



User Manual

Version 1.5

DC System Monitor FR-DCMG-MMPP



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1 Documentation statement

This manual applies to the product model FR-DCMG-MMPP, and the software version is A38F.

2 Safety Precautions

2.1 Signs

The following signs may appear in this article, and their meanings are as follows.

| Signs | Instructions |
|--|---|
|  | Indicates a hazardous situation which, if not avoided, will result in death or serious injury. |
|  | Indicates a hazardous situation which, if not avoided, could result in death or serious injury. |
|  | Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury. |
|  | Indicates a situation which, if not avoided, can result in property damage. It is not safety warning information, and does not involve personal, equipment and environmental damage. |
|  Note | Protrudes important or critical information, best practices, tips, etc. It is not safety warning information, and does not involve personal, equipment and environmental damage. |

2.2 Safety Precautions

Please read the safety precautions in this user manual carefully to avoid personal injury and property damage.

2.3 Personnel requirements

The installation and operation of FR-DCMG-MMPx must be carried out by a professional electrician.

The operator should be fully familiar with the composition and working principle of the entire photovoltaic grid-connected power generation system, as well as the relevant standards of the country/region where the project is located.



Live operation is strictly prohibited during installation. Before installation, make sure that both the DC side and the AC side are powered off.

NOTICE

Please read this user manual carefully before installation. If the equipment is damaged due to failure to install in accordance with this user manual, our company reserves the right not to guarantee the quality. ÿ Before installation, make sure that it is not electrically connected and powered on. ÿ During the installation process, except for the wiring terminals of the arc box, please do not touch other parts inside. ÿ Before making electrical connections, make sure that the voltage of the positive and negative poles of the DC busbar of the combiner box is 0V.

2.4 Electrical connection



Before electrical connection, please make sure that FR-DCMG-MMPx is not damaged and in a safe state, otherwise it may cause electric shock. ÿ All electrical connections must meet the electrical standards of the country/region where they are located.

ÿ The cables used in the PV combiner box must be firmly connected, well insulated, and have appropriate specifications.

2.5 System Installation



During the installation process, it is strictly prohibited to operate with live electrical connections. Please ensure that both the DC side and the AC side are powered off before beginning the installation.

NOTICE

Before installation, please carefully read this user manual. The company reserves the right not to provide warranty service for any equipment damage caused by not following the instructions in this manual.

ÿ Before installation, ensure that no electrical connections have been made and that the equipment is not powered on.

ÿ During installation, avoid touching any internal parts except for the terminals of the arc box.

ÿ Before making electrical connections, ensure that the DC busbar voltage in the combiner box is 0V.

2.6 System running



FR-DCMG-MMPx has high voltage during operation, which may cause electric shock or death in severe cases. Please operate strictly in accordance with the safety precautions listed in this manual and other related document.

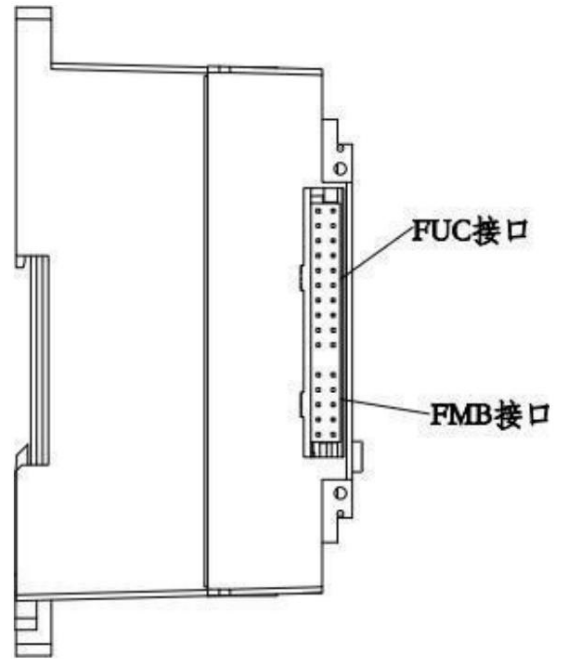
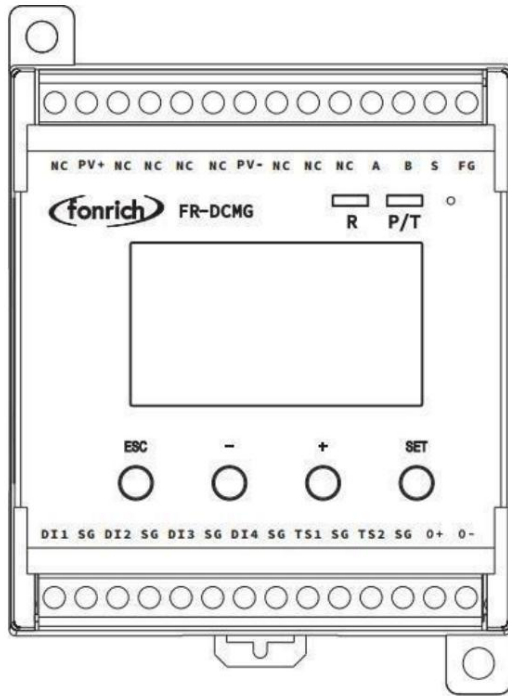
3 Product description

FR-DCMG DC monitor products are mainly used in DC transmission, power distribution and other occasions, such as photovoltaic combiner boxes, arc protection boxes, etc. Through RS485 communication with the host computer, its main functions include real-time monitoring of the current of each branch in the DC system, the temperature of the cabinet, the status of the lightning arrester and the status of the DC circuit breaker, etc. It can realize automatic alarm for abnormal conditions and real-time detection of harmful arcs in the DC circuit. Once there are harmful arcs, an alarm signal will be sent immediately to directly drive the trip unit and cut off the fault circuit, thereby effectively preventing potential safety hazards such as fires caused by arcs.

3.1 The main function

- **Monitoring function:** real-time monitoring of the generation current, voltage, temperature of the combiner box, lightning protector status, DC circuit breaker status, and DC arc fault status of each photovoltaic string in the combiner box, and communicate with the host computer through RS485.
- **Display content:** For the detected current, temperature, switch status and other data, FR-DCMG-MMPP can display histogram interface through LCD, and read current and other data more intuitively.
- **Alarm function:** According to the actual needs of the site, it can be configured to turn on or off the alarm and shunt release functions (by default, only the arc alarm and trip functions are turned on). When alarming, the interface pops up alarm information.
- **Current Calibration:** Identifying Zero Drift to Improve Current Detection Accuracy. (Default Off).
- **Tripping mode switching:** The default O+, O- voltage is 0V, and the voltage output is 24V when tripping, or it can be set to the opposite application.

3.2 Terminal Definition



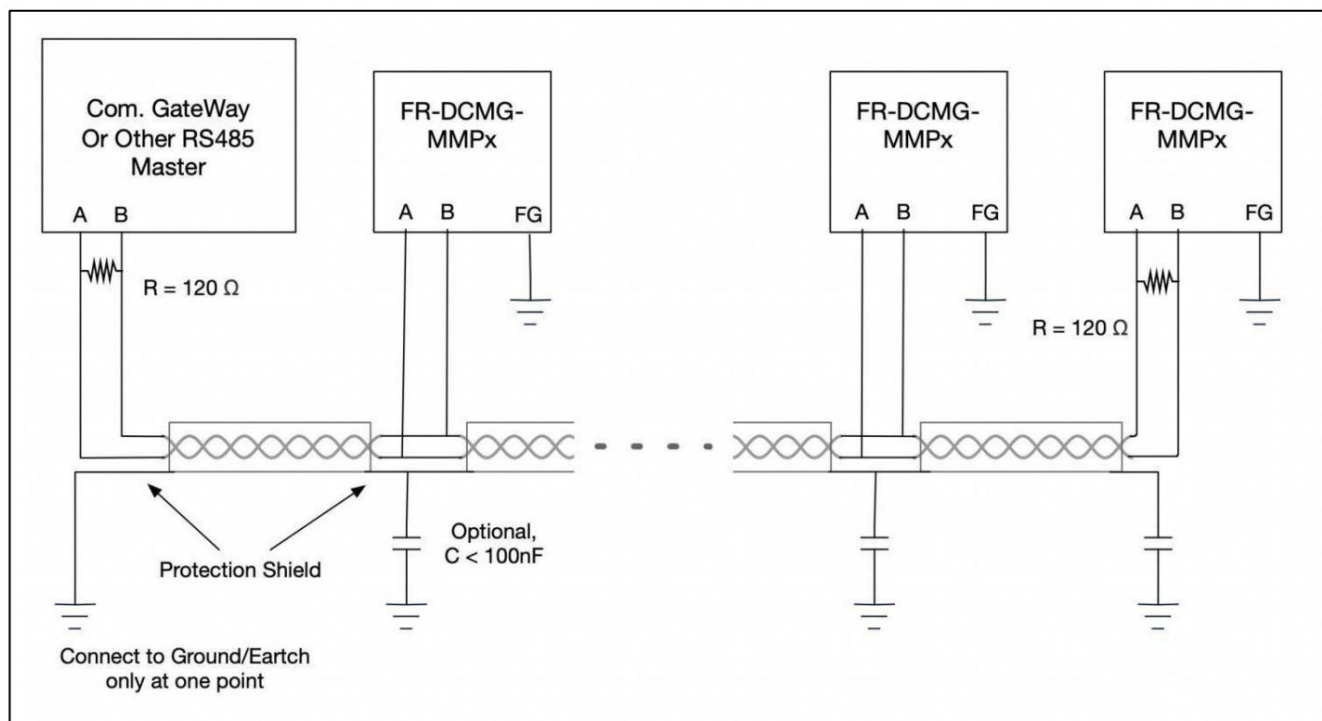
| Symbol | Meaning |
|-----------------|---|
| PV+/PV- | Measuring voltage |
| NC | No connection |
| S | No connection |
| A/B | RS485 Communication terminal |
| FG | Fixed Ground Terminal |
| TS1/TS2 | Externally connected temperature sensor terminals |
| SG | Temperature sensor and digital input ground terminal |
| DI1/DI2/DI3/DI4 | 4 digital input terminals |
| O+/O- | Connecting the shunt release |
| FUC | Can connect modules with FUC interface |
| FMB | Modules with an FMB interface can be connected, such as the FR-DCMG-AS4A DC Arc Detector. |

4 Wiring diagram of monitoring module

4.1 Ground connection and RS485 communication shielded wire

The FG terminal of the FR-DCMG must be grounded, otherwise communication will interfere and the reliability of the device will decrease. The grounding wire should be grounded nearby. The grounding wire should be no more than 15cm from the "FG" terminal to the bottom of the combiner box. It is recommended to be within 10cm. The shorter the better, the thicker the better. The bottom of the combiner box should be connected to the ground. The main control unit module is fixed on a standard guide rail with a width of 3.5 cm.

