

LogiCon

EARTH FAULT & SHORT CIRCUIT INDICATOR

For Underground Network Systems

USER MANUAL



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1. ABOUT DOCUMENT

1.1. Introduction

This user manual has been prepared for commissioning and effective use of the device Earth Fault & Short Circuit Indicator.

Please read the safety warnings in this manual carefully before connecting and powering your device.

The device's communication details are included in the Earth Fault & Short Circuit Indicator Modbus User Manual.



1.2. Safety Precautions

- Installation, commissioning, maintenance and repairing should be done by qualified technical personals.
- Strictly follow the instructions while connections are made, do not work with live wires.
- A dry dust cloth should be used for cleaning; corrosive, caustic/flammable materials should be avoided.
- Device should be de-energized before cleaning or demounting.
- No replaceable parts in ESI-3I. Device case should not be opened.
- Four current transformers can be connected to ESI-3I.
- Three current transformers are connected to ESI-3I. If the current transformer terminals wanted to be disconnected, transformer terminals should be short circuited first.
- The device should not be used for any other purposes than is it designed for.

2. DESCRIPTIONS

In this section, the general structure of the device, input/output connections, keypad and display structures will be introduced.

2.1. General Features

The device has been developed to detect current faults in medium voltage underground networks.

The device generates a fault signal if the line currents or the ground (residual) current rise above the set threshold value and continue for the set period of time. The fault signal is indicated by external signal lamp, internal led, LCD display and relays. If the current level is returned to nominal values, the fault signal is reset after three seconds, before the automatic reset time has elapsed.

The fault signal can be reset automatically after the fault has been corrected or the reset time has elapsed, or manually from the device or remote.

In case of an event, the device records the fault phase, current value, time and date with the real-time clock property the last occurrence 20 fault can be viewed from the "Events" menu.

Threshold current values and durations, fault reset time, time, date and Modbus communication parameters can be set by the user.

2.2. Technical Features

Power Supply	
Voltage	30-265VAC - 24V-310VDC
Power Consumption	<5W
Back-up Supply	
Battery	Lithium- Ion - 3600mAh 3.6V
Inputs	
Current Inputs	3 Phase
Interval	0-900 Ampere
Digital Input	24VDC
Output Specifications	
Output Number	1-3 (optional)
Contact Types	SPST - NO
Contact Current	1A
Measurements	
Parameters	Three Phase Currents (I _a , I _b , I _c), Neutral Current (I _n)
Accuracy	%3
Communication	

Communication Protocol	Modbus RTU
Communication Line	RS485
Supported Data Communication Speeds (kbaud)	9600, 19200, 38400
Mechanical Specification	
Dimensions (mm)	48x96x70
Mounting	Panel from front
Weight (gr)	280
Terminals	0.5 - 2.5mm ² , Screwed
Protection Class	IP41
Operating Temperature	-10 +70°C
Relative Humidity	Max. 95%
User Interface	
Measurement and Settings	LCD, 128x32 Single-color LCD display, 4 buttons
Fault Indication	Internal LED, External LED Signal Box
Other Specifications	
Language Options	English, Turkish
Current Transformer	
Type	Split type (3)
Dimensions	133x132x23
Cable Radius	70mm
Nominal Current	600A

2.3. Display

The device has a 128x32 monochrome graphic LCD screen.

All parameters and measurements of the device can be set and monitored with the help of pages and buttons on the screen.

When any button is pressed, the backlight of the display turns on and the light automatically turns off after 10 seconds after the last button is pressed.

2.4. Buttons

The user interface is controlled by 4 buttons on the device.



Enter: It logs in the page where the cursor is located. It saves the set parameters. In the pages where more than one parameters are set, the page immediately goes to the next parameter.

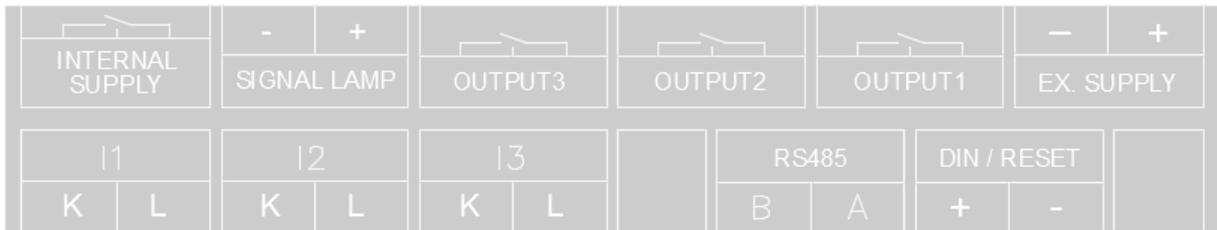
Up: It moves the cursor to. On parameter setting pages, the parameter is increased.

