

ELR-4MD

DC Earth Leakage Relay

User Manual



Version: 1.12

Revision: 2025.06

Read me

When you use ELR-4MD DC 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-4MD DC 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 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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1.- SUMMARIZE

The ELR-4MD Type A DC Earth Leakage Relay is an advanced protection device designed to enhance the safety and reliability of electrical systems. Complying with IEC 60755 Type A standard, it continuously monitors both AC and pulsating DC residual currents via a DC hall effect current sensor (HCT). When the residual current exceeds the preset threshold, the relay outputs an alarm signal, ensuring early detection of potential faults.

Equipped with adjustable pre-alarm and alarm response levels, the ELR-4MD ensures that alarm signals remain clearly indicated until received the reset signal, facilitating easy fault diagnosis and troubleshooting. With RS485 Modbus communication interface enables real-time remote monitoring and integration into SCADA systems. ELR-4MD is critical for preventing equipment damage, minimizing downtime, and safeguarding personnel against electrical hazards.

FEATURES

- Standard 35mm din rail mounting;
- Hall current sensor measurement;
- Digital display with real-time readings;
- Adjustable trip levels (5mA-3A) and time delay;
- Pre-alarm and alarm adjustable response;
- Detects AC and pulsating DC residual current;
- Remote test/reset connections for external activation;
- RS485 Modbus communication;

APPLICATIONS

- Medium and low voltage systems;
- Battery energy storage systems;
- Commercial and residential buildings;
- Utilities and power distribution systems;
- Motor control panels and switchboards;
- UPS systems and backup power supplies;
- DC system leakage current measurement;
- Industrial control system (PLC, SCADA, DCS);

2.- TECHNICAL PARAMETERS

Working power supply

Power supply	85-265VAC/DC, optional 48VDC
Power consumption	≤4VA
Frequency	50/60Hz, Accuracy ±0.01Hz

Hall CT (External)

Power supply	+/-15Vdc
Alarm threshold	5mA-3A, adjustable;
Response sensitivity	1mA
Frequency range	50-400Hz
Trip time delay	50ms-10sec, adjustable
Operating performance	Type A (acc.to IEC 62020)
Rated current range	0-250A
Hole size	60mm

I/O capacity

Digital input	2* DI for reset/ test, NC dry contact, Ri<500Ω turns on, Ri>100kΩ turns off
Digital output	1* relay NO for safety; 1* relay NC for alarm Load capacity: 5A@250VAC

Others

Communication	RS-485 MODBUS-RTU
Display	LCD with backlit
Withstand voltage	2.5KV 1min
Insulation	Input, output, power supply to shell >5MΩ
Storage environment	-40~70°C
Working environment	-25~55°C Altitude ≤2500m, 0~95%RH, non-condensing, non-corrosive gas

3.- Function Introduction

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

3.1.- Residual Current Measurement

This device samples the AC and pulsating DC residual current in real time through an external current transformer and continuously monitors the zero-sequence current or differential mode current changes in the system loop.

The collected measurement signal is processed by internal A/D conversion and digital filtering, and the real-time value is synchronously displayed on the LCD screen and can be read remotely through the RS485 Modbus communication interface, realizing local and remote dual monitoring functions.

3.2.- Pre-Alarm and Alarm Threshold

When the measured residual current exceeds the preset pre-alarm threshold, and after the configured pre-alarm time delay elapses, the LCD screen will indicate "Pre-alarm" status and display the corresponding real-time residual current value.

If the measured value continues to rise and reaches the preset alarm threshold, following the configured alarm delay time, the internal alarm output relay will be trip output, and the LCD screen will indicate "Alarm" status with the real-time residual current value.

Device parameters can be configured via the front-panel LCD and function keys or through the RS485 Modbus communication. To ensure system security, access to parameter settings can be password-protected.

3.3.- Automatic and Manual Reset

The alarm relay supports both automatic and manual reset modes, ensuring reliable operation and flexible control.

