BIM-M1000
Insulation Monitoring Device

User Manual

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Read me

When you use BIM-M1000, 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 BIM-M1000, 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**

Directory

1.- SUMMARIZE

BIM-M1000 is designed to monitor the insulation resistance of unearthed AC/DC systems (IT systems) up to 1000Vac/dc. The device generates ±15V pulsating measuring voltage to injection on the IT system. When the value falls below the preset response values, the alarm LEDs light up. The device support two separately adjustable response values allow a distinction to be made between "pre-alarm" and "alarm".

BIM-M1000 complies with IEC 61557-1:2018 and IEC 61557-8:2018 standards and is suitable for AC/DC IT systems, battery energy storage, electric vehicles, DC charging stations, and other scenarios. It also supports RS485 and CAN bus communication, facilitating integration into remote monitoring systems.

Feature

- Insulation monitoring of unearthed AC/DC system;
- Measure single-pole insulation fault in DC system (DC+ to earth and DC- to earth);
- Measure DC system-to-ground insulation fault (DC+ and DC- to earth);
- Measurement system-to-ground insulation fault in AC system (L1 and L2 to earth);
- Two separately configurable response values;
- Alarm signaling via LEDs and alarm relays;
- Comply with standards IEC 61557-1/ IEC 61557-8;
- With overvoltage alarm function;
- Automatically adapt to system Y capacitance ≤4 μF

Application

- AC and DC IT power distribution systems;
- Industrial power and automation;
- Marine electrical power distribution network systems;
- Battery packs and energy storage systems;
- Electric vehicles and transportation;
- Renewable energy power generation systems;
- DC charging stations for electric vehicles;

2.- TECHNICAL PARAMETERS

Supply voltage	
Power supply	9~30Vdc, power consumption ≤ 2W
Frequency range	40~65Hz
Monitored IT system	
Nominal system voltage	0…1000 Vac/dc
Frequency range	40~65Hz
Insulation resistance	
Insulation resistance measurement range	0~50MΩ
Insulation resistance measurement accuracy	0~100 KΩ, C_Y≤ 2μF, Bus voltage stability: ±12 KΩ 100 kΩ~1 MΩ, C_Y≤ 2μF, Bus voltage stability: ±10 % 1 MΩ~50 MΩ, C_Y =0μF, Bus voltage stability: ±10 %
IR response time	IRz≥ 500 kΩ, CY = 0μF, bus voltage stabilizes for 4s IRz < 500 kΩ, CY = 0μF, bus voltage stabilizes for 5s IRz = 1MΩ, CY = 1μF, bus voltage stabilizes for 8s IRz = 1MΩ, CY = 2μF, bus voltage stabilizes for 12s
DC equivalent internal resistance	Power on: 10.2 MΩ
High voltage input internal resistance	
When powered on (internal high-voltage relay closed)	Positive and negative poles to earth: 5.1 MΩ respectively
When powered off or not operating (internal high-voltage relay opened)	Positive and negative poles to earth: > 500 MΩ
Measuring circuit	
Injection measuring voltage	±15V
Injection measuring current	<110 μA
Injection pulse signal frequency	Self-adaptive, depending on the Y-capacitance (CY) value and insulation resistance value.
Permissible system leakage capacitance	≤4μF
Alarm output (optocoupler)	
Max. switching current	>100mA

Max. withstand voltage	12Vdc
Pre-alarm threshold	Default 1000Ω, 0-5000Ω adjustable, But must< alarm value
Alarm threshold	Default 500Ω, 0-5000Ω adjustable
Overvoltage detection	0-1000V
Safety	
High to low voltage withstanding voltage	3 500 Vd.c. 2 500 Va.c.(rms)
CAN to high voltage withstanding voltage	3 500 Vd.c. 2 500 Va.c.(rms)
Communication	
RS485 interface	Modbus RTU protocol
Canbus interface	Custom protocol
Environment	
Working temperature	- 40°C ~85°C
Storage temperature	- 40°C ~85°C, humidity: 5~95%RH
Others	
Standards	IEC 61557-1:2018 and IEC 61557-8:2018
Installation method	Standard 35mm Din-rail mounting
Dimension	W*H*D: 108*110*66mm

3.- FUNCTION INTRODUCTION

3.1.- Signal injection measurement principle

BIM-M1000 insulation monitoring device adopts the active measuring method (signal injection method) to continuously monitor insulation in unearthed systems. The device is connected between the live conductors and earth, superimposes a ±15V measuring voltage to the system.

