0.00~655.35	0.00~655.35	0.00

Display the information of unit 6.

P08 group Fault information

Function code	Name	Description	Setting range	Default
P19.00	Current fault type	Common fault types:		0
P19.01	Previous fault type	00:No fault		0
P19.02	Previous 2 fault type	01: OC		0
P19.03	Previous 3 fault type	02: Lvl		0
P19.04	Previous 4 fault type	03: Ovl		0
P19.05	Previous 5 fault type	04: SPI 05: PLLF 06: Lv 07: ov 08: ltE 09: E-DP 10: CE 11: E-CAN 12: E-NET 13: E-DEV 14: UlU 15: OL 16: EEP 17: TbE 18: E-STO 19: dF_CE 20: EF 21: dIS 22: PCE 23: UPE 24: DnE 25: END 26: PC_t1 27: PC_t2 28: E-ASC 29: E -SLE 30: CPoE Unit fault:m.n m.01: m. OUt1 m.02: m. Out2 m.03: m. Out3 m.04: m.OC m.05: m.ltE m.06: m.IbC m.07: m.OH1 m.08: m.OH2 m.09: m.EF1 m.10: m.EF2	0~26 or m01~m13 (m=1，2，3...6)	0

Function code	Name	Description	Setting range	Default
		m.11: m.EF3 m.12: m.ov m.13: m.Lv m.14: m.dn-C m.15: m.UP-C m.16: m.PER		

Refer to the fault information.

Function code	Name	Description	Setting range	Default
P19.06	Input terminal state at current fault	0x00~0xFF	0x00~0xFF	0x00
P19.07	Output terminal state at current fault	0x00~0xFF	0x00~0xFF	0x00
P19.08	DC bus voltage at current fault	0.0~2000.0V	0.0~2000.	0.0V
P19.09	Input voltage at current fault	0.0~2000.0V	0.0~2000.0	0.0V
P19.10	Input current at current fault	0.0~6000.0A	0.0~6000.	0.0A
P19.11	Current display at current fault	0.0~6000.0A	0.0~6000.0	0.0A

P10.11 records the unit current when fault occurs, and it will display the Max. current when no fault occurs.

Function code	Name	Description	Setting range	Default
P19.12	Rectifier temperature at current fault	-20.0~120.0℃	-20.0~120.0	0.0℃

P10.12 records the rectifier temperature when fault occurs, and it will display the Max. current when no fault occurs.

Function code	Name	Description	Setting range	Default
P19.13	IGBT temperature at current fault	-20.0~120.0℃	-20.0~120.0	0.0℃

P10.13 records the IGBT temperature when fault occurs, and it will display the Max. current when no fault occurs.

Function code	Name	Description	Setting range	Default
P19.22	Input terminal state at previous fault	0x00~0xFF	0x00~0xFF	0x00
P19.23	Output terminal state at previous fault	0x00~0xFF	0x00~0xFF	0x00

Function code	Name	Description	Setting range	Default
P19.24	DC bus voltage at previous fault	0.0~2000.0V	0.0~2000.0	0.0V
P19.25	Input voltage at previous fault	0.0~2000.0V	0.0~2000.0	0.0V
P19.26	Input current at previous fault	0.0~6000.0A	0.0~6000.	0.0A
P19.27	Current display at previous fault	0.0~6000.0A	0.0~6000.0A	0.0A
P19.28	Rectifier temperature at previous fault	-20.0~120.0℃	-20.0~120.0	0.0℃
P19.29	IGBT temperature at previous fault	-20.0~120.0℃	-20.0~120.0	0.0℃

Record the display value at previous fault. Refer to P10.06~P10.13.

Function code	Name	Description	Setting range	Default
P19.38	Input terminal state at previous fault	0x00~0xFF	0x00~0xFF	0x00
P19.39	Output terminal state at previous 2 fault	0x00~0xFF	0x00~0xFF	0x00
P19.40	DC bus voltage at previous 2 fault	0.0~2000.0V	0.0~2000.0	0.0V
P19.41	Input voltage at previous 2 fault	0.0~2000.0V	0.0~2000.0	0.0V
P19.42	Input current at previous 2 fault	0.0~6000.0A	0.0~6000.0	0.0A
P19.43	Current display at previous 2 fault	0.0~6000.0A	0.0~6000.0	0.0A
P19.44	Rectifier temperature at previous 2 fault	-20.0~120.0℃	-20.0~120.	0.0℃
P19.45	IGBT temperature at previous 2 fault	-20.0~120.0℃	-20.0~120.0	0.0℃

Record the display value at previous 2 faults. Refer to P19.06~P19.13.

P20 group Serial communication and CAN communication

Function code	Name	Description	Setting range	Default
P20.00	Local communication address	1~247 0: broadcast address	1~247	1

Set the slave communication address. When the address is 0, i.e. broadcast address, the slave only receives communication frames without response. Local communication address is exclusive in the communication network and this is the basis for realizing peer to peer communication between the upper PC and the rectifier.

Note: the slave address can not be set as 0.

Function code	Name	Description	Setting range	Default
P20.01	Baud rate setting	0:1200BPS 1:2400BPS 2:4800BPS 3:9600BPS 4:19200BPS 5:38400BPS	0~5	4

This parameter is used to set the data transmission rate between the upper PC and the rectifier.

Note: the upper PC must be set with identical baud rate with the rectifier. Otherwise it is impossible to realize the communication. The larger the baud rate, the higher the communication speed.

Function code	Name	Description	Setting range	Default
P20.02	Check bit setting	0: No check (N, 8, 1)for RTU 1: Odd check (E, 8, 1)for RTU 2: Even check (O, 8, 1)for RTU 3: No check (N, 8, 2)for RTU 4: Odd check (E, 8, 2)for RTU 5: Even check (O, 8, 2)for RTU	0~5	1

The upper PC must have same data format with the rectifier. Otherwise it will be impossible to realize communication.

Function code	Name	Description	Setting range	Default
P20.03	Response delay	0~200ms	0~200	5

Response delay: indicates the interval from the end of data receiving to transmitting the response data to the upper PC of the rectifier. If the response delay is shorter than the processing time of the system, the response delay will follow the processing time of the system. If the response delay is longer than the processing time of the system, after completion of data processing, the system will wait until the response delay is over before transmitting data to the upper PC.

Function code	Name	Description	Setting range	Default
P20.04	Communication overtime fault	0.0(invalid), 0.1~60.0s	0.0~60.0	0.0s

When this function code is set as 0.0s, the communication overtime fault is invalid. When this function code is set as a value other than zero, if the interval between one communication and the next communication exceeds the time for communication overtime, the system will report an error of communication fault (CE). Generally this parameter is set as invalid. In a system that communicates continuously, this parameter can be set to monitor the communication state.

Function code	Name	Description	Setting range	Default
P20.05	Communication response enabling	0: Report fault and coast to stop 1: Not to report fault and keep working 2:Not to report fault and stop (only in the communication control mode) 3:Not to report fault and stop (in all communication control modes)	0~3	0

The function code is used to set the solution mode when transmission fault occurs.

Function code	Name	Description	Setting range	Default
P20.06	Communication processing	0x00~0x11 LED ones: 0: Response to write 1: No response to write LED tens: 0: Reserved 1: Reserved	00~11	0x00

The function code is used to select the communication processing.

0: Response to write; PWM rectifier responses to read/write commands from upper PC.

1: No response to write; PWM rectifier responses to read commands from upper PC only. The communication efficiency can be improved.

Function code	Name	Description	Setting range	Default
P20.09	CAN communication address	0~127	0~127	1

The function code is used to set the CAN bus communication address. The local communication address is exclusive in the CAN bus communication network.

Function code	Name	Description	Setting range	Default
P20.10	CAN communication baud rate setting	0:50K BPS 1:125K BPS 2:250K BPS 3:500K BPS 4:1M BPS	0~4	3

This parameter is used to set the data transmission rate between two PWM rectifiers with CAN bus.

Function code	Name	Description	Setting range	Default
P20.11	CAN communication fault	0.1~100.0s 0.0 (invalid)	0.1~100.0	0.0S

When this function code is set as 0.0s, CAN communication overtime fault is invalid.

When this function code is set as a value other than zero, if the interval between one communication and the next communication exceeds the time for communication overtime, the system will report an error of communication fault (CANE). Generally this parameter is set as invalid. In a system that communicates continuously, this parameter can be set to monitor the communication state.

Function code	Name	Description	Setting range	Default
P20.12	CAN communication protocol selection	0: Common control protocol 1: Internal master-slave communication protocol	0~1	0

Select CAN communication protocol.

P21 group PROFIBUS communication

Function code	Name	Description	Setting range	Default
P21.00	Module type	0:PROFIBUS	0~1	0

Select the communication protocol.

Function code	Name	Description	Setting range	Default
P21.01	Module address	0~127	0~127	2

The function code is used to identify the address of PWM rectifier.

Note: 0 is the broadcast address. If P12.01 is 0, then it can only receive and carry out the broadcast command from upper PC, other than response.

Function code	Name	Description	Setting range	Default
P21.02	PZD2 receive	0: Invalid 1: DC voltage setting (0~20000, unit 0.1V) 2: Active current reference (-1200~1200, 1000 corresponds to 100.0% of the rated current) 3: Reactive current reference (-1200~1200, 1000 corresponds to 100.0% of the rated current) 4: Virtual input terminal command, range: 0x00~0xFF 5: AO output setting 1(-1000~1000, 1000 corresponds to 100.0%) 6: AO output setting 2(-1000~1000, 1000 corresponds to 100.0%) 7~13: Reserved	0~13	0
P21.03	PZD3 receive		0~13	0
P21.04	PZD4 receive		0~13	0
P21.05	PZD5 receive		0~13	0
P21.06	PZD6 receive		0~13	0
P21.07	PZD7 receive		0~13	0
P21.08	PZD8 receive		0~13	0
P21.09	PZD9 receive		0~13	0
P21.10	PZD10 receive		0~13	0
P21.11	PZD11 receive		0~13	0
P21.12	PZD12 receive		0~13	0

P21.02~P21.12 can be modified in any state.

Function code	Name	Description	Setting range	Default
P21.13	PZD2 send	1: DC voltage (*10, V) 2: DC voltage feedback (*10, V) 3:Input voltage valid (*10, V) 4: Input RMS current (*10, A) 5: Input power (*10, kW) 6: Input power factor (*100) 7: Grid frequency value (*10, Hz) 8: Active current feedback (100% corresponds to the rated current of the rectifier) 9: Reactive current feedback (100% corresponds to the rated current of the rectifier) 10: Fault code	0~20	0
P21.14	PZD3 send		0~20	0
P21.15	PZD4 send		0~20	0
P21.16	PZD5 send		0~20	0
P21.17	PZD6 send		0~20	0
P21.18	PZD7 send		0~20	0
P21.19	PZD8 send		0~20	0
P21.20	PZD9 send		0~20	0
P21.21	PZD10 send		0~20	0
P21.22	PZD11 send		0~20	0
P21.23	PZD12 send		0~20	0

Function code	Name	Description	Setting range	Default
		11:AI1 (*100, V) 12:AI2 (*100, V) 13:AI3 (*100, V) 14: Input state 15: Output state 16: Running status word 17~20: Reserved		

P21.13~P21.23 can be modified in any state.

Function code	Name	Description	Setting range	Default
P21.24	Temporary variable 1 of PZD sending	0~65535	0~65535	0

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

P21.24 can be written in any state.

Function code	Name	Description	Setting range	Default
P21.25	Time of Dp communication overtime fault	0.0(invalid), 0.1~60.0s	0.0~60.0	0.0s

If the function code is set to 0.0s, the fault is invalid. If the function code is set as non-zero value (actual value, unit: second), if the interval time between two communications exceeds the set time, the system will report fault PCF.

P22 group Ethernet communication

Function code	Name	Description	Setting range	Default
P22.00	Ethernet communication speed setting	0: 10M full-duplex 1: 10M half-duplex 2: 100M full-duplex 3: 100M half-duplex 4: Adaptive	0~4	3

The function code is used to set the speed of Ethernet communication.

Function code	Name	Description	Setting range	Default
P22.01	IP address 1	0~255	0~255	192
P22.02	IP address 2	0~255	0~255	168
P22.03	IP address 3	0~255	0~255	0
P22.04	IP address 4	0~255	0~255	1
P22.05	Subnet mask 1	0~255	0~255	255
P22.06	Subnet mask 2	0~255	0~255	255
P22.07	Subnet mask 3	0~255	0~255	255
P22.08	Subnet mask 4	0~255	0~255	0

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

Format of IP address: P22.01.P22.02.P22.03.P22.04.

Example: IP address is 192.168.0.1.

Format of IP subnet mask: P22.05.P22.06.P22.07.P22.08

Example: mask is 255.255.255.0.

Function code	Name	Description	Setting range	Default
P22.09	Gateway address 1	0~255	0~255	192
P22.10	Gateway address 2	0~255	0~255	168
P22.11	Gateway address 3	0~255	0~255	1
P22.12	Gateway address 4	0~255	0~255	1

Set the gateway of Ethernet.

Chapter 6 Fault information

The chapter describes how to reset faults and view the fault history. All alarm, fault information, possible cause are listed below.

