BIM-4MS
Insulation Monitoring Device

User Manual



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Read me

When you use BIM-4MS, 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-4MS, 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 voltage;

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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1.- SUMMARIZE

BIM-4MS is designed for continuous insulation monitoring in unearthed (IT) DC systems, supporting voltage ranges up to DC 100–1000 V. The device features dedicated start/stop control for insulation monitoring, enabling real-time measurement of positive and negative pole insulation resistance.

Equipped with an RS485/Modbus interface, BIM-4MS allows seamless remote monitoring of system status, ensuring enhanced safety and operational reliability.

FEATURES

- Monitoring the insulation resistance for 100-1000Vdc unearthed DC systems;
- Real-time monitoring of positive and negative pole insulation resistance to ground;
- Automatic adaptation to the system leakage capacitance up to 5μF;
- Separately adjustable response value range: 10kΩ…10MΩ;
- Selectable NC or NO relay operation;
- Two types of configurable alarm functions;
- Supports manual/automatic reset modes;
- RS-485 interface with Modbus RTU protocol;

APPLICATIONS

- EV/ HEV DC charging systems;
- DC power distribution and power supply systems;
- Rail transit and vehicle electrical systems;
- New energy generation and energy storage systems;
- Substation DC power supply systems;
- Medical and high-security power supply systems.

2.- TECHNICAL PARAMETERS

Basic parameters

Parameter	Value		
Power supply	10-30VDC, Power 3W		
DC voltage range	100V~1000V		
DC voltage measurement accuracy	≤2V+0.3%		
Insulation resistance measurement range	10KΩ~10MΩ (DC system voltage:100V~1000V)		
Max system leakage capacitance	0-5μF		
Insulation monitoring accuracy ((When: DC 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%
Insulation resistance value update time after turning on	After insulation monitoring is turned on, the time until the effective resistance value can be read for the first time	4-5s	
Insulation resistance value update time	Switch the insulation resistance until the module can read the switched insulation resistance value.	3-5s	
Insulation monitoring function switching times	$50*10^5$ times		
Off-line withstand voltage test	<2mA		
Digital output (DO)	1*DO, passive dry contact, SPST, NO Load capacity: 4A@250Vac, 4A@30Vdc		
Digital input (DI)	1*DI, passive dry contact, operating voltage 5-20Vdc, 0.25mA@short circuit		
Communication	RS485/ Modbus RTU		
Standard	IEC 61557-1: 2018; IEC 61557-8: 2018		
Dimension	Standard 35 mm DIN rail mounting Dimensions (W × H × D): 72 × 110 × 66 mm		

Storage temperature	- 55°C ~90°C; ≤90%RH (non-condensing, non-corrosive), Altitude: ≤3500 m
Operating temperature	- 40°C ~75°C; ≤90%RH (non-condensing, non-corrosive), Altitude: ≤3500 m

Notes:

1-. When the insulation resistance to earth of the positive pole (RfP) and the negative pole (RfN) differs significantly, with a ratio greater than 5:1, the higher value of RfP or RfN may deviate from the typical insulation resistance.

2-. CY refers to the Y-capacitance from the positive and negative system busbars to earth.

Withstand voltage test

Voltage injection point	Maximum voltage rating	Time
DC+/DC- to GND	4200VDC/3000VAC	≤1min
Power supply +/- to GND	3500VDC/2500VAC	≤1min
RS485 A/B to GND	3500VDC/2500VAC	≤1min
DC+/DC- to Power supply +/-	4200VDC/3000VAC	≤1min
DC+/DC- to A/B	4200VDC/3000VAC	≤1min

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

3.- Function introduction

3.1.- Insulation resistance monitoring function

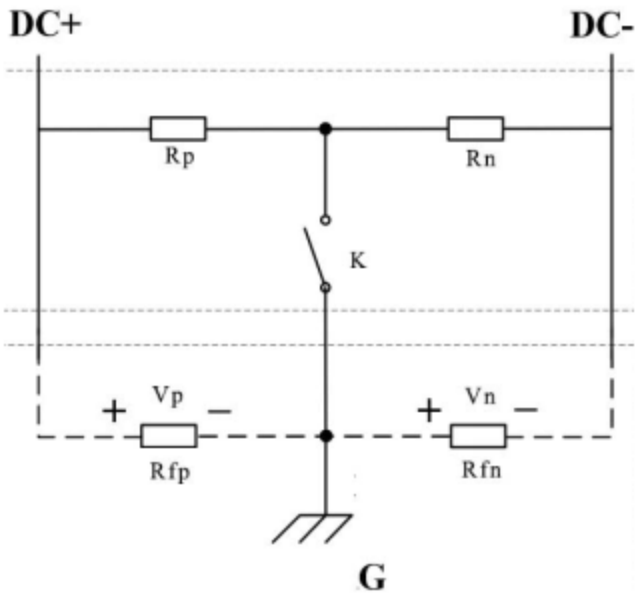
The BIM-4MS continuously monitoring the insulation resistance of IT systems (ungrounded systems). When the measured insulation resistance falls below the preset alarm threshold, the corresponding alarm relay trips out, and the LED indicator illuminates to issue an alarm. For proper measurement, the device must be connected between the IT system and the protective earth conductor (E).

