# Multifunctional Smart Circuit Breaker

## MT61SR

Communication Protocol

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# INDEX

# 1 Modbus Overview

## 1.1 Function Overview

The multifunctional smart circuit breaker adopts the standard communication protocol - Modbus-RTU, which is applicable to MT61SR. Programmatically or manually, the baud rate can be set to 9600, 19200, etc.

## 1.2 Modbus Communication Settings

Before communicating with the device using the Modbus protocol, configure the following settings through the display screen:

| Parameters | Valid Value | Default Value |
|---|---|---|
| Baud rate | 9600 | 9600 |
| | 19200 | |
| | 38400 | |
| Data bit | 8 | 8 |
| Check bit | Odd | No check |
| | Even | |
| | No check | |
| Stop bit | 1 | 1 |
| Address | 1–247 | 1 |

## 1.3 Command Request Format

| Slave Address | Function Code | Command | CRC Check |
|---|---|---|---|
| 8-Bits | 8-Bits | N×8-Bits | 16-Bits Checking |

## 1.4 Function Code

Function codes are used to instruct the device how to handle the command. The following table shows the available function codes and their descriptions.

| Function Code | | Function Code Name | Function |
|---|---|---|---|
| Decimal | Hexadecimal | | |
| 3 | 03H | Read holding register | Used to read parameters |
| 6 | 06H | Write a single holding register | Used to write parameters |
| 16 | 10H | Write multiple registers | Used to configure parameters |

## 1.5 Register List Format

The register table contains the following:

| Register Alias | Register Address | Operation Read/Write | Size | Type | Unit | Description |
|---|---|---|---|---|---|---|

- Register alias: Used to refer to the meaning of the register
- Register address: The address of Modbus data. The data address in this manual is in decimal.
- Operation: Indicates the operations that can be performed by the register
- Size: Indicates the size of how many 16-bit data is occupied
- Type: The type of data code
- Unit: Unit of register value
- Description: Introduce the function of this register

## 1.6 Data Type List

The following table lists the data types used in this manual.

| Type | Description | Range |
|---|---|---|
| UInt16 | Unsigned 16-bit integer | 0–65535 |
| Int16 | Signed 16-bit integer | -32768–+32767 |
| UInt32 | Unsigned 32-bit integer | 0–4 294 967 295 |
| UInt64 | Unsigned 64-bit integer | 0–18 446 744 073 709 551 615 |
| UTF8 | 8-bit UTF encoding | Multibyte Unicode encoding |

| | | |
|---|---|---|
| Float32 | 32-bit floating point | Standard IEEE floating point data (single precision) |
| Bitmap | – | – |
| Date Time | Time type | - |

## 1.7 Date Time

The communication LED indicates the communication status between the multifunctional smart circuit breaker and the main device as follows.

| Word | Bit | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| 1 | Reserved (0) | | | | | | | Year (00–99, Since 2000) | | | | | | | | |
| 2 | Month (1–12) | | | | | | | Day (1–31) | | | | | | | | |
| 3 | Hour (0–23) | | | | | | | Minute (0–59) | | | | | | | | |
| 4 | millisecond (0–59999) | | | | | | | | | | | | | | | |

## 1.8 Configuration via Modbus-RTU

You can use function code 6/16 to write commands to the device and configure parameters.

Device parameters can only be configured by writing corresponding data to the "Configuration Command Register".

## 1.9 Configuration Command Request

The following table lists the Modbus request format for configuration commands.

| Slave address 8 bits | Function code 8 bits | Configuration command register address 16 bits | | Configuration command register number 16 bits | | Data 8 bits | Commands (16 bits) X N | | | | CRC check (16bits) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1-247 | 16 | High 8bits | Low 8bits | High 8bits | Low 8 bits | N×2 | Command | | Command parameter | | Low 8 bits | High 8 bits |
| | | | | | | | High 8 bits | Low 8 bits | High 8 bits | Low 8 bits | | |

## 1.10 Function Code (0x10=16) Operation Instructions

Function code (0x10=16) is used to configure parameters. Its request and return data format is as follows:

### 1.10.1 Request Data Format

| No. | Name | Type | Range (decimal) | Description |
|---|---|---|---|---|
| 1 | Address | UInt8 | 1-247 | |
| 2 | Function code | UInt8 | 16 | |
| 3 | Starting register address | UInt16 | - | High byte first (sending order) |
| 4 | Number of registers | UInt16 | 1-123 | High byte first (sending order) |
| 5 | Number of register bytes | UInt8 | | Number of registers *2 |
| 6 | Write value of register 1 | UInt16 | - | High byte first (sending order) |
| 7 | … | UInt16 | - | High byte first (sending order) |
| 8 | Write value of register n | UInt16 | - | High byte first (sending order) |
| 9 | CRC-16 check code | UInt16 | - | Low byte first (sending order) |

### 1.10.1 Return Data Format

| No. | Name | Type | Range (decimal) | Description |
|---|---|---|---|---|
| 1 | Address | UInt8 | 1-247 | |
| 2 | Function code | UInt8 | 16 | |
| 3 | Starting register address | UInt16 | 300 | High byte first |
| 4 | Number of registers | UInt16 | 1-123 | High byte first |
| 5 | CRC-16 check code | UInt16 | - | Low byte first |