	✧ Only qualified electricians are allowed to maintain the system. Read the safety instructions in chapter Safety precautions before working.

6.1 Alarm and fault indications

Fault is indicated by LEDs. See *Keypad operation*. When TRIP light is on, an alarm or fault code on the panel display indicates abnormal state. Using the information given in this chapter, most alarm and fault cause can be identified and corrected. If not, contact with the INVT office.

6.2 Fault reset

PWM rectifier can be reset by pressing the keypad key STOP/RST, through digital input, or by switching the power light. When the fault has been removed, the motor can be restarted.

6.3 Fault history

Function codes P19.00~P19.05 store 6 recent faults. Function codes P19.06~P19.17, P19.22~P19.33, P19.38~P19.49 show the operation data of latest 3 faults.

6.4 Fault instruction and solution

Do as the following after the fault occurs:

1. Check to ensure there is nothing wrong with the keypad. If not, please contact with the local INVT office.

2. If there is nothing wrong, please check the function codes of P19 and ensure the corresponding recorded fault parameters to confirm the real state when the current fault occurs by all parameters.

3. See the following table for detailed solution and check the corresponding abnormal state.

4. Eliminate the fault and ask for help.

5. Check to eliminate the fault and carry out fault reset to run the inverter.

6.4.1 Device fault

Fault code	Fault type	Possible cause	What to do
OC	Input over-current	● Wrong setting of current loop or parameters ● Hardware circuit abnormal ● Rectifiers overload	● Adjust the current loop and parameters ● Ask for service ● Adjust the load or rectifier
Lvl	Input undervoltage	● Input power is abnormal power-down Input voltage detection circuit abnormal	● Check the input power ● Ask for service
Ovl	Input overvoltage	● Input power abnormal ● Interference ● Input voltage detection	● Check the input power ● Check the external interference

Fault code	Fault type	Possible cause	What to do
		circuit abnormal	● Ask for service
SPI	Input phase loss	● Input power abnormal ● Interference ● Input voltage detection circuit abnormal	● Check the input power ● Ask for service ● Check the external interference
PLLF	Phase-locked failed	● The grid environment is abnormal ● The circuit of the sample board is abnormal	● Check and find out the interference ● Ask for service
Lv	DC bus undervoltage	● Input power abnormal ● Interference ● Input voltage detection circuit abnormal	● Check the input power ● Ask for service ● Check the external interference
Ov	DC bus overvoltage	● Input power abnormal ● Interference ● Bus voltage detection circuit abnormal	● Check the input power ● Ask for service ● Check the external interference
ItE	Current detection fault	● The connection of the control board is not good ● Assistant power is bad ● Hoare components is broken ● The modifying circuit is abnormal.	● Check the connector and repatch ● Change the Hoare ● Change the main control panel
E-DP	PROFIBUSCommunication fault	● PROFIBUS communication offline ● Wrong PROFIBUS parameters setting	● Check communication ● Re-set the relevant parameters
CE	Communication fault	● Improper setting of baud rate ● Error with serial communication ● Long period of communication interrupt	● Set appropriate baud rate ● Press STOP/RST to reset and contact the service department ● Check the wiring of the communication interfaces
E-CAN	CAN communication fault	● CAN communication offline and wrong parameters setting	● Please check the parameter settings and external wiring
E-NET	Ethernet communication fault	● CAN communication offline and wrong parameters setting	● Please check the parameter settings and external wiring
E-DEV	DEVICE_NET communication fault	● CAN communication offline and wrong parameters setting	● Please check the parameter settings and external wiring

Fault code	Fault type	Possible cause	What to do
UIU	Unbalance current of the power unit	● The average current between power units exceeds 20%, possible causes: ● Disconnection and offline of the circuit of power unit ● Damage or aging to the unit reactor	● Contact with us ● Check the circuit of filter unit ● Change the reactor
OL	Rectifier overload	● The load exceeds the range	● Adjust the load or change another rectifier
EEP	EEPROM operation fault	● Read/write fault of the control parameters ● Damage to DPRAM chip	● Press STOP/RST to reset ● Ask for service
TbE	Contactor fault	● Damage to the contactor ● Contactor auxiliary abnormal ● Interference	● Check contactor ● Check the contactor auxiliary contact ● Check the external environment to exclude interference
E-STO	STO fault	● STO terminal is switched off	● Check the external controller
dF_CE	DSP-FPGA communication fault	● Excessive electromagnetic interference ● The quality of electric power is too low ● FPGA chip damage ● DSP chip damage	● View the unit state and ensure FPGA is damaged or not ● Contact with us
EF	External fault	● SI external fault input terminals action	● Check the external device input
dIS	Rectifier disabled	● The digital output function of the system: rectifier enabled but the digital terminal does not act	● Press the corresponding digital terminal and enter P5 function group to cancel the function
PCE	Communication fault of the keypad and panel	● Keyboard line is disconnected or offline ● Keyboard line is too long or interfered ● Circuit fault to the keypad or main board communication	● Check the keypad line ● Check the environment and eliminate the interference ● Change the hardware and ask for service
UPE	Upload fault	● Keyboard line is	● Check the environment

Fault code	Fault type	Possible cause	What to do
		disconnected or offline ● Keyboard line is too long or interfered ● Circuit fault to the keypad or main board communication	and eliminate the interference ● Change the hardware and ask for service ● Change the hardware and ask for service
DnE	Download fault	● Keyboard line is disconnected or offline ● Keyboard line is too long or interfered ● Date storage error	● Change the hardware and ask for service ● Change the hardware and ask for service ● Re-backup keyboard data
END	Operation time arrived	● Set time arrived	● Reset the time and ask for service
PC_t1	Timeout fault of power-on buffer 1	● Unit disabled ● Fiber connection is wrong ● The set time 1 is too short ● Snubber resistor burnout。 ● Buffer contactor fault	● Check the unit enabling ● Check the fiber connection ● Check the set time 1 and reset ● Check the snubber resistor ● Check the contactor
PC_t2	Timeout fault of power-on buffer 2	● The set time 2 is too short ● Snubber resistor burnout。 ● Buffer contactor fault	● Check the set time 2 and reset ● Check the snubber resistor ● Check the contactor
E-ASC	Slave communication fault	● Master-slave communication optical fiber is not connected correctly ● Aging of the fiber-optic lines for master-slave communication	● Check the connection of the communication fiber ● Check the aging of the communication fiber
E -SLE	Slave fault	● Slave fault	● Check relative device and environment
CPoE	Control power fault	● Operation voltage is abnormal	● Check the switch power supply ● Check the power board

6.4.2 Unit fault

Fault code	Fault type	Possible cause	What to do
m. Out1	Vce detection fault of U phase for No. m unit	● Corresponding IGBT damage ● Strong interference	● Ask for service ● Check the external environment and eliminate
m. Out2	Vce detection fault of V		

Fault code	Fault type	Possible cause	What to do
	phase for No. m unit	● External short circuit	the interference
m. Out3	Vce detection fault of W phase for No. m unit		● Check the external circuit and eliminate the external fault
m.OC	Hardware overcurrent of No. m unit	● Internal IGBT damage ● ACC time of the rectifier is too short ● Short circuit at the output side	● Ask for service ● Reset the parameters and start again ● Check the external circuit and eliminate the short circuit fault
m.ItE	Current detection fault of No. m unit	● Components damage ● Interference	● Ask for service ● Check the external environment and eliminate the inference
m.IbC	Unbalance current fault of No. m unit	● Input phase loss	● Check the input power supply ● Check the installation configuration
m.OH1	Bridge rectifier overheating fault of No. m unit	● Sudden overcurrent of the rectifier ● Shirt-circuit between 3 phases or grounding short circuit ● Duct blockage or fan damage ● Ambient temperature is too high ● Control panel connection or plug loose ● Auxiliary power damage or drive voltage undervoltage ● Power module bridge arm ● Control board abnormal	● Refer to the overcurrent solutions ● Rewire ● Clean the air duct or change the fan ● Reduce the environment temperature ● Check and rewire ● Ask for service ● Ask for service ● Ask for service
m.OH2	IGBT overheating fault of No. m unit		
m. EF1	Fan overheating fault of No. m unit	● Continous overload operation of the unit ● The air duct is jammed	● Check the rectifier load and reduce the load power ● Clean the air duct of the rectifier to ensure good ventilation
m. EF2	Filter unit overheating fault of No. m unit	● Continuous overload operation of the unit ● The air duct is jammed	● Check the rectifier load and reduce the load power ● Clean the air duct of the rectifier to ensure good ventilation

Fault code	Fault type	Possible cause	What to do
m.EF3	External fault 3 of No. m unit	● SI external fault input terminal act	● Check the device input
m.OV	Bus overvoltage fault of No. m unit	● The grid voltage is too high	● Check the input power supply
m.Lv	Bus undervoltage fault of No. m unit	● The grid voltage is too low	● Check the input power supply
m.dn-C	Send communication fault of No. m unit	● The address setting of the master and slave do not match ● The slave communication mode is not correct ● The communication wire is not connected	● Check the relative setting ● Check the communication mode ● Rewire
m.UP-C	Receive communication fault of No. m unit	● The address setting of the master and slave do not match ● The slave communication mode is not correct ● The communication wire is not connected	● Check the relative setting ● Check the communication mode ● Rewire
m.PEr	Power fault of No. m unit	● The switch power supply or operation voltage is abnormal	● Ask for service

6.4.3 Other fault

Fault	State	Cause	Measures
m.CoFF	Communication failed of No. m unit	Optical fiber is not plugged in or damage occur	Check and change the fiber
PoFF	Power loss	Normal communication of the fiber but the rectifier is not power on or the bus voltage is too low	Check the grid
	Communication between keypad and main control board failed	Abnormal connection of the keypad	Check the installation environment

Chapter 7 Communication

7.1 MODBUS protocol

Goodrive800 rectifiers provide RS485 communication interface. It adopts international standard MODBUS communication protocol to perform master-slave communication. The user can realize centralized control through PC/PLC, upper control PC, etc. (set the control command, running frequency of the inverter, modify relevant function codes, monitor and control the operating state and fault information of the inverter and so on) to adapt specific application requirements.

7.1.1 Brief introduction of MODBUS protocol

MODBUS protocol is a software protocol and common language which is applied in the electrical controller. With this protocol, the controller can communicate with other devices via network (the channel of signal transmission or the physical layer, such as RS485). And with this industrial standard, the controlling devices of different manufacturers can be connected to an industrial network for the convenient of being monitored.

There are two transmission modes: ASCII mode and RTU mode. In a same MODBUS network, all devices need to have same transmission mode, baudrate, data bit, check bit, and end bit.

MODBUS network is the control network which means that the master device controls multiple salve devices or one device is the master and the others are the slaves. The master can communicate with one slave device or send signal to various slave devices. If the master communicates with one single slave, the slave needs to return a response message, but if the master sends signal to various salves, there is no need to return.

7.1.2 Application modes

The rectifier applies RTU mode as the MODBUS protocol and the network line is RS485.

7.1.2.1 RS485

The interface of 2-wire RS485 works on semiduplex and its data signal applies differential transmission which is called balance transmission, too. It uses twisted pairs, one of which is defined as A (+) and the other is defined as B (-). Generally, if the positive electrical level between sending drive A and B is among +2~+6V, it is logic"1", if the electrical level is among -2V~-6V; it is logic"0".

485+ on the terminal board corresponds to A and 485- to B.

Communication baud rate means the binary bit number in one second. The unit is bit/s (bps). The higher the baud rate is, the quicker the transmission speed is and the weaker the anti-interference is. If the twisted pairs of 0.56mm（24AWG）is applied as the communication cables, the Max. Transmission distance is as below:

Baud rate	The maximum transmission distance	Baud rate	The maximum transmission distance
2400BPS	1800m	9600BPS	800m
4800BPS	1200m	19200BPS	600m

It is recommended to use shield cable as the grounding wires in RS485 remote distance communication.

It is recommended to use 120Ω terminator as the resistor if the distance is long.

7.1.2.2 RTU mode

(1) Communication frame structure of RTU mode

If the controller is set to communicate by RTU mode in MODBUS network every 8bit byte in the message includes two 4Bit hex characters. Compared with ACSII mode, this mode can send more data at the same baud rate.

Code system

· 1 start bit

· 7 or 8 digital bit, the minimum valid bit can be sent firstly. Every 8 bit frame includes two hex characters (0...9, A...F)

· 1 even/odd check bit. If there is no checkout, the even/odd check bit is inexistent.

· 1 end bit (with checkout), 2 bit (no checkout)

Error detection field

· CRC

The data format is illustrated as below:

11-bit character frame (BIT1~BIT8 are the digital bits)

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

10-bit character frame (BIT1~BIT7 are the digital bits)

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

In one character frame, the digital bit takes effect. The start bit, check bit and end bit is used to send the digital bit right to the other device. The digital bit, even/odd checkout and end bit should be set as the same in real application.

The MODBUS minimum idle time between frames should be no less than 3.5 bytes. The network device is detecting, even during the interval time, the network bus. When the first field (the address field) is received, the corresponding device decodes next transmitting character. When the interval time is at least 3.5 byte, the message ends.

