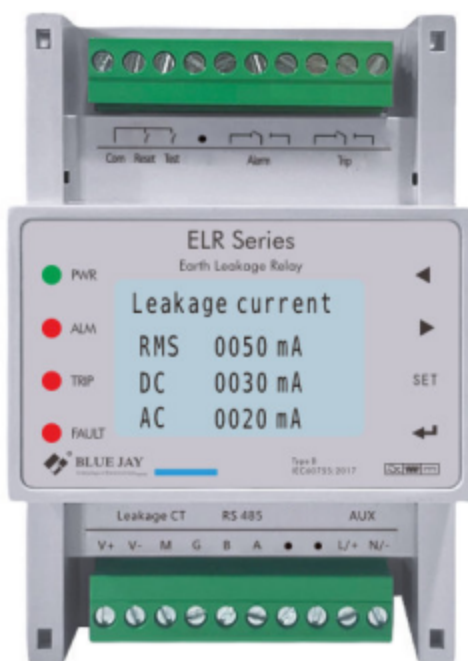


ELR-4MB Type B Earth Leakage Relay

User Manual



Version: 1.10

Revision: 2026.07

Read me

When you use ELR-4MB Type B earth leakage relay, 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 ELR-4MB Type B earth leakage relay, and help to solve the various problems at the scene.

1. Before the meter 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 (RS232/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

ELR-4MB is a Type B Earth Leakage Relay for TN and TT systems, compliant with IEC 60755:2017. It provides reliable detection of AC, pulsating DC, and smooth DC residual currents across a 0–20 kHz frequency range, it is ideal for industrial power distribution, renewable energy, and EV charging applications.

With independently adjustable alarm and trip thresholds, the ELR-4MB delivers dependable two-stage protection against electric shock, fire, and equipment damage. Integrated LCD indication, relay outputs, RS485 Modbus RTU communication, 35 mm DIN rail installation, and a wide-range power supply ensure seamless system integration and reliable operation in demanding industrial environments.

FEATURES

- Wide power supply input range 85–265Vac/dc;
- Compliant with IEC 60755 Type B standards;
- Detects AC, pulsating DC, and smooth DC fault currents;
- High-definition LCD displays total leakage current, AC and DC components;
- Supports external leakage CT connection measure range 5 mA-10A;
- Independently adjustable alarm and trip thresholds;
- 2 DI inputs for Test & Reset and 2 SPDT relay outputs for Alarm & Trip;
- RS485/Modbus RTU communication for remote monitoring and system integration;

APPLICATIONS

- Electric vehicle charging stations;
- Industrial motor protection systems;
- PV inverters and DC power systems;
- Energy storage systems (ESS);
- Battery management systems (BMS);
- Data center UPS and DC distribution systems;

2.- TECHNICAL PARAMETERS

Relay Parameters

Working power

Power supply	85-265Vac/dc
Power consumption	3w
Frequency	45-65Hz

Leakage current measurement

Measurement type	Type B according to IEC 60755
Measurement frequency	0-20KHz
Measurement range	5 mA-10A
Alarm and trip thresholds	5 mA ... 1A adjustable, Step length: 1mA

Digital input/ output

DI (Test and Reset)	2*DI, active dry contact, built-in 12 VDC pull-up voltage 0.25 mA @ short circuit
DO (Alarm and Trip)	2*SPDT, normally open, passive dry contact Load capacity: 10 A @250Vac; 5 A @ 30Vdc

Other parameters

Communication	RS485/Modbus RTU
Mounting method	Standard 35 mm DIN rail mounting
Dimensions	(Width × Height × Depth): 72 × 110 × 66 mm
Storage temperature	-55°C to 90°C; ≤90% RH (non-condensing, non-corrosive); altitude: ≤3500 m
Operating temperature	-40°C to 75°C; ≤90% RH (non-condensing, non-corrosive); altitude: ≤3500 m

