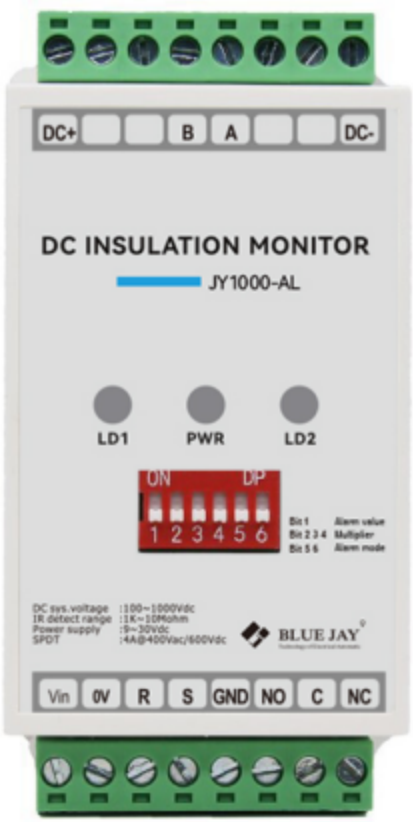
JY1000-AL
DC Insulation Monitor

User Manual



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Read me

When you use JY1000-AL, be sure to read this user manual carefully, and be able to fully understand the implications, the correct guidance of operations in accordance with user manual, which will help you make better use of JY1000-AL, and help to solve the various problems at the scene.

1. Before turning on the power supply, be sure that the power supply within the provisions of the instrument;

2. When installation, the current input terminal must non-open, voltage input terminals must Non-short circuit;

3. Communication terminal (RS485) is strictly prohibited to impose on high pressure;

4. Be sure the instrument wiring consistent with the internal system settings;

5. When communicating with the PC, instrument communication parameters must be consistent with the PC.

- **Please read this user manual carefully**
- **Please save this document**

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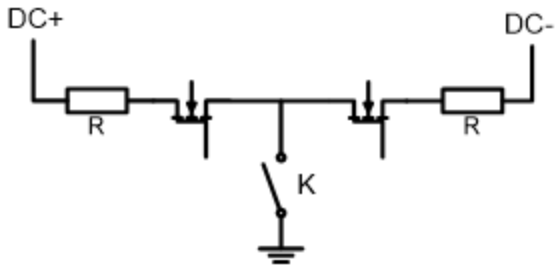
Directory

1.- SUMMARIZE

JY1000-AL is a DC to Ground insulation monitoring module based on the principle of unbalanced bridge, which has monitoring and protection functions in one. It can monitor the insulation resistance value of the positive and negative poles of the DC floating system to the ground, ranging from 1KΩ~10MΩ; at the same time, it can also detect the DC voltage value, ranging from 100V to 1000V.

The user can obtain the measurement value through RS485 communication, and can set the alarm resistance threshold through the DIP switch or RS485 communication. When the insulation resistance is less than this value, the fault relay operates and the LD2 indicator light is on. At the same time, passive reset and automatic reset can also be selected through the configuration bit of the DIP switch, and the module stops working at the same time as manual or remote reset.

JY1000-AL is equipped with a high-voltage grounding switch (switch K in the picture), which can realize the online on-off function, that is, when the module is powered off, reset, and stops working, its high-voltage switch to the ground is disconnected, and it is completely separated from the ground. The DC to ground high voltage test is not higher than 4200Vdc.