## 1.11 Function Code (0x3=3, 0x6=6) Operation Instructions

Function code (0x03=3) is used to read register parameters. Function code (0x06=6) is used to write a single register parameter. The request and return data format is as follows:

### 1.11.1 Request Data Format

| No. | Name | Type | Range (decimal) | Description |
|---|---|---|---|---|
| 1 | Address | UInt8 | 1-247 | |
| 2 | Function code | UInt8 | 3 | |
| 3 | Starting register address | UInt16 | - | High byte first (sending order) |
| 4 | Number of registers | UInt16 | 1-125 | High byte first (sending order) |
| 5 | CRC-16 check | UInt16 | - | Low byte first (sending order) |

### 1.11.2 Return Data Format

| No. | Name | Type | Range (decimal) | Description |
|---|---|---|---|---|
| 1 | Address | UInt8 | 1-247 | |
| 2 | Function code | UInt8 | 3 | |
| 3 | Read the number of register bytes | UInt8 | - | Number of read registers *2 |
| 4 | Register 1 value | | - | High byte first |
| 5 | … | | - | High byte first |
| 6 | Register n value | | - | High byte first |
| 7 | CRC-16 check | UInt16 | - | Low byte first |

### 1.12 Communication LED Indicators for Modbus Devices

The communication LED indicates the communication status between the multifunctional smart circuit breaker and the main device as follows.

| Indicator status | Description |
|---|---|
| LED is flashing | Communication with the device has been established. |
| | NOTE: The LED will also flash if an online error occurs. |
| LED off | There is no active communication between the master and slave devices. |

## 2 Register List: Device System Information

### 2.1 Product Information

| Category | DEC address | HEX address | Name | Attribute | Register length (U16) | Data type | Unit | RW |
|---|---|---|---|---|---|---|---|---|
| System parameters | 0 | 0X0000 | Communication address | The reading and writing have the same meaning, 1-247 (0 means broadcast);<br>Default 1;<br>The modification will take effect immediately;<br>Power-off storage; | 1 | UInt16 | Null | R/W |
| System parameters | 1 | 0X0001 | Communication protocol type | Read only 0;<br>0 represents MODBUS communication protocol; | 1 | UInt16 | Null | R/W |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| System parameters | 2 | 0x0002 | Communication baud rate, check bit | Reading and writing have the same meaning;<br>High byte:<br>communication baud rate 5-7<br>5: 9600;<br>6: 19200;<br>7: 38400;<br>Low byte:<br>communication check bit:<br>0 = none,<br>1 = odd,<br>2 = even,<br>note: stop bit = 1<br>Default value 0x0501;<br>The modification will take effect immediately;<br>Power-off storage; | 1 | UInt16 | Null | R/W |
| System parameters | 5 | 0X0005 | Time zone | Reading and writing have the same meaning;<br>Default 8;<br>-12 to +12, respectively representing UTC-12~UTC+12; | 1 | SInt16 | Null | R/W |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | The modification will take effect immediately;<br>Power-off storage; | | | | |
| System parameters | 6 | 0X0006 | Unix timestamp; | Reading and writing have the same meaning;<br>Range: depends on the production date, the setting value is to 2106/2/7 14:28:15;<br>It takes effect immediately after writing;<br>When the battery is charged, the time will be automatically displayed; | 2 | Timestamp | Seconds. | R/W |
| System parameters | 8 | 0X0008 | Protection password | Reading and writing have the same meaning;<br>Range: 0-9999 There is a password in the settings; default value: 0000<br>The positive integer composed of bit24 to bit31 is the first number of the | 2 | BCD | Null | R/W |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | password, and the value does not exceed 9;<br>The positive integer composed of bit16 to bit23 is the second number of the password, and the value does not exceed 9;<br>The positive integer composed of bit8 to bit15 is the third number of the password, and the value does not exceed 9;<br>The positive integer composed of bit0 to bit7 is the fourth number of the password, and the value does not exceed 9;<br>A value with more than 4 digits can also be written successfully, but the value read out is only the first 4 digits. | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Instructions are required to indicate that only 4 digits can be written. | | | | |
| Product information | 10 | 0X000A | Supplier name | Write up to 20 English visual characters;<br>The default value "matismart" (does not contain quotes);<br>Power-off storage; | 10 | string | Null | R/W |
| Product information | 20 | 0X0014 | Supplier website | Write up to 20 English visual characters;<br>The default value "www.matismart.com" (does not contain quotes);<br>Power-off storage; | 10 | string | Null | R/W |
| Product information | 30 | 0X001E | User application name: default=product model | Write up to 20 English visual characters;<br>The default value "MT61" (does not contain quotes);<br>Power-off storage; | 10 | string | Null | R/W |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Product information | 40 | 0X0028 | Current firmware version XXYYZZ | Write up to 6 English visual characters; The default value "V1.0" (does not contain quotes); Power-off storage; | 3 | string | Null | R/W |
| Product information | 43 | 0X002B | Current hardware version XXYYZZ | Write up to 6 English visual characters; The default value "V1.0" (does not contain quotes); Power-off storage;； | 3 | string | Null | R/W |
| Product information | 46 | 0X002E | Current language version XXYYZZ | Write up to 6 English visual characters; The default value "V1.0" (does not contain quotes); Power-off storage; | 3 | string | Null | R/W |
| Product information | 49 | 0X0031 | Device name | Write up to 20 English visual characters; The default value "MT61SR" (does not contain quotes); Power-off storage; | 10 | string | Null | R/W |
| Product information | 59 | 0X003B | Product code (material number) | Write up to 20 English visual characters; The default value "MT61-DLB-1753" (does not contain | 10 | string | Null | R/W |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | quotes);<br>Power-off storage; | | | | |
| Product information | 69 | 0X0045 | Device model | Write up to 20 English visual characters;<br>A maximum of 10 digits can be displayed in the corresponding interface on the human-machine interface screen;<br>The default value "MT61SR" (does not contain quotes);<br>Power-off storage; | 10 | string | Null | R/W |
| Product information | 79 | 0X004F | Serial number | Default value 1;<br>0-999999999;<br>Power-off storage; | 2 | UInt32 | Null | R/W |
| Product information | 81 | 0X0051 | Production date | Range: 2023-05-01 00:00:00 to 2106/2/7 14:28:15;<br>Power-off storage; | 2 | Timestamp | Null | R/W |