Automatic reset: The alarm relay automatically resets to normal state when the measured residual current falls below the release value and remains at that value after the configured delay time. This prevents momentary or short leakage current spikes from causing unnecessary system interruptions.

Manual reset: When the fault condition is confirmed and eliminated, the relay can be manually reset by short-circuit terminals "C" and "Rst" to restore the control device to normal monitoring status. ([Details see chapter 4.2.](#))

3.4.- Manual Self-Test Function

The device's self-test function is activated by short-circuit terminals "C" and "Test". During the test, the relay simulates an internal fault condition, causing the LCD to sequentially display all status indicators and real-time parameters, while the relay output operates accordingly. This process verifies the correct functionality of the alarm and trip mechanisms, ensuring reliable device performance. ([Details see chapter 4.2.](#))

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.

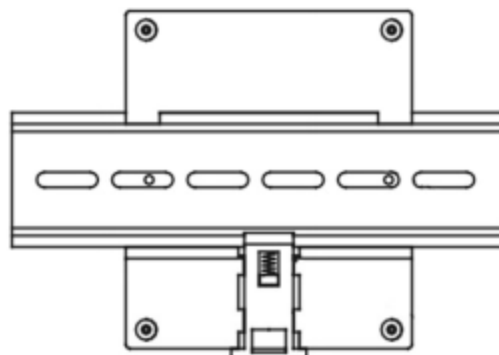
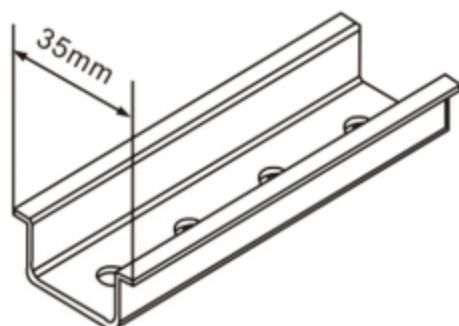
If the instrument is not used as manufacturer's specifications, the protection of the instrument will be damaged.

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.

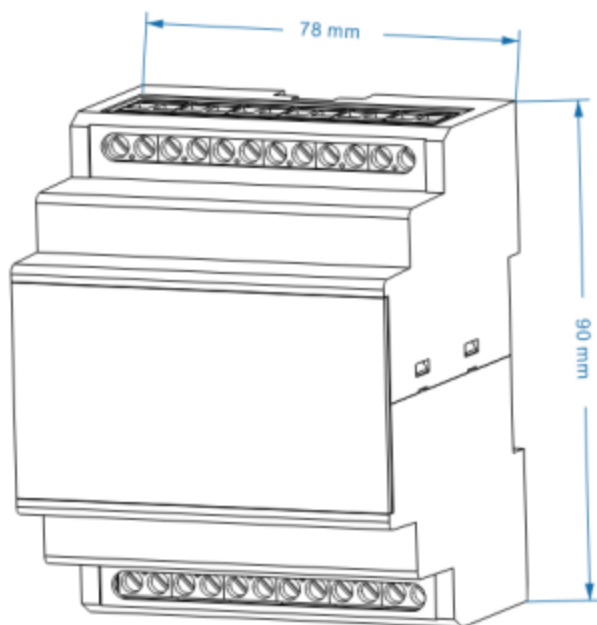
4.1.- Installation

Mounting

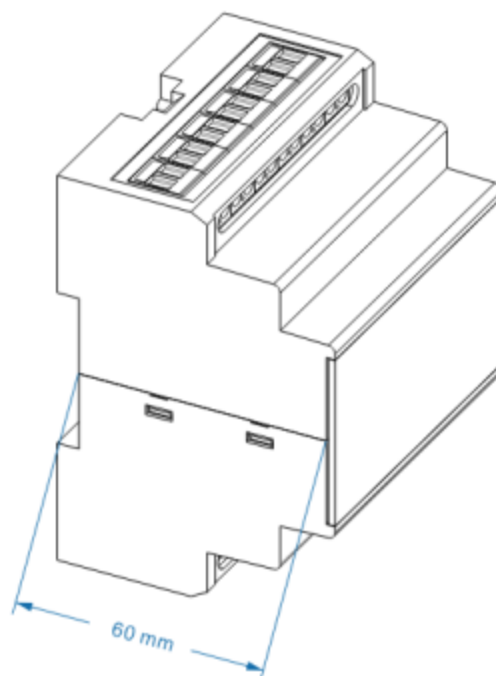
Instrument is to be mounted on 35mm Din-rail. Keep all connections into the cabinet. Please note that with the instrument powered on, the terminals could be dangerous to touch and cover opening actions or elements removal may allow accessing dangerous parts. Therefore, the instrument must not be used until this is completely installed.



