GYDCG-UBC1-HRLZ
直流绝缘监测仪
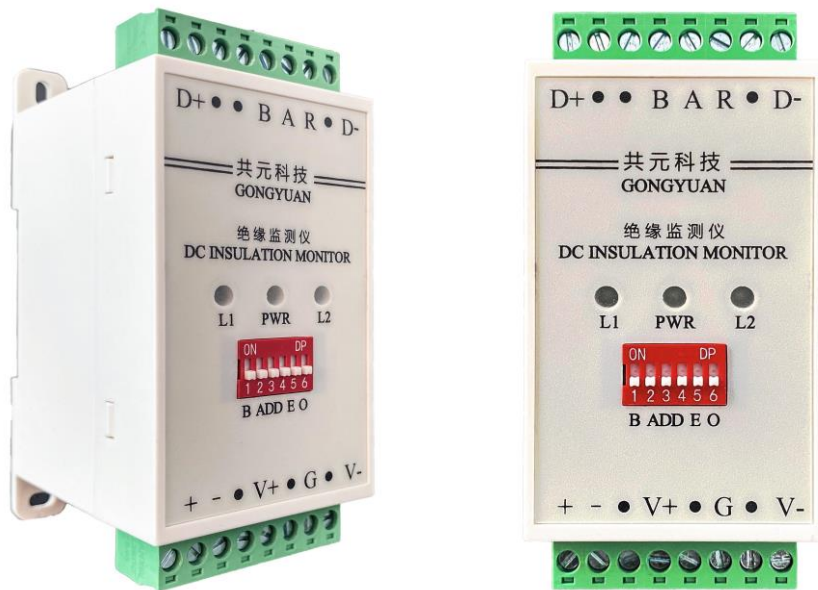# （小型款，单路）
DC insulation monitor device (IMD)
(small model, single DC channel)
使用说明书
Operating instruction

1. Powerful functions

Integrated: charging pile voltage measurement + insulation resistance monitoring + vehicle side voltage measurement + capacitance charge discharge and other measurement functions.

2. Wider power supply range

It is compatible with 12V and 24V input, and the input power supply range is 9 to 30V

3. Wider insulation monitoring range

Insulation resistance monitoring can be realized in the range of 100V~1000V DC

4. Faster monitoring accuracy and speed

The precision and speed of insulation resistance monitoring and voltage measurement are greatly improved, and the insulation resistance monitoring results can be obtained within 1 second after opening

5. Higher reliability

The insulation resistance monitoring results will not be affected when the DC voltage fluctuation changes

6. Adaptive capacitance to ground

The insulation resistance monitoring is realized when the ground capacitance of positive and negative poles is less than 0.5uF

7. More convenient parameter setting

All communication parameters can be set by DIP switch (including communication address, baud rate and parity check mode)

Catalog

1 The profile

GYDCG-UBC1-HRLZ is a DC insulation monitoring device based on MODBUS protocol, including DC to ground insulation impedance monitoring, DC voltage monitoring, DC voltage reverse connection alarm. It can be used in EV DC charging system, photovoltaic system, energy storage system, DC power grid and other DC systems under 1000V. This product has the function of insulation monitoring start and stop, insulation monitoring can be real-time monitoring of positive and negative poles to the ground insulation resistance, the monitoring result is not affected by DC voltage changing, is not affected by the positive and negative poles insulation resistance symmetry. (GYDCG-UBC1-HRLZ is a smaller version of GYDCG-UBCH1-LZ).

2 Ports and functions

2.1 Insulation monitoring function

This product can send communication frame through RS485 to enable or disable the insulation monitoring function. After the insulation monitoring function is enabled, the high voltage grounding switch K is closed and the insulation resistance is measured in real time. After the insulation monitoring function is turned off, the high voltage grounding switch K is disconnected. The host can send read instructions at any time to read the positive and negative insulation resistance values respectively from IMD. The insulation resistance monitoring can be implemented only when the DC voltage is between 100V and 1000V. When the DC voltage is less than 100V or the insulation monitoring is not enabled, the insulation resistance monitoring value is 65535 (0xFFFF), indicating an invalid value. The insulation resistance value ranges from 1KΩ to 10MΩ. If the measured value is greater than 10MΩ, the communication receives insulation resistance value of 60000, which is 0xEA60, indicating infinity. The user can turn the insulation monitoring on and off by writing register 0x0102, and determine whether the current insulation monitoring is on or off by reading register 0x001B Bit2. The opening and closing of insulation monitoring only determines whether insulation resistance monitoring is on, and does not affect DC voltage monitoring. After the product is powered, the DC voltage is continuously monitored.