## 2.2 Power System

| Category | DEC address | HEX address | Name | Attribute | Register length (U16) | Data type | Unit | RW |
|---|---|---|---|---|---|---|---|---|

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Power system information | 256 | 0X0100 | Circuit breaker poles and specifications; | Circuit breaker poles: 2P/4P (high) Single-phase default is 2, three-phase default is 4 (unit P) Circuit breaker specifications: 1-13 (low) Default 9 (represents 63A) #define BreakC_10A 1 #define BreakC_12D5A 2 #define BreakC_16A 3 #define BreakC_20A 4 #define BreakC_25A 5 #define BreakC_32A 6 | 1 | UInt16 | | R/W |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | #define BreakC_40A 7 #define BreakC_50A 8 #define BreakC_63A 9 #define BreakC_80A 10 #define BreakC_100A 11 #define BreakC_125A 12 #define BreakC_160A 13 Effective immediately, power-off storage; | | | | |
| Power system information | 257 | 0X0101 | Number of phases | Range: 1, 3; Single-phase is 1, three-phase is 3; Power-off storage; | 1 | UInt16 | | R/W |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Power system information | 258 | 0X0102 | Number of wires | 0-65535;<br>Single phase is 2, three phase is 4;<br>Power-off storage; | 1 | UInt16 | | R/W |
| Power system information | 259 | 0X0103 | Power system | The default value is 0 for single phase and 11 for three phases;<br>0=1PH2W L-N;<br>1=1PH2W L-L;<br>2=1PH3W L-L with N;<br>3=3PH3W;<br>11=3PH4W;<br>13=1PH4W multi L with N;<br>Power-off storage; | 1 | UInt16 | | R/W |

## 3 Register List: Electrical Parameters

| Category | DEC address | HEX address | Name | Attribute | Register length (U16) | Data type | Unit | RW |
|---|---|---|---|---|---|---|---|---|
| Voltage | 8204 | 0X200C | Phase A voltage | Valid value range: >=0; | 2 | UInt32 | V | R |
| Voltage | 8206 | 0X200E | Phase B voltage | Valid value range: >=0; | 2 | UInt32 | V | R |
| Voltage | 8208 | 0X2010 | Phase C voltage | Valid value range:>=0; | 2 | UInt32 | V | R |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Frequency | 8252 | 0X203C | Frequency | Valid value range: 50 and 60, changes with the frequency of the power grid; | 2 | Float32 | Hz | R |

# 4 Register List: Reclosing and Control

## 4.1 Power Off and Trip

| Category | Address | REG address | Data type | REG length (U16) | Attribute | RW | Name |
|---|---|---|---|---|---|---|---|
| Power off and trip | 260 | 0X0104 | UInt16 | 1 | The default value is 1, which means enabled;<br>0~1;<br>0: off (disabled);<br>1: enable<br>The modification will take effect immediately;<br>Power-off storage; | R/W | Power off (voltage loss) opening enable: |

## 4.2 Reclosing

### 4.2.1 Overload Short Circuit Reclosing

| Category | Address | REG address | Data type | REG length (U16) | Attribute | RW | Name |
|---|---|---|---|---|---|---|---|

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Overload short circuit reclosing | 329 | 0X0149 | UInt16 | 1 | Default value: 0 off;<br>Support 0x06, 0x10 function code writing;<br>Valid value range: 0 ... 8;<br>0 off;<br>1~7 preset mode;<br>8 custom mode;<br>Selectable reclosing mode after current (overload, short circuit) fault tripping; | R/W | Overload short circuit reclosing gear |
| Overload short circuit reclosing | 13312 | 0X3400 | UInt16 | 1 | Unit: times;<br>Default value 2;<br>Support 0x06, 0x10 function code writing;<br>Valid value range 1~2;<br>Power-off storage; | R/W | Overload short circuit_customized number of reclosing |
| Overload short circuit reclosing | 13313 | 0X3401 | UInt16 | 1 | Unit: second;<br>Default value 30;<br>Support 0x06, 0x10 function code writing;<br>Valid value range 1~180;<br>Power-off storage; | R/W | Overload short circuit_Customize the first reclosing waiting time |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Overload short circuit reclosing | 13314 | 0X3402 | UInt16 | 1 | Unit: second;<br>Default value 30;<br>Support 0x06, 0x10 function code writing;<br>Valid value range 1~180;<br>Power-off storage; | R/W | Overload short circuit_Customize the second reclosing waiting time |
| Overload short circuit reclosing | 13315 | 0X3403 | UInt16 | 1 | Unit: second;<br>Default value 1800;<br>Support 0x06, 0x10 function code writing;<br>Valid value range is 1~1800;<br>Power-off storage; | R/W | Overload short circuit_customized reclosing stabilization (clearing) time |