Leakage CT Parameters

Model	Hole Size	Rated Current	Max Operating Current	Operating voltage	CT ratio
ELR-CT35	∅ 35mm	400A	600A	±15Vdc	2000:1
ELR-CT80	∅ 80mm				
ELR-CT120	∅ 120mm				

3.- Function Introduction

ELR-4MB earth leakage relay offers comprehensive monitoring, alarm, and protection features for leakage current detection. Its operation and configuration are simple, intuitive, and highly reliable. The following sections describe its key functions:

3.1.- Leakage Current Measurement

The ELR-4MB operates based on the residual current difference detection principle. Under normal operating conditions, the vector sum of the phase and neutral currents is zero, so the device remains inactive. When insulation failure or a ground fault occurs, part of the current returns through the earth. The external current transformer (CT) detects the resulting differential current and transmits the signal to the device. Using a True RMS algorithm, the device measures leakage current in real time over a frequency range of 0-20 kHz, enabling simultaneous detection of both AC and DC leakage current components.

When the leakage current exceeds the alarm threshold for the configured delay time, the alarm relay operates and the ALM LED light up in red. If the leakage current further exceeds the trip threshold for the configured delay time, the trip relay operates and the TRIP LED light up in red. The output contacts can be interlocked with a circuit breaker to clear the fault or trigger an audible and visual alarm.

By default, the device operates in automatic reset mode, where the relays and indicators automatically return to normal after the fault is cleared. It can also be configured for manual reset mode, in which the output status remains latched until a reset is performed using the front-panel reset button or a DI (digital input) signal.

3.2.- Auto and manual reset function

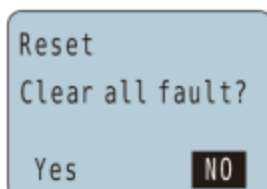
The ELR-4MB supports both manual reset and automatic reset modes. The reset mode can be selected via register 0x0100. The  button on the front panel is effective for reset function only when manual reset mode is selected.

Automatic reset mode (default): When fault occurs, the output signal is tripped immediately (e.g. self-test fault indicator turns on, 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 tripped immediately (e.g. self-test fault indicator turns on, 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  button.

Manual reset process:

After selecting manual reset mode, on any measurement interface, users manually press and hold the  button for 2 seconds or connect the DI reset signal input. A confirmation page will pop up on the screen prompting: **Clear all fault?** Then need to select yes or no.



3.3.- Manual Self-Test Function (Reserved function)

The ELR-4MB support manual self-test, the function can be triggered by pressing and holding the

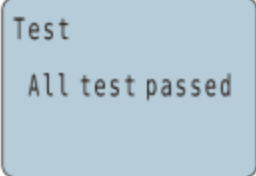


button for 2 seconds or remotely via an RS485 command.

3.3.1.- Self-test process and result display

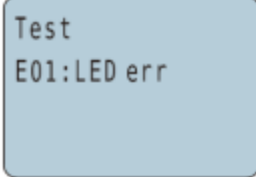
First, press and hold the  button for 2 seconds, or send a command via RS485 (register 0x0101), to trigger manual self-test. Then, the screen will enter the self-test process.

No fault be detected: after self-test completed, the screen displays "All test passed"; the system automatically returns to the main measurement screen after 5 second, without any action required.



Test
All test passed

Single fault be detected: the Fault LED will light up in red color, and the screen displays the corresponding fault code and detailed information.



Test
E01:LED err

Multiple faults be detected: up and down arrow icons will appear on the screen, allowing the user to scroll through and view each fault message.



Test
E02:Relay err ↑
Exit

If no buttons is pressed, the device will automatically return to the measurement interface after 5 seconds.

If any buttons is pressed during fault viewing, User must press the [SET] again to exit the self-test interface and return to the measurement screen. if the [SET] button is not pressed, the screen remains on the fault code display and will not return to the measurement interface.

3.3.2.- Self-test status query

Method 1: View directly on the screen

Method 2: View via RS485 register 0X0020

Fault code	Definition	Screen display
E01	Any LED light function failure	E01: LED err
E02	Relay function failure, no response	E02: Relay err

Note:

- The true fault status of code E01 and E02 can only be verified on-site inspection. RS485 queries always return a normal status by default.