Down: It moves the cursor to down. On parameter setting pages, the parameter is decreased.

Esc: It changes the current page to the previous page. In a parameter setting page, it exits from the page without saving the last settings of the parameter.

2.5. Terminals

The terminals are located on the back side of the device and are compatible with 1.5mm cables. The symbols and explanations of the terminals are given in the table below.



PART 1		
EXTERNAL SUPPLY	1	Supply Input
	2	
OUTPUT1	3	Dry Contacts
	4	
OUTPUT2	5	
	6	
OUTPUT3	7	
	8	
SIGNAL LAMP	9	Lamp Output
	10	
INT SUPPLY	11	Internal Supply
	12	

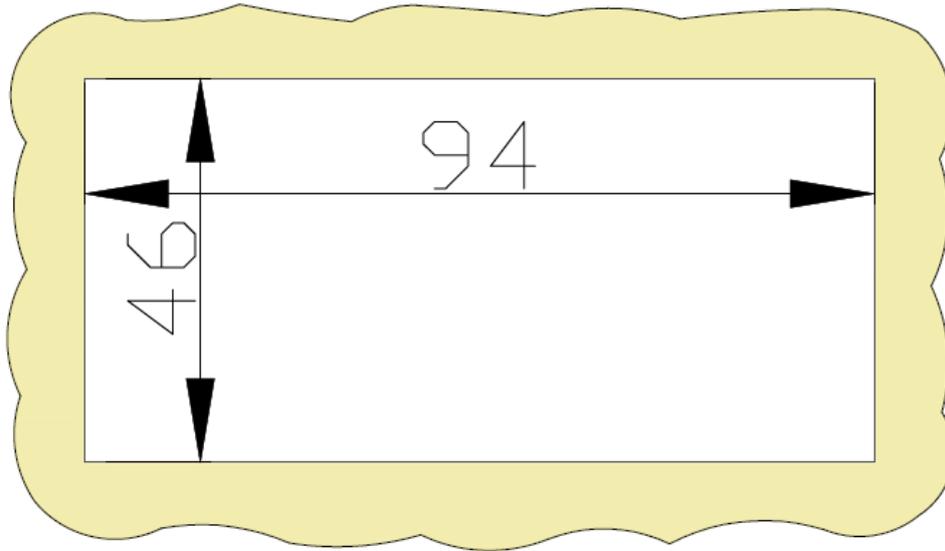
PART 2		
I1	24	Measurement Currents Line 1 K, Line 1L, Line 2 K, Line 2L, Line 3 K, Line 3L
	23	
I2	22	
	21	
I3	20	
	19	
	18	
RS485	17	RS485 Interface
	16	
DIGITAL INPUT	15	Digital Inputs
	14	
	13	

3. CONFIGURATION

3.1. Mounting

Before wiring, the device must be installed on the panel.

A suitable area of 94x46mm must be cut on the panel for mounting the device.



The device is mounted on the panel from front side, and fixed by the clamping devices.