After power-on, the “PWR” indicator turns on, and the device enters insulation resistance monitoring by default. The operating mode can be configured via registers to “manual trigger insulation monitoring after powered on.” In this mode, insulation monitoring does not start automatically after powered on and must be manually enabled or disabled through register commands.

Working principle:

BIM-4MS adopts the bridge circuit principle, as shown in the figure below. After device powered on, the grounding switch K is opened by default. After the insulation monitoring function turned on, the grounding switch K is closed, and the insulation resistance values of the positive (RfP) and negative (RfN) poles to the ground or the voltage values of the positive (VP) and negative poles (VN) to the ground can be read.

When insulation monitoring function is enabled, RfP and RfN or VP and VN data are updated in real time. The update cycle for RfP and RfN is 4-5s, and the update cycle for VP and VN is 100ms. After insulation monitoring function is disabled, the grounding switch K is opened, and the RfP, RfN, VP, and VN are all invalid values.



3.2.- Auto and manual reset function

The BIM-4MS supports both manual reset and automatic reset modes. The reset mode can be selected via register 0x0071. The RESET button is effective for reset function only when manual reset mode is selected in register 0x0071.

Automatic reset mode (default): When fault occurs, the output signal is activated immediately (e.g. alarm indicator lights up, relay output is energized). When the fault is cleared, the output signal automatically returns to the normal status.

Manual reset mode: When fault occurs, the output signal is activated immediately (e.g. relay output is energized). Even after the fault is cleared, the output signal remains in the "fault" status until it is manual reset by pressing the RESET button.

Note: Alarm function 1-2 only supports automatic reset. Selecting manual reset for these alarms is invalid.

3.3.- Alarm function

BIM-4MS support 2 types of configurable alarm function for monitoring critical parameters, the alarm thresholds can be flexibly configured to enable accurate system warning and protection.

Alarm No.	Item	Parameter	Value
Alarm -1	IR positive pole alarm	IR+	10KΩ~10MΩ, Default 300KΩ
Alarm-2	IR negative pole alarm	IR-	

3.4.- DI/ DO function

BIM-4MS supports 1 channel DO for alarm status output, and 1 channel DI for external control signals input.

Configuration	Parameter	Value
Relay output	Mapping	OFF,Alarm-1, Alarm-2
	Default status	NC: Normally close NO: Normally open

Configuration	Parameter	Value
Relay input	Function	Optional functions are as follows: **Off:** Disable function **Reset:** Reset self-test faults and relay status
	Mode	Active high Active low
	Delay	Signal response time delay, ranging from 0000 to 9999 milliseconds.

4.- INSTALLATION AND START-UP

The manual you hold contains information and warnings that users should follow 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.

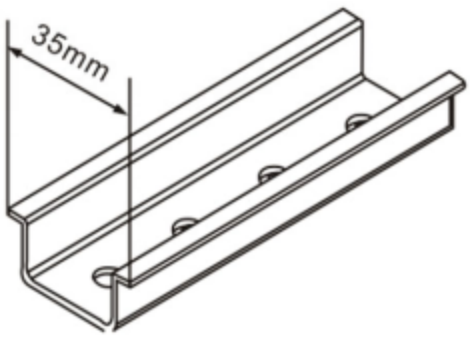
When any protection failure is suspected to exist (for example, it presents external visible damage), the instrument must be immediately powered off. In this case contact a qualified service representative.