3.4.- DI/ DO function

ELR-4MB supports 2* DO and 2* DI for alarm status output and external control input.

Configuration	Parameter	Value
Alarm DO	Mode	OFF, Rising, Falling
	Alarm value	Range: 5mA-1A
	Delay time	Range: 10ms-10s
	Hysteresis	Range: 0-9999mA
	Default status	NC: Normally close NO: Normally open
Trip DO	Trip value	Range: 5mA-1A
	Delay time	Range: 10ms-10s
	Hysteresis	Range: 0-9999 mA
	Default status	NC: Normally close NO: Normally open

Configuration	Parameter	Value
Self-test DI	Mode	OFF, Active high, Active low
	Delay	Range: 10ms-10s
Reset DI	Mode	OFF, Active high, Active low
	Delay	Range: 10ms-10s

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.

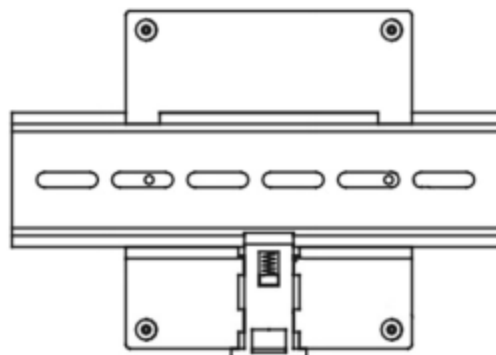
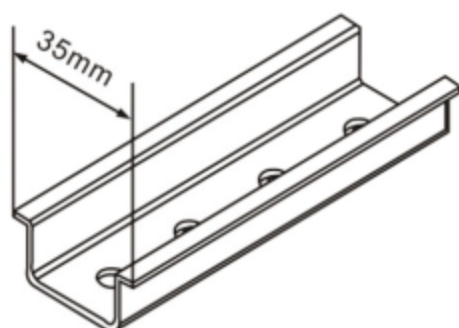
If the instrument is not used as manufacturer's specifications, the protection of the instrument will be damaged.

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.