### 4.2.2 Leakage Reclosing Gear

| Category | Address | REG address | Data type | REG length (U16) | Attribute | RW | Name |
|---|---|---|---|---|---|---|---|
| Leakage reclosing gear | 261 | 0X0105 | UInt16 | 1 | Default value: 1 preset mode 1;<br>Support 0x06, 0x10 writing;<br>Valid range 0 ... 12; 0: disabled 1~11 preset mode, 12: customized; | R/W | Leakage reclosing gear |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | When the residual current exceeds the operating current value and the gear trips, the reclosing mode can be selected;<br>Power-off storage; | | |

### 4.2.3 Leakage Reclosing Customization

| Category | Address | REG address | Data type | Register length (U16) | Attribute | Name | RW |
|---|---|---|---|---|---|---|---|
| Leakage reclosing | 13328 | 0X3410 | UInt16 | 1 | Unit: times;<br>Default value 30<br>Support 0x06, 0x10 function code writing;<br>Valid value range 1-30;<br>Power-off storage; | Leakage_customized number of reclosings | R/W |
| Leakage reclosing | 13329 | 0X3411 | UInt16 | 1 | Unit: seconds;<br>Default value 20;<br>Support 0x06, 0x10 function code writing;<br>Valid value range is 1 to 1920;<br>Power-off storage; | Leakage_Customize the 1st reclosing waiting time | R/W |
| Leakage reclosing | 13330 | 0X3412 | UInt16 | 1 | Unit: seconds;<br>Default value 40; | Leakage_Customize the 2nd | R/W |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | Support 0x06, 0x10 function code writing;<br>Valid value range is 1 to 1920;<br>Power-off storage; | reclosing waiting time | |
| Leakage reclosing | 13331 | 0X3413 | UInt16 | 1 | Unit: seconds;<br>Default value 300;<br>Support 0x06, 0x10 function code writing;<br>Valid value range is 1 to 1920;<br>Power-off storage; | Leakage_Customize the 3rd reclosing waiting time | R/W |
| Leakage reclosing | 13332 | 0X3414 | UInt16 | 1 | Same as above | Leakage_Customize the 4th reclosing waiting time | R/W |
| Leakage reclosing | 13333 | 0X3415 | UInt16 | 1 | Same as above | Leakage_Customize the 5th reclosing waiting time | R/W |
| Leakage reclosing | 13334 | 0X3416 | UInt16 | 1 | Same as above | Leakage_Customize the 6th reclosing waiting time | R/W |
| Leakage reclosing | 13335 | 0X3417 | UInt16 | 1 | Same as above | Leakage_Customize the 7th reclosing waiting time | R/W |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Leakage reclosing | 13336 | 0X3418 | UInt16 | 1 | Same as above | Leakage_Customize the 8th reclosing waiting time | R/W |
| Leakage reclosing | 13337 | 0X3419 | UInt16 | 1 | Same as above | Leakage_Customize the 9th reclosing waiting time | R/W |
| Leakage reclosing | 13338 | 0X341A | UInt16 | 1 | Same as above | Leakage_Customize the 10th reclosing waiting time | R/W |
| Leakage reclosing | 13339 | 0X341B | UInt16 | 1 | Same as above | Leakage_Customize the 11th reclosing waiting time | R/W |
| Leakage reclosing | 13340 | 0X341C | UInt16 | 1 | Same as above | Leakage_Customize the 12th reclosing waiting time | R/W |
| Leakage reclosing | 13341 | 0X341D | UInt16 | 1 | Same as above | Leakage_Customize the 13th reclosing waiting time | R/W |
| Leakage reclosing | 13342 | 0X341E | UInt16 | 1 | Same as above | Leakage_Customize the 14th reclosing waiting time | R/W |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Leakage reclosing | 13343 | 0X341F | UInt16 | 1 | Same as above | Leakage_Customize the 15th reclosing waiting time | R/W |
| Leakage reclosing | 13344 | 0X3420 | UInt16 | 1 | Same as above | Leakage_Customize the 16th reclosing waiting time | R/W |
| Leakage reclosing | 13345 | 0X3421 | UInt16 | 1 | Same as above | Leakage_Customize the 17th reclosing waiting time | R/W |
| Leakage reclosing | 13346 | 0X3422 | UInt16 | 1 | Same as above | Leakage_Customize the 18th reclosing waiting time | R/W |
| Leakage reclosing | 13347 | 0X3423 | UInt16 | 1 | Same as above | Leakage_Customize the 19th reclosing waiting time | R/W |
| Leakage reclosing | 13348 | 0X3424 | UInt16 | 1 | Same as above | Leakage_Customize the 20th reclosing waiting time | R/W |
| Leakage reclosing | 13349 | 0X3425 | UInt16 | 1 | Same as above | Leakage_Customize the 21st reclosing waiting time | R/W |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Leakage reclosing | 13350 | 0X3426 | UInt16 | 1 | Same as above | Leakage_Customize the 22nd reclosing waiting time | R/W |
| Leakage reclosing | 13351 | 0X3427 | UInt16 | 1 | Same as above | Leakage_Customize the 23rd reclosing waiting time | R/W |
| Leakage reclosing | 13352 | 0X3428 | UInt16 | 1 | Same as above | Leakage_Customize the 24th reclosing waiting time | R/W |
| Leakage reclosing | 13353 | 0X3429 | UInt16 | 1 | Same as above | Leakage_Customize the 25th reclosing waiting time | R/W |
| Leakage reclosing | 13354 | 0X342A | UInt16 | 1 | Same as above | Leakage_Customize the 26th reclosing waiting time | R/W |
| Leakage reclosing | 13355 | 0X342B | UInt16 | 1 | Same as above | Leakage_Customize the 27th reclosing waiting time | R/W |
| Leakage reclosing | 13356 | 0X342C | UInt16 | 1 | Same as above | Leakage_Customize the 28th reclosing waiting time | R/W |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Leakage reclosing | 13357 | 0X342D | UInt16 | 1 | Same as above | Leakage_Customize the 29th reclosing waiting time | R/W |
| Leakage reclosing | 13358 | 0X342E | UInt16 | 1 | Same as above | Leakage_Customize the 30th reclosing waiting time | R/W |
| Leakage reclosing | 13359 | 0X342F | UInt16 | 1 | Unit: seconds;<br>Default value 900;<br>Support 0x06, 0x10 function code writing;<br>Valid value range is 1 to 900;<br>Power-off storage; | Leakage_customized reclosing stabilization (clearing) time | R/W |