The whole message frame in RTU mode is a continuous transmitting flow. If there is an interval time (more than 1.5 bytes) before the completion of the frame, the receiving device will renew the uncompleted message and suppose the next byte as the address field of the new message. As such, if the new message follows the previous one within the interval time of 3.5 bytes, the receiving device will deal with it as the same with the previous message. If these two phenomena all happen during the transmission, the CRC will generate a fault message to respond to the sending devices.

The standard structure of RTU frame:

START	T1-T2-T3-T4(transmission time of 3.5 bytes)
ADDR	Communication address: 0~247(decimal system)(0 is the broadcast address)
CMD	03H:read slave parameters 06H:write slave parameters
DATA (N-1) … DATA (0)	The data of 2*N bytes are the main content of the communication as well as the core of data exchanging
CRC CHK low bit	Detection value:CRC (16BIT)
CRC CHK high bit	
END	T1-T2-T3-T4(transmission time of 3.5 bytes)

(2) RTU communication frame error checkout

Various factors (such as electromagnetic interference) may cause error in the data transmission. For example, if the sending message is logic “1”, A-B potential difference on RS485 should be 6V, but in reality, it may be -6V because of electromagnetic interference, and then the other devices take the sent message as logic“0”. If there is no error checkout, the receiving devices will not find the message is

wrong and they may give incorrect response which cause serious result. So the checkout is essential to the message.

The theme of checkout is that: the sender calculate the sending data according to a fixed formula, and then send the result with the message. When the receiver gets this message, they will calculate anther result according to the same method and compare it with the sending one. If two results are the same, the message is correct. If not, the message is incorrect.

The error checkout of the frame can be divided into two parts: the bit checkout of the byte and the whole data checkout of the frame (CRC check).

Bit checkout of the byte

The user can select different bit checkouts or non-checkout, which impacts the check bit setting of each byte.

The definition of even checkout: add an even check bit before the data transmission to illustrate the number of "1" in the data transmission is odd number or even number. When it is even, the check byte is "0"; otherwise, the check byte is"1". This method is used to stabilize the parity of the data.

The definition of odd checkout: add an odd check bit before the data transmission to illustrate the number of "1" in the data transmission is odd number or even number. When it is odd, the check byte is "0", otherwise, the check byte is"1". This method is used to stabilize the parity of the data.

For example, when transmitting "11001110", there are five "1" in the data. If the even checkout is applied, the even check bit is "1"; if the odd checkout is applied; the odd check bit is "0". The even and odd check bit is calculated on the check bit position of the frame. And the receiving devices also carry out even and odd checkout. If the parity of the receiving data is different from the setting value, there is an error in the communication.

CRC check

The checkout uses RTU frame format. The frame includes the frame error detection field which is based on the CRC calculation method. The CRC field is two bytes, including 16 figure binary values. It is added into the frame after calculated by transmitting device. The receiving device recalculates the CRC of the received frame and compares them with the value in the received CRC field. If the two CRC values are different, there is an error in the communication.

During CRC, 0*FFFF will be stored. And then, deal with the continuous 6-above bytes in the frame and the value in the register. Only the 8Bit data in every character is effective to CRC, while the start bit, the end and the odd and even check bit is ineffective.

The calculation of CRC applies the international standard CRC checkout principles. When the user is editing CRC calculation, he can refer to the relative standard CRC calculation to write the required CRC calculation program.

Here provided a simple function of CRC calculation for the reference (programmed with C language):

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

return(crc_value);

}

In ladder logic, CKSM calculated the CRC value according to the frame with the table inquiry. The method is advanced with easy program and quick calculation speed. But the ROM space the program occupied is huge. So use it with caution according to the program required space.

7.1.3 RTU command code and communication data illustration

7.1.3.1 Command code: 03H, read N words (Word) (the Max. continuous reading is 16 words)

Command code 03H means that the master reads data from the rectifier and the read number is determined by the data number in the command. The address of red parameters is continuous. Each byte occupies 2 bits. Below command are shown as hex ("H" after data means hex), and one hex occupies a byte.

The command is used to read the parameter and operation state of the rectifier.

For example, read continuous 2 data content from0004H from the rectifier with the address of 01H (read the content of data address of 0004H and 0005H), the frame structure is as below:

RTU master command message (from the master to the rectifier):

START	T1-T2-T3-T4(transmission time of 3.5 bytes)
ADDR(address)	01H
CMD(command code)	03H
High bit of the start address	00H
Low bit of the start address	04H
High bit of data number	00H
Low bit of data number	02H
CRC low bit	85H
CRC high bit	CAH
END	T1-T2-T3-T4(transmission time of 3.5 bytes)

T1-T2-T3-T4 between START and END is to provide at least the time of 3.5 bytes as the leisure time and distinguish two messages for the avoidance of taking two messages as one message.

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

CMD=03H means the command message is sent to read data form the rectifier and CMD occupies one byte

"Start address" means reading data form the address and it occupies 2 bytes with the fact that the high bit is in the front and the low bit is in the behind.

"Data number" means the reading data number with the unit of word. If the "start address' is 0004H and the "data number" is 0002H, the data of 0004H and 0005H will be read.

CRC occupies 2 bytes with the fact that the high bit is in the front and the low bit is in the behind.

RTU slave response message (from the rectifier to the master)

START	T1-T2-T3-T4(transmission time of 3.5 bytes)
ADDR	01H
CMD	03H
Byte number	04H
Data high bit of address 0004H	13H
Data low bit of address 0004H	88H

Data high bit of address 0005H	00H
Data low bit of address 0005H	00H
CRC low bit	7EH
CRC high bit	9DH
END	T1-T2-T3-T4(transmission time of 3.5 bytes)

The meaning of the response is that:

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

CMD=03H means the message is received from the rectifier to the master for the response of reading command and CMD occupies one byte

"Byte number" means all byte number from the byte (excluding the byte) to CRC byte (excluding the byte). 04 means there are 4 byte of data from the "byte number" to "CRC CHK low bit", which are "digital address 0004H high bit", "digital address 0004H low bit", "digital address 0005H high bit" and "digital address 0005H low bit".

There are 2 bytes stored in one data with the fact that the high bit is in the front and the low bit is in the behind of the message, the data of data address 0004H is 1388H, and the data of data address 0005H is 0000H.

CRC occupies 2 bytes with the fact that the high bit is in the front and the low bit is in the behind.

7.1.3.2 Command code: 06H, write one word

06H (correspond to binary 0000 0110), write one word (Word)

The command means that the master write data to the rectifier and one command can write one data other than multiple dates. The effect is to change the working mode of the rectifier.

For example, write 5000 (1388H) to 0004H from the rectifier with the address of 02H, the frame structure is as below:

RTU master command message (from the master to the rectifier):

START	T1-T2-T3-T4(transmission time of 3.5 bytes)
ADDR	02H
CMD	06H
High bit of writing data address	00H
Low bit of writing data address	04H
data content	13H
data content	88H
CRC low bit	C5H
CRC high bit	6EH
END	T1-T2-T3-T4(transmission time of 3.5 bytes)

RTU slave response message (from the rectifier to the master):

START	T1-T2-T3-T4(transmission time of 3.5 bytes)
ADDR	02H
CMD	06H
High bit of writing data address	00H
Low bit of writing data address	04H
High bit of data content	13H
Low bit of data content	88H
CRC low bit	C5H
CRC high bit	6EH
END	T1-T2-T3-T4(transmission time of 3.5 bytes)

Note: section 7.1.3.2 and 7.1.3.3 mainly describe the command format, and the detailed application will

be mentioned in 10.8 with examples.

7.1.3.3 Command code 08H for diagnosis

Meaning of sub-function codes:

Sub-function Code	Description
0000	Return to inquire information data

For example: The inquiry information string is same as the response information string when the loop detection to address 01H of driver is carried out.

The RTU request command is:

START	T1-T2-T3-T4(transmission time of 3.5 bytes)
ADDR	01H
CMD	08H
High bit of sub-function code	00H
Low bit of sub-function code	00H
High bit of data content	12H
Low bit of data content	ABH
CRC CHK low bit	ADH
CRC CHK high bit	14H
END	T1-T2-T3-T4(transmission time of 3.5 bytes)

The RTU response command is:

START	T1-T2-T3-T4(transmission time of 3.5 bytes)
ADDR	01H
CMD	08H
High bit of sub-function code	00H
Low bit of sub-function code	00H
High bit of data content	12H
Low bit of data content	ABH
CRC CHK low bit	ADH
CRC CHK high bit	14H
END	T1-T2-T3-T4(transmission time of 3.5 bytes)

7.1.3.4 The definition of data address

The address definition of the communication data in this part is to control the running of the rectifier and get the state information and relative function parameters of the rectifier.

(1) The rules of parameter address of the function codes

The parameter address occupies 2 bytes with the fact that the high bit is in the front and the low bit is in the behind. The range of high and low byte is: high byte—00~ffH; low byte—00~ffH. The high byte is the group number before the radix point of the function code and the low byte is the number after the radix point. But both the high byte and the low byte should be changed into hex. For example P05.05, the group number before the radix point of the function code is 05, then the high bit of the parameter is 05, the number after the radix point 05, then the low bit of the parameter is 05, then t he function code address is 0505H and the parameter address of P10.01 is 0A01H.

P10.00	Simple PLC means	0:Stop after running once. The inverter has to be commanded again after finishing a cycle. 1:Run at the final value after running once. After finish a signal, the inverter will keep the running frequency and direction of the last run. 2:Cycle running. The inverter will keep on running until receiving a stop command and then, the system will stop.	0	○
P10.01	Simple PLC memory selection	0: Power loss without memory 1:Power loss memory: PLC record the running stage and frequency when power loss.	0	○

Note: P29 group is the factory parameter which can not be read or changed. Some parameters can not be changed when the inverter is in the running state and some parameters can not be changed in any

state. The setting range, unit and relative instructions should be paid attention to when modifying the function code parameters.

Besides, EEPROM is stocked frequently, which may shorten the usage time of EEPROM. For users, some functions are not necessary to be stocked on the communication mode. The needs can be met on by changing the value in RAM. Changing the high bit of the function code form 0 to 1 can also realize the function. For example, the function code P00.07 is not stocked into EEPROM. Only by changing the value in RAM can set the address to 8007H. This address can only be used in writing RAM other than reading. If it is used to read, it is an invalid address.

(2) The address instruction of other function in MODBUS

The master can operate on the parameters of the rectifier as well as control the rectifier, such as running or stopping and monitoring the working state of the rectifier.

Below is the parameter list of other functions:

Function instruction	Address definition	Data meaning instruction	R/W characteristics
Communication control command	2000H	0001H: running	W
		0002H:	
		0003H:	
		0004H:	
		0005H: normal stopping	
		0006H:	
		0007H: fault reset	
		0008H:	
		0009H: power on buffer	
Communication setting address	2001H		W
	2002H	Active current reference, range (-1000~1000, 1000 corresponds to 100.0%)	
	2003H	Reactive current reference, range (-1000~1000, 1000 corresponds to 100.0%)	W
	2004H	DC bus voltage reference (unit:0.1V)	W
	2005H		W
	2006H		W
	2007H		W
	2008H		W
	2009H	Special control command word: Bit0~1: Bit3~4:=00 single machine operation =01:master-slave mode 1 operation =10: master-slave mode 2 operation	W
	200AH	Virtual input terminal command, range:0x000~0xFF	W
	200BH	Virtual output terminal command, range:0x00~0x0F	W
	200CH		W
	200DH	AO 1(-1000~1000，1000 corresponds to 100.0%)	W
	200EH	AO 2(-1000~1000，1000 corresponds to 100.0%)	W
Rectifier state word 1	2100H	0001H: in operation	R
		0002H:	
		0003H: in stopping	
		0004H: in fault	
		0005H: in POFF state	

Function instruction	Address definition	Data meaning instruction	R/W characteristics
Rectifier state word 2	2101H	Bit0: =0: Bus voltage is not established =1: Bus voltage is established Bit4:=0: No overload pre-alarm =1: Overload pre-alarm Bit5~6:=00: single machine operation =01: master-slave mode 1 operation =10: master-slave mode 2 operation	R
Rectifier fault code	2102H	Refer to the fault information	R
Rectifier identification code	010EH		R

R/W characteristics means the function is with read and write characteristics. For example, "communication control command" is writing chrematistics and control the inverter with writing command (06H). R characteristic can only read other than write and W characteristic can only write other than read.

Note: when operate on the rectifier with the table above, it is necessary to enable some parameters. For example, the operation of running and stopping, it is necessary to set P00.01 to communication running command channel and set P00.02 to MODBUS communication channel.

The encoding rules for device codes (corresponds to identifying code 2103H of the rectifier):

Code high 8bit	Meaning	Code low 8 position	Meaning
01	Goodrive	ox0E	Goodrive800 series converters or inverters
		ox0F	Goodrive800 series PWM rectifiers

Note: the code is consisted of 16 bit which is high 8 bits and low 8 bits. High 8 bits mean the model series and low 8 bits mean the derivative models.

7.1.3.5 Fieldbus ratio values

The communication data is expressed by hex in actual application and there is no radix point in hex. For example, 50.12Hz can not be expressed by hex so 50.12 can be magnified by 100 times into 5012, so hex 1394H can be used to express 50.12.

A non-integer can be timed by a multiple to get an integer and the integer can be called fieldbus ratio values.