The wiring specification of the communication shielded wire is shown in the figure below:



The wiring of on-site communication lines requires that the communication shield can only be grounded at a single point, otherwise there will be a risk of lightning surge damage to all equipment on the entire communication line during a lightning strike; If you encounter a situation where communication line

interference is too large to communicate, you can refer to the figure above, and insert a high voltage capacitor $C < 100nF$ between the shielded wire of each combiner box and the ground wire, and use this capacitor to filter the shielding layer interference.

5 UI introduction

5.1 Key operation

FR-DCMG-MMPP has four keys "ESC", "-", "+", and "SET".

"ESC" key is used to return to the default interface and cancel parameter settings;

"SET" key is used to enter the parameter setting mode, select the parameter to be set and complete the setting of the parameter;

The "+" and "-" keys are used to scroll the screen and adjust parameters;

Press the "+" and "-" keys at the same time to display the software version interface;

Press the "ESC" and "-" keys simultaneously to display the current calibration interface;

Press the "ESC" and "+" keys simultaneously to display the trip self-test interface;

If there is no key operation for 10 seconds, the interface will automatically jump to the default interface of the current mode, and the brightness will decrease after 5 seconds.

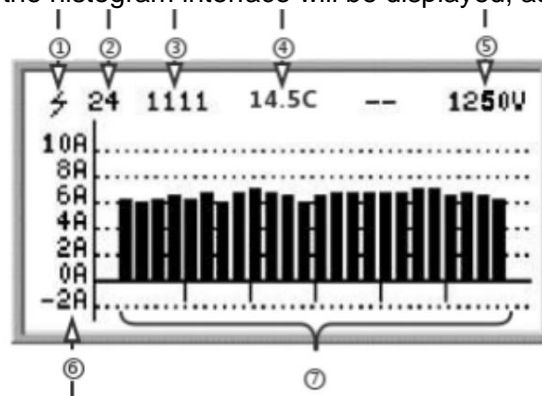
5.2 Boot interface

After the device is powered on, the following interface will be displayed:



5.3 Current interface

After the boot interface, the histogram interface will be displayed, as shown below:



ÿ It indicates that the connected Hall has the arc detection function, and the ordinary Hall does not have this mark;

ÿ The number of online current channels varies according to the number of Halls actually connected;

ÿ Switch input status: DI1, DI2, DI3, DI4 real-time status;

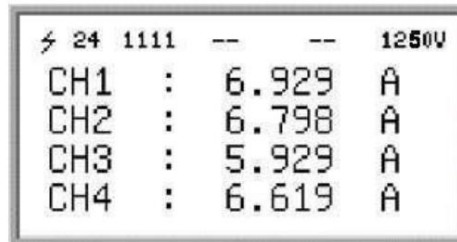
ÿ Real-time temperature;

ÿ No voltage displayed when PV+/PV- is not connected;

- Current histogram; the default display range is -4A ~ 20A, and the display range can be expanded by setting register 0x0B16;
- Histogram partition: because 6 Halls are inserted, 6 partitions

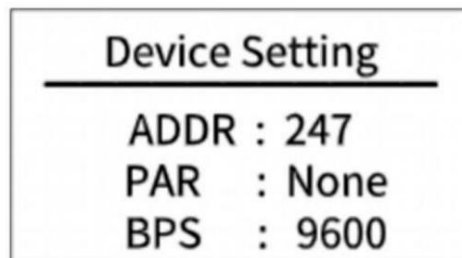
5.4 Channel Current and Power Generation Detailed Data Interface

In the current interface, press the "+" or "-" key to enter the channel current display interface, and the current value of each channel is displayed on the screen. You can scroll through the screen by continuing to press the "+" or "-" key. The picture above is the current display interface. "CH1:" in the above figure indicates that the real-time monitoring current value of channel 1 is "6.929A", and so on.



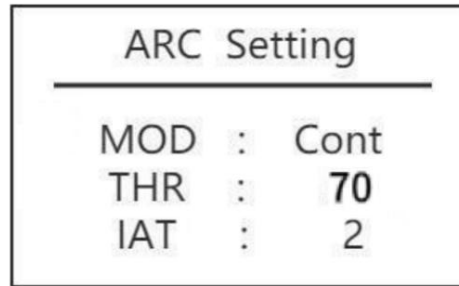
5.5 Parameter settings

5.5.1 Press the "SET" key to enter the Modbus parameter setting interface. The Modbus parameter setting is as shown in the figure below:



- **ADDR:** The communication address of the Modbus slave node, the range is 1 ~ 247 (default is 247).
- **PAR:** The data verification method of Modbus communication. The optional parity (None), odd parity (Odd), even parity (Even), and no parity by default.
- **BPS:** Baud rate for Modbus communication. The selectable baud rates are 2400, 4800, 9600 (default), 19200, 38400.

5.5.2 Press the "+" key to continue to select downwards to the arc parameter setting interface:

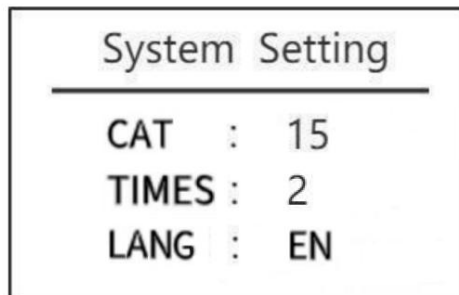


• **MOD:** Arc protection mode (Cont: continuous Arc Alarm mode, Single: Instantaneous Arc alarm mode)

• **THR:** Arc threshold (default 70) •

IAT: 2 (Instantaneous Arc Time, default 2 seconds)

5.5.3 Press the "+" key to continue to select downwards to the arc parameter setting interface:



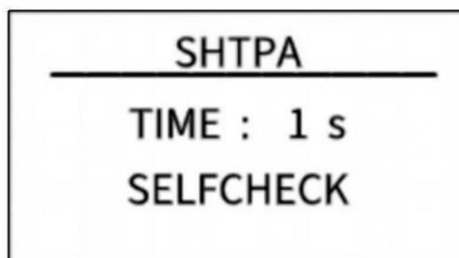
• **CAT:** Continuous Arc Time (default 15 seconds) •

TIMES: Times to trigger the shunt tripping signal within CAT (default: 2) •

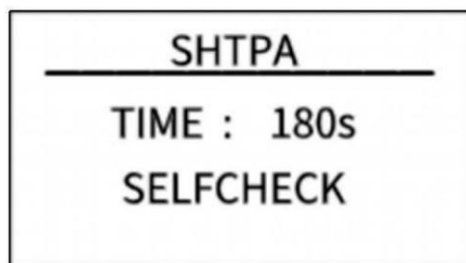
LANG: Language setting (default: EN)

5.6 Trip self-test setting interface

Press "ESC" and "+" at the same time to enter the shunt tripping setting interface.
(Factory default) Release mode (O+/O- DC voltage is 0v), the interface is as follows:



(Special needs) Relay mode (O+/O- DC voltage is 24v), the interface is as follows:



On the shunt trip setting interface, you can set the shunt trip enable time (TIME) and trip self-check (SELFCHECK) when an arc alarm occurs.

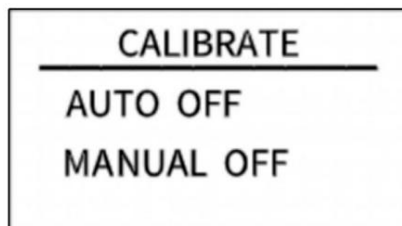
When the "*" flashes in the TIME line, press the "SET" key, and then **press "+" or "-"** to modify the shunt release time.

When "*" flashes in the SELFCHECK line, press the "SET" key to automatically perform the self-check of the shunt release.

The specific performance is: when the time is reached, the shunt release will act, and after the enabling time, the shunt release will recover.

5.7 Current calibration setting interface

Press the "ESC" and "-" keys at the same time to enter the current calibration setting interface, as shown below:



Note: To use this feature, please contact the company's technical support staff.

5.8 System information display interface

In the histogram interface, press the "+" and "-" keys at the same time to enter the software version number display interface, as shown below:

| CBM Information | |
|-----------------|--------|
| HV : | 4000 |
| SV : | A38F 4 |
| ST : | 0 |

• HV—

• SV—Software version number

• ST—

5.9 Alarm status display interface

Alarm messages can be cleared remotely and manually. Manual clearing requires long-pressing the host's "ESC" key for 2 seconds, remote clearing requires writing "1" to register 0x0079 to clear. If an arc trip alarm occurs, it must be cleared manually or remotely. Restarting the host will still display the alarm message.

5.10 DC arc fault alarm interface

After the DC arc sensor detects the occurrence of a fault arc, the alarm information interface of the host is as shown below.

| ALARM TRIP |
|--------------|
| 02 — 4 |
| CH Arc Alarm |

In the figure above: "02" means channel arc fault alarm, and "4" means that the fault arc alarm channel is 4.