FEATURES

- High voltage grounding switch;
- Widely power supply range;
- Widely insulation monitoring range (100V~1000VDC);
- insulation monitoring equipment self-test;
- Adaptive capacitance to ground;
- Convenient parameter setting;
- Remote monitoring and management;
- Monitor positive and negative poles;
- Ground insulation resistance;
- Voltage reverse polarity alarm;

APPLICATIONS

- Insulation resistance monitoring;
- DC voltage monitoring;
- Guarantee the safety and stability of charging;
- Improvement of the efficiency and charging quality;
- Personnel and equipment security;

2.- TECHNICAL PARAMETERS

Parameter	Value		
Power supply	9-30VDC, Power 3W		
DC voltage range	100V~1000V		
DC voltage measurement accuracy	100-200Vdc: ≤2V		
	200-1000Vdc: ≤0.5%		
Insulation resistance measurement range	1KΩ~10 MΩ (DC system voltage:100V~1000V)		
Insulation monitoring accuracy @DC system voltage:100V-1000V)	**C_Y range**	**Resistance range**	**Accuracy**
	0~0.8μF	≤60kΩ	≤3kΩ
		60kΩ<R≤1MΩ	≤5%
	0.8μF ~3μF	≤60kΩ	≤6kΩ
		60kΩ<R≤1MΩ	≤20%
Off-line withstand test	<2mA		
Maximum relay switching current /voltage	4A@400Vac/ 600Vdc		
Relay contact resistance	<100mΩ		
Relay insulation resistance	1000MΩ		
Standard	IEC 61851-23 (2014-03):2014-11		
Storage environment	Temp: - 55°C ~90°C, Humidity: ≤90%RH, Altitude: ≤3500m		
Operating environment	Temp: - 40°C ~75°C, Humidity: ≤90%RH, Altitude: ≤3500m		

Notes:

1.When facing the ground insulation resistance R_{ISO}+ and negative insulation resistance to ground R_{ISO}-, The difference is too large, Multiplier of difference>5 times, R_{ISO}+ and R_{ISO}- Large resistors may not be typical values.

2.C_Y Refers to the positive and negative Y capacitance values of the system bus to ground respectively.

High voltage test

Voltage test point	Maximum voltage rating	Time
DC+/DC- to GND	4200VDC/2500VAC	≤1min
Power supply +/- to GND	3500VDC/2500VAC	≤1min
RS485 A/B to GND	3500VDC/2500VAC	≤1min
DC+/DC- to power supply +/-	3500VDC/2000VAC	≤1min
DC+/DC- to A/B	3500VDC/2000VAC	≤1min

Note:

The power supply (+/-), RS485(A/B), and Ground(G) should be isolated from each other.

3.- FUNCTION INTRODUCTION

3.1.- Working mode introduction

The insulation monitoring module can be in "working" mode or "stop working" mode, when device powered on, device default in working mode, the LED light “PWR” and “L1” ON.

"Working" mode	Insulation resistance monitoring is enabled, alarm function ON, L1 light is on.
"Stop working" mode	Insulation resistance monitoring is disabled, alarm function OFF, L1 light is off

Note: Whether in "working" mode or "stop working" mode, the DC voltage can also be detected.

3.1.1.- Two methods to disable the insulation monitoring function:

1.- Short circuit terminal "R" and "S", the short circuit must be electrically isolated, by using push button or relay closed.

2.- Send turn off command to register 0x0102.

Note: User can write register 0x0102 to turn ON and OFF the insulation monitoring function and can read bit 5 of register 0x0104 to query whether the insulation monitoring function is ON or OFF.

3.2.- Reading insulation resistance

Users can read insulation resistance values as quickly as 0.7s to 2.5s after enabling the insulation monitoring function. For DC to ground capacitance, the module can adaptively monitor ground capacitance below 3μF (positive and negative ground capacitances below 3μF, total capacitance below 6μF). Monitoring time for ground capacitance is no longer than 2.5s.

The insulation resistance values in registers 0x0012 and 0x0013 are valid only if it meets the conditions listed in the table below. The insulation resistance value in registers 0x0012 and 0x0013 can be read via RS485 communication. If the resistance value is >10MΩ, 0xEA60 (60000) is displayed; if the resistance value in 0x0012 and 0x0013 is invalid, 0xFFFF (65535) is displayed.