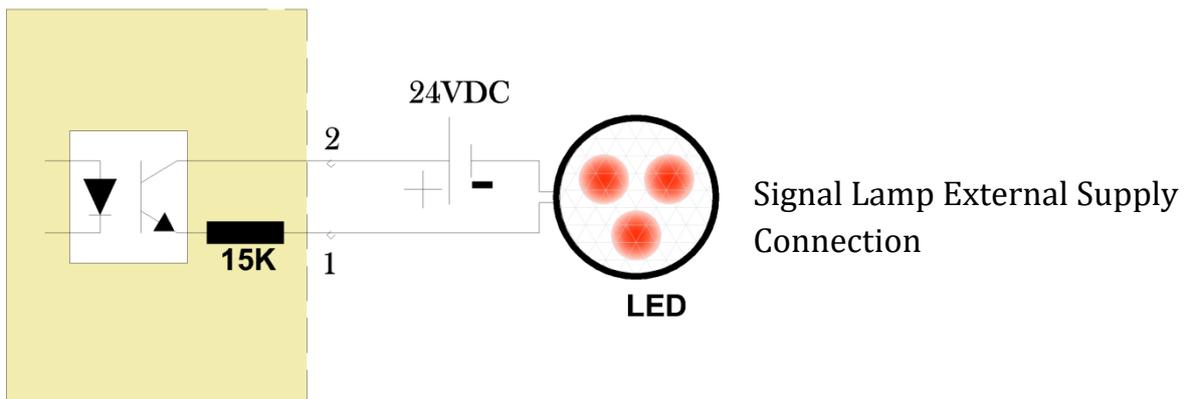
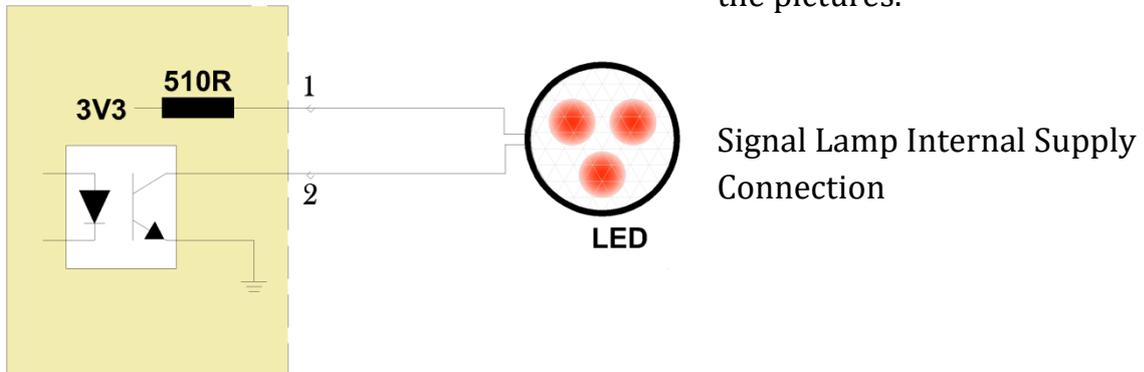
3.2. Cabling

Make sure that you are not working with live terminals during wiring.

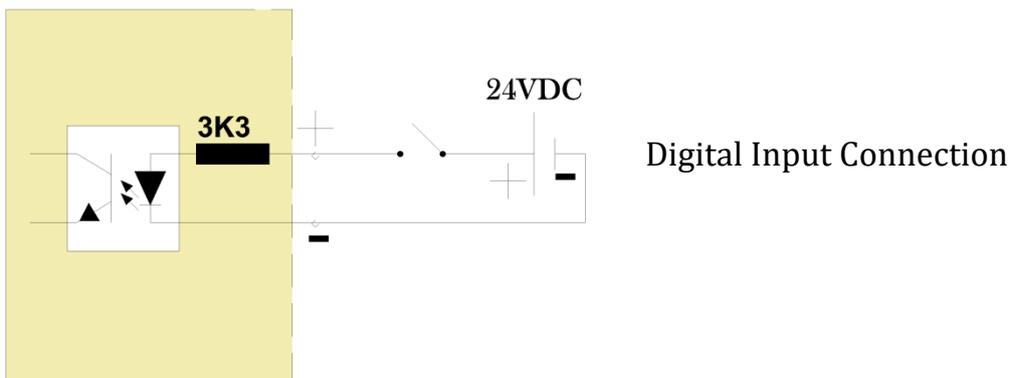
It is recommended to install a 1.5mm cable and fork type cable terminal for a healthy cabling operation.

Make sure that the cables are connected firmly to the terminal when installing the current transformer.