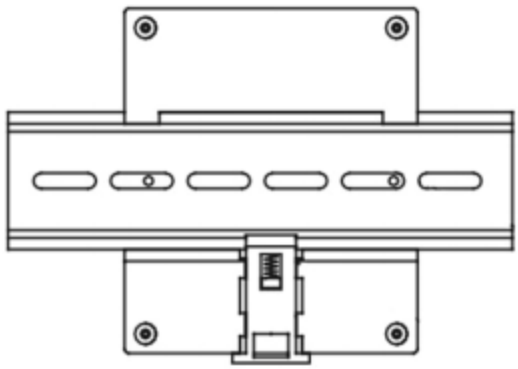
4.1.- Installation

Mounting

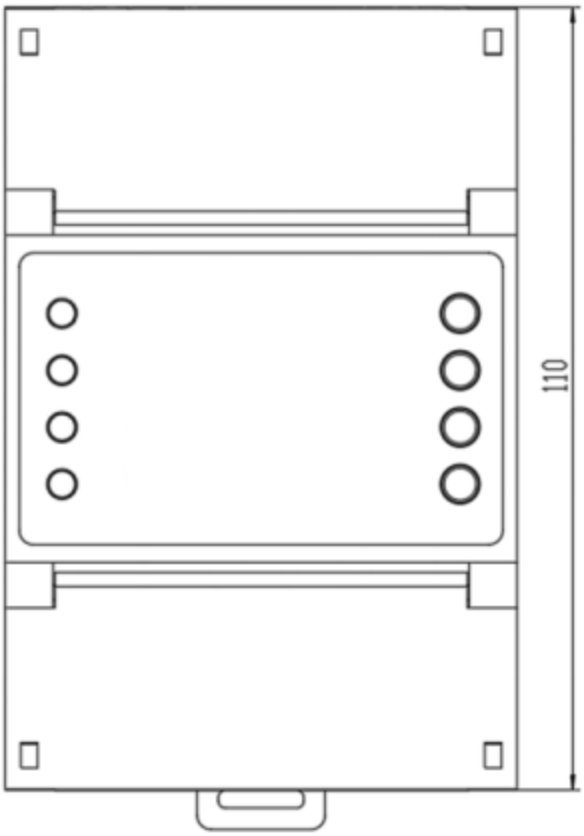
The instrument is to be mounted on the 35mm Din-rail. Keep all connections inside the cabinet.

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. Therefore, the instrument must not be used until this is completely installed.