Resistance value validity check condition:

Measured value	Valid or not	Conition	Readable
DC to ground insulation resistance	Valid	**Need to meet both:** 1. Send turn ON command to 0x0102 2. Turn on module exceed 0.7s~2.5s 3. DC voltage ≥100V;	0x0102: Positive to ground resistance R_{fp} 0x0103: Positive to ground resistance R_{fn} 0x0014: Bit=1
	Invalid	**Meet any of the following:** 1. Send turn OFF command to 0x0102 2. Turn on module less than 0.7s~2.5s 3. DC voltage <100V;	0x0102: 0XFFFF 0x0103: 0XFFFF 0x0014: Bit=0

3.3.- Insulation resistance alarm and reset function

3.3.1.- Dip switch description

Insulation resistance alarm threshold and reset mode can be set by the DIP switch. The direction marked with "ON" represents: 1, and reverse direction marked with number represents: 0.

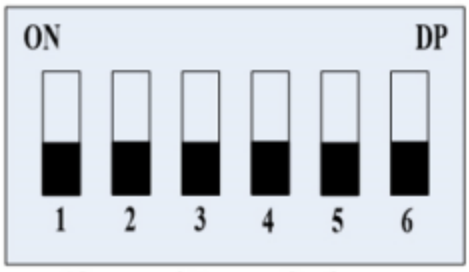
	Function	Description
	**1-4:** Setting alarm threshold	Using binary encoding: 0000~1111, that is 0~15
	5: Setting alarm multiplier	**0:** Alarm threshold high byte x10 **1:** Alarm threshold high byte x100
	6: Setting reset mode	**0:** Auto reset **1:** Manual reset

For example: alarm threshold is 15 and the multiplier is 10, means the set alarm value is 150KΩ.

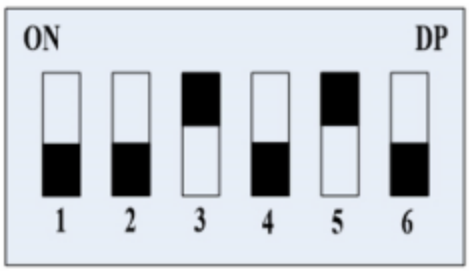
Note:

When DIP switches 1 - 4 are set to '0', it means using internal alarm value, which can only be configured via RS485 communication, with a factory default of 0kΩ. The value set through communication is stored in flash memory and will not be erased after power-off.

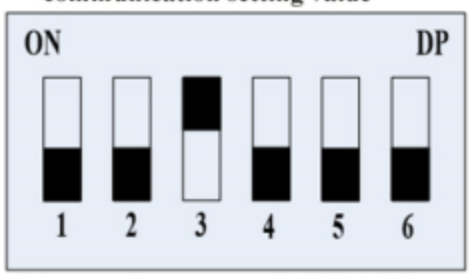
Example:



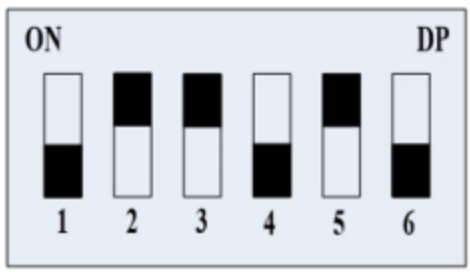
Alarm resistance value is communication setting value



Alarm resistance threshold is 200KΩ



Alarm resistance threshold is 20KΩ



Alarm resistance threshold is 600KΩ

3.3.2.- Auto reset/ Manual reset description

Auto reset: When fault disappears, relay and 'LD2' light automatically reset.
Manual reset: User must stop insulation monitoring to reset the fault relay and indicator light 'LD2'.

Two methods to disable the insulation monitoring function:

1.- Short circuit terminal "R" and "S", the short circuit must be electrically isolated, by using push button or relay closed.

2.- Send turn off command to register 0x0102

3.3.3.- Alarm relay description

Terminal "C" is the common contact, terminal "NO" is the Normally open contact, and terminal "NC" is the Normally close contact. When an insulation resistance alarm occurs, the NO contact closes and the NC contact opens.