The fieldbus ratio values are referred to the radix point of the setting range or default value in the function parameter list. If there are figures behind the radix point (n=1), then the fieldbus ratio value m is 10^n.

Take the table as the example:

P01.20	Hibernation restore delay time	Note: The time is the total value when the set frequency is above the lower limit one.	0.0s	○
P01.21	Restart after power off	0: Odisable 1: Enable. if the starting need is met, the inverter will run automatically after waiting for the time defined by P01.22.	0	○

If there is one figure behind the radix point in the setting range or the default value, then the fieldbus ratio value is 10. if the data received by the upper monitor is 50, then the "hibernation restore delay time" is 5.0 (5.0=50÷10).

If Modbus communication is used to control the hibernation restore delay time as 5.0s. Firstly, 5.0 can be magnified by 10 times to integer 50 (32H) and then this data can be sent.

01	06	01 14	00 32	49 E7
Inverter address	Read command	Parameters address	Data number	CRC check

After the rectifier receives the command, it will change 50 into 5 according to the fieldbus ratio value and then set the hibernation restore delay time as 5s.

Another example, after the upper monitor sends the command of reading the parameter of hibernation

restore delay time ,if the response message of the rectifier is as following:

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

Because the parameter data is 0032H (50) and 50 divided by 10 is 5, then the hibernation restore delay time is 5s.

7.1.3.6 Fault message response

There may be fault in the communication control. For example, some parameter can only be read. If a writing message is sent, the inverter will return a fault response message.

The fault message is from the inverter to the master, its code and meaning is as below:

Code	Name	Meaning
01H	Illegal command	The command from master can not be executed. The reason maybe: 1. This command is only for new version and this version can not realize. 2. Slave is in fault state and can not execute it.
02H	Illegal data address.	Some of the operation addresses are invalid or not allowed to access. Especially the combination of the register and the transmitting bytes are invalid.
03H	Illegal data	When there are invalid data in the message framed received by slave. Note: This error code does not indicate the data value to write exceed the range, but indicate the message frame is an illegal frame.
04H	Operation failed	The parameter setting in parameter writing is invalid. For example, the function input terminal can not be set repeatedly.
05H	Password error	The password written to the password check address is not same as the password set by P7.00.
06H	Data frame error	In the frame message sent by the upper monitor, the length of the digital frame is incorrect or the counting of CRC check bit in RTU is different from the lower monitor.
07H	Written not allowed.	It only happen in write command, the reason maybe: 1. The written data exceeds the parameter range. 2. The parameter should not be modified now. 3. The terminal has already been used.
08H	The parameter can not be changed during running	The modified parameter in the writing of the upper monitor can not be modified during running.
09H	Password protection	When the upper monitor is writing or reading and the user password is set without password unlocking, it will report that the system is locked.

The slave uses functional code fields and fault addresses to indicate it is a normal response or some error occurs (named as objection response). For normal responses, the slave shows corresponding function codes, digital address or sub-function codes as the response. For objection responses, the slave returns a code which equals the normal code, but the first byte is logic 1.

For example: when the master sends a message to the slave, requiring it to read a group of address data of the rectifier function codes, there will be following function codes:

0 0 0 0 0 0 1 1 (Hex 03H)

For normal responses, the slave responds the same codes, while for objection responses, it will return:

1 0 0 0 0 0 1 1 (Hex 83H)

Besides the function codes modification for the objection fault, the slave will respond a byte of abnormal code which defines the error reason.

When the master receives the response for the objection, in a typical processing, it will send the message again or modify the corresponding order.

For example, set the "running command channel" of the rectifier (P00.01, parameter address is 0001H) with the address of 01H to 03, the command is as following:

01	06	00 01	00 03	98 0B
Inverter address	Read command	Parameters address	Parameters data	CRC check

But the setting range of "running command channel" is 0~2, if it is set to 3, because the number is beyond the range, the rectifier will return fault response message as below:

01	86	04	43 A3
Inverter address	Abnormal response code	Fault code	CRC check

Abnormal response code 86H means the abnormal response to writing command 06H; the fault code is 04H. In the table above, its name is operation failed and its meaning is that the parameter setting in parameter writing is invalid. For example, the function input terminal can not be set repeatedly.

7.1.3.7 Example of writing and reading

Refer to 7.1.3.1 and 7.1.3.2 for the command format.

(1) Example of reading command 03H

Read the state word 1 of the rectifier with the address of 01H (refer to table 1). From the table 1, the parameter address of the state word 1 of the rectifier is 2100H.

The command sent to the rectifier:

01	03	21 00	00 01	8E 36
Inverter address	Read command	Parameters address	Data number	CRC check

If the response message is as below:

01	03	02	00 03	F8 45
Inverter address	Read command	Parameters address	Data number	CRC check

The data content is 0003H. From the table 1, the rectifier stops.

Watch "the current fault type" to "the previous 5 times fault type" of the rectifier through commands, the corresponding function code is P10.00~P10.05 and corresponding parameter address is 0A00H~0A05H (there are 6 from 0A00H).

The command sent to the rectifier:

03	03	07 1B	00 06	B5 59
Inverter address	Read command	Starting address	6 parameters	CRC check

If the response message is as below:

03	03	0C	00 23	00 23	00 23	00 23	00 23	00 23	5F D2
Inverter address	Read command	Byte number	Current fault type	Previous fault type	Previous 2 fault type	Previous 3 fault type	Previous 4 fault type	Previous 5 fault type	CRC check

See from the returned data, all fault types are 0012H with the meaning of maladjustment (STo).

(2) Example of writing command 06H

Make the inverter with the address of 03H to run forward. See table 1, the address of "communication control command" is 2000H and forward running is 0001. See the table below.

Function instruction	Address definition	Data meaning instruction	R/W characteristics
Communication control command	2000H	0001H:forward running	W
		0002H:reverse running	
		0003H:forward jogging	
		0004H:reverse jogging	
		0005H:stop	
		0006H:coast to stop (emergency stop)	
		0007H:fault reset	
		0008H:jogging stop	
		0009H:pre-exciting	

The command sent by the master:

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

If the operation is success, the response may be as below (the same with the command sent by the master):

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

Example: set the carrier frequency of rectifier with address of 07H to 6.0kHz.

P00.03	Max. output frequency	This parameter is used to set the maximum output frequency of the inverter. Users should pay attention to this parameter because it is the foundation of the frequency setting and the speed of acceleration and deceleration. Setting range: P00.04~400.00Hz	50.00Hz	◎

See the figures behind the radix point, the fieldbus ratio value of P00.07 is 10. 6.k0Hz timed by 10 is 60 and the corresponding hex is 3CH.

The command sent by the master:

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

If the operation is successful, the response may be as below (the same with the command sent by the master):

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

Note: the blank in the above command is for illustration. The blank can not be added in the actual application unless the upper monitor can remove the blank by themselves.

7.1.4 Common communication faults

Common communication faults are: no response to the communication or the rectifier returns abnormal fault.

The possible reason for no response to the communication:

Selecting wrong serial interface, for example, if the converter is COM1, selecting COM2 during the communication

The baud rate, digital bit, end bit and check bit are not the same with the inverter + and - of RS485 are connected in reverse.

RS 485 + and – are connected wrong

7.1.5 Relative function codes

Function code	Name	Description	Setting range	Default

Function code	Name	Description	Setting range	Default
P20.00	Local communication address	1~247 0: broadcast address	1~247	1
P20.01	Baud rate setting	0:1200BPS 1:2400BPS 2:4800BPS 3:9600BPS 4:19200BPS 5:38400BPS	0~5	4
P20.02	Check bit setting	0: No check (N, 8, 1)for RTU 1: Odd check (E, 8, 1)for RTU 2: Even check (O, 8, 1)for RTU 3: No check (N, 8, 2)for RTU 4: Odd check (E, 8, 2)for RTU 5: Even check (O, 8, 2)for RTU	0~5	1
P20.03	Response delay	0~200ms	0~200	5
P20.04	MODBUS communication overtime	0.0(invalid), 0.1~60.0s	0.0~60.0s	0.0s
P20.05	Communication response enabling	0: Report fault and coast to stop 1: Not to report fault and keep working 2:Not to report fault and stop (only in the communication control mode) 3:Not to report fault and stop (in all communication control modes)	0~3	0
P20.06	Communication processing	0x00~0x11 LED ones: 0: Response to write 1: No response to write LED tens: 0: Reserved 1: Reserved	0x00~0x11	0x00

7.2 PROFIBUS protocol

(1) PROFIBUS is an open international fieldbus standard that allows data exchange among various types of automation components. It is widely used in manufacturing automation, process automation and in other areas automation such as buildings, transportation, power, providing an effective solution for the realization of comprehensive automation and site-equipment intellectualization.

(2) PROFIBUS is composed of three compatible components, PROFIBUS-DP (Decentralized Periphery, distributed peripherals), PROFIBUS-PA (Process Automation), PROFIBUS-FMS (Fieldbus Message Specification, Fieldbus Message Specification). It is periodically exchange data with the inverter when using master-slave function. PRNV PROFIBUS-DP adapter module only supports PROFIBUS-DP protocol.

(3) The physical transmission medium of bus is twisted-pair (in line with RS-485 standard), two-wire cable or fiber optic cable. Baud rate is from 9.6Kbit/s to 12Mbit/s. The maximum bus cable length is

between 100 m and 1200 m, specific length depending on the selected transmission rate (see the technical data chapter). Up to 31 nodes can be connected to the same PROFIBUS network when repeaters aren't used. But, if use repeaters, up to 127 nodes can be connected to the same PROFIBUS network segment (including repeaters and master stations).

(4) In the process of PROFIBUS communication, token assign among masters and master-slave transmission among master-slave stations. Supporting single-master or multi-master system, stations-programmable logic controller (PLC)-choose nodes to respond to the master instruction. Cycle master-from user data transmission and non-cyclic master-master station can also send commands to multiple nodes in the form of broadcast. In this case, the nodes do not need to send feedback signals to the master. In the PROFIBUS network, communication between nodes can not be allowed.

(5) PROFIBUS protocol is described in detail in EN 50170 standard. To obtain more information about PROFIBUS, please refer to the above-mentioned EN 50170 standards.

7.2.1 Product information of PROFIBUS-DP

EC-TX103 communication card module is a selection device to PWM rectifier makes rectifier connected to PROFIBUS network. In PROFIBUS network, PWM rectifier is a subsidiary device. The following functions can be completed using EC-TX103 communication card module:

- Send control commands to PWM rectifier (start, stop, fault reset, etc.);
- Send speed or torque reference to PWM rectifier;
- Read out state and actual values of PWM rectifier;
- Modify the PWM rectifier parameter.

Please refer to the description of function codes in Group PD for the commands supported by the device.

Note:

1. EC-TX103 communication card is compatible with Goodrive800 series products and all rectifiers which support PROFIBUS extension.

2. EC-TX103 communication card is compatible with all master stations which support PROFIBUS-DP protocol.

7.2.2 PROFIBUS-DP communication

PROFIBUS-DP is a distributed I/O system, which enables master machine to use a large number of peripheral modules and field devices. Data transmission shows cycle: master machine read input information from subsidiary machine then give feedback signal. EC-TX communication card module supports PROFIBUS-DP protocol.

7.2.2.1 Service access point

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

7.2.2.2 PROFIBUS-DP information frame data structure

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

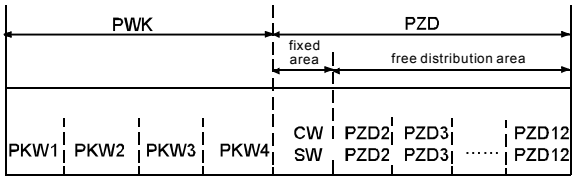


Figure 7-2 PROFIBUS-DP message structure

PKW area (parameter identification marks PKW1-value area)

PKW area 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 PKW area:

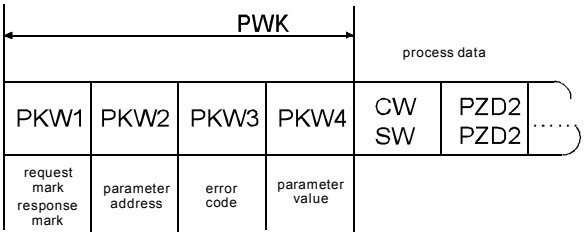


Figure 7-3 Parameter identification zone

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

Word	Bit	Definition	Range
The first word PKW1 (16 bit)	Bit 15~00	Task or response identification marks	0~7
The second word PKW2 (16 bit)	Bit 15~00	Basic parameters address	0~247
The third word PKW3 (16 bit)	Bit 15~00	Parameter value (high word) or return error code value	00
The fourth word PKW4 (16 bit)	Bit 15~00	Parameter value (low bit word)	0~65535

Note: If the master requests one parameter value, the value of PKW3 and PKW4 will not be valid.

Task requests and responses

When passing data to slave machine, master machine use request label while slave machine use response label to positive or negative confirmation.