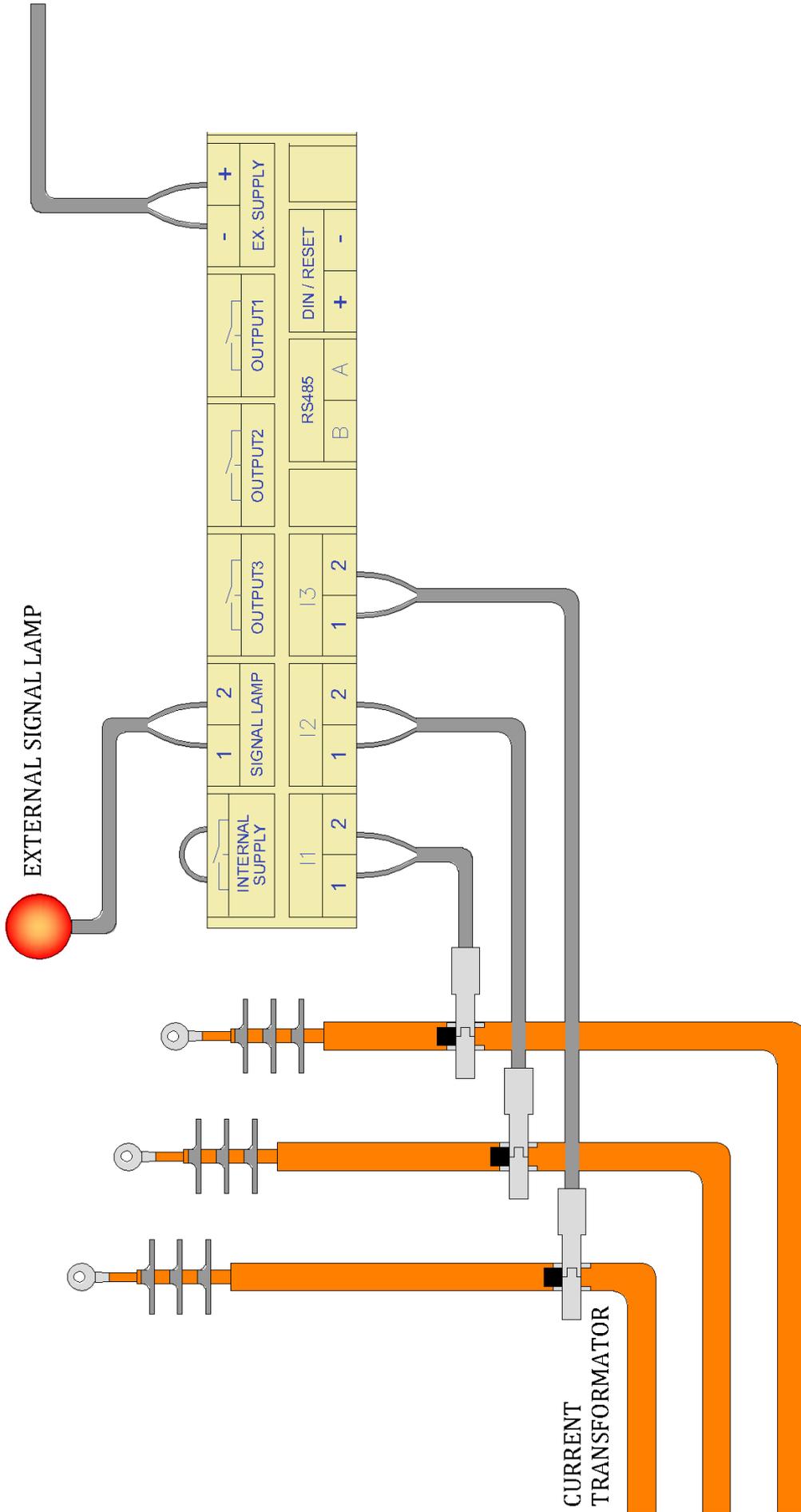
The external signal lamp can be manufactured to be an internal (3VDC) supply or external (24VDC) supply according to the order. Depending on the type of your device, make the external signal lamp in accordance with the wiring diagram in the pictures.



Digital Input (external reset) is optically isolated. It requires external 24V power supply. Positive and negative connection points must be connected as shown in the drawing.



The terminals "Int Supply 1-2" must be shunted for commissioning of the internal lithium battery.



4. WORKING PRINCIPLE

The three-phase current effective (RMS) values from the current transformer inputs are calculated with periods of 20ms. The ground (residual) current is generated from the vectoral sum of the three phase current inputs and the effective value is calculated again with periods of 20ms.

When an RMS current value exceeds the set threshold current value, for the set time, a fault signal is generated.

The graphs below show the network current changes that will cause the instrument to generate a fault signals.