3.4.- Buzzer function description (optional)

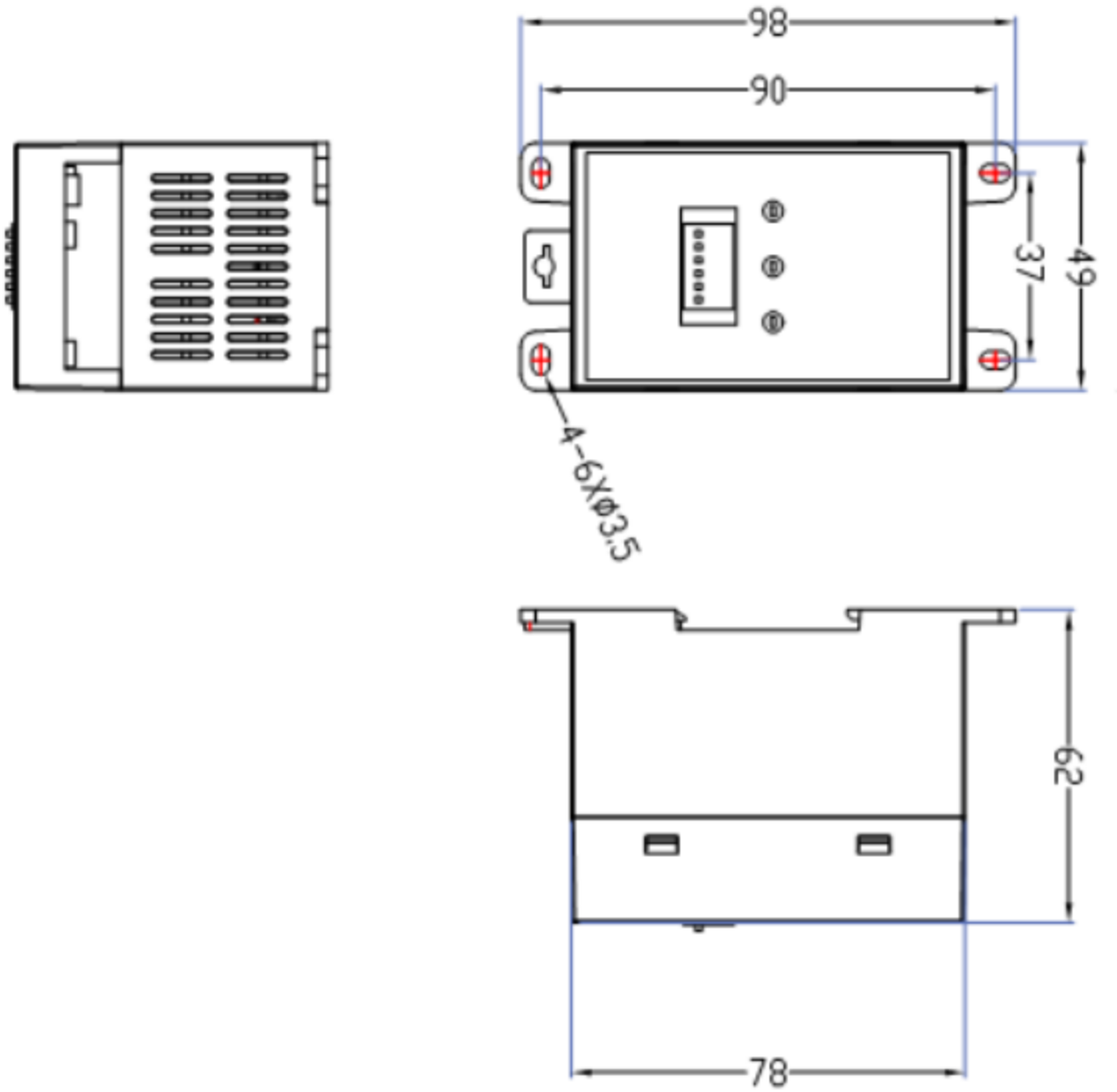
When the insulation monitoring module is in "working" mode, when the monitored insulation resistance value is lower than the alarm value, the module alarms and the buzzer works.