5.11 Fault alarm clear interface

The host sends an alarm when it detects a fault, and the user can choose to handle it locally or remotely. By long-pressing the "ESC" key for about 5 seconds locally, the system jumps out of the interface as shown below, indicating that the alarm status has been cleared; remote processing needs to write "1" to 0x0079 to clear, and the interface shown below will be displayed after clearing successfully.

| |
|----------------|
| Clear Alarm ST |
|----------------|

6 Alarm information management

6.1 Items that can generate alarms can be set

Channel arc

Voltage is too high

Voltage is too low

Temperature is too high

Channel reverse current

Total reverse current is too high

Total current is too high

Total current is too low

Channel without current

Low channel current

High channel current

Channel current value undercurrent

Channel current value overcurrent

Switch DI1 status

Switch DI2 status

Switch DI3 status

Switch DI4 status

6.2 Items that can be tripped by setting

Channel arc

Voltage is too high

Temperature is too high

Channel reverse current

Total reverse current is too high

Total current is too high

Channel without current

Low channel current

High channel current

Channel current value undercurrent

Channel current value overcurrent

Switch DI1 status

Switch DI2 status

Switch DI3 status

Switch DI4 status

6.3 Alarm conditions

6.3.1 Alarm judgment condition

Prerequisites for alarm judgment of channels such as reverse current, no current, undercurrent, overcurrent, low current, and high current:

a. When the average value of the channel current is greater than the set [current channel alarm activation threshold](#), the alarm function of the above current-related items will be activated, otherwise the alarm status will be forced to

clear to 0; b. As for whether the alarm needs to meet the respective alarm conditions (above or lower than the respective alarm

threshold). c. Confirm whether the corresponding [alarm register](#) is turned on. By default, only the channel arc alarm is turned on; Current reverse, no current, under current, over current, low current, high current, etc. Channel alarm and trip judgment preconditions:

6.3.2 Trip judgment condition

Reverse current, no current, under current, over current, low current, high current channel alarm and trip judgment prerequisites:

a. They need to meet their alarm conditions.

b. At the same time, when the cumulative number of alarm channels is greater than the set [number of trip channels](#), a trip will occur.

c. Confirm whether the corresponding [trip register](#) is open, the default is closed

6.4 Alarm message

- Undercurrent alarm. After the channel average current value is subtracted from the overcurrent / undercurrent alarm threshold, the current value is still less than or equal to the current channel start alarm start threshold. The overcurrent / undercurrent alarm threshold will change as the average current changes.
- Over current alarm. After the channel average current value plus the over current / under current alarm threshold, the current value is still greater than or equal to the current channel start alarm start threshold. The over current / under current alarm threshold will change as the average current changes.
- Low current alarm, when the current is less than or equal to the channel current low alarm threshold, an alarm occurs.
- High current alarm. When the current is greater than or equal to the channel current high alarm threshold, an alarm occurs.
- No current alarm, when the absolute value of the current is less than 250mA, an alarm occurs.

6.5 Arc Alarm Strategy

The following arc strategies are designed according to the latest arc standards of UL1699B:

1. If the arc intensity of any channel exceeds the channel alarm threshold (threshold can be set, default 70), a channel arc alarm will be generated;
2. In the trip mode (DC voltage at $0 \pm$ terminal is 0v), the arc of any channel exceeds the alarm threshold, the arc alarms and trips the circuit breaker. After the trip, the alarm status of the alarm interface must be manually or remotely cleared. restore;
3. In relay mode (DC voltage at $0 \pm$ terminal is 24v), the arc of any channel exceeds the alarm threshold, $0 \pm$ voltage becomes 0v for 3 minutes (time can be set), and $0 \pm$ voltage returns to 24v after 3 minutes; if the same

Channel alarm 5 times (number of times can be set), 0 ±voltage is no longer restored, and it cannot be restored after power failure. You must manually or remotely clear the alarm status of the alarm interface to return to normal;

4. Accumulation method of channel arc times: The arc alarm times are only +1 if continuous arc occurs on the same channel. For example, if the first channel has 3 consecutive arc alarms, the fourth is the second channel alarm, the number of alarms is reset, and if the second channel has another alarm, the second channel alarm number is +1. After reaching 5 alarms, you must manually Clear the alarm interface.

6.5.1 Arc mode

We divide the arcs into Instantaneous Arc and Continuous Arc.

Instantaneous Arc

The arc duration does not exceed the Instantaneous Arc Time (IAT), and there is no arc occurring again within the Continuous Arc Time (CAT).

Continuous Arc

The arc duration exceeds the IAT, or the arc duration does not exceed the IAT, but the arc occurs again within the CAT.

6.6 Combined alarm strategy (closed by default, follow the steps below when needed)

The alarm will only take effect when two or more alarm conditions are met at the same time Example: Simultaneously meet-when the voltage is lower than 800V and the total current is greater than 50A, the module will alarm and trip. operate:

Step 1: Turn on bit4 of 0x0B21 (2849) and 0x0B24 (2852);

Step 2: Turn on the low voltage (Bit2) and total current too high (Bit9)

functions of 0x0B26 (2854); Step 3: Turn on the alarms of 0x0B20 (2848) and 0x0B23 (2851) corresponding to low voltage (Bit2) and high total current (Bit9); Step 4 (optional): Set 0x0B05 (2821) total current too low, The total current of 0x0B06 (2822) is too high, The 0x0B01

(2817) voltage is too low, and the threshold of these 3 data is adjusted to a value that meets the test conditions

illustrate:

- The status of the combined alarm is kept consistent with the register locations of other alarms
- The status of the combined alarm 03 The position of the function code is in bit 4 of the register 0x12B and 0x12E
- The status of the combined alarm 02

The position of the function code is 0x214 in the register

7 MODBUS Protocol Definition

7.1 Configuration format communication

- Modbus communication mode: RTU mode
- Address of the slave device: range from 1 to 247 (default 247)
- Baud rate (bps): 2400, 4800, 9600 (default), 19200, 38400
- Byte check mode: odd check, even check, no check (default)

7.2 Data frame format description (refer to Modbus RTU standard)

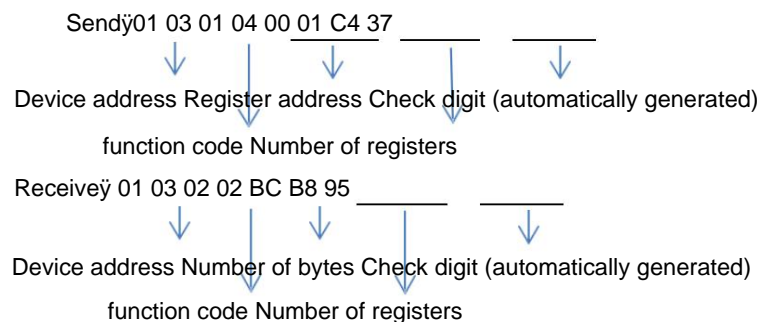
The byte in the communication frame composed by 1 start bit, 8 bits data bit, 1 parity bit, 1 stop bit like the below table (Refer to standard modbus RTU protocol):

Table 1: Data frame format table

| Address Code | Function Code | Data Area | Check Zone |
|--------------|---------------|-----------|------------|
| 1byte | 1byte | N*1byte | 2bytes |

The address code is used to identify the slave that receives the data frame and the response frame sent by that slave. The function code indicates how the master requires the slave to respond and the slaves responds to that function code. Data area The content can be the address value, the number of registers, the data from the slave response and the data sent by the master to the slave, etc., which can hold up to 252 bytes of data. The check area uses CRC cyclic redundancy to check whether a frame of data is wrong. The high byte of the data frame comes first, and the low byte comes after.

7.2.1 Data message example



Message example analysis: The above sending message reads the value of slave address 1 and register address 0x0104 (voltage V), and the received message responds with voltage data 0x02BC, which is converted to decimal, which is 700V.

7.3 Function code description

Register reads and writes in bits

- Function code 01 used to read the contents of the bit register
- Function code 02 used to read the contents of the bit register
- Function code 05 used to write single bit-type registers
- The contents represented by the register in bits are: switch value, alarm information, etc.

Register read and write in word units

- Function codes 03~04 are used to read multiple word-type registers
- Function code 06 is used to write single word-type registers
- Function code 16 is used to multiple word-type registers
- The content of the word-type registers can be voltage, current, generated energy, etc.

7.4 Register description

7.4.1 Register description in bit units (function code 02)

| Bit address | | Functional description | remark |
|-------------|---------|---|--|
| Hex | Decimal | | |
| 0x0200 | 512 | Bus arc trip state | The bus arc is faulted and a trip is performed and this bit is set. Clear the alarm and set it to 0. |
| 0x0201 | 513 | Channel arc trip state | The channel arc is faulted and a trip is performed and this bit is set. Clear the alarm and set it to 0. |
| 0x0203 | 515 | Bus voltage is too high trip state | The bus voltage is high and an trip is performed and this bit is set. Clear the alarm and set it to 0. |
| 0x0204 | 516 | Temperature sensor 1 over temperature and high trip state | The temperature sensor 1 overtemperature alarm and performs a tripping action, this bit is set to 1. Clear alarm after setting 0. |
| 0x0205 | 517 | Temperature sensor 2 over temperature and high trip state | The temperature sensor 2 overtemperature alarm and performs a tripping action, this bit is set to 1. Clear alarm after setting 0. |
| 0x0206 | 518 | Channel reverse current trip state | This bit is set to 1 when the channel current is reversed and the trip condition is met and a trip is performed. Clear alarm after |

| | | | |
|--------|---|--|--|
| | | | setting 0. |
| 0x0207 | 519 Total reverse current trip state | | The total reverse current alarm and a trip action is performed and this bit is set. Clear the alarm and set it to 0. |
| 0x0209 | 521 Total current is too high trip state | | The total current is high and an trip is performed and this bit is set. Clear the alarm and set it to 0. |
| 0x020A | 522 Channel no current trip state | | This bit is set to 1 when the channel has no current alarm and the trip condition is met and a trip is performed. Clear alarm after setting 0 |
| 0x020B | 523 Channel undercurrent trip state | | This bit is set to 1 when the channel undercurrent alarm is set and the trip condition is fulfilled and a trip is performed. Clear alarm after setting 0 |
| 0x020C | 524 Channel overcurrent trip state | | This bit is set to 1 when the channel is overcurrent and the trip condition is met and a trip is performed. Clear alarm after setting 0 |
| 0x020D | 525 Channel current is too low to trip state | | This bit is set to 1 when the channel current is low and the trip condition is met and a trip is performed. Clear alarm after setting 0 |
| 0x020E | 526 Channel current is too high to trip state | | This bit is set to 1 when the channel current is high and the trip condition is met and a trip is performed. Clear alarm after setting 0 |
| 0x0210 | 528 Switch 1 trip status | | Switch 1 performs a trip action |
| 0x0211 | 529 Switch 2 trip status | | Switch 2 performs a trip action |
| 0x0212 | 530 Switch 3 trip status | | Switch 3 performs a trip action |
| 0x0213 | 531 Switch 4 trip status | | Switch 4 performs a trip action |
| 0x0214 | 532 Combined alarm trip status | | Combined alarm trip action |
| | | | |
| 0x021E | 542 Remote manual trip status | The remote manual control release performs a trip action and this bit is set to 1. Clear alarm after setting 0 | |
| 0x0230 | 560 Bus arc alarm status | | This bit is set when the bus arc strength is above the alarm threshold. Clear the alarm and set it to 0 |
| 0x0231 | 561 Channel arc alarm status | This bit is set when the channel arc strength is above the alarm threshold. Clear the alarm and set it to 0 | |
| 0x0232 | 562 Bus voltage too low alarm status | | This bit is set when the bus voltage is below the alarm threshold. Cleared below the alarm release threshold |
| 0x0233 | 563 Bus voltage to high alarm status | | This bit is set when the bus voltage exceeds the alarm threshold. Cleared below the alarm release threshold |