The definition of task logo PKW1 is as follows:

Request label (From master to slave)		Response label	
Request	Function	Positive confirmation	Negative confirmation
0	No task	0	—
1	Request parameter value	1，2	3
2	Modification parameter value (one word) [only change RAM]	1	3 or 4
3	Modification parameter value (double word) [only change RAM]	2	3 or 4
4	Modification parameter value (one word) [RAM and EEPROM are modified]	1	3 or 4

Request label (From master to slave)		Response label	
Request	Function	Positive confirmation	Negative confirmation
5	Modification parameter value (double word) [RAM and EEPROM are modified]	2	3 or 4

Reponses logo PKW1 defines as below:

Response label (From slave to master)	
Confirmation	**Function**
0	No response
1	Transmission parameter value (one word)
2	Transmission parameter value (two word)
3	Task can not be executed and returns the following error number: 0: Illegal parameter number 1: Parameter values can not be changed (read-only parameter) 2: Out of setting value range 3: The sub-index number is not correct 4: Setting is not allowed (only reset) 5: Data type is invalid 6: The task could not be implemented due to operational status 7: Request isn't supported. 8: Request can't be completed due to communication error 9: Fault occurs when write operation to stationary store 10: Request fails due to timeout 11: Parameter can not be assigned to PZD 12: Control word bit can't be allocated 13: Other errors
4	No parameter change rights

Example for PKW:

Example 1: Read parameter value

Read keypad setting frequency value (the address of keypad setting frequency is 4) which can be achieved by setting PKW1 as 1, PKW2 as 4, return value is in PKW4.

Request (From master to rectifier):

	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 read parameter

Response (From rectifier to master):

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

0001: Response 0001: Address 4

Example 2: Modify the parameter values (RAM and EEPROM are modified); modify the value which determines the DC bus voltage (address of DC bus voltage setting is 4), set PKW1 to 2 and PKW2 to 4

and the value (1) which is to be modified is in PKW4.

Request (From master to rectifier):

	PKW1		PKW2		PKW3		PKW4		CW		PZD2		PZD3		…	PZD12	
Request	00	02	00	04	00	00	00	01	xx	xx	xx	xx	xx	xx	…	xx	xx

0001: Address 4

0004: Modify

Response (From rectifier to master):

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

0001: Response

PZD example: the transmission in PZD zone is set by the setting of function codes of rectifier.

7.2.2.3 PZD area (process data area)

PZD area of communication message is designed for control and monitor PWM rectifier. PZD from master and slave station is addressed in high priority; the priority of dealing with PZD is superior to that of PKW, and always sends current valid date from interface.

Control word (CW) and status word (SW)

Control word (CW) is a basic method of fieldbus system controlling PWM rectifier. It is sent by the fieldbus master station to PWM rectifier and the communication card module act as gateway. PWM rectifier responds according to the control word and gives feedbacks to master machine through status word (SW).

Given value

PWM rectifier can receive control information by several ways, these channels include: analog and digital input terminals, PWM rectifier control board and module communication (such as RS485, EC-TX103 communication card modules). In order to use PROFIBUS control PWM rectifier, the communication module must be set to be PWM rectifier controller.

Actual value

Actual value is a 16-bit word, which contains converter operation information. Monitoring capabilities are defined by PWM rectifier parameter. The integer scaling of actual value is sent to master machine depending on selected function, please refer to PWM rectifier manual.

Note: PWM rectifier always check the control word (CW) and bytes of given value.

Mission message (From master station to inverter)

Control word (CW)

The first word of PZD is control word (CW) of PWM rectifier; due to different control word (CW) of PWM rectifier regenerative part and inverter part Illustration is depart in next two tables.

PZD message (master→ PWM rectifier)

The 1st word of PZD message is the control word of PWM rectifier:

Bit	Name	Value	Status/Description
0~7	COMMAND BYTE	1	Run
		2	
		3	
		4	

Bit	Name	Value	Status/Description
		5	Normal stop
		6	
		7	Fault reset
		8	
		9	Power on buffer
8	WIRTE ENABLE	1	Write enable (mainly PKW1-PKW4)
		0	
9	Reserved	1	
		0	
10	Reserved	1	
		0	
11	Reserved	1	
		0	
12	Reserved	1	
		0	
13~14	MASTER-SLAVER MODE SELECTION	00	SINGLE MACHINE MODE
		01	MASTER-SLAVER MODE 1
		02	MASTER-SLAVER MODE 2
		03	
15	HEARTBEAT REF	1	Heartbeat enable
		0	Heartbeat disabled

Setting value (REF):

From 2nd word to 12th of PZD task message is the main setting value REF, main frequency setting value is offered by main setting signal source. As PWM rectifier feedback part doesn't have main frequency setting part, corresponding settings belong to reserved part, the following table shows PWM rectifier settings for Goodrive800:

Bit	Name	From master to slave
PZD2	DC voltage setting (0~20000, unit 0.1V) Active current reference (-1200~1200, 1000 corresponds to 100.0% of the rated current) Reactive current reference (-1200~1200, 1000 corresponds to 100.0% of the rated current) Virtual input terminal command, range:0x00~0xFF AO output setting 1(-1000~1000, 1000 corresponds to 100.0%) AO output setting 2(-1000~1000, 1000 corresponds to 100.0%)	Determined by the master
PZD3		Determined by the master
PZD4		Determined by the master
PZD5		Determined by the master
PZD6		Determined by the master
PZD7		Determined by the master
PZD8		Determined by the master
PZD9		Determined by the master
PZD10		Determined by the master

Bit	Name	From master to slave
PZD11		Determined by the master
PZD12		Determined by the master

Response message (From PWM rectifier to master)

Status word (SW):

The first word of PZD response message is status word (SW) of inverter, the definition of status word is as follows:

Bit	Name	Value	Status/Description
0~7	RUN STATUS BYTE	1	In running
		2	
		3	In stopping
		4	In fault
		5	POFF state
8	DC VOLTAGE ESTABLISH	1	Ready for operation
		0	Not ready for operation
9	Reserved	1	
		0	
10	Reserved	1	
		0	
11	Reserved	1	
		0	
12	OVERLOAD ALARM	1	Overload alarm
		0	No overload alarm
13~14	MASTER-SLAVER MODE FEEDBACK	0	SINGLE MACHINE MODE
		1	MASTER-SLAVER MODE 1
		2	MASTER-SLAVER MODE 2
		3	
15	HEARTBEAT FEEDBACK	1	Heartbeat feedback
		0	No heartbeat feedback

Actual value (ACT):

From 2nd word to 12th of PZD task message is main setting value ACT, main frequency setting value is offered by main setting signal source.

Bit	Name
PZD2	1: DC voltage(*10, V) 2: DC voltage feedback (*10, V) 3:Input voltage valid (*10, V) 4: Input RMS current (*10, A) 5: Input power (*10, kW) 6: Input power factor (*100) 7: Grid frequency value (*10, Hz) 8: Active current feedback (100% corresponds to the rated current of the rectifier) 9: Reactive current feedback (100% corresponds to the rated current of the rectifier)
PZD3	
PZD4	
PZD5	
PZD6	
PZD7	
PZD8	
PZD9	
PZD10	
PZD11	
PZD12	

Bit	Name
	10: Fault code 11:AI1 (*100, V) 12:AI2 (*100, V) 13:AI3 (*100, V) 14: Input state 15: Output state 16: Running status word

Example for PZD:

Transmission of PZD area is achieved through PWM rectifier function code; please refer to relevant INVT inverter user manual to know relevant function code.

Example 1: Read procedure data of PWM rectifier

PWM rectifier parameter selects "8: Run frequency" as PZD3 to transmit which can be achieved by setting Pd.14 as 8. This operation is mandatory until the parameter is instead of others.

Response (From PWM rectifier to master):

	PKW1		PKW2		PKW3		PKW4		CW		PZD2		PZD3		…	PZD12	
Response	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	00	05	…	xx	xx

Example 2: Write procedure data into PWM rectifier

PWM rectifier parameter selects "2": active current reference from PZD3 which can be achieved by setting Pd.03 as 2. In each request frame, parameters will use PZD3 to update until re-select a parameter.

Request (From master to PWM rectifier):

	PKW1		PKW2		PKW3		PKW4		CW		PZD2		PZD3		…	PZD12	
Response	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	00	10	…	xx	xx

In each request frame contents of PZD3 are given by traction until re-select a parameter.

7.2.3 Fault information

EC-TX103 module is equipped with three fault display LEDs as shown is figure below. The roles of these LEDs are as follows:

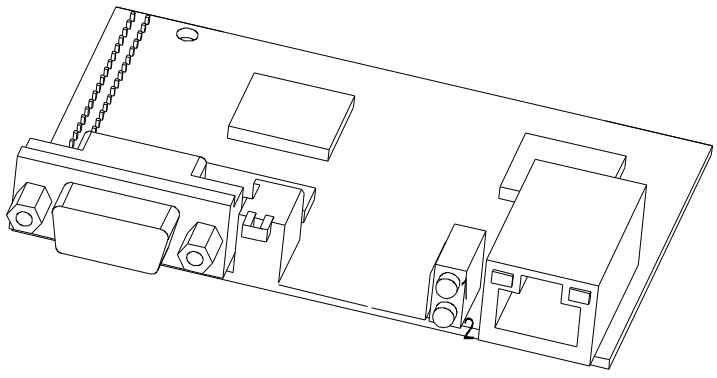


Figure 2-10 Fault display LEDs

LED no.	Name	Color	Function

LED no.	Name	Color	Function
1	Online	Green	ON-module online and data can be exchanged. OFF-module is not in "online" state.
2	Offline/fault	Red	Flicker frequency 1Hz-configuration error: The length of user parameter data sets is different from that of network configuration process during module initialization process. Flicker frequency 2Hz-user parameter data error: The length or content of user parameter data sets is different from that of network configuration process during module initialization process. Flicker frequency 4Hz-PROFIBUS communication ASIC initialization error. OFF-Diagnostic closed.

7.2.4 Relative function codes

Function code	Name	Description	Setting range	Default
P21.00	Module type	0:Profibus	0~1	0
P21.01	Module address	0~127	0~127	2
P21.02	PZD2 receive	0: Invalid 1: DC voltage setting (0~20000, unit 0.1V) 2: Active current reference (-1200~1200, 1000 corresponds to 100.0% of the rated current) 3: Reactive current reference (-1200~1200, 1000 corresponds to 100.0% of the rated current) 4: Virtual input terminal command, range: 0x00~0xFF 5: AO output setting 1(-1000~1000, 1000 corresponds to 100.0%) 6: AO output setting 2(-1000~1000, 1000 corresponds to 100.0%) 7~13: Reserved	0~13	0
P21.03	PZD3 receive	1: DC voltage (*10, V) 2: DC voltage feedback (*10, V) 3:Input voltage valid (*10, V) 4: Input RMS current (*10, A) 5: Input power (*10, kW) 6: Input power factor (*100) 7: Grid frequency value (*10, Hz) 8: Active current feedback (100% corresponds to the rated current of the rectifier)	0~13	0
P21.04	PZD4 receive		0~13	0
P21.05	PZD5 receive		0~13	0
P21.06	PZD6 receive		0~13	0
P21.07	PZD7 receive		0~13	0
P21.08	PZD8 receive		0~13	0
P21.09	PZD9 receive		0~13	0
P21.10	PZD10 receive		0~13	0
P21.11	PZD11 receive		0~13	0
P21.12	PZD12 receive		0~13	0

Function code	Name	Description	Setting range	Default
P21.13	PZD2 send	9: Reactive current feedback (100% corresponds to the rated current of the rectifier) 10: Fault code 11:AI1 (*100, V) 12:AI2 (*100, V) 13:AI3 (*100, V) 14: Input state 15: Output state 16: Running status word 17~20: Reserved	0~20	0
P21.14	PZD3 send	0~65535	0~20	0
P21.15	PZD4 send		0~20	0
P21.16	PZD5 send		0~20	0
P21.17	PZD6 send		0~20	0
P21.18	PZD7 send		0~20	0
P21.19	PZD8 send		0~20	0
P21.20	PZD9 send		0~20	0
P21.21	PZD10 send		0~20	0
P21.22	PZD11 send		0~20	0
P21.23	PZD12 send		0~20	0
P21.24	Temporary variable 1 of PZD sending		0~65535	0
P21.25	Time of Dp communication overtime fault	0.0(invalid), 0.1~60.0s	0.0~60.0s	0.0s

7.3 CAN protocol (reserved)

7.4 DEVICE-NET (reserved)

7.5 Ethernet communication

Goodrive800 series rectifiers have integrated Ethernet communication with standard RJ45 wires. It is necessary to download the INVT PC software on the website of www.invt.com.cn.

It is easy to set, upload and download all parameters of PWM rectifier through the PC, as well as monitor up to 100 waveforms of PWM rectifier at any time.

Goodrive800 series rectifiers have the function of "black box", which means that it can save the waveform information 0.2 second before stopping. It is easy to access for fault analysis.