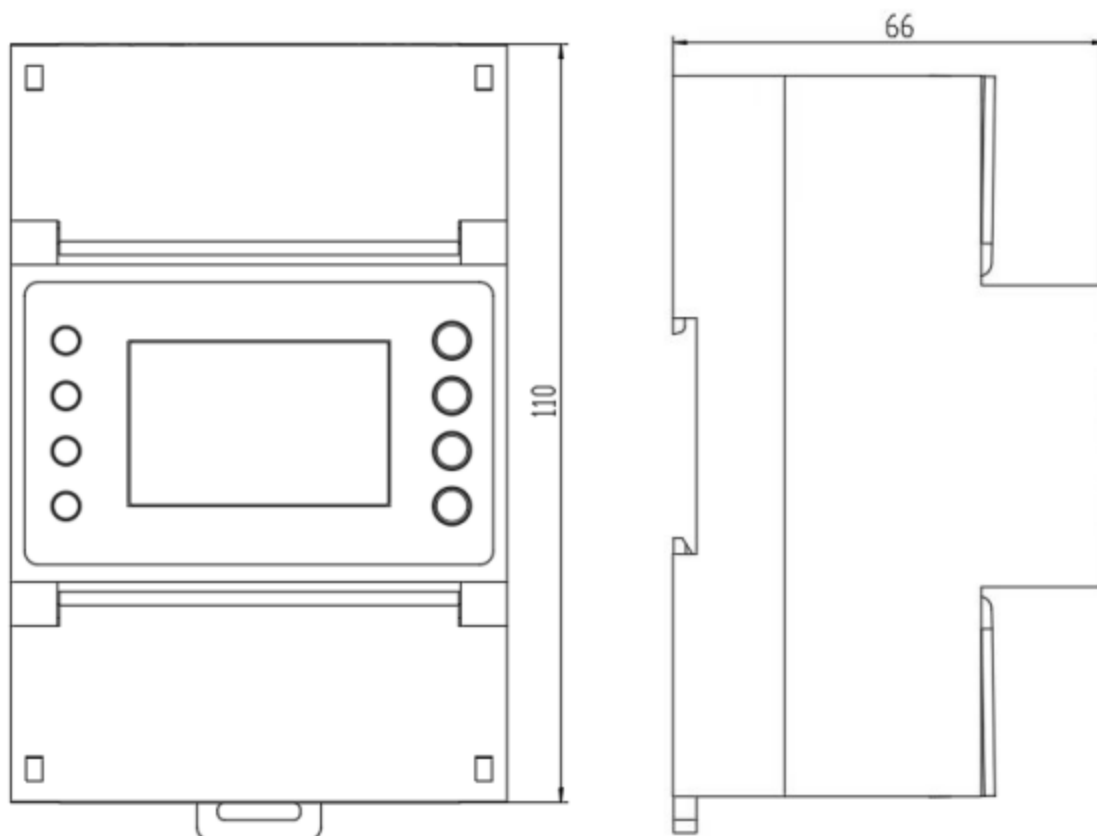
4.1.- Mounting and dimensions

Mounting

The instrument is to be mounted on 35mm Din-rail. Keep all connections into the cabinet. 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. Therefore, the instrument must not be used until this is completely installed.