## 4.3 Timing Control

| Category | Address | REG address | Data type | REG length (U16) | Attribute | Unit | RW | Name |
|---|---|---|---|---|---|---|---|---|
| Timing control | 272 | 0X0110 | UInt16 | 1 | Default value 0;<br>b15-b14 time period setting: 0: time period is invalid; 1: closing; 2: opening;<br>b13-b00 period start | M | R/W | Timing period settings:<br>b15-b14 time period setting: 0: time period is invalid; 1: |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | time (minutes starting at zero o'clock every day): range 00:00-24:00; The modification will take effect immediately; Power-off storage; | | | closing; 2: opening; b13-b00 period start time (minutes starting at zero o'clock every day) |
| Timing control | 273 | 0X0111 | UInt16 | 1 | Default value 0; b15-b14 time period setting: 0: time period is invalid; 1: closing; 2: opening; b13-b00 period start time (minutes starting at zero o'clock every day): range 00:00-24:00; The modification will take effect immediately; Power-off storage; | M | R/W | Timing period settings: b15-b14 time period setting: 0: time period is invalid; 1: closing; 2: opening; b13-b00 period start time (minutes starting at zero o'clock every day) |
| Timing control | 274 | 0X0112 | UInt16 | 1 | Default value 0; b15-b14 time period setting: 0: time period is invalid; 1: closing; 2: opening; b13-b00 period start time (minutes | M | R/W | Timing period settings: b15-b14 time period setting: 0: time period is invalid; 1: closing; 2: |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | starting at zero o'clock every day): range 00:00-24:00; The modification will take effect immediately; Power-off storage; | | | opening; b13-b00 period start time (minutes starting at zero o'clock every day) |
| Timing control | 275 | 0X0113 | UInt16 | 1 | Default value 0; b15-b14 time period setting: 0: time period is invalid; 1: closing; 2: opening; b13-b00 period start time (minutes starting at zero o'clock every day): range 00:00-24:00; The modification will take effect immediately; Power-off storage; | M | R/W | Timing period settings: b15-b14 time period setting: 0: time period is invalid; 1: closing; 2: opening; b13-b00 period start time (minutes starting at zero o'clock every day) |
| Timing control | 276 | 0X0114 | UInt16 | 1 | Default value 0; b15-b14 time period setting: 0: time period is invalid; 1: closing; 2: opening; b13-b00 period start time (minutes starting at zero | M | R/W | Timing period settings: b15-b14 time period setting: 0: time period is invalid; 1: closing; 2: opening; |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | o'clock every day): range 00:00-24:00; The modification will take effect immediately; Power-off storage; | | | b13-b00 period start time (minutes starting at zero o'clock every day) |
| Timing control | 277 | 0X0115 | UInt16 | 1 | Default value 0; b15-b14 time period setting: 0: time period is invalid; 1: closing; 2: opening; b13-b00 period start time (minutes starting at zero o'clock every day): range 00:00-24:00; The modification will take effect immediately; Power-off storage; | M | R/W | Timing period settings: b15-b14 time period setting: 0: time period is invalid; 1: closing; 2: opening; b13-b00 period start time (minutes starting at zero o'clock every day) |
| Timing control | 278 | 0X0116 | UInt16 | 1 | Default value 0; b15-b14 time period setting: 0: time period is invalid; 1: closing; 2: opening; b13-b00 period start time (minutes starting at zero o'clock every day): | M | R/W | Timing period settings: b15-b14 time period setting: 0: time period is invalid; 1: closing; 2: opening; b13-b00 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | range 00:00-24:00;<br>The modification will take effect immediately;<br>Power-off storage; | | | period start time (minutes starting at zero o'clock every day) |
| Timing control | 279 | 0X0117 | UInt16 | 1 | Default value 0;<br>b15-b14 time period setting: 0: time period is invalid; 1: closing; 2: opening;<br>b13-b00 period start time (minutes starting at zero o'clock every day): range 00:00-24:00;<br>The modification will take effect immediately;<br>Power-off storage; | M | R/W | Timing period settings:<br>b15-b14 time period setting: 0: time period is invalid; 1: closing; 2: opening;<br>b13-b00 period start time (minutes starting at zero o'clock every day) |