| | | | |
|--------|-------|--|---|
| 0x0234 | 564 | Temperature sensor 1 high temperature alarm status | This bit is set when the temperature sensor 1 temperature exceeds the alarm threshold. Cleared below the alarm release threshold |
| 0x0235 | 565 | Temperature sensor 2 high temperature alarm status | This bit is set when the temperature sensor 2 temperature exceeds the alarm threshold. Cleared below the alarm release threshold |
| 0x0236 | 566 | Channel reverse current alarm status | When the reverse current is generated in the channel, the position is 1, and the alarm is cleared. |
| 0x0237 | 567 | Total reverse current alarm status | This bit is set when the total reverse current exceeds the alarm threshold. Cleared below the alarm release threshold |
| 0x0238 | 568 | Total current too low alarm state | This bit is set when the total current exceeds the alarm threshold. Cleared below the alarm release threshold |
| 0x0239 | 569 | Total current too high alarm state | This bit is set when the total current exceeds the alarm threshold. Cleared below the alarm release threshold |
| 0x023A | 570 | Channel current value zero | The channel has no current alarm and this bit is set to 1 |
| 0x023B | 571 | Channel current value undercurrent | Channel undercurrent alarm, this bit is set to 1 |
| 0x023C | 572 | Channel current value overcurrent | Channel overcurrent alarm, this bit is set to 1 |
| 0x023D | 573 | Channel current value is too low | Channel current low alarm, this bit is set to 1 |
| 0x023E | 574 | Channel current value is too high | Channel current high alarm, this bit is set to 1 |
| 0x0240 | 576 | Switch 1 alarm status | The state of the device's input switch DI1, 0: open, 1: closed |
| 0x0241 | 577 | Switch 2 alarm status | The state of the device's input switch DI2, 0: open, 1: closed |
| 0x0242 | 578 | Switch 3 alarm status | The state of the device's input switch DI3, 0: open, 1: closed |
| 0x0243 | 579 | Switch 4 alarm status | The state of the device's input switch DI4, 0: open, 1: closed |
| | | | |
| 0x0260 | 608 | Channel 1 arc alarm status | When the arc intensity of the channel is greater than the alarm threshold, this bit is set to 1; after clearing the alarm, it is set to 0 |
| 0x0261 | 609 | Channel 2 arc alarm status | When the arc intensity of the channel is greater than the alarm threshold, this bit is set to 1; after clearing the alarm, it is set to 0 |
| 0x0262 | 610 | Channel 3 arc alarm status | When the arc intensity of the channel is greater than the alarm threshold, this bit is set to 1; after clearing the alarm, it is set to 0 |
| 0x0263 | 611 | Channel 4 arc alarm status | When the arc intensity of the channel is greater than the alarm threshold, this bit is set to 1; after clearing the alarm, it is set to 0 |
| 0x0264 | 612 | Channel 5 arc alarm status | When the arc intensity of the channel is greater than the alarm threshold, this bit is set to 1; after clearing the alarm, it is set to 0 |

| | | |
|--------|--|---|
| 0x0265 | 613 Channel 6 arc alarm status | When the arc intensity of the channel is greater than the alarm threshold, this bit is set to 1; after clearing the alarm, it is set to 0 |
| 0x0266 | 614 Channel 7 arc alarm status | When the arc intensity of the channel is greater than the alarm threshold, this bit is set to 1; after clearing the alarm, it is set to 0 |
| 0x0267 | 615 Channel 8 arc alarm status | When the arc intensity of the channel is greater than the alarm threshold, this bit is set to 1; after clearing the alarm, it is set to 0 |
| 0x0268 | 616 Channel 9 arc alarm status | When the arc intensity of the channel is greater than the alarm threshold, this bit is set to 1; after clearing the alarm, it is set to 0 |
| 0x0269 | 617 Channel 10 arc alarm status | When the arc intensity of the channel is greater than the alarm threshold, this bit is set to 1; after clearing the alarm, it is set to 0 |
| 0x026A | 618 Channel 11 arc alarm status | When the arc intensity of the channel is greater than the alarm threshold, this bit is set to 1; after clearing the alarm, it is set to 0 |
| 0x026B | 619 Channel 12 arc alarm status | When the arc intensity of the channel is greater than the alarm threshold, this bit is set to 1; after clearing the alarm, it is set to 0 |
| 0x026C | 620 Channel 13 arc alarm status | When the arc intensity of the channel is greater than the alarm threshold, this bit is set to 1; after clearing the alarm, it is set to 0 |
| 0x026D | 621 Channel 14 arc alarm status | When the arc intensity of the channel is greater than the alarm threshold, this bit is set to 1; after clearing the alarm, it is set to 0 |
| 0x026E | 622 Channel 15 arc alarm status | When the arc intensity of the channel is greater than the alarm threshold, this bit is set to 1; after clearing the alarm, it is set to 0 |
| 0x026F | 623 Channel 16 arc alarm status | When the arc intensity of the channel is greater than the alarm threshold, this bit is set to 1; after clearing the alarm, it is set to 0 |
| 0x0270 | 624 Channel 17 arc alarm status | When the arc intensity of the channel is greater than the alarm threshold, this bit is set to 1; after clearing the alarm, it is set to 0 |
| 0x0271 | 625 Channel 18 arc alarm status | When the arc intensity of the channel is greater than the alarm threshold, this bit is set to 1; after clearing the alarm, it is set to 0 |
| 0x0272 | 626 Channel 19 arc alarm status | When the arc intensity of the channel is greater than the alarm threshold, this bit is set to 1; after clearing the alarm, it is set to 0 |
| 0x0273 | 627 Channel 20 arc alarm status | When the arc intensity of the channel is greater than the alarm threshold, this bit is set to 1; after clearing the alarm, it is set to 0 |
| 0x0274 | 628 Channel 21 arc alarm status | When the arc intensity of the channel is greater than the alarm threshold, this bit is set to 1; after clearing the alarm, it is set to 0 |
| 0x0275 | 629 Channel 22 arc alarm status | When the arc intensity of the channel is greater than the alarm threshold, this bit is set to 1; after clearing the alarm, it is set to 0 |
| 0x0276 | 630 Channel 23 arc alarm status | When the arc intensity of the channel is greater than the alarm threshold, this bit is set to 1; after clearing the alarm, it is set to 0 |
| 0x0277 | 631 Channel 24 arc alarm status | When the arc intensity of the channel is greater than the alarm threshold, this bit is set to 1; after clearing the alarm, it is set to 0 |
| | | |
| 0x0280 | 640 Channel 1 current reverse alarm status | This bit is set when the channel current is reversed and greater than the alarm threshold, otherwise cleared. |

| | | |
|--------|---|---|
| 0x0281 | 641 Channel 2 current reverse alarm status | This bit is set when the channel current is reversed and greater than the alarm threshold, otherwise cleared. |
| 0x0282 | 642 Channel 3 current reverse alarm status | This bit is set when the channel current is reversed and greater than the alarm threshold, otherwise cleared. |
| 0x0283 | 643 Channel 4 current reverse alarm status | This bit is set when the channel current is reversed and greater than the alarm threshold, otherwise cleared. |
| 0x0284 | 644 Channel 5 current reverse alarm status | This bit is set when the channel current is reversed and greater than the alarm threshold, otherwise cleared. |
| 0x0285 | 645 Channel 6 current reverse alarm status | This bit is set when the channel current is reversed and greater than the alarm threshold, otherwise cleared. |
| 0x0286 | 646 Channel 7 current reverse alarm status | This bit is set when the channel current is reversed and greater than the alarm threshold, otherwise cleared. |
| 0x0287 | 647 Channel 8 current reverse alarm status | This bit is set when the channel current is reversed and greater than the alarm threshold, otherwise cleared. |
| 0x0288 | 648 Channel 9 current reverse alarm status | This bit is set when the channel current is reversed and greater than the alarm threshold, otherwise cleared. |
| 0x0289 | 649 Channel 10 current reverse alarm status | This bit is set when the channel current is reversed and greater than the alarm threshold, otherwise cleared. |
| 0x028A | 650 Channel 11 current reverse alarm status | This bit is set when the channel current is reversed and greater than the alarm threshold, otherwise cleared. |
| 0x028B | 651 Channel 12 current reverse alarm status | This bit is set when the channel current is reversed and greater than the alarm threshold, otherwise cleared. |
| 0x028C | 652 Channel 13 current reverse alarm status | This bit is set when the channel current is reversed and greater than the alarm threshold, otherwise cleared. |
| 0x028D | 653 Channel 14 current reverse alarm status | This bit is set when the channel current is reversed and greater than the alarm threshold, otherwise cleared. |
| 0x028E | 654 Channel 15 current reverse alarm status | This bit is set when the channel current is reversed and greater than the alarm threshold, otherwise cleared. |
| 0x028F | 655 Channel 16 current reverse alarm status | This bit is set when the channel current is reversed and greater than the alarm threshold, otherwise cleared. |
| 0x0290 | 656 Channel 17 current reverse alarm status | This bit is set when the channel current is reversed and greater than the alarm threshold, otherwise cleared. |
| 0x0291 | 657 Channel 18 current reverse alarm status | This bit is set when the channel current is reversed and greater than the alarm threshold, otherwise cleared. |
| 0x0292 | 658 Channel 19 current reverse alarm status | This bit is set when the channel current is reversed and greater than the alarm threshold, otherwise cleared. |
| 0x0293 | 659 Channel 20 current reverse alarm status | This bit is set when the channel current is reversed and greater than the alarm threshold, otherwise cleared. |
| 0x0294 | 660 Channel 21 current reverse alarm status | This bit is set when the channel current is reversed and greater than the alarm threshold, otherwise cleared. |
| 0x0295 | 661 Channel 22 current reverse alarm status | This bit is set when the channel current is reversed and greater than the alarm threshold, otherwise cleared. |