4.- INSTALLATION AND STAR UP

4.1.- Mounting

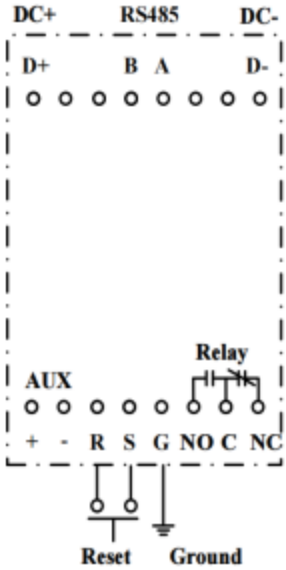
JY1000-AL module can be installed by rail or screw. Guide rails use standard width of 35mm. Overall dimensions are shown below: (Unit: mm)

Dimensions: L*W*H (mm) 98*49*62



4.2.- Wiring Method

The system wiring diagram is shown below. Remote reset is implemented using a switching device, with a short-circuit current of 0.25 mA in the R → S direction.



Interface	Connection mode	Definition
D+	Positive pole of DC	DC current input port
D-	Negative pole of DC	
A	RS485-A	RS485 communication port
B	RS485-B	
+	Positive pole of power supply	9-30VDC
-	Negative pole of power supply	
R, S	Remote reset	
GND	Grounding point	
C	Relay common point	When insulation resistance alarm occurs NO contact is closed NC contact is disconnected.
NO	NO contact	
NC	NC contact	

4.3.- The LED indicator introduction

After the module is powered on, the PWR indicator is on.

PWR "ON"	The device is powered on.
LD1 "ON"	**"Working" mode** Insulation resistance is continuously monitoring, the alarm function is activated, and the relay is closed.
LD1 "OFF"	**"Stop working" mode** Insulation resistance is not monitored, the alarm function is stopped, and the relay is disconnected.
LD2 "ON"	When the monitored insulation resistance value is lower than the alarm value, the module alarms. the coil of the fault relay is closed, the corresponding normally open dry contact is closed the normally closed dry contact is disconnected.

5.- COMMUNICATION INTERFACE

5.1.- Connection for RS485

Users can send and receive data frames through the RS485 communication port. The circuit is equipped with a 510Ω terminal resistor, terminals A and B correspond to RS485 outputs A and B respectively.

JY1000-AL adopt standard Modbus RTU protocol function 03/06, default address: 0x10, default baud rate: 9600bps, default parity: none, stop bit 1, data bit 8 (n.8.1). The interval between each byte in the sent frame must not exceed 20ms; otherwise, the frame will be cleared. This module works in slave mode.

Modbus RTU Frame Format:

Address code	**1 BYTE**	Slave device address **1-247**
Function code	**1 BYTE**	Indicates the function codes like read coils / inputs
Data code	**4 BYTE**	Starting address, high byte Starting address, low byte Length of registers, high byte Length of registers, low byte
Error Check code	**2 BYTE**	Cyclical Redundancy Check (**CRC**)

MODBUS FUNCTIONS:

Code	Meaning	Description
FUNCTION 03	Read hold register	This function permits to read all the electrical parameters
FUNCTION 06	Write single register	This function permits to write a value into a single holding register.

5.2.- Register map

Function	Register	Data	Description
0x03	0x0010	DC bus voltage	Unit V,16-bits **10 03 00 10 00 01 86 8E**
	0x0012	Insulation resistance of DC+ to Ground	Unit KΩ, take an integer **10 03 00 12 00 01 27 4E** (0xFFFF: invalid value; 0xEA60: resistance value is infinite.)
	0x0013	Insulation resistance of DC- to Ground	Unit KΩ, take an integer **10 03 00 13 00 01 76 8E** (0xFFFF: invalid value; 0xEA60: resistance value is infinite.)
	0x0014	Status bit	Details see **chapter 5.2.1**. **10 03 00 14 00 01 C7 4F**
0x06	0x0102	Insulation monitoring control	Turn ON insulation monitoring function **10 06 01 02 00 11 EA BB**
			Turn OFF insulation monitoring function **10 06 01 02 00 00 2A B7**
	0x0007	Internal alarm resistance threshold	Modify the alarm threshold to100kΩ **10 06 00 07 00 64 3A A1**
	0x0103	Modify slave address	Modify the address from 10 to 02 **10 06 01 03 00 02 FA B6**