1. Condition

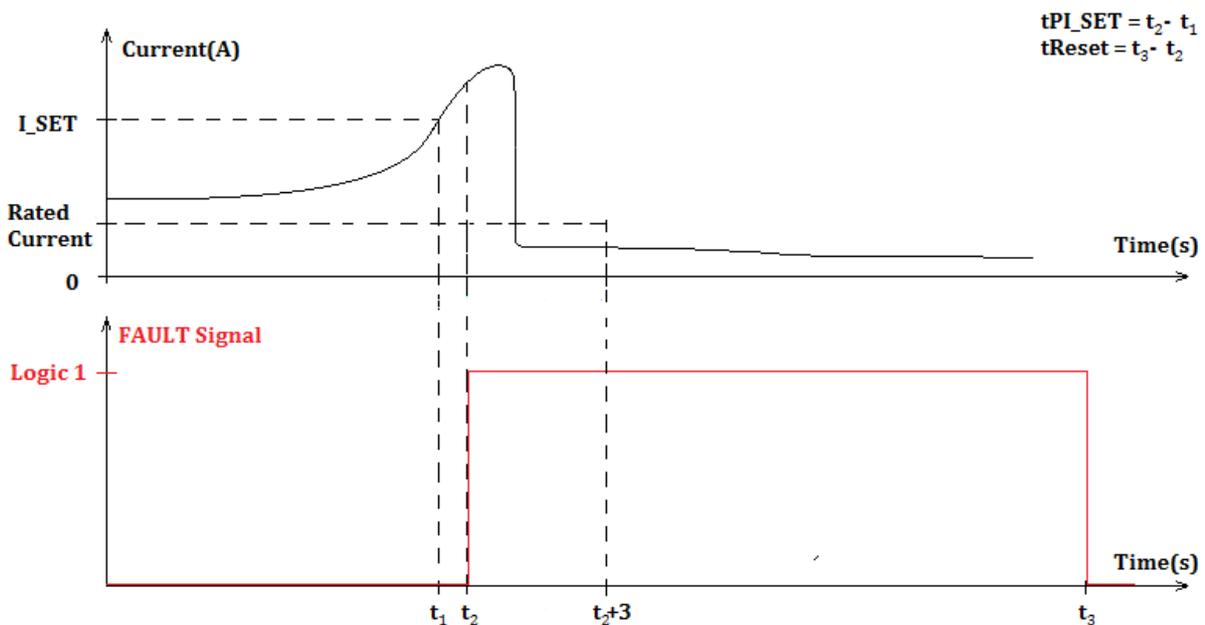


Figure 1

A high current that occurs due to a fault in the network exceeds the threshold value and continues above the threshold value for the set time or longer. When protection equipments trip the current becomes zero.

The device generates a fault signal when (t_2) current (I) exceeds the adjusted threshold value (I_{SET}) at the adjusted detection time (t_{PSET}). When the protection element is opened, the current is zero and it does not mean that the fault is corrected, so the fault signal continues. After the user-defined automatic reset time (t_{Reset}) is full (at time t_3), the device is automatically reset.

2. Condition

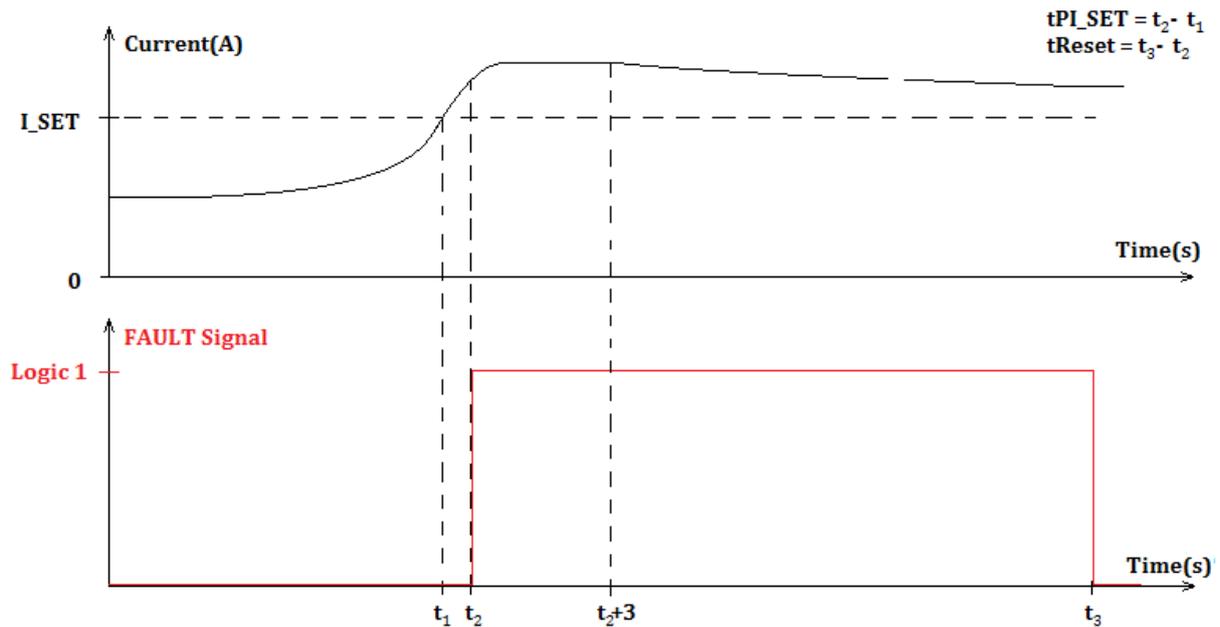


Figure 2

A high current that occurs due to a fault in the network exceeds the threshold value and continues above the threshold value for the set time or longer. If the breaker- disconnecter does not open, the current keep going above the threshold value.