## 4.4 Main Circuit Control and Status

| Category | Address | REG address | Data type | REG length (U16) | Attribute | Unit | RW | Name |
|---|---|---|---|---|---|---|---|---|
| Main circuit control and status | 4096 | 0X1000 | UInt16 | 1 | 01 Close,<br>02 Open,<br>03 Lock,<br>04 Unlock, | *1 | W | Control ON/OFF; |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Main circuit control and status | 4097 | 0X1001 | UInt16 | 1 | | Times | R | 0: Manual opening or power-on opening<br>1: 485 command opening<br>2: Fault tripping (including over-voltage, under-voltage, phase loss, over-current, and over-power)<br>3: Voltage loss tripping<br>4: Manual closing or power-on closing<br>5: 485 command closing<br>6: Automatic closing (including over / under voltage recovery closing and automatic reclosing)<br>7: Lock with 485 command (note that the switch can |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | only be closed after unlocking with 485 command)<br>8: Fault lock (including over/under voltage, phase loss, over-current, over-power)<br>9: Security mechanism padlock or unlock (highest priority)<br>10: 485 command unlock<br>11: Timing closing<br>12: Timing opening<br>13: Leakage tripping |
| Main circuit control and status | 4098 | 0X1002 | UInt16 | 1 | Power-off storage; | Times | R | Total number of openings |
| Main circuit control and status | 4099 | 0X1003 | UInt16 | 1 | Power-off storage; | Times | R | Total number of closings |
| Main circuit control and | 4100 | 0X1004 | UInt16 | 1 | Power-off storage; | Times | R | Number of mechanical locks |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| status | | | | | | | | |
| Main circuit control and status | 4101 | 0X1005 | UInt16 | 1 | Power-off storage; | Times | R | RS485 opening times |
| Main circuit control and status | 4102 | 0X1006 | UInt16 | 1 | Power-off storage; | Times | R | RS485 closing times |
| Main circuit control and status | 4103 | 0X1007 | UInt16 | 1 | Power-off storage; | Times | R | Command lock times |
| Main circuit control and status | 4104 | 0X1008 | UInt16 | 1 | Power-off storage; | Times | R | Number of non-leakage tripping (including manual opening, circuit breaker overload and short-circuit tripping, and safety lock being pulled directly from the closing position) |
| Main circuit control and status | 4105 | 0X1009 | UInt16 | 1 | Power-off storage; | Times | R | Number of manual closings |
| Main circuit control and status | 4106 | 0X100A | UInt16 | 1 | Power-off storage; | Times | R | Number of undervoltage and phase loss openings |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Main circuit control and status | 4107 | 0X100B | UInt16 | 1 | Power-off storage; | Times | R | Overvoltage, undervoltage and phase loss recovery closing times |
| Main circuit control and status | 4108 | 0X100C | UInt16 | 1 | Power-off storage; | Times | R | Overvoltage, undervoltage and phase loss lock times |
| Main circuit control and status | 4109 | 0X100D | UInt16 | 1 | Power-off storage; | Times | R | Number of scheduled openings |
| Main circuit control and status | 4110 | 0X100E | UInt16 | 1 | Power-off storage; | Times | R | Number of scheduled closings |
| Main circuit control and status | 4111 | 0X100F | UInt16 | 1 | Power-off storage; | Times | R | Power-off tripping times |