7.5.1 Relative function codes

Function code	Name	Description	Setting range	Default
P22.00	Ethernet	0: 10M full-duplex	0~4	3

Function code	Name	Description	Setting range	Default
	communication speed setting	1: 10M half-duplex 2: 100M full-duplex 3: 100M half-duplex 4: Adaptive		
P22.01	IP address 1	0~255	0~255	192
P22.02	IP address 2	0~255	0~255	168
P22.03	IP address 3	0~255	0~255	0
P22.04	IP address 4	0~255	0~255	1
P22.05	Subnet mask 1	0~255	0~255	255
P22.06	Subnet mask 2	0~255	0~255	255
P22.07	Subnet mask 3	0~255	0~255	255
P22.08	Subnet mask 4	0~255	0~255	0
P22.09	Gateway address 1	0~255	0~255	192
P22.10	Gateway address 2	0~255	0~255	168
P22.11	Gateway address 3	0~255	0~255	1
P22.12	Gateway address 4	0~255	0~255	1

Appendix Parameters list

The function parameters of Goodrive800 series PWM rectifiers have been divided into various groups (P00~P29) according to the function. Each function group contains certain function codes applying 3-level menus. For example, "P08.08" means the eighth function code in the P8 group function, P29 group is factory reserved, and users are forbidden to access these parameters.

For the convenience of function codes setting, the function group number corresponds to the first level menu, the function code corresponds to the second level menu and the function code corresponds to the third level menu.

1. Below is the instruction of the function lists:

The first line "Function code": codes of function parameter group and parameters;

The second line "Name": full name of function parameters;

The third line "Description": Detailed illustration of the function parameters

The fourth line "Setting range": the setting range of the function parameter;

The fifth line "Default": the original factory set value of the function parameter;

The sixth line "Modify": the modifying character of function codes (the parameters can be modified or not and the modifying conditions), below is the instruction:

"○": means the set value of the parameter can be modified on stop and running state;

"◎": means the set value of the parameter can not be modified on the running state;

"●": means the value of the parameter is the real detection value which can not be modified.

(PWM rectifier has limited the automatic inspection of the modifying character of the parameters to help users avoid mismodifying)

2. "Parameter radix" is decimal (DEC), if the parameter is expressed by hex, then the parameter is separated from each other when editing. The setting range of certain bits are 0~F (hex).

3."The default value" means the function parameter will restore to the default value during default parameters restoring. But the detected parameter or recorded value won't be restored.

4. For a better parameter protection, PWM rectifier provides password protection to the parameters. After setting the password (set P07.00 to any non-zero number), the system will come into the state of password verification firstly after the user press PRG/ESC to come into the function code editing state. And then "0.0.0.0.0." will be displayed. Unless the user input right password, they cannot enter into the system. For the factory setting parameter zone, it needs correct factory password (remind that the users can not modify the factory parameters by themselves, otherwise, if the parameter setting is incorrect, damage to PWM rectifier may occur). If the password protection is unlocked, the user can modify the password freely and the PWM rectifier will work as the last setting one. When P07.00 is set to 0, the password can be canceled. If P07.00 is not 0 during powering on, then the parameter is protected by the password. When modify the parameters by serial communication, the function of the password follows the above rules, too.

Function code	Name	Description	Setting range	Default	Modify
P00 group Basic functions					
P00.00	Operation mode	0: Rectifier mode (normal operation) 1: Converter mode (reserved)	0~1	0	◎
P00.01	Control command	0: Keypad (LED off)	0~2	0	◎

Function code	Name	Description	Setting range	Default	Modify
	channel	1:Terminal (LED blinking) 2: Communication (LED on)			
P00.02	Communication command channel	0:485 communication 1:PROFIBUS communication 2:Ethernet communication 3:CAN communication (reserved) 4:DEVICE_NET communication (reserved)	0~4	0	◎
P00.03	Operation channel	0:COSφ mode 1: Reactive power compensation mode 2: Current closed loop mode	0~2	0	◎
P00.04	Setting mode of DC bus voltage	0:Aotumatic 1:Keypad 2:Communication	0~2	1	◎
P00.05	DC bus voltage setting	300.0~2000.0V	300.0~2000.0	AC380V: 680V; AC690:1050V	○
P00.06	Setting channel of DC bus voltage	0:485 communication 1:PROFIBUS communication 2:Ethernet communication 3:CAN communication (reserved) 4:DEVICE_NET communication (reserved)	0~4	0	◎
P00.07	Carrier frequency setting	2.0~8.0kHz	2.0~8.0	5.0kHz	◎
P00.08	PWM modulation	0: SVPWM1 (Two-phase modulation) 1: SVPWM2(Three-phase modulation)	0~1	1	◎
P00.09	Overmodulation selection	0: Invalid 1: Valid	0~1	0	◎
P00.10	Operation mode of the fan	0:Normal 1: Operate after power on	0~1	0	○
P00.11	Reserved				●
P00.12	Reserved				●
P00.13	Reserved				●
P00.14	Reserved				●
P00.15	Function parameters restore	0: Disabled 1: All parameters restore default 2: Delete recent fault log	0~2	0	◎

Function code	Name	Description	Setting range	Default	Modify
		3: Clear accumulated electricity consumption			
P00.16	Function parameters	0: For write/read 1: For read only	0~1	0	○
P01 group Power control and protection functions					
P01.00	Valid bit control	0x00~0x3F	0x00~0x3F	0x3F	◎
P01.01	Main contactor detection	0: No detection 1: Detection	0~1	1	◎
P01.02	Power-on buffer control mode (Buffer contactor)	0:Switch on automatically after power on 1: Terminal 2: Communication	0~2	0	◎
P01.03	Control communication channel	0:485 communication 1:PROFIBUS communication 2:Ethernet communication 3:CAN communication (reserved) 4:DEVICE_NET communication (reserved)	0~4	0	◎
P01.04	Timeout 1	0.01~10.00s	0.01~10.00	1.00s	○
P01.05	Timeout 2	0.01~10.00s	0.01~10.00	3.00s	○
P01.06	Waiting time of automatic operation	0~3600.0s 0.0: Invalid	0~3600.0	0.0s	○
P01.07	Delay time of automatic fault reset	0.0~3600.0s	0.0~3600.0s	1.0s	○
P01.08	Fault reset times	0~10	0~10	0	○
P02 group Master-slave control					
P02.00	Rectifier control mode	0: Single machine mode 1: Master-slave control 1 (PWM synchronous mode) 2: Master-slave control 2 (Control word mode)	0~2	0	◎
P02.01	Master-slave mode selection	0: Master 1: Slave	0~1	0	◎
P02.02	Master-slave communication mode selection	0: Optical fiber communication 1:485 communication 2:PROFIBUS communication 2:Ethernet communication 4:CAN communication (reserved) 5:DEVICE_NET communication (reserved)	0~5	0	◎
P02.03	Partition coefficient of the	0.0%~200.0%	0~200.0%	100.0%	○

Function code	Name	Description	Setting range	Default	Modify
	active current				
P02.04	Slave operation command	0: The local 1: The master	0~1	0	○
P02.05	Fault processing of the slave	0: Stopping 1: Keep running	0~1	0	○
P02.06	Slave bypass	0: Disable 1: Enable	0~1	0	○
P02.07	Slave number display	0~16	0~16	0	●
P03 group Control parameters					
P03.00	Setting channel of active current	0: Keypad 1:AI1 2:AI2 3:AI3 4: Communication	0~4	0	◎
P03.01	Keyboard setting of active current	-150.0%~150.0%(rated current of the rectifier)	-150.0~150.0%	0.0%	○
P03.02	Reference channel of active current commendation	0:485 communication 1:PROFIBUS 2:Ethernet communication 3:CAN communication (reserved) 4:DEVICE_NET communication (reserved)	0~4	0	◎
P03.03	Setting channel of reactive current	0:Keypad 1:AI1 2:AI2 3:AI3 4:Communication	0~4	0	◎
P03.04	Keyboard setting of reactive current	-150.0%~150.0%	-150.0~150.0	0.0%	○
P03.05	Reference channel of reactive current commendation	0:485 communication 1:PROFIBUS 2:Ethernet communication 3:CAN communication (reserved) 4:DEVICE_NET communication (reserved)	0~4	0	◎
P03.06	Positive limit amplitude of active current	0.0~200.0%	0.0~200.0	150.0%	○
P03.07	Negative limit amplitude of active current	0.0~200.0%	0.0~200.0	150.0%	○
P03.08	Positive limit amplitude of reactive current	0.0~200.0%	0.0~200.0	150.0%	○

Function code	Name	Description	Setting range	Default	Modify
P03.09	Negative limit amplitude of reactive current	0.0~200.0%	0.0~200.0	150.0%	○
P03.10	Maximum current setting	0~250.0%	0~250.0	200.0%	○
P03.11	Proportional coefficient of voltage loop 1	0.001~30.000	0.001~30.000	1.000	○
P03.12	Integral coefficient of voltage loop 1	0.01~300.00	0.01~300.00	1.50	○
P03.13	Proportional coefficient of voltage loop 2	0.001~30.000	0.001~30.000	5.000	○
P03.14	Integral coefficient of voltage loop 2	0.01~300.00	0.01~300.00	1.50	○
P03.15	Switching voltage of PI parameters	0.01~30.00	0.01~30.00V	10.00V	○
P03.16	Output filter time of voltage loop	0~1.000s	0~1.000	0.000s	○
P03.17	Current loop proportional coefficient P	0.001~30.000	0.001~30.000	1.000	○
P03.18	Current loop integral coefficient I	0.01~300.00	0.01~300.00	0.50	○
P03.19	Power factor setting	0:Angle setting 1: Power factor set directly	0~1	0	◎
P03.20	Rectifier power factor angle (COS)	-90.0°~90.0°	-90.0~90.0	0.0°	○
P03.21	Feedback power factor angle (COS)	-90.0°~90.0°	-90.0~90.0	0.0°	○
P03.22	Rectification power factor	-100.0%~100.0%	-100.0~100.0	100.0%	○
P03.23	Feedback power factor			100.0%	○
P05 group Input terminals					
P05.00	Reserved				●
P05.01	S1 terminal function selection	0: No function 1: Run 2: Fault reset 3: External fault 4: Slave fault 5: Run enabling 6: Switch between master and slave 7: Reserved 8: Reserved 9: Power on buffer control 10: Switch to the keypad operation 11: Switch to the terminal	0~15	0	◎
P05.02	S2 terminal function selection		0~15	0	◎
P05.03	S3 terminal function selection		0~15	0	◎
P05.04	S4 terminal function selection		0~15	0	◎
P05.05	S5 terminal function selection		0~15	0	◎
P05.06	S6 terminal function selection		0~15	0	◎
P05.07	S7 terminal function selection		0~15	0	◎

Function code	Name	Description	Setting range	Default	Modify
P05.08	S8 terminal function selection	operation 12: Switch to the communication operation 13: Total electricity consumption cleared 14: Cumulative power maintain 15: Reserved	0~15	0	◎
P05.09	Polarity selection of digital input terminals	0x00~0xFF	0x00~0xFF	0x00	◎
P05.10	Digital input filtering time	0.000~1.000s	0.000~1.000	0s	○
P05.11	Virtual input terminal setting	0: Virtual terminal is invalid 1:MODBUS communication virtual terminal valid 2:PROFIBUS communication virtual terminal valid 3~10: Reserved	0~10	0	◎
P05.12	Reserved				●
P05.13	Delay time of S1 switching-on	0.000~60.000s	0.000~60.000	0.000s	○
P05.14	Delay time of S1 switching-off	0.000~60.000s	0.000~60.000	0.000s	○
P05.15	Delay time of S2 switching-on	0.000~60.000s	0.000~60.000	0.000s	○
P05.16	Delay time of S2 switching-off	0.000~60.000s	0.000~60.000	0.000s	○
P05.17	Delay time of S3 switching-on	0.000~60.000s	0.000~60.000	0.000s	○
P05.18	Delay time of S3 switching-off	0.000~60.000s	0.000~60.000	0.000s	○
P05.19	Delay time of S4 switching-on	0.000~60.000s	0.000~60.000	0.000s	○
P05.20	Delay time of S4 switching-off	0.000~60.000s	0.000~60.000	0.000s	○
P05.21	Delay time of S5 switching-on	0.000~60.000s	0.000~60.000	0.000s	○
P05.22	Delay time of S5 switching-off	0.000~60.000s	0.000~60.000	0.000s	○
P05.23	Delay time of S6 switching-on	0.000~60.000s	0.000~60.000	0.000s	○
P05.24	Delay time of S6 switching-off	0.000~60.000s	0.000~60.000	0.000s	○
P05.25	Delay time of S7 switching-on	0.000~60.000s	0.000~60.000	0.000s	○