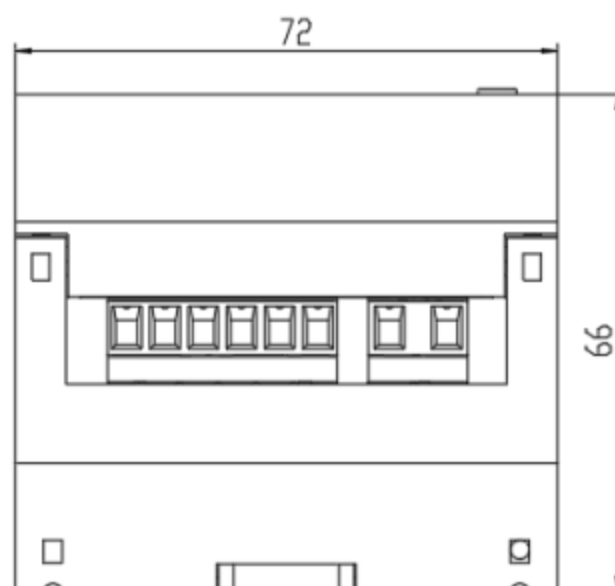


Dimension: W*H*D: 72*110*66 mm



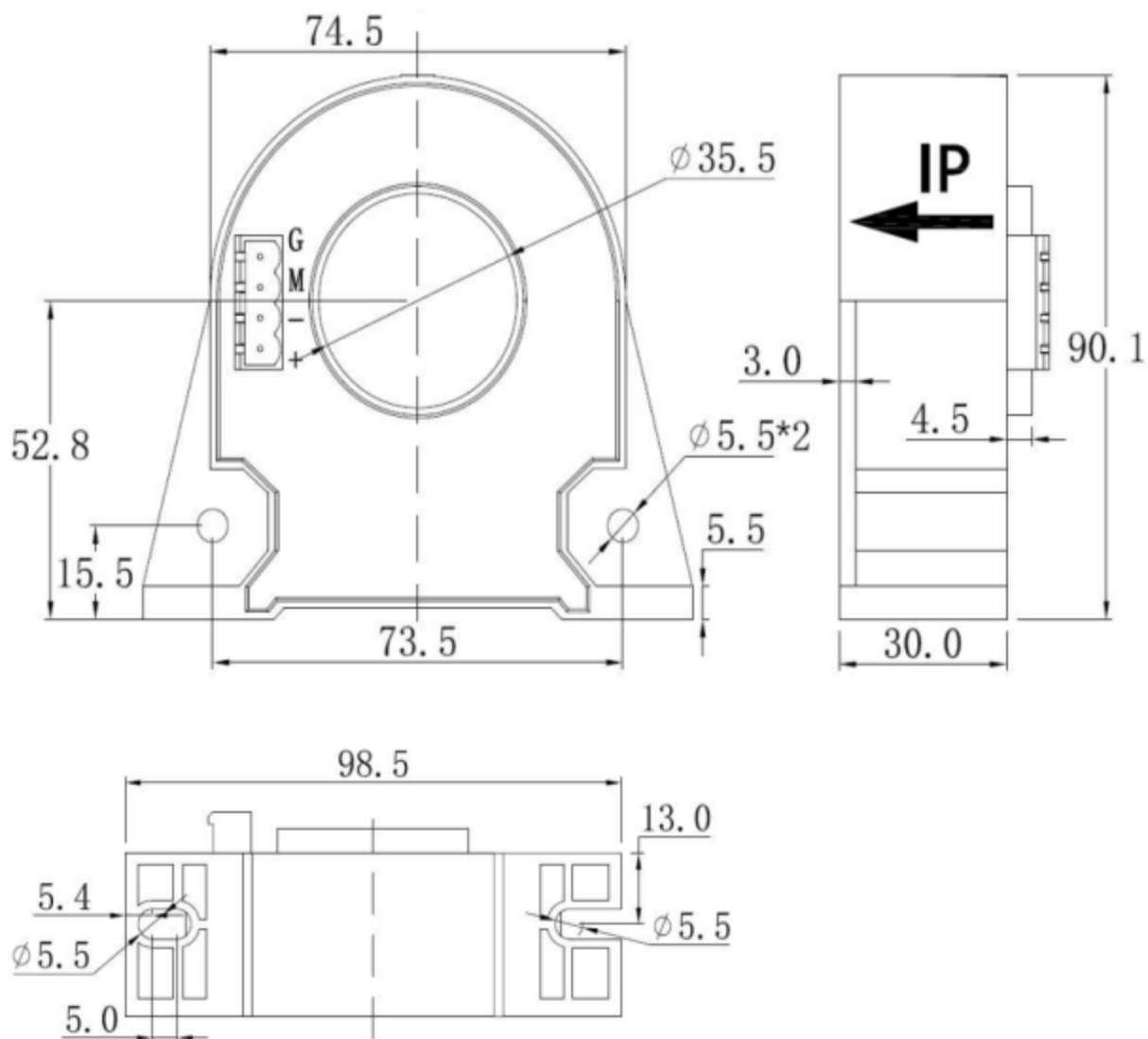
Front view

Side view

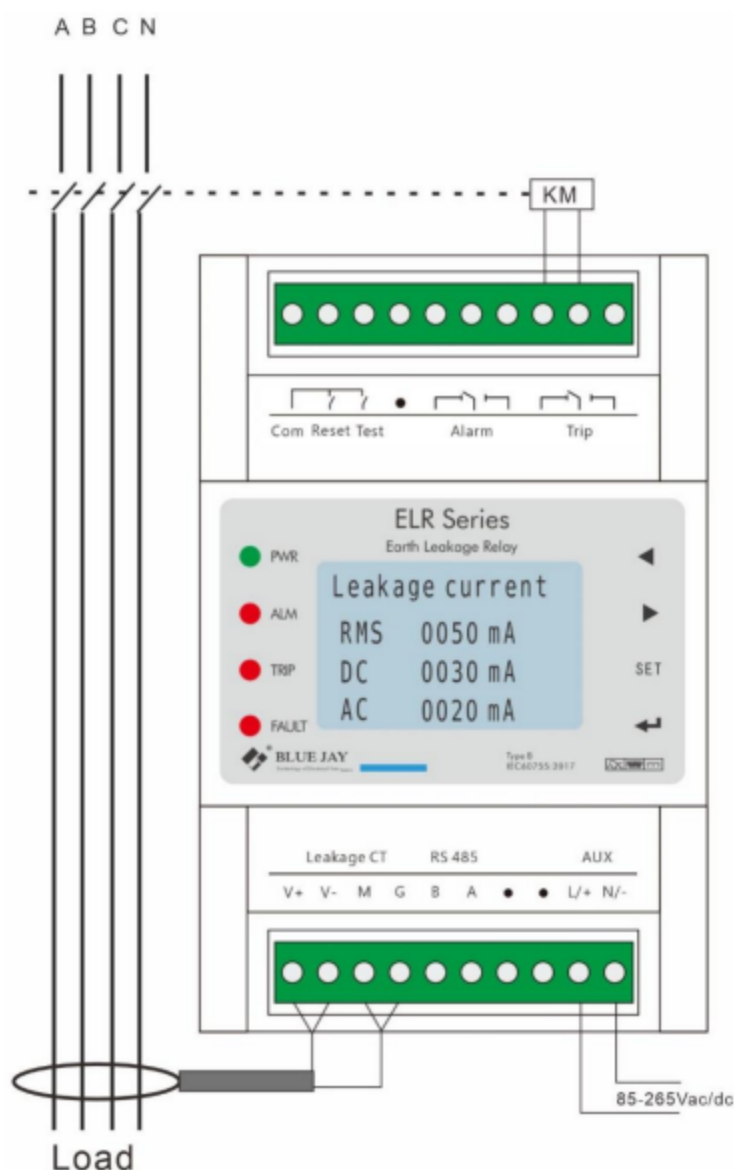


Upper view

4.2.- Current transformer dimensions



4.3.- Wiring diagram and terminal definition



Marked	Notes
Com, Reset, Test	Relay inputs (Common, Reset, Self-test)
Alarm	Alarm relay output
Trip	Trip relay output
Leakage CT	Earth leakage CT input (15V+, 15V-, M (OUT+), GND)
RS485	RS485 communication A, B
AUX	Auxiliary power supply 85–265 VAC/VDC

Note: This connection drawing is for reference only; the actual connecting terminal please refer to the label on the rear part.

4.4.- 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 Green: Device powered on and operating normally
ALM	Alarm DO status indicator OFF: Alarm DO not trip; Red: Alarm DO tripped
TRIP	Trip DO status indicator OFF: Trip DO not trip; Red: Trip DO tripped.
FAULT	Self-test fault status indicator OFF: no fault Red: self-test fault detected

Buttons description:

Buttons	In monitor screen	In config menu	In parameter setup
 Test	Short press: The screen will switch to previous page. Press and hold for 2s: Activate manual self-test.	Move cursor up and down to select function	Move setting cursor to left
 Reset	Short press: The screen will switch to next page. Press and hold for 2s: Activate manual reset.		Scroll selection number 0 ~ 9
	Call out password screen	Exit & roll back to up level menu.	
	Call out sub-screen	Confirm the values & Entry or jump to down level menu	

Notes:

- 1-. Users need to send command to select manual reset in register 0x0100, then press and hold the  button, the reset function will valid.
- 2-. Simultaneously press and hold both the  and  buttons for 3 seconds to reset the communication to the default parameters: address 1, baud rate 9600, parity n.8.1. After changing, device must be restarted, then the change can be valid.
- 3-. In Setup menu, if change the setting value, **SET** for exit menu, device will call out confirm screen ask "SAVE". Then press **SET** exit without saving, press  save and exit.

5.- SCREEN DISPLAY

5.1.- Measurement screen

After device powered on, the "PWR" light on and display a welcome screen. After 3s, show the measurement screen, users can press  or  to switch to view between different pages.

Leakage current

RMS 0050 mA ▲
 DC 0030 mA
 AC 0020 mA

Leakage current real time measurement

Real time leakage current (True RMS)
 Real time DC component of leakage current
 Real-time AC component of leakage current
 ▲: means measured value > set threshold

Leakage current

MAX RMS 0050 mA
 MAX DC 0030 mA
 MAX AC 0020 mA

Maximum leakage current real time measurement

Maximum leakage current (True RMS)
 Maximum DC component of leakage current
 Maximum AC component of leakage current

Trip threshold

Value 0050 mA
 Delay 0500 ms

Trip threshold display

Trip value
 Trip delay time

Note:

The maximum leakage current value refers to the highest value recorded since the device was powered on. This record value will be cleared if the device power off.