The device generates a fault signal when (t_2) current (I) exceeds the adjusted threshold value (I_{SET}) at adjusted detection time (t_{PSET}). After the user-defined automatic reset time (t_{Reset}) is full (at time t_3), the device automatically resets.

3. Condition

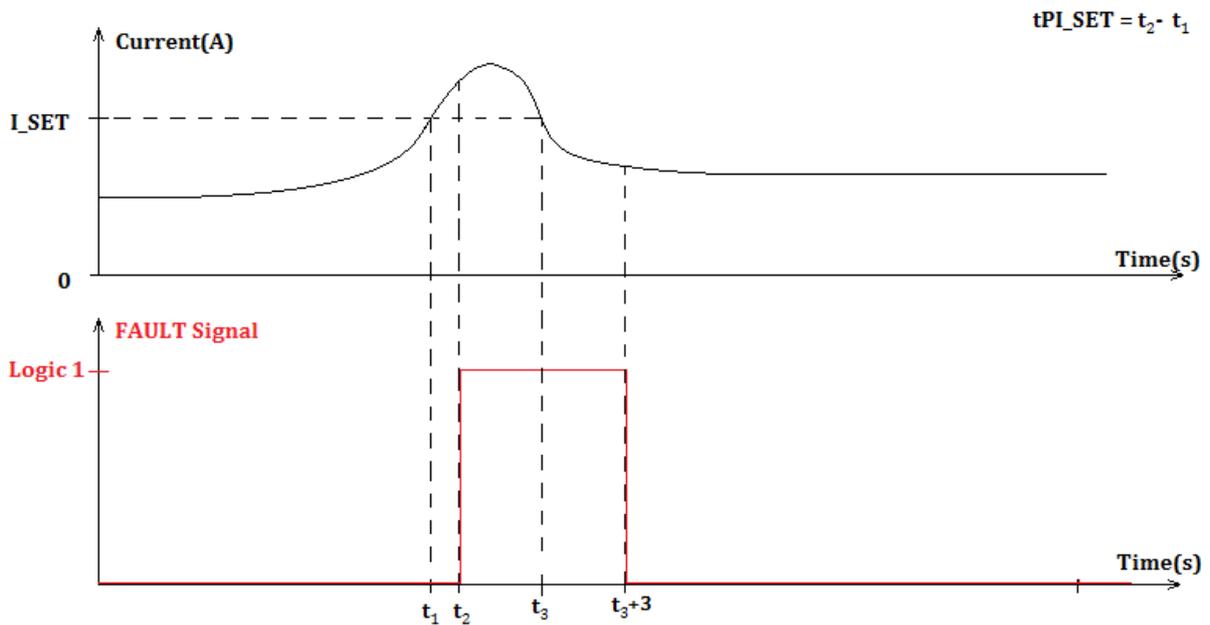


Figure 3

A high current due to a fault in the network passes the threshold value and falls below the threshold value for the adjusted period of time or longer.

In this graph, the current (I) produces the device fault signal when (t_2) the threshold value (I_{SET}) rises over the adjusted sensing period (t_{PI_SET}). If the current restores before the current reset time (t_{Reset}) has elapsed, the fault signal is automatically reset after 3 seconds after (t_3) the current threshold value (I_{SET}) falls below the current threshold value (I_{SET}).