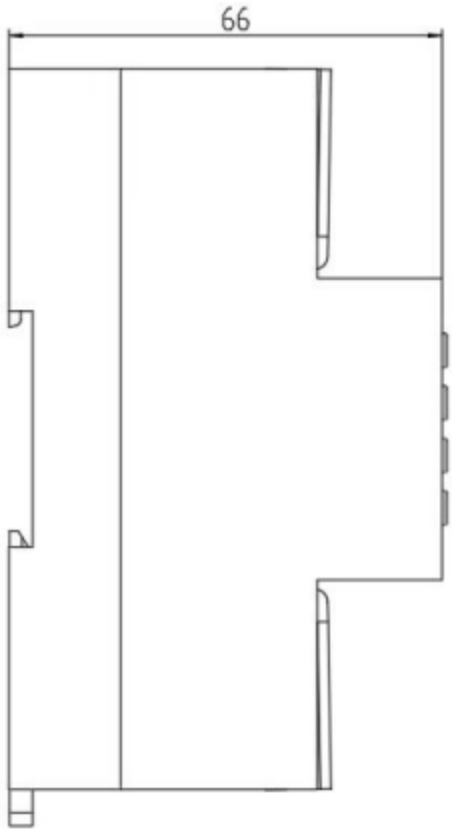




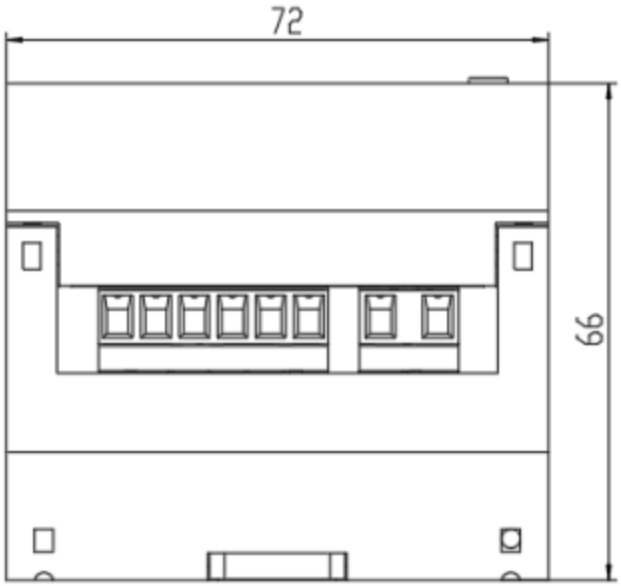
Dimension: W*H*D: 72*110*66 mm



Front view

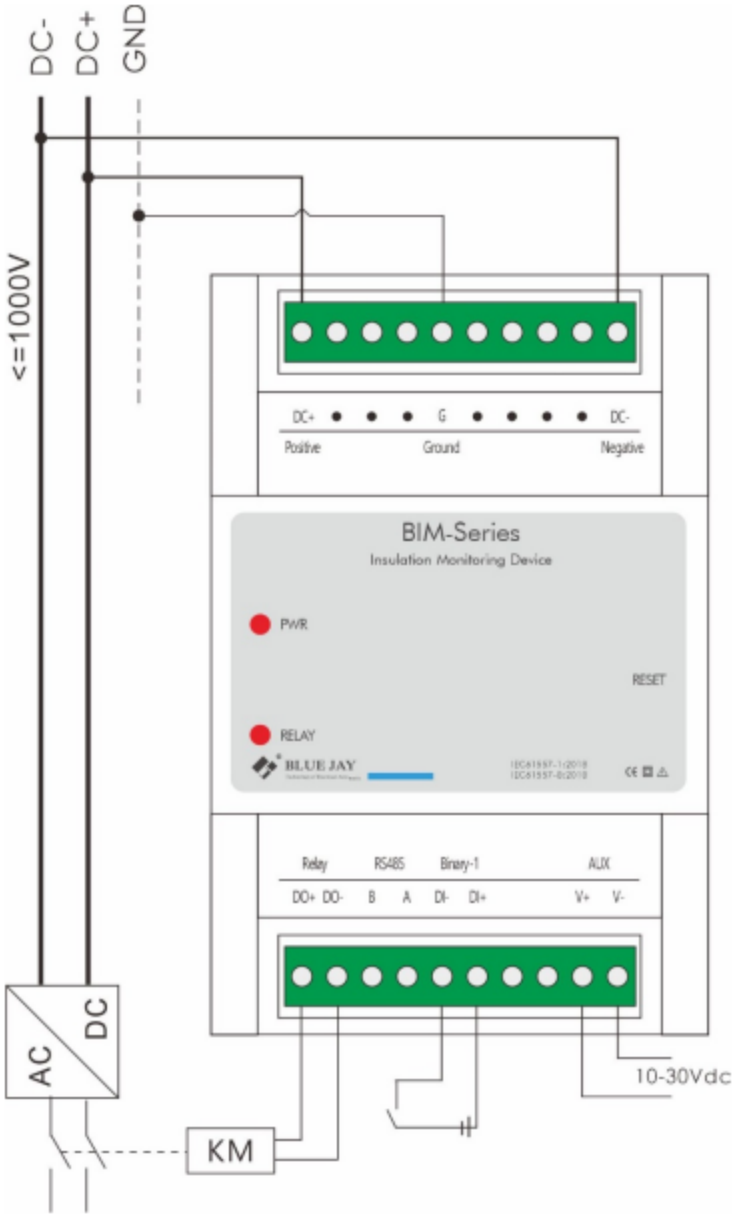


Side view



Upper view

4.2.- Wiring diagram and terminal definition



Terminal	Description
DC+	DC positive pole
G	System ground wire
DC-	DC negative pole
DO+/ DO-	Relay output
DI+/ DI-	Relay input for reset function
RS485	RS485 communication interface A, B
AUX	Auxiliary power supply 10-30VDC

!!!Note: Due to the enclosure version differences, the 5th–6th terminals from the left on the lower terminal may be marked "Temperature +/-" or "Binary2 +/-". These terminals are reserved and not available for this model. Please do not connect any external wiring.

4.3.- Indicator lights and buttons description

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



Indicator	Description
PWR	**Power indicator** Off: Device not powered Red: Device powered on and operating normally
RELAY	**Relay output status indicator** Off: Relay not trip Red: Relay trip out

Buttons description:

Buttons	Description
RESET	Press for manual reset (Note: It is effective for reset function only when manual reset mode is selected in register 0x0071.) Press and hold for 3s: Reset communication to default parameters

Note:

Press and hold the RESET buttons for 3 seconds to reset communication to default parameters: address 1, baud rate 9600, parity n.8.1. After changing, device must be restarted, then the change can be valid.

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 510Ω terminal resistance. Terminals A and B correspond to RS485 outputs A and B respectively.

5.2.- Communication Protocol

This device use Modbus RTU protocol 0x03/0x06 command, default initial baud rate 9600, communication address 001, parity check mode n.8.1. 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.