# 5 Register List: Protection, Pre-alarm

## 5.1 Overvoltage / Undervoltage Protection, Phase Loss Protection

| Category | Address | REG address | Data type | REG length (U16) | Attribute | Unit | RW | Name |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Over voltage protection | 287 | 0X011F | Float32 | 2 | Default 275;<br>265~350V;<br>Power-off storage; | V | R/W | Phase voltage overvoltage alarm threshold |
| Over voltage protection | 289 | 0X0121 | Float32 | 2 | Default 255;<br>Power-off storage; | V | R/W | Phase voltage overvoltage recovery threshold |
| Over voltage protection | 291 | 0X0123 | UInt16 | 1 | Default 5;<br>Power-off storage; | S | R | Phase voltage overvoltage alarm trigger delay |
| Over voltage protection | 292 | 0X0124 | UInt16 | 1 | Default 30;<br>20~60s;<br>Power-off storage; | S | R/W | Phase voltage overvoltage recovery delay |
| Over voltage protection | 293 | 0X0125 | UInt16 | 1 | Default value 1: associated alarm;<br>Support 0x06, 0x10 function code writing;<br>The meaning of each bit: 0 = not correlated; 1 = correlated<br>Bit0 = Alarm<br>Bit1 = Open<br>Bit2 = Lock (after executing the action, it will not | | R/W | Actuator actions associated with phase voltage overvoltage: |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | close automatically even if the voltage recovers)<br>Priority: higher position first;<br>Power-off storage; | | | |
| | | | | | | | | |
| Under voltage protection | 294 | 0X0126 | UInt32 | 2 | Default value 160;<br>100~190;<br>Power-off storage; | V | R/W | Phase voltage undervoltage alarm threshold |
| Under voltage protection | 296 | 0X0128 | UInt32 | 2 | Default value 195;<br>Power-off storage; | V | R/W | Phase voltage undervoltage recovery threshold |
| Under voltage protection | 298 | 0X012A | UInt16 | 1 | Default value 3;<br>Power-off storage; | S | R/W | Phase voltage undervoltage alarm trigger delay |
| Under voltage protection | 299 | 0X012B | UInt16 | 1 | Default value 30;<br>20~60s;<br>Power-off storage; | S | R/W | Phase voltage undervoltage recovery delay |
| Under voltage protection | 300 | 0X012C | UInt16 | 1 | Default value 1: associated alarm;<br>Support 0x06, 0x10 function code writing;<br>The meaning of | | R/W | Actuator actions related to phase voltage undervoltage; |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | each bit: 0 = not correlated; 1 = correlated<br>Bit0 = Alarm<br>Bit1 = Open<br>Bit2 = Lock (after executing the action, it will not close automatically even if the voltage recovers)<br>Priority: higher position first;<br>Power-off storage; | | | |
| | | | | | | | | |
| Phase loss protection | 301 | 0X012D | UInt32 | 2 | Default value 20;<br>10~100V;<br>Power-off storage; | V | R/W | Phase voltage phase loss alarm threshold |
| Phase loss protection | 303 | 0X012F | UInt32 | 2 | Default value 195;<br>Power-off storage; | V | R/W | Phase voltage phase loss recovery threshold |
| Phase loss protection | 305 | 0X0131 | UInt16 | 1 | Default value 3;<br>Power-off storage; | S | R/W | Phase voltage phase loss alarm trigger delay |
| Phase loss | 306 | 0X0132 | UInt16 | 1 | Default value 30;<br>20~60s; | S | R/W | Phase voltage phase loss |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| protection | | | | | Power-off storage; | | | recovery delay |
| Phase loss protection | 307 | 0X0133 | UInt16 | 1 | Default value 1: associated alarm;<br>Support 0x06, 0x10 function code writing;<br>The meaning of each bit: 0 = not correlated; 1 = correlated<br>Bit0 = Alarm<br>Bit1 = Open<br>Bit2 = Lock (after executing the action, it will not close automatically even if the voltage recovers)<br>Priority: higher position first;<br>If the enable of the power-off protection is disabled, the phase loss protection is enabled and the power is lost at this time, the phase loss | | R/W | Actuator actions associated with phase loss; |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | protection still works; for example: the phase loss protection currently selects phase loss opening, and under the above conditions, the opening will be executed. At this time, the opening is caused by phase loss (single-phase, two-phase, three-phase). Power-off storage; | | | |

## 5.2 Alarm

| Category | Address | REG address | Data type | REG length (U16) | RW | Name |
|---|---|---|---|---|---|---|
| Alarm | 1280 | 0X0500 | UInt16 | 1 | R/W | Reserved |
| Alarm | 1281 | 0X0501 | UInt16 | 1 | R/W | Reserved |
| Alarm | 1282 | 0X0502 | UInt16 | 1 | R/W | Reserved |
| Alarm | 1283 | 0X0503 | UInt16 | 1 | R/W | Reserved |
| Alarm | 1284 | 0X0504 | UInt16 | 1 | R | Alarm generation bitmap 1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Alarm | 1285 | 0X0505 | UInt16 | 1 | R | Reserved |
| Alarm | 1286 | 0X0506 | UInt16 | 1 | R | Reserved |
| Alarm | 1287 | 0X0507 | UInt16 | 1 | R | Reserved |
| Alarm | 1288 | 0X0508 | UInt16 | 1 | R | Reserved |
| Alarm | 1289 | 0X0509 | UInt16 | 1 | R | Reserved |
| Alarm | 1290 | 0X050A | UInt16 | 1 | R | Reserved |
| Alarm | 1291 | 0X050B | UInt16 | 1 | R | Reserved |

# 6 Register List: Logging

## 6.1 Function Code (0X2D) Operation Instructions

Function code (0x2D) is used to read log records. Its request and return data formats are as follows:

### 6.1.1 Request Data Format

| Byte No. | Data Example (Hex.) | Description | Remarks |
|---|---|---|---|
| 0 | 01 | Communication address (range from 0x01 to 0xF7, i.e. 1 to 247) | |
| 1 | 2D | 0x2D function code | |
| 2 | 00 | Log sequence number high byte | |
| 3 | 01 | Low byte of the log sequence number (0x01 to 0x28 for the current product, corresponding to the first 1 to the first 40 records) | |
| 4 | 50 | CRC check code | |
| 5 | 11 | CRC check code | |