4. Condition

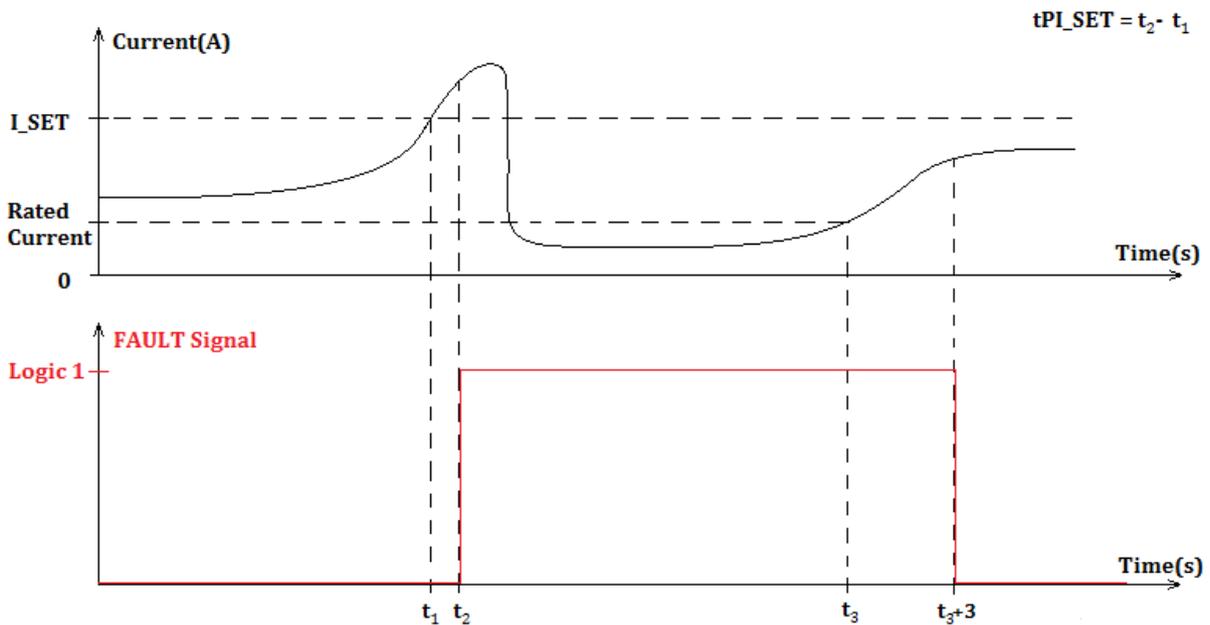


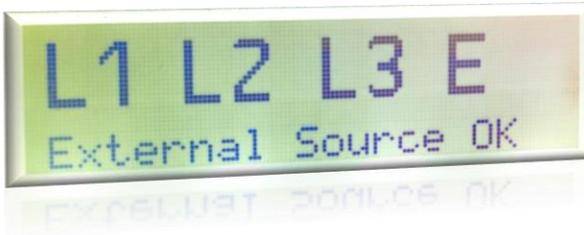
Figure 4

A high current that occurs due to a fault in the network exceeds the threshold value and continues above the threshold value for the adjusted time or longer. By tripping on the breaker-disconnector, the current flow stops. The fault corrects before the automatic reset time expires and the faulty current restores below the threshold value again.

When at (t_2) the current (I) exceeds the threshold (I_{SET}) by the adjusted detection time (t_{PI_SET}), the device generates a fault signal. When the protection equipment trips, the current is zero but it does not mean that the fault is corrected, so the fault signal continues. When the current returns to the nominal values (at t_3) before the automatic reset time has elapsed, the fault signal is reset after 3 seconds the fault has been restored (t_{Reset}).