After the insulation monitoring function is enabled, the product continuously monitors the insulation resistance in real time. The user can read the insulation resistance value at the earliest 1s after the insulation monitoring function is enabled, and the longest time is no more than 2.5 seconds. In the case of DC ground capacitance, the module can realize adaptive monitoring of grounding capacitance below 3uF (positive and negative ground capacitance are

3uF respectively). In the case of DC ground capacitance, the maximum monitoring time is not more than 2.5s. The user can determine whether the current insulation resistance value is valid by reading Bit1 in register 0x001B. If the insulation monitoring is off, or the DC voltage is less than 100V, or for a short time after it is on, the value of register 0x001B Bit1 is 0; The value of insulation resistance read is valid only if the value of register 0x001B Bit1 is 1.
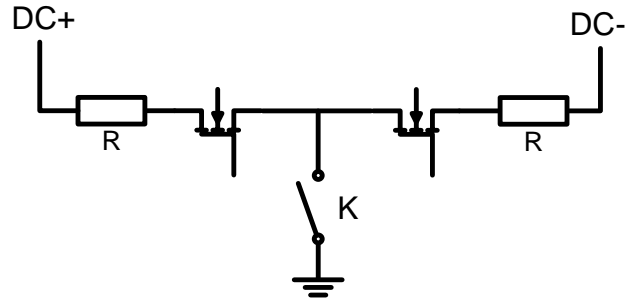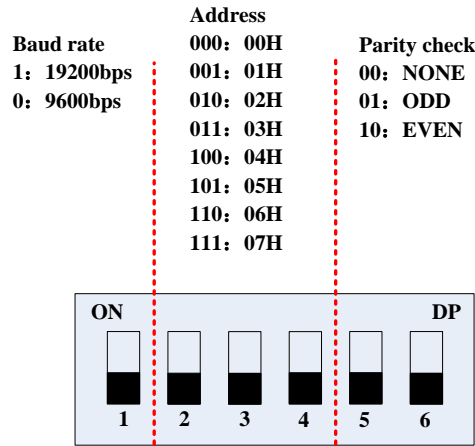

2.2 The LED display

After the module is powered on, the PWR indicator is on. When the insulation monitoring is power on, the 'L1' light is on, and when the insulation monitoring is power off, the 'L1' light is off.

2.3 RS485 communication

Users can send and receive data frames through the RS485 communication port. The circuit is equipped with 510Ω terminal resistance. For details, see 6 Communication Protocol. Terminals RG, A, and B correspond to the ground cable A and B of the RS485 output.

2.4 Communication Parameter configuration bit

Dip switch 1 bit is used to set the baud rate, 2 to 4 bits are used to set the communication address, and 5 to 6 bits are used to set the parity check. The setting mode is shown below.

Baud rate
1：19200bps
0：9600bps

Address
000：00H
001：01H
010：02H
011：03H
100：04H
101：05H
110：06H
111：07H

Parity check
00：NONE
01：ODD
10：EVEN

ON					DP
1	2	3	4	5	6

3   Wiring Method

The positive DC   **The negative DC**

D+   B A   D-

RS485

+ -   G

9-30V power supply   **Ground**
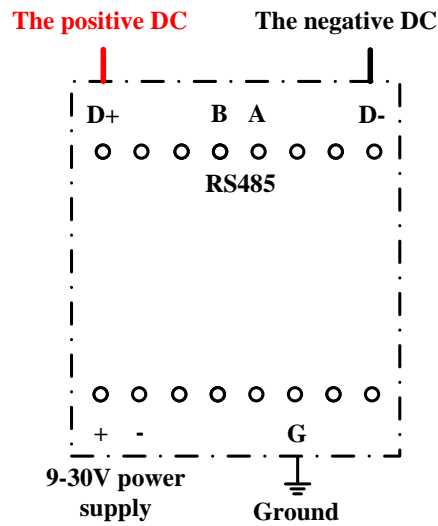
Modules without discharge function need not be connected with external discharge resistance; Without vehicle side measurement, there is no need to connect the DC voltage V+ and V- on the vehicle side.

The name of the interface	Connection mode	The name of the interface	Connection mode
D+	DC positive	D-	DC negative
+	The positive pole of power supply	-	The negative pole of power supply
A	RS485-A	B	RS485-B
GND	The system earth		