| | | | |
|--------|-------|---|---|
| 0x0296 | 662 | Channel 23 current reverse alarm status | This bit is set when the channel current is reversed and greater than the alarm threshold, otherwise cleared. |
| 0x0297 | 663 | Channel 24 current reverse alarm status | This bit is set when the channel current is reversed and greater than the alarm threshold, otherwise cleared. |
| | | | |
| 0x02A0 | 672 | Channel 1 no current alarm status | This bit is set to 1 when there is no current in this channel, otherwise cleared. |
| 0x02A1 | 673 | Channel 2 no current alarm status | This bit is set to 1 when there is no current in this channel, otherwise cleared. |
| 0x02A2 | 674 | Channel 3 no current alarm status | This bit is set to 1 when there is no current in this channel, otherwise cleared. |
| 0x02A3 | 675 | Channel 4 no current alarm status | This bit is set to 1 when there is no current in this channel, otherwise cleared. |
| 0x02A4 | 676 | Channel 5 no current alarm status | This bit is set to 1 when there is no current in this channel, otherwise cleared. |
| 0x02A5 | 677 | Channel 6 no current alarm status | This bit is set to 1 when there is no current in this channel, otherwise cleared. |
| 0x02A6 | 678 | Channel 7 no current alarm status | This bit is set to 1 when there is no current in this channel, otherwise cleared. |
| 0x02A7 | 679 | Channel 8 no current alarm status | This bit is set to 1 when there is no current in this channel, otherwise cleared. |
| 0x02A8 | 680 | Channel 9 no current alarm status | This bit is set to 1 when there is no current in this channel, otherwise cleared. |
| 0x02A9 | 681 | Channel 10 no current alarm status | This bit is set to 1 when there is no current in this channel, otherwise cleared. |
| 0x02AA | 682 | Channel 11 no current alarm status | This bit is set to 1 when there is no current in this channel, otherwise cleared. |
| 0x02AB | 683 | Channel 12 no current alarm status | This bit is set to 1 when there is no current in this channel, otherwise cleared. |
| 0x02AC | 684 | Channel 13 no current alarm status | This bit is set to 1 when there is no current in this channel, otherwise cleared. |
| 0x02AD | 685 | Channel 14 no current alarm status | This bit is set to 1 when there is no current in this channel, otherwise cleared. |
| 0x02AE | 686 | Channel 15 no current alarm status | This bit is set to 1 when there is no current in this channel, otherwise cleared. |
| 0x02AF | 687 | Channel 16 no current alarm status | This bit is set to 1 when there is no current in this channel, otherwise cleared. |
| 0x02B0 | 688 | Channel 17 no current alarm status | This bit is set to 1 when there is no current in this channel, otherwise cleared. |
| 0x02B1 | 689 | Channel 18 no current alarm status | This bit is set to 1 when there is no current in this channel, otherwise cleared. |

| | | | |
|--------|-------|--------------------------------------|---|
| 0x02B2 | 690 | Channel 19 no current alarm status | This bit is set to 1 when there is no current in this channel, otherwise cleared. |
| 0x02B3 | 691 | Channel 20 no current alarm status | This bit is set to 1 when there is no current in this channel, otherwise cleared. |
| 0x02B4 | 692 | Channel 21 no current alarm status | This bit is set to 1 when there is no current in this channel, otherwise cleared. |
| 0x02B5 | 693 | Channel 22 no current alarm status | This bit is set to 1 when there is no current in this channel, otherwise cleared. |
| 0x02B6 | 694 | Channel 23 no current alarm status | This bit is set to 1 when there is no current in this channel, otherwise cleared. |
| 0x02B7 | 695 | Channel 24 no current alarm status | This bit is set to 1 when there is no current in this channel, otherwise cleared. |
| | | | |
| 0x02C0 | 704 | Channel 1 undercurrent alarm status | This bit is set to 1 when the channel is undercurrent, otherwise cleared. |
| 0x02C1 | 705 | Channel 2 undercurrent alarm status | This bit is set to 1 when the channel is undercurrent, otherwise cleared. |
| 0x02C2 | 706 | Channel 3 undercurrent alarm status | This bit is set to 1 when the channel is undercurrent, otherwise cleared. |
| 0x02C3 | 707 | Channel 4 undercurrent alarm status | This bit is set to 1 when the channel is undercurrent, otherwise cleared. |
| 0x02C4 | 708 | Channel 5 undercurrent alarm status | This bit is set to 1 when the channel is undercurrent, otherwise cleared. |
| 0x02C5 | 709 | Channel 6 undercurrent alarm status | This bit is set to 1 when the channel is undercurrent, otherwise cleared. |
| 0x02C6 | 710 | Channel 7 undercurrent alarm status | This bit is set to 1 when the channel is undercurrent, otherwise cleared. |
| 0x02C7 | 711 | Channel 8 undercurrent alarm status | This bit is set to 1 when the channel is undercurrent, otherwise cleared. |
| 0x02C8 | 712 | Channel 9 undercurrent alarm status | This bit is set to 1 when the channel is undercurrent, otherwise cleared. |
| 0x02C9 | 713 | Channel 10 undercurrent alarm status | This bit is set to 1 when the channel is undercurrent, otherwise cleared. |
| 0x02CC | 714 | Channel 11 undercurrent alarm status | This bit is set to 1 when the channel is undercurrent, otherwise cleared. |
| 0x02CB | 715 | Channel 12 undercurrent alarm status | This bit is set to 1 when the channel is undercurrent, otherwise cleared. |
| 0x02CC | 716 | Channel 13 undercurrent alarm status | This bit is set to 1 when the channel is undercurrent, otherwise cleared. |
| 0x02CD | 717 | Channel 14 undercurrent alarm status | This bit is set to 1 when the channel is undercurrent, otherwise cleared. |

| | | | |
|--------|-------------|------------------------------|---|
| 0x02CE | 718 Channel | 15 undercurrent alarm status | This bit is set to 1 when the channel is undercurrent, otherwise cleared. |
| 0x02CF | 719 Channel | 16 undercurrent alarm status | This bit is set to 1 when the channel is undercurrent, otherwise cleared. |
| 0x02D0 | 720 Channel | 17 undercurrent alarm status | This bit is set to 1 when the channel is undercurrent, otherwise cleared. |
| 0x02D1 | 721 Channel | 18 undercurrent alarm status | This bit is set to 1 when the channel is undercurrent, otherwise cleared. |
| 0x02D2 | 722 Channel | 19 undercurrent alarm status | This bit is set to 1 when the channel is undercurrent, otherwise cleared. |
| 0x02D3 | 723 Channel | 20 undercurrent alarm status | This bit is set to 1 when the channel is undercurrent, otherwise cleared. |
| 0x02D4 | 724 Channel | 21 undercurrent alarm status | This bit is set to 1 when the channel is undercurrent, otherwise cleared. |
| 0x02D5 | 725 Channel | 22 undercurrent alarm status | This bit is set to 1 when the channel is undercurrent, otherwise cleared. |
| 0x02D6 | 726 Channel | 23 undercurrent alarm status | This bit is set to 1 when the channel is undercurrent, otherwise cleared. |
| 0x02D7 | 727 Channel | 24 undercurrent alarm status | This bit is set to 1 when the channel is undercurrent, otherwise cleared. |
| | | | |
| 0x02E0 | 736 Channel | 1 overcurrent alarm status | This bit is set to 1 when the channel is overcurrent, otherwise cleared. |
| 0x02E1 | 737 Channel | 2 overcurrent alarm status | This bit is set to 1 when the channel is overcurrent, otherwise cleared. |
| 0x02E2 | 738 Channel | 3 overcurrent alarm status | This bit is set to 1 when the channel is overcurrent, otherwise cleared. |
| 0x02E3 | 739 Channel | 4 overcurrent alarm status | This bit is set to 1 when the channel is overcurrent, otherwise cleared. |
| 0x02E4 | 740 Channel | 5 overcurrent alarm status | This bit is set to 1 when the channel is overcurrent, otherwise cleared. |
| 0x02E5 | 741 Channel | 6 overcurrent alarm status | This bit is set to 1 when the channel is overcurrent, otherwise cleared. |
| 0x02E6 | 742 Channel | 7 overcurrent alarm status | This bit is set to 1 when the channel is overcurrent, otherwise cleared. |
| 0x02E7 | 743 Channel | 8 overcurrent alarm status | This bit is set to 1 when the channel is overcurrent, otherwise cleared. |
| 0x02E8 | 744 Channel | 9 overcurrent alarm status | This bit is set to 1 when the channel is overcurrent, otherwise cleared. |
| 0x02E9 | 745 Channel | 10 overcurrent alarm status | This bit is set to 1 when the channel is overcurrent, otherwise cleared. |