Dimension: 78*90*60 mm W*H*D



Front view



Side view

4.2.- Connection Terminal

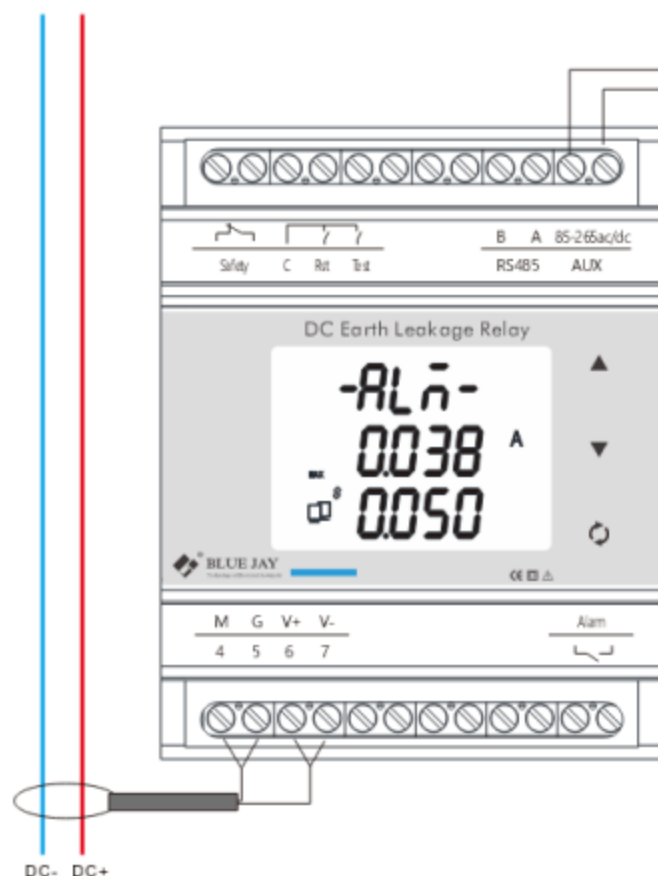


Marked	Notes
Safety	Device disconnection detection
C	Common terminal
Rst	Remote reset, NO contact
Test	Remote test, NO contact
RS485	RS485 communication A, B
AUX	Power supply+/- 85-265Vac/dc
M	Hall CT signal output
G	Hall CT grounding
V+ V-	Hall CT power supply +/-15Vdc
Alarm	Alarm output relay

Notes:

- Short-circuit terminal "C" and "Rst" to activate reset function, then short-circuit terminal "C" and "Test" to activate test function.
- The terminal pin definition may change depends on customer order; please refer to the label on the device.

4.3.- Typical Wiring







Note:

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

5.- SCREEN DISPLAY

5.1.- Button description

Button	In Monitor Screen	In Config Sub-menu	In Parameter Setup
	Move to previous or next page	Move cursor up and down to select function	Move setting cursor to left
	Press and hold: Call out password screen	Move cursor up and down to select function	Scroll selection number 0 ~ 9
	Press and hold: Display version information	Confirm the values & Entry or jump to down level menu	

Note: In **Config. menu**, if change the setting value, press and hold  for exit menu, device will call out confirm screen ask "SAVE".

Then press and hold  for *exit without saving*;

press and hold  for *save and exit*.