4 Structural Parameters

The module can be installed by guide rail or screw fixation. Guide rail using standard width 36mm. External dimensions are shown as follows: (Unit: mm)
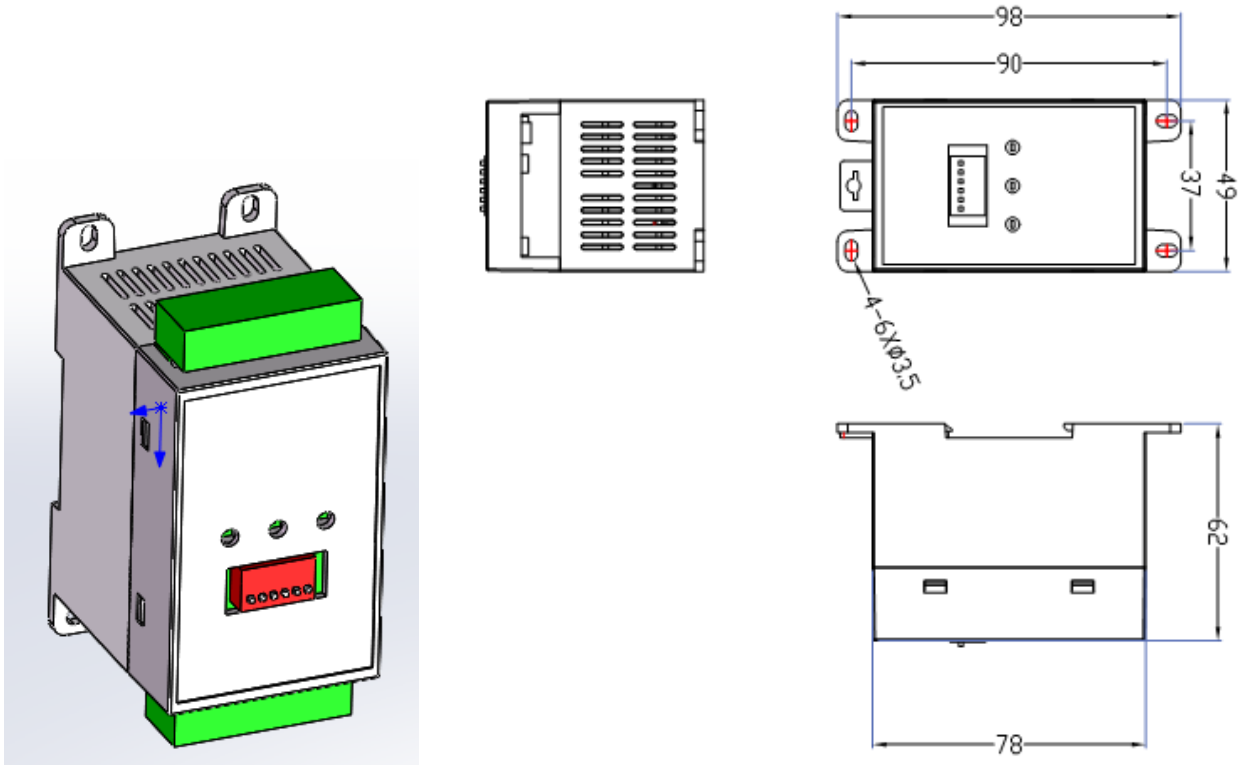
5 Electrical Parameters

- System DC voltage range: 0V~1000V
- Vehicle side voltage measurement range: 0V~1000V
- Power supply: 9~30VDC, power 4W
- Insulation resistance measurement range: 1KΩ~10MΩ (DC system voltage 100V~1000V, within this range, monitoring positive and negative poles to the ground insulation resistance
- Insulation monitoring accuracy: ≤3KΩ+5%
- Measurement accuracy of DC voltage at pile side: ≤ 2V+0.3%
- Environmental parameters:

Storage temperature ……………………………… - 40 ℃ ~ 125 ℃

Operating temperature ……………………………… - 40 ℃ ~ 70 ℃

Humidity... 85%

- Off-line pressure test <2mA:

Withstand voltage point		Maximum withstand voltage class	The test of time
D+/D- TO GND	DC voltage positive and negative to the earth	4200VDC/3000VAC	≤1min
+/- TO GND	The power supply is positive and negative to the earth	4200VDC/3000VAC	≤1min
A/B TO GND	The RS485 port connects to the ground	3000VDC/2500VAC	≤1min

6 Communication Protocol

In RS485 communication system, this IMD module works in slave mode。Baud rate, communication address, parity check mode, can be set by DIP switch, default stop bit 1, data bit 8. The interval between each byte in the sent frame must not exceed 20ms, otherwise the frame will be cleared.

6.2Write operation function code 0x06: Writes a single register

6.1.1 Request command

BYTE[0] Device address

BYTE[1] Function code 0x03

BYTE[2] The high BYTE of the register's starting address

BYTE[3] Register start address low BYTE

BYTE[4] High BYTE of register length

BYTE[5] Low bytes of register length

BYTE[6] Indicates the low value of CRC check

BYTE[7] Indicates the high value of CRC check

6.1.2 Response command

BYTE[0] Device address

BYTE[1] Function code 0x03

BYTE[2] Register BYTE length

BYTE[3] Register high BYTE

BYTE[4] Low BYTE in register

BYTE[5] Register high BYTE

... ...