| | | | |
|--------|-------|-------------------------------------|--|
| 0x02EA | 746 | Channel 11 overcurrent alarm status | This bit is set to 1 when the channel is overcurrent, otherwise cleared. |
| 0x02EB | 747 | Channel 12 overcurrent alarm status | This bit is set to 1 when the channel is overcurrent, otherwise cleared. |
| 0x02EC | 748 | Channel 13 overcurrent alarm status | This bit is set to 1 when the channel is overcurrent, otherwise cleared. |
| 0x02ED | 749 | Channel 14 overcurrent alarm status | This bit is set to 1 when the channel is overcurrent, otherwise cleared. |
| 0x02EE | 750 | Channel 15 overcurrent alarm status | This bit is set to 1 when the channel is overcurrent, otherwise cleared. |
| 0x02EF | 751 | Channel 16 overcurrent alarm status | This bit is set to 1 when the channel is overcurrent, otherwise cleared. |
| 0x02F0 | 752 | Channel 17 overcurrent alarm status | This bit is set to 1 when the channel is overcurrent, otherwise cleared. |
| 0x02F1 | 753 | Channel 18 overcurrent alarm status | This bit is set to 1 when the channel is overcurrent, otherwise cleared. |
| 0x02F2 | 754 | Channel 19 overcurrent alarm status | This bit is set to 1 when the channel is overcurrent, otherwise cleared. |
| 0x02F3 | 755 | Channel 20 overcurrent alarm status | This bit is set to 1 when the channel is overcurrent, otherwise cleared. |
| 0x02F4 | 756 | Channel 21 overcurrent alarm status | This bit is set to 1 when the channel is overcurrent, otherwise cleared. |
| 0x02F5 | 757 | Channel 22 overcurrent alarm status | This bit is set to 1 when the channel is overcurrent, otherwise cleared. |
| 0x02F6 | 758 | Channel 23 overcurrent alarm status | This bit is set to 1 when the channel is overcurrent, otherwise cleared. |
| 0x02F7 | 759 | Channel 24 overcurrent alarm status | This bit is set to 1 when the channel is overcurrent, otherwise cleared. |
| | | | |
| 0x0300 | 768 | Channel 1 current low alarm state | This bit is set to 1 when the channel current is too low, otherwise cleared. |
| 0x0301 | 769 | Channel 2 current low alarm state | This bit is set to 1 when the channel current is too low, otherwise cleared. |
| 0x0302 | 770 | Channel 3 current low alarm state | This bit is set to 1 when the channel current is too low, otherwise cleared. |
| 0x0303 | 771 | Channel 4 current low alarm state | This bit is set to 1 when the channel current is too low, otherwise cleared. |
| 0x0304 | 772 | Channel 5 current low alarm state | This bit is set to 1 when the channel current is too low, otherwise cleared. |
| 0x0305 | 773 | Channel 6 current low alarm state | This bit is set to 1 when the channel current is too low, otherwise cleared. |

| | | |
|--------|--|---|
| 0x0306 | 774 Channel 7 current low alarm state | This bit is set to 1 when the channel current is too low, otherwise cleared. |
| 0x0307 | 775 Channel 8 current low alarm state | This bit is set to 1 when the channel current is too low, otherwise cleared. |
| 0x0308 | 776 Channel 9 current low alarm state | This bit is set to 1 when the channel current is too low, otherwise cleared. |
| 0x0309 | 777 Channel 10 current low alarm state | This bit is set to 1 when the channel current is too low, otherwise cleared. |
| 0x030A | 778 Channel 11 current low alarm state | This bit is set to 1 when the channel current is too low, otherwise cleared. |
| 0x030B | 779 Channel 12 current low alarm state | This bit is set to 1 when the channel current is too low, otherwise cleared. |
| 0x030C | 780 Channel 13 current low alarm state | This bit is set to 1 when the channel current is too low, otherwise cleared. |
| 0x030D | 781 Channel 14 current low alarm state | This bit is set to 1 when the channel current is too low, otherwise cleared. |
| 0x030E | 782 Channel 15 current low alarm state | This bit is set to 1 when the channel current is too low, otherwise cleared. |
| 0x030F | 783 Channel 16 current low alarm state | This bit is set to 1 when the channel current is too low, otherwise cleared. |
| 0x0310 | 784 Channel 17 current low alarm state | This bit is set to 1 when the channel current is too low, otherwise cleared. |
| 0x0311 | 785 Channel 18 current low alarm state | This bit is set to 1 when the channel current is too low, otherwise cleared. |
| 0x0312 | 786 Channel 19 current low alarm state | This bit is set to 1 when the channel current is too low, otherwise cleared. |
| 0x0313 | 787 Channel 20 current low alarm state | This bit is set to 1 when the channel current is too low, otherwise cleared. |
| 0x0314 | 788 Channel 21 current low alarm state | This bit is set to 1 when the channel current is too low, otherwise cleared. |
| 0x0315 | 789 Channel 22 current low alarm state | This bit is set to 1 when the channel current is too low, otherwise cleared. |
| 0x0316 | 790 Channel 23 current low alarm state | This bit is set to 1 when the channel current is too low, otherwise cleared. |
| 0x0317 | 791 Channel 24 current low alarm state | This bit is set to 1 when the channel current is too low, otherwise cleared. |
| | | |
| 0x0320 | 800 Channel 1 current too high alarm state | This bit is set to 1 when the channel current is too high, otherwise cleared. |
| 0x0321 | 801 Channel 2 current too high alarm state | This bit is set to 1 when the channel current is too high, otherwise cleared. |

| | | |
|------------|---|---|
| 0x0322 | 802 Channel 3 current too high alarm state | This bit is set to 1 when the channel current is too high, otherwise cleared. |
| 0x0323 | 803 Channel 4 current too high alarm state | This bit is set to 1 when the channel current is too high, otherwise cleared. |
| 0x0324 | 804 Channel 5 current too high alarm state | This bit is set to 1 when the channel current is too high, otherwise cleared. |
| 0x0325 | 805 Channel 6 current too high alarm state | This bit is set to 1 when the channel current is too high, otherwise cleared. |
| 0x0326 | 806 Channel 7 current too high alarm state | This bit is set to 1 when the channel current is too high, otherwise cleared. |
| 0x0327 | 807 Channel 8 current too high alarm state | This bit is set to 1 when the channel current is too high, otherwise cleared. |
| 0x0328 | 808 Channel 9 current too high alarm state | This bit is set to 1 when the channel current is too high, otherwise cleared. |
| 0x0329 | 809 Channel 10 current too high alarm state | This bit is set to 1 when the channel current is too high, otherwise cleared. |
| 0x032A 810 | Channel 11 current too high alarm state | This bit is set to 1 when the channel current is too high, otherwise cleared. |
| 0x032B 811 | Channel 12 current too high alarm state | This bit is set to 1 when the channel current is too high, otherwise cleared. |
| 0x032C 812 | Channel 13 current too high alarm state | This bit is set to 1 when the channel current is too high, otherwise cleared. |
| 0x032D 813 | Channel 14 current too high alarm state | This bit is set to 1 when the channel current is too high, otherwise cleared. |
| 0x032E 814 | Channel 15 current too high alarm state | This bit is set to 1 when the channel current is too high, otherwise cleared. |
| 0x032F | 815 Channel 16 current too high alarm state | This bit is set to 1 when the channel current is too high, otherwise cleared. |
| 0x0330 | 816 Channel 17 current too high alarm state | This bit is set to 1 when the channel current is too high, otherwise cleared. |
| 0x0331 | 817 Channel 18 current too high alarm state | This bit is set to 1 when the channel current is too high, otherwise cleared. |
| 0x0332 | 818 Channel 19 current too high alarm state | This bit is set to 1 when the channel current is too high, otherwise cleared. |
| 0x0333 | 819 Channel 20 current too high alarm state | This bit is set to 1 when the channel current is too high, otherwise cleared. |
| 0x0334 | 820 Channel 21 current too high alarm state | This bit is set to 1 when the channel current is too high, otherwise cleared. |
| 0x0335 | 821 Channel 22 current too high alarm state | This bit is set to 1 when the channel current is too high, otherwise cleared. |
| 0x0336 | 822 Channel 23 current too high alarm state | This bit is set to 1 when the channel current is too high, otherwise cleared. |

| | | | |
|------------|--|---|---|
| 0x0337 823 | | Channel 24 current too high alarm state | This bit is set to 1 when the channel current is too high, otherwise cleared. |
|------------|--|---|---|

7.4.2 Register description in word unit (function code 03 04 06)

| Modbus address | | Function description | Data Type | instruction | R/ W |
|--|--------------|----------------------------------|-----------------|---|---------|
| Hex | Decimal | | | | |
| Address 0x0100~0x0158, a total of 89 consecutive addresses | | | | | |
| Address 0x0100~0x0123, a total of 36 consecutive addresses (data in this address supports data freeze) | | | | | |
| 0x0104 | 260 | bus voltage | Unsigned shorts | Unit V, default 0 | R |
| 0x0105 | 261 | Temperature sensor 1 | short | Unit: 0.1 °C, default -424 Unit: | R |
| 0x0106 | 262 | Temperature sensor 2 | short | 0.1 °C, default -424 bit0: DI1, | R |
| 0x0107 | 263 | Switch input | Unsigned shorts | bit1: DI2, bit2: DI3, bit3: DI4 0: open, 1: closed, default 0 | R |
| 0x0108 | 264 | Quantity of online Hall channels | Unsigned shorts | Showsthe quantity of Hall channels currently connected. default 0 | R |
| 0x0109 | 265 | Total reverse current | shorts | Unit is 10mA, default is 0 Unit | R |
| 0x010A | 266 | Total current | Shorts | is 10mA, default is 0, Unit mA, | R |
| 0x010B | 267 | Average current | Shorts | default 0 | |
| 0x010C ~ 0x0123 | 268 ~ 291 | Channel 1 to 24 current | Shorts | Unit mA, default 0 | R |
| Address 0x012A~0x0158, a total of 45 addresses (function code 04 read, but the data is not latched) | | | | | |
| 0x012A | 298 | Shunt trip status 1 | Unsigned shorts | Bit0 bus arc, the trip code is (01) Bit1 channel arc, (02) Bit3 overvoltage, (04) Bit4 high temperature 1, (05) Bit5 high temperature 2, (06) Bit6 channel current value is reversed, (07) Bit7 Total reverse current is high, (08) Bit9 total current is high, (10) Bit10 channel current value is zero, (11) Bit11 channel current value undercurrent, (12) Bit12 channel current value overcurrent, (13) Bit13 channel current value is low, (14) Bit14 channel current value is high, (15) Bit15 reserved, (16) 0: No tripping, 1: Tripped, default 0 | R |
| 0x012B | 299 | Shunt trip status 2 | Unsigned shorts | Bit0 DI1, (17) Bit1 DI2, (18) Bit2 DI3, (19) Bit3 DI4, (20) Bit4 combined alarm Bit14: Tripped remotely, (31) 0: No tripping, 1: Tripped, default 0 | R |
| 0x012C | 300 | Shunt trip status 3 | Unsigned shorts | Bit15: Total trip status (not open) 0: no trip, 1: tripped, default 0 | |
| 0x012D | 301 | Alarm status 1 | Unsigned shorts | Bit0 bus bar arc, Bit1 channel arc, Bit2 low voltage, Bit3 high voltage, Bit4 high temperature 1, Bit5 high temperature 2, Bit6 channel current value reverse Bit7 total reverse current is high, | R |