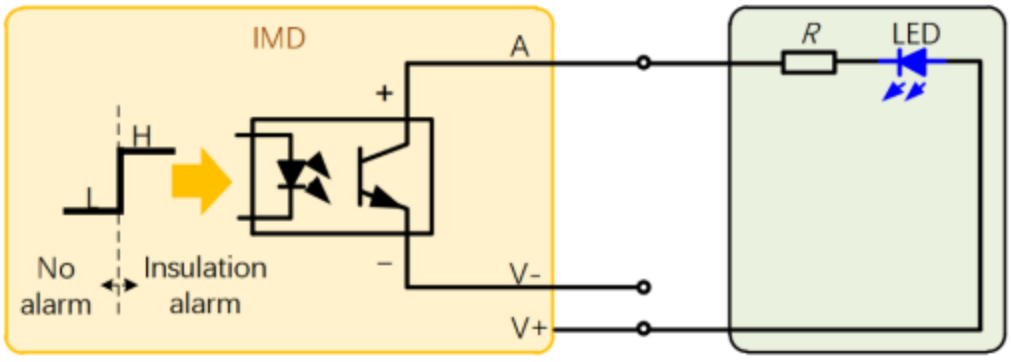
When the system insulation is intact, the resulting measuring current is minimal. If an insulation fault occurs, the measuring circuit closes, generating a small current inversely proportional to the insulation fault. The device's internal electronics continuously capture and analyze this measuring current, and an alarm is triggered when the insulation resistance drops below the preset response value.

3.2.- Alarm function

The alarm function of the BIM-M1000 insulation monitoring device is implemented via an optocoupler. The negative output ("–") of the internal optocoupler is internally connected to the negative terminal ("V–") of the device's auxiliary power supply.

When using the alarm function, the user must connect an external circuit between the device's "A" terminal and "V+" terminal, consisting of a resistor R and an alarm indicator (LED) or a 12 Vdc relay, ensuring that the maximum current in this circuit does not exceed 100 mA (Details see chapter 4.5).

When the measured insulation resistance falls below the set alarm value, the optocoupler activates, connecting the "A" terminal to V– internally and triggering the external LED or relay.



Insulation monitor internal ALARM principle External circuit

Note: If the alarm function is not required, leave the "A" terminal unconnected.

4.- INSTALLATION AND START-UP

The manual you hold in your hand contains information and warnings that the user should respect in order to guarantee a proper operation of all the instrument functions and keep it in safety conditions. The instrument must not be powered on and used until its definitive assembly is on the cabinet's door.

If the instrument is not used as manufacturer's specifications, the protection of the instrument will be damaged.

When any protection failure is suspected to exist (for example, it presents external visible damages), the instrument must be immediately powered off. In this case contact a qualified
service representative.

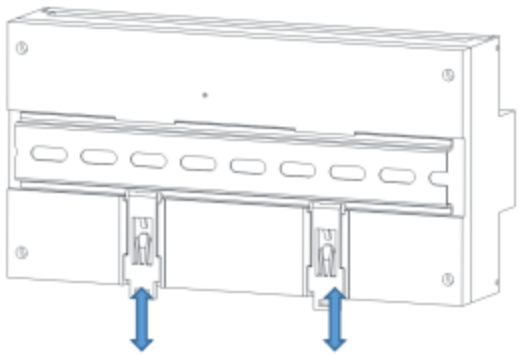
4.1.- Installation method

BIM-M1000 is to be mounted on 35mm Din-rail.

Step-1 Fasten a section of 35 mm DIN rail (at least 8 inches long) to the mounting surface with appropriate hardware.

Step-2 Use the white plastic clips on the back of the BIM-M1000 to clip onto the rail.

Step-3 Verify that the device is securely fastened to the wall.

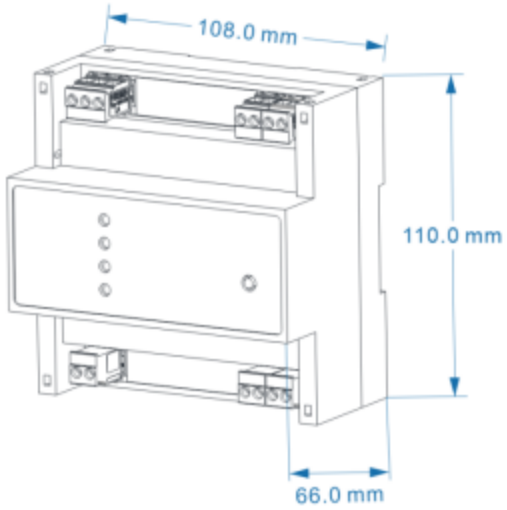


There have two flaps covers, can sealed by lead wire to protect unauthorized access terminal block, to achieve physical anti-theft function. Also capable of completely shielding the terminal head to prevent accident electrical shock.