5.2.- Overall screen


Page 1: Real time measurement data



First row: present leakage current value

Second row: max/min leakage current value

In this screen, press  and  can check the max/min leakage current value between the last time reset action and this time reset action.

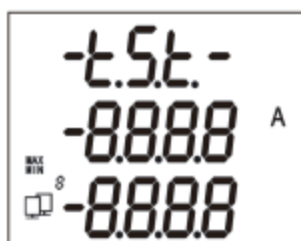
Press  switch to Page 2: Present parameter threshold



First row: leakage current alarm threshold

Second row: delay time alarm threshold

Page 3: Device test status



Screen will show all the displayed contents

Note: test function is activated by DI signal, and the "safety" and "alarm" output relay will act according to the device status.

Page 4: Alarm tripped screen





First row: Alarm prompt words

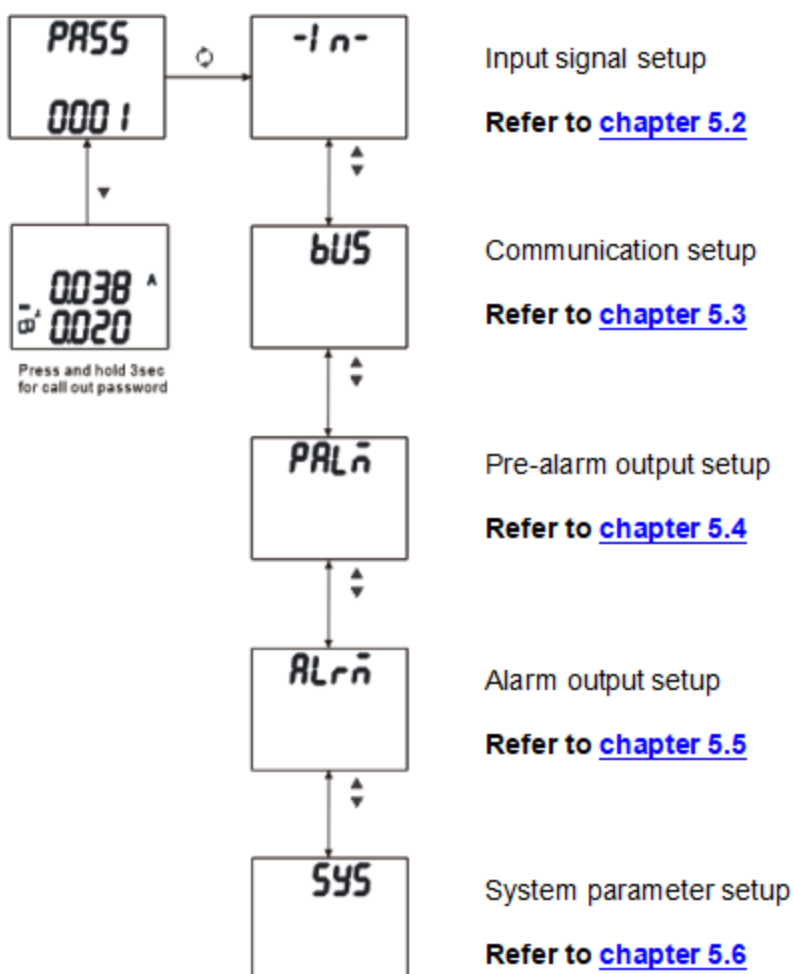
Second row: Leakage current value

Third row: Maximum leakage current value

6.- SETUP PROCEDURE

6.1.- Enter setup menu

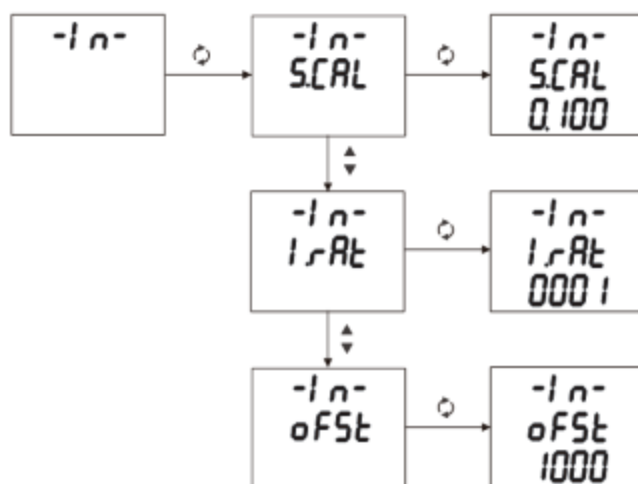