| | | | | | |
|--------------------|--------------|--|-----------------|---|---|
| | | | | Bit8 total current is low, Bit9 total current is high, Bit10 channel current value is zero, Bit11 channel current value underlying Bit12 channel current value overcurrent Bit13 channel current value is low Bit14 channel current value is high 0: no alarm, 1: alarm, default 0 | |
| 0x012E | 302 | Alarm status 2 | Unsigned shorts | Bit0 DI1 Bit1 DI2 Bit2 DI3 Bit3 DI4 Bit4 combined alarm 0: no alarm, 1: alarm, default 0 | |
| 0x0130 | 304 | Channel 1 ÷ 16 arc alarm | Unsigned shorts | Default 0 0: No alarm, 1: Alarm | R |
| 0x0131 | 305 | Channel 17~24 arc alarm | Unsigned shorts | Default 0 0: No alarm, 1: Alarm | R |
| 0x0132 | 306 | The quantity of Bus arc history alarm | Unsigned shorts | If the current channel alarms continuously, the value will increase by 1. If there are alarms on other channels, the count will restart. | R |
| 0x0133 ~ 0x014A | 307 ~ 330 | The quantity of Channel 1~24 arc history alarm | Unsigned shorts | default 0 This value is incremented by 1 for each channel arc alarm. | R |
| 0x014B | 331 | Channel 1÷16 reverse current alarm | Unsigned shorts | Default 0 0: No alarm, 1: Alarm | R |
| 0x014C | 332 | Channel 17 ÷ 24 reverse current alarm | Unsigned shorts | Default 0 0: No alarm, 1: Alarm | R |
| 0x014D | 333 | Channel 1 ÷ 16 no current alarm | Unsigned shorts | Default 0 0: No alarm, 1: Alarm | R |
| 0x014E | 334 | Channel 17 ÷ 24 no current alarm | Unsigned shorts | Default 0 0: No alarm, 1: Alarm | R |
| 0x014F | 335 | Channel 1 ÷ 16 undercurrent alarm | Unsigned shorts | Default 0 0: No alarm, 1: Alarm | R |
| 0x0150 | 336 | Channel 17 ~ 24 undercurrent alarm | Unsigned shorts | Default 0 0: No alarm, 1: Alarm | R |
| 0x0151 | 337 | Channel 1 ÷ 16 overcurrent alarm | Unsigned shorts | Default 0 0: No alarm, 1: Alarm | R |
| 0x0152 | 338 | Channel 17 ~ 24 overcurrent alarm | Unsigned shorts | Default 0 0: No alarm, 1: Alarm | R |
| 0x0153 | 339 | Channel 1÷16 current low alarm | Unsigned shorts | Default 0 0: No alarm, 1: Alarm | R |
| 0x0154 | 340 | Channel 17 ÷ 24 current low alarm | Unsigned shorts | Default 0 0: No alarm, 1: Alarm | R |
| 0x0155 | 341 | Channel 1÷16 current high alarm | Unsigned shorts | Default 0 0: No alarm, 1: Alarm | R |
| 0x0156 | 342 | Channel 17 ~ 24 current high alarm | Unsigned shorts | Default 0 0: No alarm, 1: Alarm | R |
| 0x0157 | 343 | Channel 1 ÷ 16 arc channelself-check status | Unsigned shorts | default 0 ,0 means self-check passed, 1 means self-check failed | R |
| 0x0158 | 344 | Channel 17 ÷ 24 arc channelself-check status | Unsigned shorts | default 0 ,0 means self-check passed, 1 means self-check failed | R |
| | | | | | |

The address 0x0200 ~ 0x02FF, which has a total of 128 consecutive addresses. It is recommended to read in sections.

| Power information 0x0200-0x024B | | | | | |
|---|--------------|--|-----------------|--|-----|
| 0x0200 | 512 | Total power | Unsigned shorts | Unit is 100W, default 0 | R |
| 0x0201 | 513 | Average power | Unsigned shorts | Unit is W, default 0, the unit is 10W when using a large range of Hall | R |
| 0x0202 ~ 0x0219 | 514 ~ 537 | Channel 1 ~ 24 power | Unsigned shorts | Unit W, default 0 | R |
| 0x021A | 538 | The highest 16bit of the total generated energy | Unsigned shorts | Unit Wh, default 0 | R |
| 0x021B | 539 | The lower 16bit of the total generated energy | Unsigned shorts | Unit Wh, default 0 | R |
| 0x021C | 540 | The higher 16bit of the generated energy of channel1 | Unsigned shorts | Unit Wh, default 0 | R |
| 0x021D | 541 | The lower 16bit of the generated energy of channel1 | Unsigned shorts | Unit Wh, default 0 | R |
| | | | | | ... |
| 0x024A | 586 | The higher 16bit of the generated energy of Channel 24 | Unsigned shorts | Unit Wh, default 0 | R |
| 0x024B | 587 | The lower 16bit of the generated energy of Channel 24 | Unsigned shorts | Unit Wh, default 0 | R |
| Arc information (0x0250-0x0297) | | | | | |
| 0x0250 ~ 0x0267 | 592 ~ 615 | Channel 1~24 arc intensity real-time value | short | Unit 1, default 0 | R |
| 0x0268 ~ 0x027F | 616 ~ 639 | Channel 1~24 arc intensity maximum history | short | Unit 1, default 0 | R |
| 0x0280 ~ 0x0297 | 640 ~ 663 | Channel 1~24 10 minutes arc intensity value | short | Unit 1, default 0 | R |
| FR-DCMG-HS4Q Hall special register (0x0400-0x0431) | | | | | |
| 0x0400 | 1024 | Current value of current channel 1 | shorts | Unit 10mA, default 0 | |
| 0x0401 | 1025 | Current value of current channel 2 | shorts | Unit 10mA, default 0 | |
| | | | | | |
| 0x0416 | 1046 | Current value of current channel 23 | shorts | Unit 10mA, default 0 | |
| 0x0417 | 1047 | Current value of current channel 24 | shorts | Unit 10mA, default 0 | |
| 0x0418 | 1048 | Total reverse current | shorts | Unit 100mA, default 0 | |
| 0x0419 | 1049 | Total current | shorts | Unit 100mA, default 0 | |
| 0x041A | 1050 | Average current | shorts | Unit 10mA, default 0 | |
| 0x041B | 1051 | Total power | shorts | Unit 1000W, default 0 | |
| 0x041C | 1052 | Average power | shorts | Unit 10W, default 0 | |
| 0x041D ~ | 1053 ~ | Channel 1 ~ 24 power | shorts | Unit 10W, default 0 | |

| | | | | | |
|--|-------|--|-----------------|---|-----|
| 0x0434 | 1076 | | | | |
| FR-DCMG-HS4Q Hall special register Large-range energy information (0x0500-0x0540) | | | | | |
| 0x0500 | 1280 | The higher 16bit of the total generated energy | Unsigned shorts | Unit 10W, default 0 | |
| 0x0501 | 1281 | The lower 16bit of the total generated energy | Unsigned shorts | Unit 10W, default 0 | |
| 0x0502 | 1282 | The higher 16bit of the generated energy of channel1 | Unsigned shorts | Unit 10W, default 0 | |
| 0x0503 | 1283 | The lower 16bit of the generated energy of channel1 | Unsigned shorts | Unit 10W, default 0 | |
| | | | | | |
| 0x0539 | 1343 | The higher 16bit of the generated energy of Channel 24 | Unsigned shorts | Unit 10Wh, default 0 | |
| 0x0540 | 1344 | The lower 16bit of the generated energy of Channel 24 | Unsigned shorts | Unit 10Wh, default 0 | |
| System information configuration (0x0B00-0x0B24) | | | | | |
| 0x0B00 | 2816 | Alarm release | Unsigned Shorts | The percentage of the alarm threshold is used as the alarm release threshold. Unit %, default 2, setting range 0 to 100 | W/R |
| 0x0B01 | 2817 | Bus voltage alarm low threshold | Unsigned shorts | Unit V, default 300 | W/R |
| 0x0B02 | 2818 | Bus voltage alarm high threshold | Unsigned shorts | Unit V, default 1500 | W/R |
| 0x0B03 | 2819 | Temperature sensor 1 alarm high threshold | shorts | Unit 0.1 °C, default 800, setting range is greater than -400 | W/R |
| 0x0B04 | 2820 | Temperature sensor 2 alarm high threshold | shorts | Unit 0.1 °C, default 800, setting range is greater than -400 | W/R |
| 0x0B05 | 2821 | Total current low alarm threshold | Unsigned Shorts | Unit 10mA, default 1600 | W/R |
| 0x0B06 | 2822 | Total current too high alarm threshold | Unsigned Shorts | Unit 10mA, default 50000 | W/R |
| 0x0B07 | 2823 | Current channel related alarm activation threshold | Unsigned Shorts | Unit mA, default 2000. The average current value is greater than this value; tea total current is too high, too low, the channel is undercurrent, overcurrent, no current, high current, low current, otherwise these alarms will be forcibly turned off. | W/R |
| 0x0B08 | 2824 | Undercurrent, overcurrent alarm threshold | Unsigned shorts | Unit mA, default 2000. The average current is subtracted from this value as the undercurrent alarm threshold; tea average current is added to this value as the overcurrent alarm threshold. | W/R |
| 0x0B09 | 2825 | Channel current low alarm threshold | Unsigned shorts | Unit mA, default 1000. | W/R |
| 0x0B0A | 2826 | Channel current high alarm threshold | Unsigned shorts | Unit mA, default 20000. | W/R |
| 0x0B0B | 2827 | Reverse total current too high threshold | shorts | Unit 10mA, default -600. | W/R |
| 0x0B0C | 2828 | Channel reverse current too high threshold | shorts | Unit mA, default -2000. | W/R |
| 0x0B0D | 2829 | Current channel related trip | Unsigned | Default 3. When the channel is reversed, W/R | |