Modbus Exception Response Description

-. **For Function 0x03:** an illegal register address returns 01 83 02 + CRC, while an invalid data value/range returns 01 83 03 + CRC.

-. **For Function 0x06:** an illegal register address returns 01 83 02 + CRC, while an invalid data value/range returns 01 83 03 + CRC.

5.3.- Register map

5.3.1.- Parameter query- basic parameters, read only, function 03 to read

Register	Data	Description
0x0000-0x000A	Reserved	
0x000B	DC bus voltage	Unit: 0.1V
0x000C	Positive pole to ground voltage	Unit: 0.1V
0x000D	Negative pole to ground voltage	Unit: 0.1V
0x000E-0x0028	Reserved	
0x0029	Positive pole insulation resistance	Unit: KΩ (0xFFFF: invalid value; 0xEA60: resistance value greater than 10MΩ)
0x002A	Negative pole insulation resistance	
0x002B-0x0033	Reserved	
0x0034	System leakage capacitance (Reserved)	Unit: 0.1μF
0x0035-0x0064	Reserved	

Special code 0XFF, for host reads the slave address

Register	Data	Description
0X0037	Host reads the slave address	Example: Host inquiry: FF 37 A5 AA 2B 10 FC Slave response: FF 37 01 AB 90 10 FC The slave address is 0x01

5.3.2.- Basic parameters, readable& writable, function 03 to read/ 06 to write

Register	Data	Description
0x0064-0x006D	Reserved	
0x006E	Working mode	0: Auto start insulation monitoring after power-on (default) 1: Manual trigger insulation monitoring after powered on (via 0x070)
0x006F	Reserved	
0x0070	Insulation monitoring control	0: Turn off insulation monitoring function 1: Turn on insulation monitoring function (default)
0x0071	Reset mode	0: Manual reset 1: Auto reset (default)
0x0072-0x00C7	Reserved	
0x00FA	Modbus ID	Range: 1-247 (default 001)
0x00FB	Comm. port baud rate	0:1200; 1:2400; 2:4800; 3:9600 (default);
0x00FC	Comm. port data format	0: n.8.1 (default); 1: o.8.1; 2: e.8.1; 3: n.8.2
0x00FD-0x012B	Reserved	

Note: Modify the communication baud rate and format need to restart device to take effect. Only modify Modbus ID not need restart device.

5.3.3.- Alarm, DI, DO configuration, readable& writable, function 03 to read/ 06 to write

Register	Data	Description
0x0137	Alarm-1 Mode	0: Off (default); 1: Rising; 2: Falling
0x0138	Alarm-1 Data	0: IR positive pole alarm (IR+), unit: KΩ
0x013A	Alarm-1 Trip value	Range: 0000-9999, (default 300)
0x013B-0x014A	Reserved	
0x014B	Alarm-2 Mode	0: Off (default); 1: Rising; 2: Falling
0x014C	Alarm-2 Data	1: IR negative pole alarm (IR-), unit: KΩ
0x014E	Alarm-2 Value	Range: 0000-9999, (default 300)

Register	Data	Description
0X02BD	DO-1 mapping data	0: OFF (default) 1: Alarm-1 2: Alarm-2
0X02BE	DO-1 link data	0: OFF (default) 1: Alarm-1 2: Alarm-2
0X02BF	DO-1 association logic mode	0: AND (default); 1: OR
0X02C0	DO-1 default status	0: NC (when power on, relay closes and when reached the trigger condition relay opens). 1: NO (default)

Register	Data	Description
0X03E9	DI-1 Function	0: OFF (default) 1: Reset
0X03EA	DI-1 Mode	0: Active low 1: Active high (default)
0X03EB-0X03FC	Reserved	

5.3.4.- Query alarm status and self-test fault status, read only, function 03 to read

Register	Data	Byte mode		Description
0X0547	Alarm status	Int	2	Bit 0: Alarm 1 status (0: Normal; 1: Triggered) Bit 1: Alarm 2 status (0: Normal; 1: Triggered) Bit 2-15: Reserved

Note: Bit sequence is from LSB to MSB.

5.3.5.- Factory information query, read only, function 03 to read

Register	Data	Description
0XF000	Manufacturer	BLUE JAY
0XF010	Device model	BIM-4MS
0XF020	Product number	100
0XF030	Firmware version	
0XF040	Firmware date	
0XF050	Hardware version	
0XF060	Production week	Reserved
0XF070	SN code	Reserved
0XF080	MAC address (Reserved)	
0XF090	Reserved	
0XF0A0	Reserved	
0XF0B0-0XFFFF	Reserved	

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 BIM-4MS 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