5.2.- Configuration screen

Press the **SET** button on any measurement screen and enter the default password **0001** to enter the configuration menu.

5.2.1.- System & Communication setting

►01-System
02-Comm
03-Alarm
04-D0

Rotate **Manual**
Backl. 5min
Contrast 5
Password 0001

System settings

Screens rotate interval: manual, 3-30s
Screen backlight duration: 0-10
Screen contrast: 1-9, default 5
Password: 1-9999, default 0001

01-System
►02-Comm
03-Alarm
04-D0

ID **001**
Baud 9600
Mode n.8.1

Communication settings

Modbus ID: **1-247** (default: 001)
Comm. port baud rate (default: 9600)
Comm. port data format (default: n.8.1)

5.2.2.- Alarm & trip relay setting

01-System
02-Comm
►03-Alarm
04-D0

Mode **OFF**
Value 0030 mA
Delay 0050 mS
HYS. 0005 mA

Alarm relay settings

Mode: OFF, Rising, Falling
Threshold value: 5 mA -1A
Delay time: 10ms-10s
Hysteresis value: 0-9999 mA
Relay default status: NC (normally close), NO (normally open)

Def. **NO**

Trip relay settings

Threshold value: 5 mA -10A
Delay time: 10ms-10s
Hysteresis value: 0-9999 mA
Relay default status: NC (normally close), NO (normally open)

01-System
02-Comm
03-Alarm
►04-Trip

Value **0050 mA**
Delay 0050 mS
Hys. 0005 mA
Def. NO

5.2.3.- Test & reset relay setting

►05-Test
06-Reset

Mode **OFF**
Delay 10s

Self-test settings

Self-test mode: OFF, active high, active low

Self-test delay: 10ms-10s

05-Test
►06-Reset

Mode **OFF**
Delay 10s

Reset settings

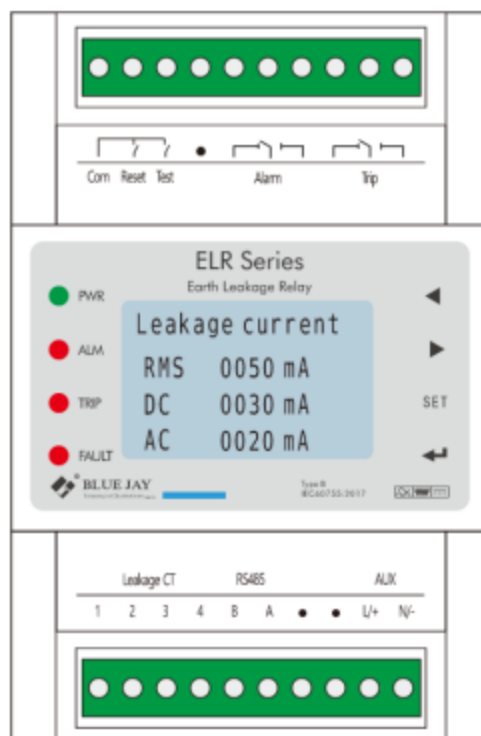
Reset mode: OFF, active high, active low

Reset delay: 10ms-10s

6.- COMMUNICATION INTERFACE

6.1.- Connection for RS485 BUS

The composition of the RS-485 cabling must be carried out with a meshed screen cable (minimum 3 wire), diameter of not less than 0.5mm², with a maximum distance of 1,200 m between the ELR-4MB... and the master unit. This Bus may connect a maximum of 32pcs.



Notes:

- For communication with the master unit, user can choose RS-485 to RS-232 converter or RS485 to USB adapter to use.
 - For expand the number of devices in the communication network, a signal repeater can be used.
 - Due to product modifications or special requirements, the interface pin place may be change.
- For details, please refer to product label on the rear side.