| | | | | | |
|--------|------------|--|----------------|--|-----|
| | | threshold | shorts | undercurrent, overcurrent, no current, high current, and the number of channels with low current is greater than or equal to this value, the trip unit performs the tripping action. Otherwise it will not work. | |
| 0x0B0E | 2830 | Channel arc intensity super high alarm threshold | Short The | default is 70. Need to set according to the site conditions or customer requirements, you can call the company's technical staff | W/R |
| 0x0B0F | 2831 O + O | output level during alarm | Bool | 0: low level; 1: 24V, Release mode: default is 1; Relay mode: the default is 0; Unit | W/R |
| 0x0B10 | 2832 O + O | output time during alarm | Unsigned short | S (seconds), Release mode: default is 1; Relay mode: default is 180 Write 1 to enable | W/R |
| 0x0B11 | 2833 | Automatic current calibration setting | Bool | automatic current calibration, write 0 to disable, default is 0 Write 1 to start current | W/R |
| 0x0B12 | 2834 | Manual current calibration setting | Bool | calibration, write 0 to turn off, default is 0 Note: Make sure the channel has no current when starting calibration . bit0ÿ Represents the switch setting for | W/R |
| 0x0B13 | 2835 | Channel 1~16 current channels switch setting | Unsigned short | channel 1 bit15ÿRepresents the switch setting for channel 16 0 means disabled, 1 means enabled Default 0xFFFF | W/R |
| 0x0B14 | 2836 | Channel 17~24 current channel switch setting | Unsigned short | bit0ÿRepresents the switch setting for channel 7 bit7ÿRepresents the switch setting for channel 24 0 means disabled, 1 means enabled Default 0xFFFF 0 | W/R |
| 0x0B16 | 2838 | Current UI display, direction, reverse order control | Unsigned short | means that the maximum current displayed on the UI interface is 10A 1 indicates that the maximum current displayed on the UI interface is 20A 2 indicates that the maximum current displayed on the UI interface is 30A 3 means that the UI interface shows a maximum current of 40A Bit8: Current channel positive sequence/reverse sequence setting (Positive sequence: Hall close to the host is arranged according to channels 1ÿ24; Reverse sequence: Hall close to the host is calculated according to channels 24 to 1) 0 means positive order; 1 means reverse order Bit9: Channel current direction setting 0 means that the direction is positive, and 1 means that the current is reversed. | W/R |

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| | | | | Bit10: Auto range enable The default is 0x0401; | |
| 0x0B17 | 2839 | Arc output mode setting | Unsigned short | 0: Tripper mode; 1: Relay mode Default value: 1 | W/R |
| 0x0B18 | 2840 | Arc detection mode | Unsigned short | 0: Instantaneous arc; 1: Continuous bow Default value: 1 | W/R |
| 0x0B19 | 2841 | Instantaneous arc time IAT Unsigned | shorts | 2-5 Default value: 2 | W/R |
| 0x0B1A | 2842 | Continuous arc time CAT Unsigned | shorts | 15-60 Default value: 15 | W/R |
| 0x0B20 | 2848 | Alarm function management 1 | Unsigned short | Bit0 bus bar arc, Bit1 channel arc, Bit2 low voltage, Bit3 high voltage, Bit4 high temperature 1, Bit5 high temperature 2, Bit6 channel current value is reversed, Bit7 total reverse current is high, Bit8 total current is low, Bit9 total current is high, Bit10 channel current value is zero, Bit11 channel current value undercurrent, Bit12 channel current value is overcurrent, Bit13 channel current value is too low, Bit14 channel current value is too high, 1: Enable (open) alarm, 0: Disable (close) alarm Default: 0x0002 | W/R |
| 0x0B21 | 2849 | Alarm function management 2 (Combined alarm management 1) | Unsigned short | Bit0 DI1 Bit1 DI2 Bit2 DI3 Bit3 DI4 Bit4 combined alarm switch Bit14: remote trip, Bit15: Alarm switch, (the function is forcibly turned on) 1: Enable alarm, 0: Disable alarm Default value: 0x800F | W/R |
| 0x0B23 | 2851 | Alarm trip action management 1 | Unsigned short | Bit0 bus bar arc, Bit1 channel arc, Bit2 low voltage, Bit3 high voltage, Bit4 high temperature 1, Bit5 high temperature 2, Bit6 channel current value is reversed, Bit7 total reverse current is high, Bit9 total current is high, Bit10 channel current value is zero, Bit11 channel current value undercurrent, Bit12 channel current value is overcurrent, Bit13 channel current value is too low, Bit14 channel current value is too high, 1: Enable (open) trip, 0: Disable (close) | W/R |

| | | | | | |
|---|------|---|----------------|---|-----|
| | | | | trip Default: 0x0002 | |
| 0x0B24 | 2852 | Alarm trip action management 2 | Unsigned short | Bit0 DI1, Bit1 DI2, Bit2 DI3, Bit3 DI4 Bit4 combined alarm switch Bit14: remote trip, Bit15 alarm trip main switch, (the function is forcibly opened) 1: Enable (open) trip, 0: Disable (close) trip Default: 0x8000 | W/R |
| 0x0B26 | 2854 | Logic AND Alarm Ctrl 1 | Unsigned short | bit0 AndEn_bus arc, bit1 AndEn_channel arc, bit2 AndEn_low voltage, bit3 AndEn_High pressure, bit4 AndEn_high temperature 1, bit5 AndEn_high temperature 2, bit6 AndEn_channel current value is reversed, bit7 AndEn_total reverse current high, bit9 AndEn_total current high, bit10 AndEn_channel current value is zero, bit11 AndEn_channel current value flow, bit12 AndEn_channel current value is overcurrent, bit13 AndEn_channel current value is too low, bit14 AndEn_channel current value is too high, 1: Participate in combinational logic, 0: Not participate in combinational logic Default: 0x0000 | W/R |
| 0x0B27 | 2855 | Logic AND Alarm Ctrl 2 | Unsigned short | Bit0 AndEn_DI1 y bit1 AndEn_DI2 y bit2 AndEn_DI3 y bit3 AndEn_DI4 1: Participate in combinatorial logic, 0: Do not participate in combinatorial logic Default: 0x0000 | W/R |
| System information configuration 2 (0x0C00-0x0C06) | | | | | |
| 0x0C00 | 3072 | Clear power generation history value record short | Unsigned short | Write 1 reset energy history record, read always 0 Write 1 | W/R |
| 0x0C01 | 3073 | Clear channel arc and bus arc history alarms short | Unsigned short | reset channel arc and bus arc history alarm times record, read always 0 Write 1 reset trip | W/R |
| 0x0C02 | 3074 | Clear alarm trip status information and alarm short interface | Unsigned short | alarm status information and alarm interface, read always 0.(remove interface and status information related to trip management) | W/R |
| 0x0C03 | 3075 | Retain | | | |
| 0x0C04 | 3076 | Remote manual control release performstripping | Unsigned short | Write 1 manually to control the trip unit to perform the tripping action, and the read is always 0 | W/R |

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| | | | | Note: The remote alarm trip enable must be turned on first (write 1 for bit14 of 0xb21 and bit14 of 0xb24) | |
| 0x0C05 | 3077 | Arc channel self-check operation | Unsigned shorts | Write 1 to start the arc channel self-check, 1S to end the self-check. read always 0 | W/R |
| 0x0C06 | 3078 | Retain | | | |
| System settings (0xFE00-0xFE54) | | | | | |
| 0xFE00 | 65024 | Modbus address | Unsigned shorts | Set range 1 ~ 247, default 247. Set other values to restore the default values. | W/R |
| 0xFE01 | 65025 | Modbus Baud rate | Unsigned shorts | 19200, 57600, 9600, 2400, 4800, 38400 Default is 3, setting other values to restore the default | W/R |
| 0xFE02 | 65026 | Modbus Parity | Unsigned shorts | 0: NONE, 1: ODD, 2: EVEN Default is 0, setting other values to restore the default | W/R |
| 0xFE06 | 65030 | System UI display settings | Unsigned shorts | Lower 8 bits: system language setting 0: Chinese; 1: English, default value 1 High eight bits: system logo settings Reserved, default 0 | W/R |
| 0xFFCC | 65484 | Automatic recovery times of arc alarm | Shorts | Unit 1, default 5. Only effective in relay fashion | W/R |

8.1 Document revision record

| Revision | Time | Description |
|----------|------------|--|
| 1.0 | 2020-03-12 | <p>For A088 and above products</p> <p>Update switch description, terminal definition, new setting interface and alarm interface;</p> <p>Add</p> <ul style="list-style-type: none"> —Arc Intensity 10 Minute Value Register —Arc Alarm Strategy — Trip mode high-low levels switching function, interface and register —Communication shielded wire wiring specification —Current calibration function, interface and register —FAQ (screen flicker troubleshooting method) —PLC System diagram —Parametersetting range <p>Deletion—Broadcast, battery board and other registers</p> |
| 1.1 | 2020-04-28 | Add—FR-DCMG-HS4Q Hall Register |
| 1.2 | 2020-07-03 | Add—HS4Q long range register 0x0400, 0x0500 |
| 1.3 | 2021-04-19 | <p>Add—combined alarm strategy</p> <ul style="list-style-type: none"> —Combined alarm register 0x0B21, 0x0B24 —The status of the combined alarm 03 The position of the function code is in bit 4 of the register 0x12B and 0x12E —Combined alarm status 02 The position of function code is 0x214 in the register |
| 1.4 | 2021-05-15 | Add—safety precautions— installation method |
| 1.5 | 2024-07-29 | <p>Software version:</p> <p>A38F: Combination alarm function bugfix, page name adjustment, 0xb18 arc mode (0 instantaneous arc, 1 continuous arc), 0xb19 instantaneous arc IAT function, and 0xb1a continuous arc CAT function.</p> <p>Add-UIsetting interface, new MOD, IAT, CAT parameter setting options</p> <ul style="list-style-type: none"> —Combined alarm logic, closed by default —Interpretation of arc alarm terms, interpretation of instantaneous arc and continuous arc —Data message example — <p>0x0B18 Arc detection mode register 0x0B19 continuous arc IAT 0x0B1A continuous arc CAT</p> <p>Delete-PLC function description, PLC function in FR-DCMG-MMPL</p> |

| | | |
|--|--|---|
| | | manual Modification-optimized text description of alarm conditions Add- add 0xFFCC register |
|--|--|---|

8.2 Contact us

If you have any questions about this product, please contact us.

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