In measuring screen, press and hold the  button, and the prompt of "Password" will appear, and enter the password (default is **0001**), press  button to enter the configuration menu, ELR-4MD provides five configure parameters items: input (-IN-), communication (BUS), pre-alarm (PALM), alarm (ALRM) and system factory commissioning (SYS), Adopt LCD display layered menu structure management.



Note:

Parameters also can remote setup via RS485 communication. Details see [chapter 6](#).

6.2.- Input signal setup



Rated leakage value

default: 100, unit: mA

Alarm ratio

default: 1

DC offset compensation

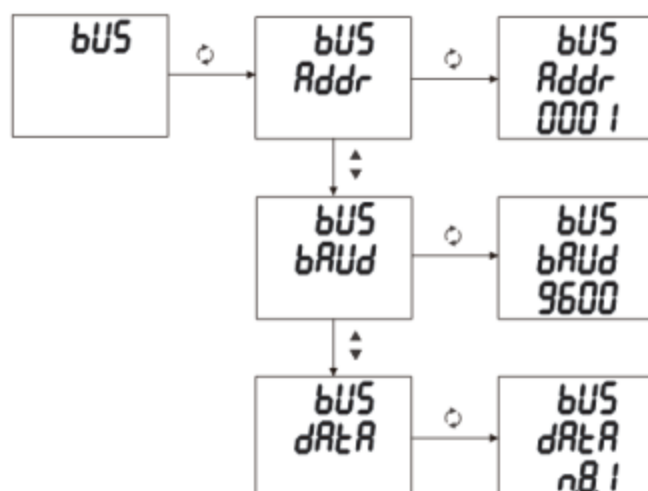
default value: 1000

> 1000 means positive compensation;

< 1000 means negative compensation;

Compensation unit is 0.1% of rated value

6.3.- Communication setup



Modbus address⁽¹⁾ *

default 0001

Comm. port baud ratio⁽²⁾ *

default 9600^{(2)*}

Comm. port data format

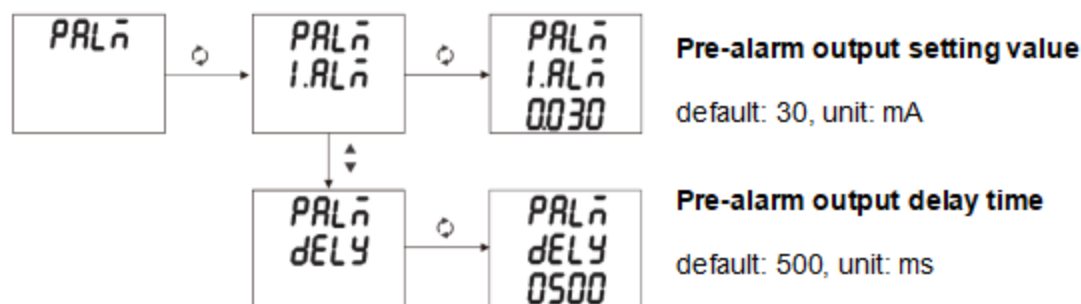
default n.8.1, can select o.8.1/ e.8.1 / n.8.2

Notes:

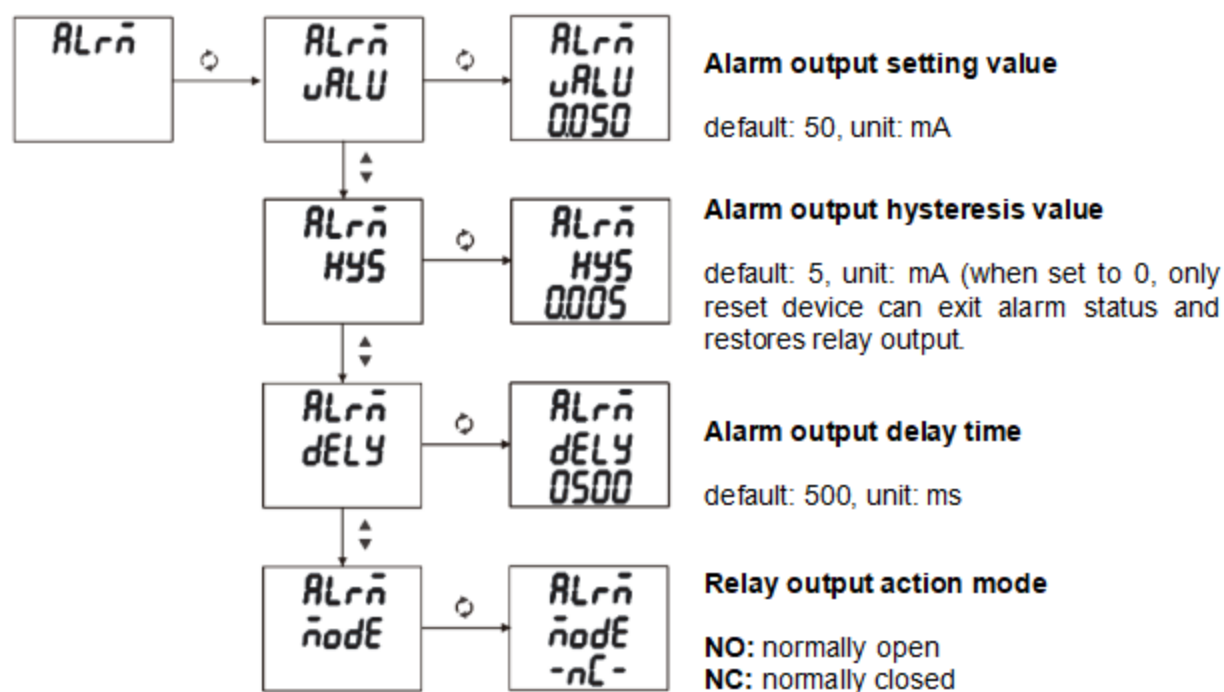
(1) Modbus address setup range 1-247.

(2) Baud ratio can select 1200 / 2400 / 4800/ 9600 / 19200, and regular meter equipped with communication port max baud ratio is 19200bps. If need higher speed, please contact Blue Jay sales team.