Notes:

Only when the DC voltage is between 10V~1000V, Insulation resistance monitoring can be realized. If DC voltage is low than 100V, or it is turned on within a short time, the insulation resistance read is 0xFFFF (means invalid value).

If the read insulation resistance value is a valid number, the insulation resistance value monitoring range is between 1KΩ~10MΩ. When the measured value is greater than 10MΩ, the value received by the communication is 0xEA60 (means infinity).

5.2.1.- Register 0x0014 bit definition, read only, function 03 to read.

Bit	Definition	
bit15~bit6	Null	
Bit5	Insulation monitoring function turned ON or OFF	**0:** Insulation monitoring function turned on, and the grounding switch K is closed.
		1: Insulation monitoring function turned off, and the grounding switch K is disconnected.
Bit3	Negative pole to ground insulation alarm status	**0:** No alarm **1:** Negative to ground insulation alarm (negative grounding resistance < set threshold)
Bit2	Positive pole to ground insulation alarm status	**0:** No alarm **1:** Positive to ground insulation alarm (positive grounding resistance < set threshold value)
Bit1	Null	
Bit0	Null	

5.3.- Command samples

5.3.1.- Read Command (Fun 03)

Sample 1 Read the DC bus voltage and positive and negative insulation resistance to the ground

Host inquiry:
10 03 00 10 00 04 46 8D

Slave response:
10 03 08 00 C6 00 64 00 32 EA 60 FC A8

Means that:
Read the DC voltage 0X00C6 (198V),
0X 0064: invalid value, register 0011 is empty,
Read the positive insulation resistance 0X0032 (50KΩ),
Read the negative insulation resistance 0XEA60 (infinite).

Sample 2 Read status bit

Host inquiry:
10 03 00 14 00 01 C7 4F

Slave response:
10 03 02 10 00 49 87

Means that:
0x1000= (0001 0000 0000 0000),
Bit5=0: The insulation monitoring function is turned on.
Bit2 and bit3=0: No insulation resistance alarm in positive and negative pole.

5.3.2.- Write Command (Fun 06)

Sample 1 Turn on insulation monitoring

Host inquiry:
10 06 01 02 00 11 EA BB

Slave response:
10 06 01 02 00 11 EA BB

Sample 2 Turn off insulation monitoring

Host inquiry:
10 06 01 02 00 00 2A B7

Slave response:
10 06 01 02 00 00 2A B7

6.- SAFETY CONSIDERATIONS

All installation specification described at the previous chapters named: **INSTALLATION AND STARTUP, INSTALLATION MODES and SPECIFICATIONS.**

Please note that with the instrument powered on, the terminals could be dangerous to touching and cover opening actions or elements removal may allow accessing dangerous parts. This instrument is factory-shipped at proper operation condition.

- The device must have a professional installation and maintenance
- Any operation of the device, you must cut off the input signal and power;

7.- MAINTENANCE

The JY1000-AL does not require any special maintenance. No adjustment, maintenance or repairing action should be done when the instrument is open and powered on, should those actions are essential, high-qualified operators must perform them.

Before any adjustment, replacement, maintenance or repairing operation is carried out, the instrument must be disconnected from any power supply source.

When any protection failure is suspected to exist, the instrument must be immediately put out of service. The instrument's design allows a quick replacement in case of any failure.

For any inquiry about the instrument performance or any failure,
contact to Blue Jay's technical service.

Blue Jay - After-sales service

E-mail: tech@cqbluejay.com