Warning that with the instrument powered on, the terminals could be dangerous to touch and cover opening actions or elements removal may allow accessing dangerous parts.

Therefore, the instrument must not be used or operation key button until this is completely installed and close the cover.

4.2.- Dimension (Unit: mm)



4.3.- Indicator lights and button function description

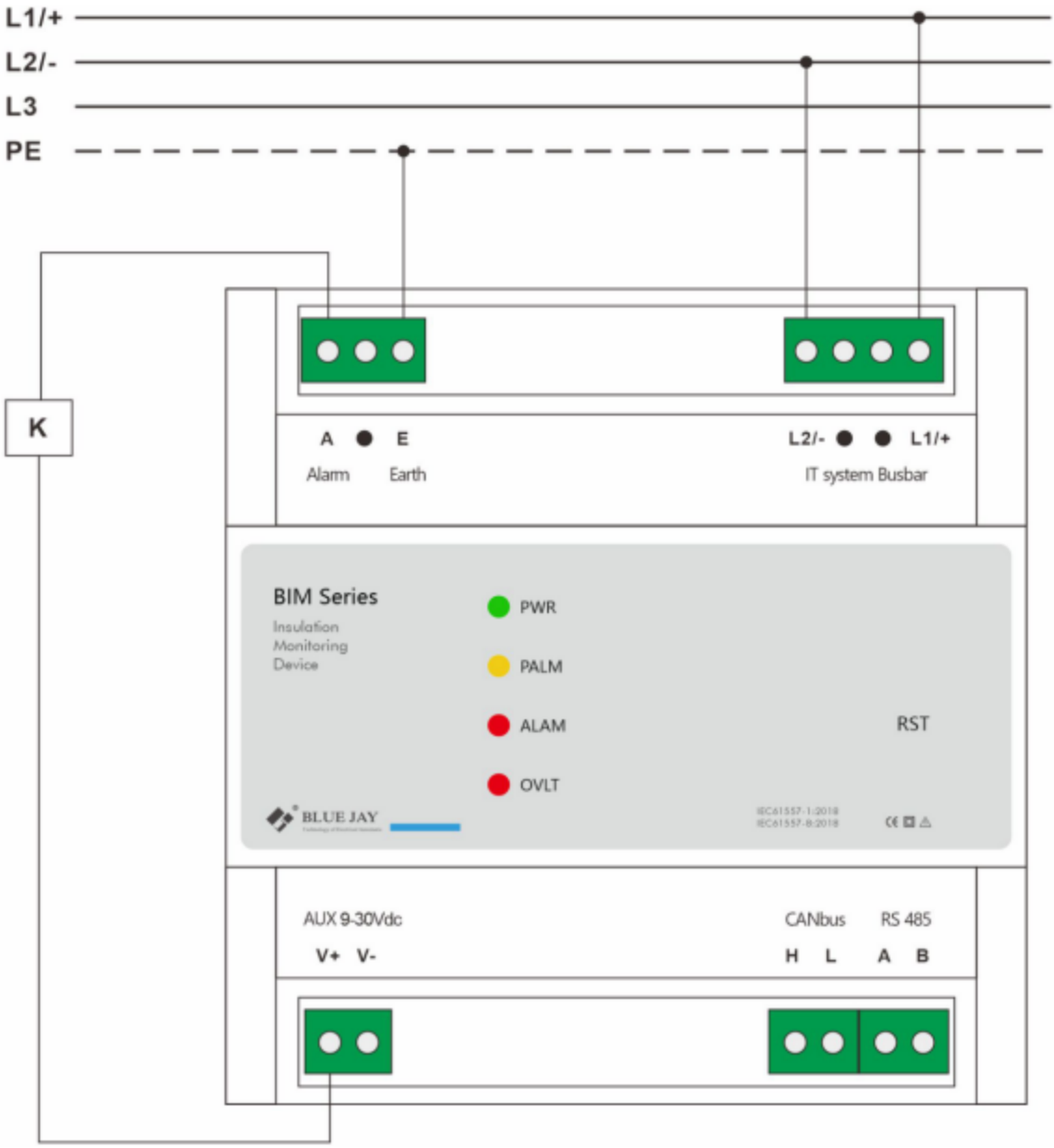
Indicator	Description
PWR	Device status indicator: when device powered on, the light is on, normally it is green. If it turns red means device Internal hardware failure. If it is OFF means device power loss.
PALM	Pre-alarm indicator: turns red when insulation resistance reaches the pre-alarm threshold.
ALAM	Alarm indicator: turns red when insulation resistance reaches the alarm threshold.
OVLT	Overvoltage alarm indicator: turns red when the measuring voltage reaches the threshold.