Function code	Name	Description	Setting range	Default	Modify
P05.26	Delay time of S7 switching-off	0.000~60.000s	0.000~60.000	0.000s	○
P05.27	Delay time of S8 switching-on	0.000~60.000s	0.000~60.000	0.000s	○
P05.28	Delay time of S8 switching-off	0.000~60.000s	0.000~60.000	0.000s	○
P05.29	AI1 lower limit	0.00V~ P05.31	0.00~P05.31	0.00V	○
P05.30	AI 1 lower limit corresponding setting	-100.0%~ P05.32	-100.0~P05.32	0.0%	○
P05.31	AI1 upper limit	P05.29~10.00V	P05.29~10.00	10.00V	○
P05.32	AI 1 upper limit corresponding setting	P05.30~100.0%	P05.30~100.0	100.0%	○
P05.33	AI1 input filtering time	0.00s~10.000s	0.00~10.000	0.100s	○
P05.34	AI2 lower limit	0.00V~ P05.36	0.00~P05.36	0.00V	○
P05.35	AI2 lower limit corresponding setting	-100.0%~ P05.37	-100.0~P05.37	0.0%	○
P05.36	AI2 upper limit	P05.34~10.00V	P05.34~10.00	10.00V	○
P05.37	AI2 upper limit corresponding setting	P05.35~100.0%	P05.35~100.0	100.0%	○
P05.38	AI2 input filtering time	0.00s~10.000s	0.00~10.000	0.100s	○
P05.39	AI32 lower limit	-10.00V~ P05.41	-10.00~P05.41	-10.00V	○
P05.40	AI3 lower limit corresponding setting	-100.0%~ P05.42	-100.0~P05.42	-100.0%	○
P05.41	AI3 upper limit	P05.39~P05.43	P05.39~P05.43	0.00V	○
P05.42	AI3 upper limit corresponding setting	P05.40~ P05.44	P05.40~P05.44	0.0%	○
P05.43	AI3 input filtering time	P05.41~10.00V	P05.41~10.00	10.00V	○
P05.44	AI3 lower limit	P05.42~100.0%	P05.42~100.0	100.0%	○
P05.45	AI3 lower limit corresponding setting	0.000s~10.000s	0.000~10.000	0.100s	○
P05.46	Reserved				●
P05.47	Reserved				●
P05.48	Reserved				●
P05.49	Reserved				●
P05.50	Reserved				●
P05.51	Reserved				●
P05.52	Reserved				●
P05.53	Reserved				●
P05.54	Reserved				●
P05.55	Reserved				●
P05.56	Reserved				●
P05.57	Reserved				●
P05.58	Reserved				●

Function code	Name	Description	Setting range	Default	Modify
P05.59	Reserved				●
P06 group Output terminals					
P06.00	Reserved				●
P06.01	Y1 output selection	0: No output 1: Ready to run 2: In running 3: Fault output 4: Master mode 5: Slave mode 6: Buffer contactor state 7: Main contactor state 8:MODBUS communication virtual terminal output 9:PROFIBUS communication virtual terminal output 10~31: Reserved	0~31	0	○
P06.02	Y2 output selection		0~31	0	○
P06.03	Relay 1 output selection		0~31	0	○
P06.04	Relay 2 output selection		0~31	0	○
P06.05	Relay 3 output selection		0~31	0	○
P06.06	Relay 4 output selection (STO)		0~31	0	○
P06.07	Polarity selection of digital output terminal	0x00~0x3F	0x00~0x3F	0x00	○
P06.08	Delay time of Y1 switching-on	0.000~60.000s	0.000~60.000s	0.000s	○
P06.09	Delay time of Y1 switching-off	0.000~60.000s	0.000~60.000s	0.000s	○
P06.10	Delay time of Y2 switching-on	0.000~60.000s	0.000~60.000s	0.000s	○
P06.11	Delay time of Y2 switching-off	0.000~60.000s	0.000~60.000s	0.000s	○
P06.12	Delay time of RO1 switching-on	0.000~60.000s	0.000~60.000	0.000s	○
P06.13	Delay time of RO1 switching-off	0.000~60.000s	0.000~60.000	0.000s	
P06.14	Delay time of RO2 switching-on	0.000~60.000s	0.000~60.000	0.000s	○
P06.15	Delay time of RO2 switching-off	0.000~60.000s	0.000~60.000	0.000s	○
P06.16	Delay time of RO3 switching-on	0.000~60.000s	0.000~60.000	0.000s	○
P06.17	Delay time of RO3 switching-off	0.000~60.000s	0.000~60.000	0.000s	○
P06.18	Delay time of RO4 switching-on	0.000~60.000s	0.000~60.000	0.000s	○
P06.19	Delay time of RO4 switching-off	0.000~60.000s	0.000~60.000	0.000s	○
P06.20	AO1 output selection	0: Null	0~20	0	○

Function code	Name	Description	Setting range	Default	Modify
P06.21	AO2 output selection	1: The set value of the DC voltage 2: The actual value of the DC voltage 3: Valid value of input voltage 4: Valid value of input current 5: Input power 6: Input power factor 7: Grid frequency value 8: Active current reference 9: Active current feedback 10: Reactive current reference 11: Reactive current feedback 12: MODBUS communication setting 1 13: MODBUS communication setting 2 14: PROFIBUS communication setting 1 15: PROFIBUS communication setting 2 16: AI1 17: AI2 18: AI3 19~20: Reserved	0~20	0	○
P06.22	Reserved				●
P06.23	Lower output limit 1	0.0%~P06.25	0.0~P06.25	0.0%	○
P06.24	Lower limit corresponding AO1 output	0.00~ P06.26 V	0.00~ P06.26	0.00V	○
P06.25	Upper output limit 1	P06.25~100.0%	P06.25~100.0	100.0%	○
P06.26	Upper limit corresponding AO1 output	P06.24~10.00V	P06.24~10.00	10.00V	○
P06.27	AO1 output filtering time	0.000~10.000s	0.000~10.000	0.000s	○
P06.28	Lower output limit 2	-100.0%~ P06.30	-100.0~P06.30	0.0%	○
P06.29	Lower limit corresponding AO2 output	-10.00~ P06.31 V	-10.00~P06.31	0.00V	○
P06.30	Upper output limit 2	P06.28~100.0%	P06.28~100.0	100.0%	○
P06.31	Upper limit corresponding AO2 output	P06.29~10.00V	P06.29~10.00	10.00V	○
P06.32	AO2 output filtering time	0.000~10.000s	0.000~10.000	0.000s	○
P06.33	Reserved				●
P06.34	Reserved				●
P06.35	Reserved				●

Function code	Name	Description	Setting range	Default	Modify
P06.36	Reserved				●
P06.37	Reserved				●
P06.38	Reserved				●
P06.39	Reserved				●
P06.40	Reserved				●
P06.41	Reserved				●
P06.42	Reserved				●
P06.43	Reserved				●
P06.44	Reserved				●
P06.45	Reserved				●
P06.46	Reserved				●
P06.47	Reserved				●
P06.48	Reserved				●
P06.49	Reserved				●
P07 group Human machine interface					
P07.01	User password	0~65535	0~65535	0	○
P07.02	Parameter copy	0: Invalid 1: Upload parameters to the local 2: Download parameters from the local	0~2	0	◎
P07.03	QUICK/JOG function selection	0:No function 1: Press QUICK/JOG to switch the displayed function code 2: Press QUICK/JOG to switch the command mode 3: Quick debugging	0~3	0	○
P07.04	Switching sequence of operation channel	0:Keypad→terminal→communciation 1: Keypad←→terminal 2: Keypad←→communciation 3: Terminal←→communciation	0~3	0	○
P07.05	STOP/RST function selection	0: Valid when keypad control 1: Valid when keypad or terminal control 2: Valid when keypad or communication control 3: Always valid	0~3	3	○
P07.06	Parameter display selection in rectifier state	0x0000~0xFFFF	0~0xFFFF	0x000F	○
P07.07	Reserved				●
P07.08	Factory barcode 1	0x0000~0xFFFF			●
P07.09	Factory barcode 2	0x0000~0xFFFF			●

Function code	Name	Description	Setting range	Default	Modify
P07.10	Factory barcode 3	0x0000~0xFFFF			●
P07.11	Factory barcode 4	0x0000~0xFFFF			●
P07.12	Factory barcode 5	0x0000~0xFFFF			●
P07.13	Factory barcode 6	0x0000~0xFFFF			●
P07.14	Reserved				●
P07.15	Reserved				●
P07.16	Reserved				●
P07.17	Reserved				●
P07.18	Accumulated high electricity consumption	0~65535°	0~65535	0°	●
P07.19	Accumulated low electricity consumption	0.0~999.9°	0.0~999.9	0.0°	●
P07.20	Software version (DSP)	0.00~655.35	0.00~655.35	0.00	●
P07.21	Software version (FPGA)	0.00~655.35	0.00~655.35	0.00	●
P07.22	Local cumulative operation time	0~65535h	0~65535	0	●
P17 group System information					
P17.00	Rated power of the rectifier	0~6000.0kW	0~6000.0	Depend on model	●
P17.01	Rated current of the rectifier	0.0~6000.0A	0.0~6000.0	Depend on model	●
P17.02	Valid unit number	0~6	0~6	Depend on model and unit	●
P17.03	Valid unit bit set by the factory	0x00~0x3F	0x00~0x3F	0x00	●
P17.04	Valid unit display	0x00~0x3F	0x00~0x3F	0x00	●
P17.05	DC voltage	0.0~2000.0V	0.0~2000.0	0.0V	●
P17.06	Grid frequency	0.00~120.0Hz	0.00~120.0	0.0Hz	●
P17.07	Grid voltage	0~2000V	0~2000	0V	●
P17.08	Grid input current	0.0~6000.0A	0.0~6000.0	0.0A	●
P17.09	Power factor	-1.00~1.00	-1.00~1.00	0.00	●
P17.10	Percentage of active current	-200.0~200.0%	-200.0~200.0	0.0%	●
P17.11	Percentage of reactive current	-200.0~200.0%	-200.0~200.0	0.0%	●
P17.12	Digital input terminal state	0x00~0xFF BIT0 corresponds to S1	0x00~0xFF	0x00	●
P17.13	Digital output terminal state	0x00~0xFF BIT0 corresponds to RO1	0x00~0xFF	0x00	●
P17.14	AI1 input voltage	0.00~10.00V	0.00~10.00	0.00V	●
P17.15	AI2 input voltage	0.00~10.00V	0.00~10.00	0.00V	●
P17.16	AI3 input voltage	-10.00V~10.00V	-10.00~10.00	0.00V	●

Function code	Name	Description	Setting range	Default	Modify
P17.17	Input apparent power	0~6000.0kVA	0~6000.0	0 .0kVA	●
P17.18	Input active power	0~6000.0kW	0~6000.0	0 .0kW	●
P17.19	Input reactive power	0~6000.0kVar	0~6000.0	0 .0kVar	●
P17.20	Unbalance factor of three-phase voltage	1.00~10.00	1.00~10.00	0.00	●
P17.21	Bridge rectifier module temperature	-20.0~120.0℃	-20.0~120.0℃	0.0℃	●
P17.22	IGBT module temperature	-20.0~120.0℃	-20.0~120.0℃	0.0℃	●
P18 group Unit information					
P18.00	The display current value of unit 1	0~2000.0A	0~2000.0	0.0A	●
P18.01	The sample DC voltage of unit 1	0.0~2000.0V	0.0~2000.0	0.0V	●
P18.02	Display temperature value of unit 1 rectifier bridge	-20.0~120.0℃	-20.0~120.0	0.0℃	●
P18.03	Display temperature value of unit 1 IGBT	-20.0~120.0℃	-20.0~120.0	0.0℃	●
P18.04	Fault code of unit 1 Line voltage of unit 1 (reserved)				●
P18.05	DSP software version of unit 1	0x0000~0xFFFF	0x0000~0xFFFF	0x0000	●
P18.06	FPGA software version of unit 1				●
P18.07	The display current value of unit 1				●
P18.08	The sample DC voltage of unit 1	0.00~655.35	0.00~655.35	0.00	●
P18.09	Display temperature value of unit 1 rectifier bridge	0.00~655.35	0.00~655.35	0.00	●
P18.10	The display current value of unit 2	0~2000.0A	0~2000.0	0.0A	●
P18.11	The sample DC voltage of unit 2	0.0~2000.0V	0.0~2000.0	0.0V	●
P18.12	Display temperature value of unit 2 rectifier bridge	-20.0~120.0℃	-20.0~120.0	0.0℃	●
P18.13	Display temperature value of unit 2 IGBT	-20.0~120.0℃	-20.0~120.0	0.0℃	●
P18.14	Fault code of unit 2				●
P18.15	DSP software version of unit 2	0x0000~0xFFFF	0x0000~0xFFFF	0x0000	●
P18.16	FPGA software version of unit 2				●

Function code	Name	Description	Setting range	Default	Modify
P18.17	The display current value of unit 2				●
P18.18	The sample DC voltage of unit 2	0.00~655.35	0.00~655.35	0.00	●
P18.19	Display temperature value of unit 2 rectifier bridge	0.00~655.35	0.00~655.35	0.00	●
P18.20	The display current value of unit 3	0~2000.0A	0~2000.0	0.0A	●
P18.21	The sample DC voltage of unit 3	0.0~2000.0V	0.0~2000.0	0.0V	●
P18.22	Display temperature value of unit 3 rectifier bridge	-20.0~120.0℃	-20.0~120.0	0.0℃	●
P18.23	Display temperature value of unit 3 IGBT	-20.0~120.0℃	-20.0~120.0	0.0℃	●
P18.24	Fault code of unit 3				●
P18.25	DSP software version of unit 3	0x0000~0xFFFF	0x0000~0xFFFF	0x0000	●
P18.26	FPGA software version of unit 3				●
P18.27	The display current value of unit 3				●
P18.28	The sample DC voltage of unit 3	0.00~655.35	0.00~655.35	0.00	●
P18.29	Display temperature value of unit 3 rectifier bridge	0.00~655.35	0.00~655.35	0.00	●
P18.30	The display current value of unit 4	0~2000.0A	0~2000.0	0.0A	●
P18.31	The sample DC voltage of unit 4	0.0~2000.0V	0.0~2000.0	0.0V	●
P18.32	Display temperature value of unit 4 rectifier bridge	-20.0~120.0℃	-20.0~120.0	0.0℃	●
P18.33	Display temperature value of unit 4 IGBT	-20.0~120.0℃	-20.0~120.0	0.0℃	●
P18.34	Fault code of unit 4				●
P18.35	The display current value of unit 4	0x0000~0xFFFF	0x0000~0xFFFF	0x0000	●
P18.36	Reserved				●
P18.37	Reserved				●
P18.38	DSP software version of unit 4	0.00~655.35	0.00~655.35	0.00	●
P18.39	FPGA software version of unit 4	0.00~655.35	0.00~655.35	0.00	●
P18.40	The display current value	0~2000.0A	0~2000.0	0.0A	●