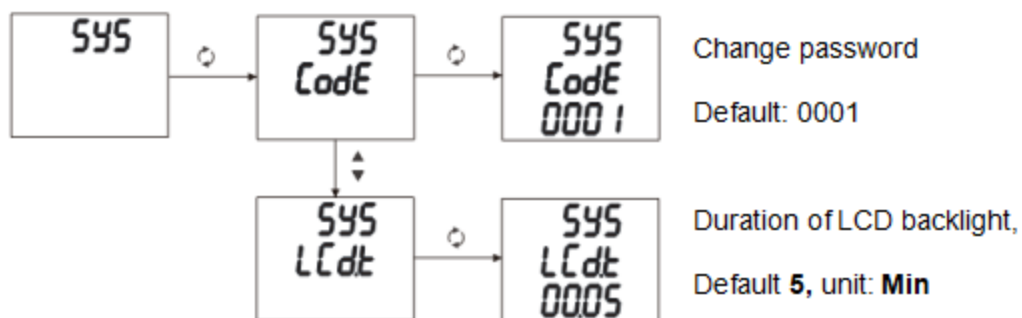
6.4.- Pre-alarm output relay setup



6.5.- Alarm output relay setup



6.6.- System setup



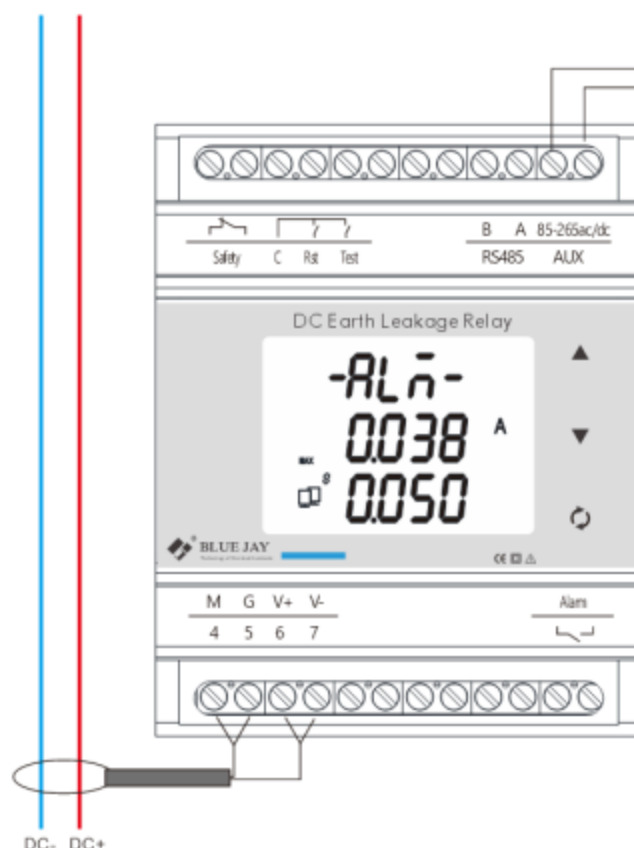
Note:

- If change the password, please keep the password safety, or only return to Blue Jay to reset new password!

7.- COMMUNICATION INTERFACE

7.1.- 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-4MD... 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.

7.2.- 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 BYTE	<i>Starting address, high byte Starting address, low byte Number of registers, high byte Number of registers, low byte</i>
Error Check code	2 BYTE	<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>

7.3.- Register Map

7.3.1.- Basic power data -Primary Side; Function 03 to Read

Register	Data	Byte mode		Instruction
00	Io	int	1	Present real-time DC leakage value, unit: mA
01	Io _{max}	int	1	Historical maximum leakage value, unit: mA
02	Io _{min}	int	1	Historical minimum leakage value, unit: mA
10	Pre-alarm status	int	1	0 : no alarm; 1 : enter alarm status
11	DI	int	1	Bit0 : reset; Bit1 : test
12	DO	int	1	Bit0 : safety; Bit1 : alarm

7.3.2.-Configuration menu (Function 03 to Read & Function 06 to Write)

Register	Data	Byte mode		Instruction
20	Password	int	1	Default: 1
21	Backlight time	int	1	Default: 5 minutes
22	Communication address	int	1	Input range: 1-247
23	Communication baud rate	int	1	0 :1200; 1 :2400; 2 :4800; 3 :9600; 4 :19200.
24	Communication data format	int	1	0 : n.8.1; 1 : o.8.1; 2 : e.8.1; 3 : n.8.2
30	Rated leakage value	int	1	Default: 100, unit: mA
31	DC compensation offset	int	1	Default value: 1000, means no compensation; > 1000 means positive compensation; < 1000 means negative compensation; Compensation unit is 0.1% of rated value
32	Pre-alarm output setting value	int	1	Default: 30, unit: mA
33	Pre-alarm output delay time	int	1	Default: 500, unit: ms
34	Alarm ratio	int	1	Default: 1
35	Alarm output setting value	int	1	Default: 50, unit: mA
36	Alarm output hysteresis value	int	1	Default: 5, unit: mA (when set to 0, only reset device can exit alarm status and restores relay output.)
37	Alarm output delay time	int	1	Default: 500, unit: ms
38	Relay action mode	int	1	0 : normally open, 1 : normally closed

8.- 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;

9.- MAINTENANCE

The ELR-4MD 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