Button	Description
RST	Reset button **Press:** Clears the alarm status. **Press and hold for more than 3s:** Restores communication parameters to default values.

4.4.- Terminal Definition

Marked	Notes
V+, V-	AUX power supply 9-30Vdc
CANBUS H/ L	CANBUS high port
	CANBUS low port
RS485 A, B	RS485 communication interface
A	Alarm output (no need connect if not required)
E	Protective earth
L1/+	Connect to AC system line 1/ DC system positive pole
L2/-	Connect to AC system line 2/ DC system negative pole

4.5.- Typical wiring diagram



In DC system: Connect terminal **+, -** to positive (+) and negative (-) terminals of DC busbar.

Measurement parameters:

- Positive pole to earth insulation resistance (IR+)
- Negative pole to earth insulation resistance (IR-)
- Positive and negative pole to earth parallel insulation resistance (IRz)
- DC system bus voltage

In AC system (Support single and three phase)

Single-phase: Connect L1 and L2 terminals to the corresponding L1 and L2 of the system.
Three-phase: Connect L1 and L2 terminals to any two of the three phases (L1, L2, or L3).

Measurement parameters:

- L1 and L2 to earth parallel insulation resistance (IRz)
- Measure the L1 to L2 line voltage (L-L)

Note:

Users must first configure measure AC system or DC system in register map (0x0101). If measuring DC system, also need to configure the output resistance type in (0x0103). Detail see **chapter 5.4.3**.

5.- COMMUNICATION INTERFACE

BIM-M1000 supports two industry-standard communication interfaces:

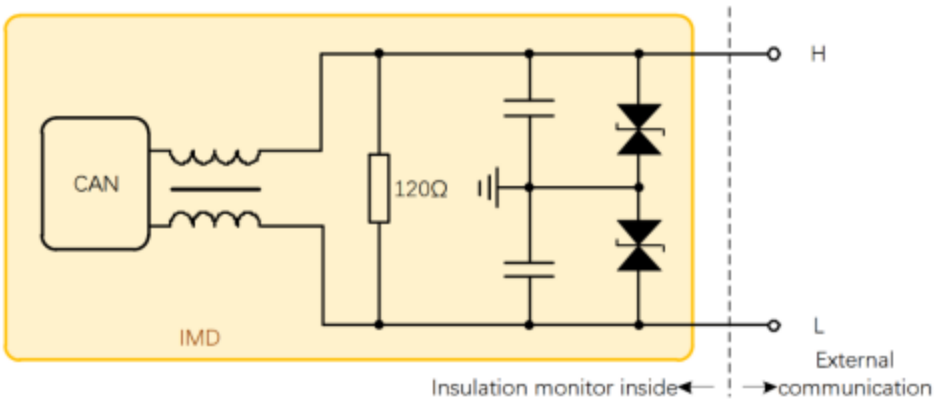
RS485 Modbus RTU: The primary communication interface used for data exchange and parameter configuration with a host computer.

CANbus custom protocol: The optional communication interface allows networking with other devices supporting the CAN protocol.

Note: in present product version, CANbus related parameters need to be completed via RS485. Parameters cannot be set directly through the CAN interface. Details see register 0x0310-0x0315 of chapter 5.4.2.

5.1.- CANbus communication connection

The CAN communication circuit of BIM-M1000 insulation monitor defaulted connected with a terminal resistance of 120Ω. Terminals H and L correspond to CANbus high port and low port respectively.



5.2.- RS485 communication connection

Users can send and receive data frames through the RS485 communication port. The circuit is equipped with 510Ω terminal resistance. For details, see communication protocol. Terminals A and B correspond to RS485 outputs A and B respectively.

5.3.- RS485 communication protocol

BIM-M1000 device supports Modbus RTU protocol, using Modbus RTU 0x03/0x06 command; baud rate, communication address, parity check mode, stop bit 1, data bit 8. The time interval between each byte in the sent frame shall not exceed 20ms, otherwise the frame will be cleared.

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.

5.4.- Register map

5.4.1.- Parameter query, read only, function 03 to read.