BYTE[n] Indicates the low value of CRC check

BYTE[n+1] Indicates the high value of CRC verification

6.2 Write operation function code 0x06: Writes a single register

6.2.1 Request command

BYTE[0] Device address

BYTE[1] Function code 0x06

BYTE[2] The high BYTE of the register's starting address

BYTE[3] Register start address low BYTE

BYTE[4] The register parameter is high in bytes

BYTE[5] Register parameter low bytes

BYTE[6] Indicates the low value of CRC check

BYTE[7] Indicates the high value of CRC check

6.2.2 Response command

BYTE[0] Device address

BYTE[1] Function code 0x06

BYTE[2] Register BYTE length

BYTE[3] Register high BYTE

BYTE[4] Low BYTE in register

BYTE[5] Register high BYTE

... ...

BYTE[n] Indicates the low value of CRC check

BYTE[n+1] Indicates the high value of CRC verification

■ CRC-16 algorithm (RS485)：

The check data is generated according to the generation polynomial of CRC rules, and the result is added after the instruction as the check code.

Generating polynomial：$X^{16}+X^{15}+X^{2}+1$

1. Set the CRC register and set it to 0Xffff.

2. Xor the first 8-bit character of the data with the lower 8 bits of the 16-bit CRC register, and store the result in the CRC register.

3. Move the CRC register one bit to the right. MSB fill 0, move out and check LSB.

4. If LSB is 0, repeat step 3. If LSB is 1, the CRC register is xor with the polynomial code.

5. Repeat steps 3 and 4 to 8 to complete the shift. At this point an 8-bit data processing is complete.

	Function code	Register address	content	Send Example (address 01)	note
1		0x0010	Bus voltage	01 03 00 10 00 01 85 CF	Unit: 0.1V, voltage between positive and negative DC bus
2					
3		0x0012	Positive insulation resistance	01 03 00 12 00 01 24 0F	The unit is KΩ, an integer
4		0x0013	Negative insulation resistance	01 03 00 13 00 01 75 CF	The unit is KΩ, an integer
5	03 Read the register	0x001A	Read version number	01 03 00 1A 00 01 A5 CD	
6		0x001B	IO state	01 03 00 1B 00 01 F4 0D	Bit1: Insulation resistance monitoring function is effective. Bit2: Whether the insulation monitoring is turn on and the ground switch is closed. Bit7: DC bus voltage reverse connection alarm (position 1 when reverse connection voltage is above 170V)
7	06 Write the register	0x0102	Insulation monitoring and control	01 06 01 02 00 11 E9 FA	Enable insulation monitoring function
8			Insulation monitoring and control	01 06 01 02 00 00 29 F6	Disable insulation monitoring function
9	0xFF	0x 66	The host broadcast reads the slave address	The host sends 0xFF 0x66 0xA5 0xAA 0x2B The slave sends 0xFF 0x66 ADD CRClo CRCHi Add is the mailing address of the slave computer	Example of reply from the slave 0xFF 0x66 0x01 0xAB 0x90 The slave machine address is 0x01

The sample：

1. Start insulation monitoring: 01 06 01 02 00 11 E9 FA

Return frame: 01 06 02 00 11 78 84

2, Turn off insulation monitoring: 01 06 01 02 00 00 29 F6

Frame 01 06 02 00 00 B8 88

3, Read the DC bus voltage and positive and negative electrode resistance to the ground (read 4 registers) : 01 03 00 10 00 04 45 CC

01 03 08 13 88 02 58 EA 60 02 58 C8 75

Read the DC voltage 0X1388(500V), the total insulation resistance 0X0258 (600KΩ), the positive insulation resistance 0XEA60 (infinite), and the negative insulation resistance 0X0258 (600KΩ).

4, Read IO status: 01 03 00 1B 00 01 F4 0D

01 03 02 00 84 B8 27

On behalf of bus voltage reverse connection, insulation monitoring is started (ground relay is closed), insulation resistance monitoring is turn off.

Return frame 01 03 02 00 06 38 46

It means that there is no reverse connection of bus voltage, insulation monitoring is started (ground relay is closed), and insulation resistance monitoring is turn on.

01 03 00 1A 00 01 A5 CD

Return frame: 01 03 02 22 01 61 24

The version number is V2201.

7 Analysis of common problems and solutions

1. First send the frame of enabling insulation monitoring function, and then read insulation resistance value. L1 light will be on after startup.

2. After startup, if insulation resistance 0xFFFF is read, it means invalid value, indicating that the module startup process is not complete, you can continue reading at intervals.

3, Ensure that the DC voltage is above 100V, can read the insulation resistance value.