6.2.- MODBUS © Protocol

Modbus RTU Frame Format:

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

MODBUS FUNCTIONS:

Code	Meaning	Description
FUNCTION 03	Reading of n Words	<i>This function permits to read all the electrical parameters</i> <i>Disable in default</i>
FUNCTION 06	Preset Single register	<i>If need valid this code, please contact Blue Jay Sales Team before your order!</i>

6.3.- Register Map

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

Register	Data	Byte mode		Instruction
0x0001	True RMS	int	1	Real time leakage current (True RMS), unit: mA
0x0002	DC component	int	1	Real time DC component of leakage current, unit: mA
0x0003	AC component	int	1	Real time AC component of leakage current, unit: mA
0x0004	Max True RMS	int	1	Maximum leakage current (True RMS)
0x0005	Max component DC	int	1	Maximum DC component of leakage current
0x0006	Max component AC	int	1	Maximum AC component of leakage current

6.3.2.- Parameter query - self-test and DI/DO relay status - read only, function 03 to read

Register	Data	Byte mode		Instruction
0x0020	Self-test status (Reserved)	int	1	Bit 0: Self-test progress (0: completed; 1: in progress) Bit 1: Reserved Bit 2: Reserved Bit 3: Code E01 fault status (0: Normal; 1: Fault) Bit 4: Code E02 fault status (0: Normal; 1: Fault)
0x0021	Alarm DO status	int	1	0: DO not trip; 1: DO tripped
0x0022	Trip DO status	int	1	0: DO not trip; 1: DO tripped

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 Slave response: FF 37 01 AB 90 The slave address is 0x01

6.3.3.- Parameter configuration (read/write); function 03 to read, 06 to write

Register	Data	Byte mode		Instruction
0x0100	Reset mode	int	1	0: Manual reset 1: Auto reset (default)
0x0101	Trigger self-test	int	1	0: Not in self-test status (default) 1: Trigger a device self-test
Reserved				
0x0110	Screens rotate interval	int	1	Manual, 3-30 seconds (default: 15s)
0x0111	Screen backlight duration	int	1	0-10min (default: 5min)
0x0112	Screen contrast	int	1	1-9, default 5
0x0113	Password	int	1	0-9999, default 0001
Reserved				
0x0120	Communication address	int	1	Range: 1-247 (default 001)
0x0121	Communication baud rate	int	1	0:1200; 1:2400; 2:4800; 3:9600 (default); 4: 19200; 5: 38400; 6: 57600; 7:115200
0x0122	Communication data format	int	1	0: n.8.1 (default); 1: o.8.1; 2: e.8.1; 3: n.8.2

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

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

Register	Data	Byte mode		Description
0x0130	Alarm DO mode	int	1	0: Off (default); 1: Rising; 2: Falling
0x0131	Alarm DO threshold	int	1	Range: 5mA - 1 A
0x0132	Alarm DO delay time	int	1	Range: 10ms - 10 s
0x0133	Alarm DO hysteresis	int	1	Range: 0 - 9999 mA
0x0134	Alarm DO default status	int	1	NC: Normally Closed; NO: Normally Open (default)
Reserved				
0x0140	Trip DO threshold	int	1	Range: 5mA - 1 A
0x0141	Trip DO delay time	int	1	Range: 10ms - 10 s
0x0142	Trip DO hysteresis	int	1	Range: 0 - 9999 mA
0x0143	Trip DO default status	int	1	NC: Normally Closed; NO: Normally Open (default)
Reserved				
0x0160	Self-test mode	int	1	OFF, active high, active low
0x0161	Self-test delay	int	1	10ms-10s
0x0170	Reset mode	int	1	OFF, active high, active low
0x0171	Reset delay	int	1	10ms-10s

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

Register	Data	Description
0XF000	Manufacturer	BLUE JAY
0XF010	Device model	ELR-4MB
0XF020	Product number	
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	

Note: The above specifications may be updated due to product revisions. Please refer to the actual device query for final information.

7.- 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;

8.- MAINTENANCE

The ELR-4MB 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