### 6.1.2 Return Data Format (Three-phase)

| Data Format | Data Example (Hex) | Temporary Equivalent Register Address | Description |
|---|---|---|---|
| byte | 01 | <N/A> | Communication address (range from 0x01 to 0xF7, i.e. 1 to 247) |
| byte | 2D | <N/A> | 0x2D function code |
| byte | 34 | <N/A> | Return data byte number 0x38 = 56 bytes |
| <N/A> | BF 02 02 00 | 0x0000 | System reserved |
| UnixTimeStamp_LittleEndian | 5A 64 24 62 | 0x0002 | Timestamp, little endian first; |
| UInt32_LittleEndian | 04 00 00 00 | 0x0004 | Fault type: Little endian first;<br>0: Overvoltage (Overvoltage occurs if any phase is overvoltage)<br>1: Undervoltage (Undervoltage occurs if any phase is undervoltage)<br>2: Overcurrent (Both alarms and trips will generate logs. Overcurrent occurs if any phase exceeds the set value in the register.)<br>3: Overpower (Both alarms and trips will be generated. Overpower occurs if any phase exceeds the set value in the register.)<br>4: Phase loss (Includes power-off tripping. For single-phase meters, phase loss is equivalent to power-off tripping.)<br>5: Tripping (Includes manual tripping, circuit breaker overload and short-circuit tripping, and intentionally pulling out the safety lock while in the closed |

| | | | |
|---|---|---|---|
| | | | position.)<br>6: Leakage trip<br>7: RS485 command opening;<br>8: Reserved;<br>9: RS485 command closing;<br>10: Automatic closing (Includes over-voltage and under-voltage recovery closing, overload reclosing, and leakage reclosing);<br>11: Fault lock (Overvoltage lock or undervoltage lock or phase loss lock);<br>12: RS485 command lock;<br>13: RS485 command unlock;<br>14: Safety lock (push back) unlock;<br>15: Timed closing;<br>16: Timed opening;<br>17: DI-controlled closing<br>18: DI-controlled tripping<br>19: Manual closing or power-on closing;<br>Declaration: For events other than 0-6, parameters such as voltage, current, power, and leakage values will be filled with 0xFFFF; only the timestamp will be present. |
| UInt32_LittleEndian | 2B 00 00 00 | 0x0006 | Voltage A (unit 0.001V) |
| UInt32_LittleEndian | 2E 00 00 00 | 0x0008 | Voltage B (unit: 0.001V) |
| UInt32_LittleEndian | 2D 00 00 00 | 0x000A | Voltage C (unit: 0.001V) |
| <N/A> | 04 1A | <N/A> | CRC check code |

### 6.1.3 Return Data Format (Single Phase)

| Data Format | Data Example (Hex) | Temporary Equivalent Register Address | Description |
|---|---|---|---|
| byte | 01 | <N/A> | Communication address (range from 0x01 to 0xF7, i.e. 1 to 247) |
| byte | 2D | <N/A> | 0x2D function code |
| byte | 34 | <N/A> | Return data byte number 0x38 = 56 bytes |
| <N/A> | BF 02 02 00 | 0x0000 | System reserved |
| UnixTimeStamp_LittleEndian | 5A 64 24 62 | 0x0002 | Timestamp, little endian first; |
| UInt32_LittleEndian | 04 00 00 00 | 0x0004 | Fault type: Little endian first;<br>0: Overvoltage (Overvoltage occurs if any phase is overvoltage)<br>1: Undervoltage (Undervoltage occurs if any phase is undervoltage)<br>2: Overcurrent (Both alarms and trips will generate logs. Overcurrent occurs if any phase exceeds the set value in the register.)<br>3: Overpower (Both alarms and trips will be generated. Overpower occurs if any phase exceeds the set value in the register.)<br>4: Phase loss (Includes power-off tripping. For single-phase meters, phase loss is equivalent to power-off tripping.)<br>5: Tripping (Includes manual tripping, circuit breaker overload and short-circuit tripping, and intentionally pulling out the safety lock while in the closed position.)<br>6: Leakage trip |

| | | | |
|---|---|---|---|
| | | | 7: RS485 command opening;<br>8: Reserved;<br>9: RS485 command closing;<br>10: Automatic closing (Includes over-voltage and under-voltage recovery closing, overload reclosing, and leakage reclosing);<br>11: Fault lock (Overvoltage lock or undervoltage lock or phase loss lock);<br>12: RS485 command lock;<br>13: RS485 command unlock;<br>14: Safety lock (push back) unlock;<br>15: Timed closing;<br>16: Timed opening;<br>17: DI-controlled closing<br>18: DI-controlled tripping<br>19: Manual closing or power-on closing;<br>Declaration: For events other than 0-6, parameters such as voltage, current, power, and leakage values will be filled with 0xFFFF; only the timestamp will be present. |
| UInt32_LittleEndian | 2B 00 00 00 | 0x0006 | Voltage (unit: 0.001V) |
| <N/A> | 04 1A | <N/A> | CRC check code |

# 7 Version Revision History

| Version | Description | Date | Revised by |
|---|---|---|---|
| v1.0 | Firs edition | 2024/9/19 | wynn |

| | | | |
|---|---|---|---|
| | | | |