Function code	Name	Description	Setting range	Default	Modify
	of unit 5				
P18.41	The sample DC voltage of unit 5	0.0~2000.0V	0.0~2000.0	0.0V	●
P18.42	Display temperature value of unit 5 rectifier bridge	-20.0~120.0℃	-20.0~120.0	0.0℃	●
P18.43	Display temperature value of unit 5 IGBT	-20.0~120.0℃	-20.0~120.0	0.0℃	●
P18.44	Reserved				●
P18.45	Fault code of unit 5	0x0000~0xFFFF	0x0000~0xFFFF	0x0000	●
P18.46	Reserved				●
P18.47	Reserved				●
P18.48	DSP software version of unit 5	0.00~655.35	0.00~655.35	0.00	●
P18.49	FPGA software version of unit 5	0.00~655.35	0.00~655.35	0.00	●
P18.50	The display current value of unit 6	0~2000.0A	0~2000.0	0.0A	●
P18.51	The sample DC voltage of unit 6	0.0~2000.0V	0.0~2000.0	0.0V	●
P18.52	Display temperature value of unit 6 rectifier bridge	-20.0~120.0℃	-20.0~120.0	0.0℃	●
P18.53	Display temperature value of unit 6 IGBT	-20.0~120.0℃	-20.0~120.0	0.0℃	●
P18.54	Reserved				●
P18.55	Fault code of unit 6	0x0000~0xFFFF	0x0000~0xFFFF	0x0000	●
P18.56	Reserved				●
P18.57	Reserved				●
P18.58	DSP software version of unit 6	0.00~655.35	0.00~655.35	0.00	●
P18.59	FPGA software version of unit 6	0.00~655.35	0.00~655.35	0.00	●
P18.60	Reserved				●
P18.61	Rated power of the unit	0.1~3000.0kW	0.1~3000.0	0.1KW	•
P18.62	Rated current of the unit	0.0~2000.0A	0.0~2000.0	0.0A	•
P18.63	Reserved				•
P18.64	Reserved				•
P18.65	Reserved				●
P18.66	Reserved				●
P18.67	Reserved				●
P18.68	Reserved				●
P18.69	Reserved				●
P19 group Fault information					

Function code	Name	Description	Setting range	Default	Modify
P19.00	Current fault type	Common fault types: 00:No fault 01: OC 02: Lvl 03: Ovl 04: SPl 05: PLLF 06: Lv 07: ov 08: ltE 09: E-DP 10: CE 11: E-CAN 12: E-NET 13: E-DEV 14: UlU 15: OL 16: EEP 17: TbE 18: E-STO 19: dF_CE 20: EF 21: dIS 22: PCE 23: UPE 24: DnE 25: END 26: PC_t1 27: PC_t2 28: E-ASC 29: E -SLE 30: CPoE Unit fault:m.n m.01: m. OUt1 m.02: m. Out2 m.03: m. Out3 m.04: m.OC m.05: m.ltE m.06: m.lbC m.07: m.OH1 m.08: m.OH2 m.09: m.EF1 m.10: m.EF2 m.11: m.EF3	0~31 or m.01~m.16 （m=1，2，3...6）	0	●
P19.01	Previous fault type			0	●
P19.02	Previous 2 fault type			0	●
P19.03	Previous 3 fault type			0	●
P19.04	Previous 4 fault type			0	●
P19.05	Previous 5 fault type			0	●

Function code	Name	Description	Setting range	Default	Modify
		m.12: m.ov m.13: m.Lv m.14: m.dn-C m.15: m.UP-C m.16: m.PER			
P19.06	Input terminal state at current fault	0x00~0xFF	0x00~0xFF	0x00	●
P19.07	Output terminal state at current fault	0x00~0xFF	0x00~0xFF	0x00	●
P19.08	DC bus voltage at current fault	0.0~2000.0V	0.0~2000.0	0.0V	●
P19.09	Input voltage at current fault	0.0~2000.0V	0.0~2000.0	0.0V	●
P19.10	Input current at current fault	0.0~6000.0A	0.0~6000.0	0.0A	●
P19.11	Current display at current fault	0.0~2000.0A	0.0~2000.0	0.0A	●
P19.12	Rectifier temperature at current fault	-20.0~120.0℃	-20.0~120.0	0.0℃	●
P19.13	IGBT temperature at current fault	-20.0~120.0℃	-20.0~120.0	0.0℃	●
P19.14	Reserved				●
P19.15	Reserved				●
P19.16	Reserved				●
P19.17	Reserved				●
P19.18	Reserved				●
P19.19	Reserved				●
P19.20	Reserved				●
P19.21	Reserved				●
P19.22	Input terminal state at previous fault	0x00~0xFF	0x00~0xFF	0x00	●
P19.23	Output terminal state at previous fault	0x00~0xFF	0x00~0xFF	0x00	●
P19.24	DC bus voltage at previous fault	0.0~2000.0V	0.0~2000.0	0.0V	●
P19.25	Input voltage at previous fault	0.0~2000.0V	0.0~2000.0	0.0V	●
P19.26	Input current at previous fault	0.0~6000.0A	0.0~6000.0	0.0A	●
P19.27	Current display at previous fault	0.0~2000.0A	0.0~2000.0	0.0A	●
P19.28	Rectifier temperature at previous fault	-20.0~120.0℃	-20.0~120.0	0.0℃	●

Function code	Name	Description	Setting range	Default	Modify
P19.29	IGBT temperature at previous fault	-20.0~120.0℃	-20.0~120.0	0.0℃	●
P19.30	Reserved				●
P19.31	Reserved				●
P19.32	Reserved				●
P19.33	Reserved				●
P19.34	Reserved				●
P19.35	Reserved				●
P19.36	Reserved				●
P19.37	Reserved				●
P19.38	Input terminal state at previous fault	0x00~0xFF	0x00~0xFF	0x00	●
P19.39	Output terminal state at previous 2 fault	0x00~0xFF	0x00~0xFF	0x00	●
P19.40	DC bus voltage at previous 2 fault	0.0~2000.0V	0.0~2000.0	0.0V	●
P19.41	Input voltage at previous 2 fault	0.0~2000.0V	0.0~2000.0	0.0V	●
P19.42	Input current at previous 2 fault	0.0~6000.0A	0.0~6000.0	0.0A	●
P19.43	Current display at previous 2 fault	0.0~2000.0A	0.0~2000.0	0.0A	●
P19.44	Rectifier temperature at previous 2 fault	-20.0~120.0℃	-20.0~120.0	0.0℃	●
P19.45	IGBT temperature at previous 2 fault	-20.0~120.0℃	-20.0~120.0	0.0℃	●
P19.46	Reserved				●
P19.47	Reserved				●
P19.48	Reserved				●
P19.49	Reserved				●
P19.50	Reserved				●
P19.51	Reserved				●
P19.52	Reserved				●
P19.53	Reserved				●
P20 group Serial communication and CAN communication					
P20.00	Local communication address	1~247 0: broadcast address	1~247	1	○
P20.01	Baud rate setting	0: 1200BPS 1: 2400BPS 2: 4800BPS 3: 9600BPS 4:19200BPS 5: 38400BPS	0~5	4	○

Function code	Name	Description	Setting range	Default	Modify
P20.02	Check bit setting	0: No check (N, 8, 1)for RTU 1: Odd check (E, 8, 1)for RTU 2: Even check (O, 8, 1)for RTU 3: No check (N, 8, 2)for RTU 4: Odd check (E, 8, 2)for RTU 5: Even check (O, 8, 2)for RTU	0~5	1	○
P20.03	Response delay	0~200ms	0~200	5	○
P20.04	Communication overtime fault	0.0(invalid), 0.1~60.0s	0.0~60.0	0.0s	○
P20.05	Communication response enabling	0: Report fault and coast to stop 1: Not to report fault and keep working 2:Not to report fault and stop (only in the communication control mode) 3:Not to report fault and stop (in all communication control modes)	0~3	0	◎
P20.06	Communication processing	0x00~0x11 LED ones: 0: Response to write 1: No response to write LED tens: 0: Reserved 1: Reserved	0x00~0x11	0x00	◎
P20.07	Reserved				●
P20.08	Reserved				●
P20.09	CAN communication address	0~127	0~127	1	◎
P20.10	CAN communication baud rate setting	0:50K BPS 1:125K BPS 2:250K BPS 3:500K BPS 4:1M BPS	0~4	3	◎
P20.11	CAN communication fault	0.1~100.0s 0.0 (invalid)	0.1~100.0	0.0S	◎
P20.12	CAN communication protocol selection	0: Common control protocol 1: Internal master-slave communication protocol	0~1	0	◎
P20.13	Reserved				●
P20.14	Reserved				●
P20.15	Reserved				●
P20.16	Reserved				●

Function code	Name	Description	Setting range	Default	Modify
P21 group PROFIBUS communication					
P21.00	Module type	0:Profibus	0~1	0	◎
P21.01	Module address	0~127	0~127	2	◎
P21.02	PZD2 receive	0: Invalid 1: DC voltage setting (0~20000, unit 0.1V) 2: Active current reference (-1200~1200, 1000 corresponds to 100.0% of the rated current) 3: Reactive current reference (-1200~1200, 1000 corresponds to 100.0% of the rated current) 4: Virtual input terminal command, range: 0x00~0xFF 5: AO output setting 1(-1000~1000, 1000 corresponds to 100.0%) 6: AO output setting 2(-1000~1000, 1000 corresponds to 100.0%) 7~13: Reserved	0~13	0	○
P21.03	PZD3 receive		0~13	0	○
P21.04	PZD4 receive		0~13	0	○
P21.05	PZD5 receive		0~13	0	○
P21.06	PZD6 receive		0~13	0	○
P21.07	PZD7 receive		0~13	0	○
P21.08	PZD8 receive		0~13	0	○
P21.09	PZD9 receive		0~13	0	○
P21.10	PZD10 receive		0~13	0	○
P21.11	PZD11 receive		0~13	0	○
P21.12	PZD12 receive		0~13	0	○
P21.13	PZD2 send	1: DC voltage (*10, V) 2: DC voltage feedback (*10, V) 3:Input voltage valid (*10, V) 4: Input RMS current (*10, A) 5: Input power (*10, kW) 6: Input power factor (*100) 7: Grid frequency value (*10, Hz) 8: Active current feedback (100% corresponds to the rated current of the rectifier) 9: Reactive current feedback (100% corresponds to the rated current of the rectifier) 10: Fault code 11:AI1 (*100, V) 12:AI2 (*100, V) 13:AI3 (*100, V) 14: Input state 15: Output state 16: Running status word 17~20: Reserved	0~20	0	○
P21.14	PZD3 send		0~20	0	○
P21.15	PZD4 send		0~20	0	○
P21.16	PZD5 send		0~20	0	○
P21.17	PZD6 send		0~20	0	○
P21.18	PZD7 send		0~20	0	○
P21.19	PZD8 send		0~20	0	○
P21.20	PZD9 send		0~20	0	○
P21.21	PZD10 send		0~20	0	○
P21.22	PZD11 send		0~20	0	○
P21.23	PZD12 send		0~20	0	○
P21.24	Temporary variable 1 of	0~65535	0~65535	0	○

Function code	Name	Description	Setting range	Default	Modify
	PZD sending				
P21.25	Time of Dp communication overtime fault	0.0(invalid), 0.1~60.0s	0.0~60.0	0.0s	○
P21.26	Reserved				●
P21.27	Reserved				●
P21.28	Reserved				●
P21.29	Reserved				●
P22 group Ethernet communication					
P22.00	Ethernet communication speed setting	0: 10M full-duplex 1: 10M half-duplex 2: 100M full-duplex 3: 100M half-duplex 4: Adaptive	0~4	3	◎
P22.01	IP address 1	0~255	0~255	192	◎
P22.02	IP address 2		0~255	168	◎
P22.03	IP address 3		0~255	0	◎
P22.04	IP address 4		0~255	1	◎
P22.05	Subnet mask 1	0~255	0~255	255	◎
P22.06	Subnet mask 2		0~255	255	◎
P22.07	Subnet mask 3		0~255	255	◎
P22.08	Subnet mask 4		0~255	0	◎
P22.09	Gateway address 1	0~255	0~255	192	◎
P22.10	Gateway address 2		0~255	168	◎
P22.11	Gateway address 3		0~255	1	◎
P22.12	Gateway address 4		0~255	1	◎
P22.13	Reserved				●
P22.14	Reserved				●
P29 group Factory reserved					
P29.00	Factory password	0~65535	0~65535	*****	●