Register	Data	Byte mode		Description
0x0010	DC bus voltage	Int	1	Unit 0.1V,16-bits
0x0011	Reserve	/	/	/
0x0012	Positive pole to earth insulation resistance IR+	Int	1	Unit: kΩ, (0xFFFF: invalid value; 0xEA60: resistance > 50 MΩ)
0x0013	Negative pole to earth insulation resistance IR-	Int	1	
0x0014	Total insulation resistance IRz	Int	1	Unit: KΩ, For AC system
0x0015	Positive pole to earth voltage			Unit: 0.1V, Only valid in DC system
0x0016	Negative pole to earth voltage			
0x0017-0019	Reserve	/	/	/
0x001A	Read version number	Int	1	Ver. 1.21
0x001B	Device status bit			Details see chapter 5.4.2
0x001C-0x0030	Reserve	/	/	/
0x0031	System leakage capacitance	Int	1	Unit:0.1μF
0x0033	Temperature measurement	Int	1	Unit:0.1°C
0x0034-0x0040	Reserve	/	/	/

5.4.2.- 0x001B Register bit definition

Byte	Bit	Definition
Byte 0	7	**1:** Insulation resistance monitoring function already started. **0:** Insulation resistance monitoring function already stopped.
	6	**1:** Output the insulation resistance value of the positive and negative poles to the earth, IR+ and IR-. In AC system: Output the insulation resistance value of the entire AC system to the earth, IRz.
	5	**10:** IR+ > IR-: Negative pole to earth insulation resistance is low. **01:** IR+ < IR-: Positive pole to earth insulation resistance is low. **00:** IR+ = IR-: Positive and negative pole insulation resistance value are equal.
	4	
	3	Reserve (Default 0)
	2	**1:** Overvoltage alarm occurs (Default: ∞V, adjustable) **0:** No overvoltage alarm occurs.
	1	**1:** Insulation resistance pre-alarm occurs **(Default: 1000Ω/V, adjustable)** **0:** No insulation resistance pre-alarm occurs
	0	**1:** Insulation resistance alarm occurs **(Default: 500Ω/V, adjustable)** **0:** No insulation resistance alarm occurs

5.4.3.- Basic parameters, read and write, fun03 to read/ 06 to write

Register	Data	Byte mode		Description
0x0100	Present measurement mode	Int	1	**10:** Automatic monitoring on power-up **11:** Trigger-based operation after power-on
0x0101	Bus voltage mode	Int	1	**0:** DC system voltage **1:** AC system voltage
0x0102	Insulation monitoring function	Int	1	**11:** Turn on insulation monitoring function **00:** Turn off insulation monitoring function
0x0103	Insulation resistance output value	Int	1	**0:** Outputs IRz; **1:** Outputs IR+ and IR-respectively. **For details, see chapter 5.4.2. (bit 6)**

Register	Data	Byte mode		Description
0x0300	RS485 address	Int	1	**Default: 1;** range:1-247
0x0301	Baud rate	Int	1	**Default:** 9600; **0:** 1200; **1:** 2400; **2:** 4800; **3:** 9600; **4:** 19200
0x0302	Data format	Int	1	**Default:** n.8.1; **0:** n.8.1; **1:** o.8.1; **2:** e.8.1; **3:** n.8.2
0x0303-0x030F	Reserve	/	/	/
0x0310	CAN send ID high 16 bits	Int	1	**Default:** 0X1819
0x0311	CAN send ID low 16 bits	Int	1	**Default:** 0XA1A5
0x0312	CAN receive ID high 16 bits	Int	1	**Default:** 0X1819
0x0313	CAN receive ID low 16 bits	Int	1	**Default:** 0XA1A4
0x0314	CAN baud rate	Int	1	**Default:** 250kbps; range: 0-1000kbps
0x0315	CAN send cycle	Int	1	**Default:** 1s; range: 1-5000ms
0x0316-0x032F	Reserve	/	/	/
0x0330	Insulation resistance alarm threshold high 16 bits	Int	1	**Default:** 500 Ω/V; range: 0–5000, unit: Ω/V
0x0331	Insulation resistance alarm threshold low 16 bits	Int	1	
0x0332	Insulation resistance pre-alarm threshold high 16 bits	Int	1	**Default:** 1000 Ω/V range: 0–5000, unit: Ω/V
0x0333	Insulation resistance pre-alarm threshold low 16 bits	Int	1	
0x0334	Voltage alarm threshold			Range: 0~1000V, unit 0.1V, default value 0xEA60, 6000V, means not valid.

6.- SAFETY CONSIDERATIONS

All installation specifications described in 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 touch and cover opening actions or elements removal may allow accessing dangerous parts. This instrument is factory-shipped at proper operation conditions.

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

7.- MAINTENANCE

The BIM-M1000 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 repair 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