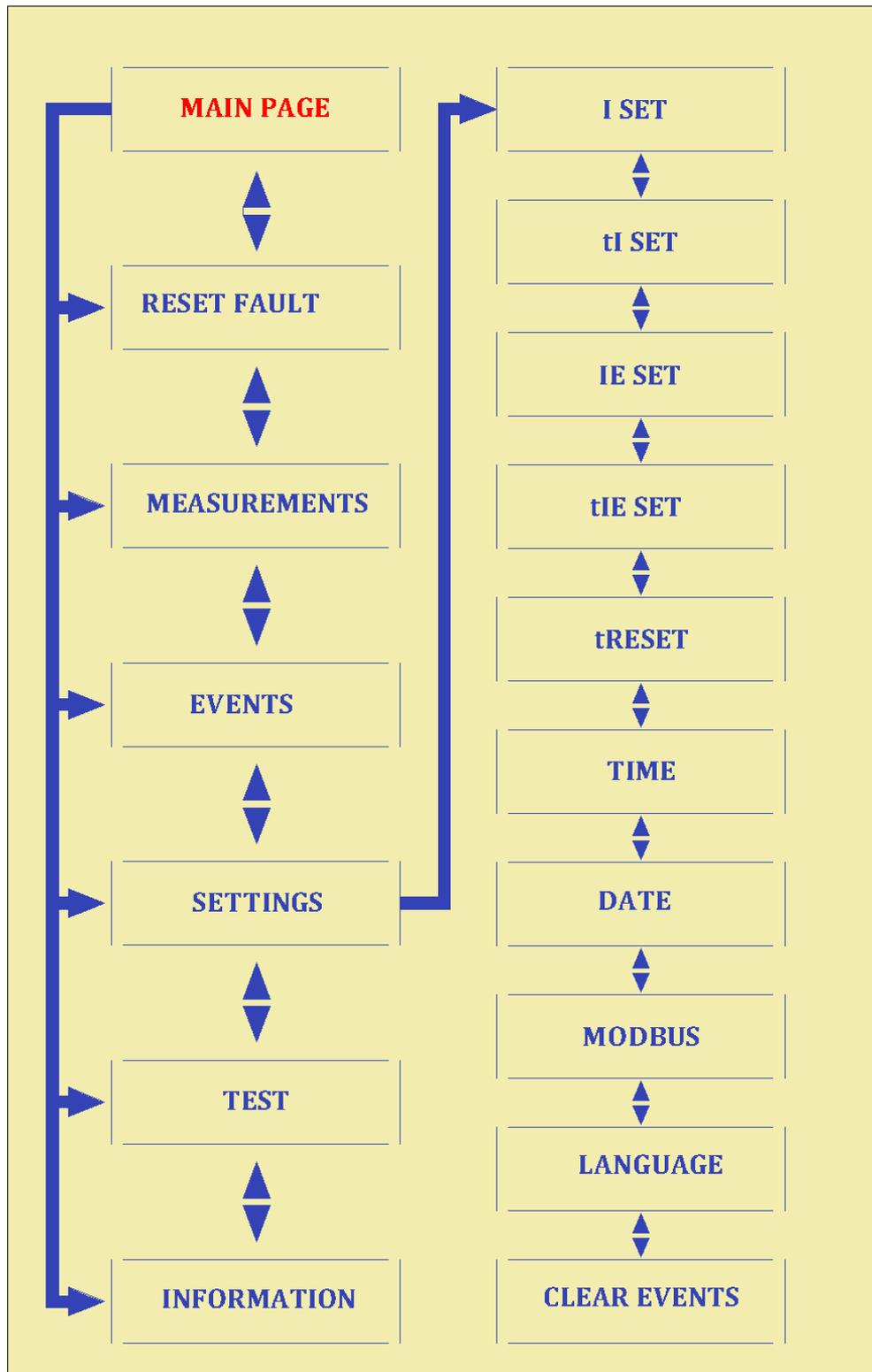
When a fault signal is generated, the LEDs will flash in every 2 seconds in the first half of the adjusted auto reset period, and flash in every 4 seconds in the next half.

5. MAIN PAGE

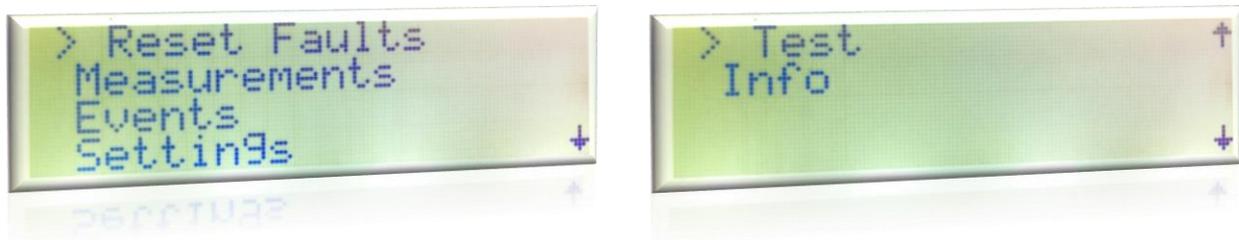


The "Main Page" screen opens when the device is turned on. On the main page, external source status and the symbols L1, L2, L3 and E, representing phase and earth current, appear. In the event of a fault, the phase symbol of the fault will flash.

The "enter" button is pressed to switch the "menu page".



5.1. Menu Page

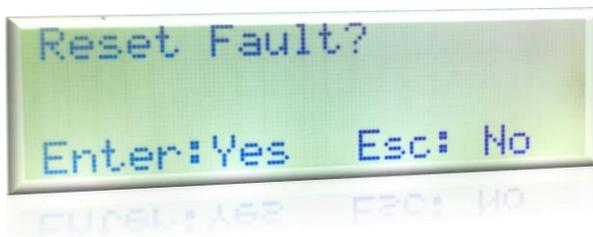


There are 6 subheadings of the menu page. The cursor is moved with the “up” and “down” direction buttons and the desired page can be selected.

Once the desired page is selected, the “enter” button is pressed and the selected page opens.

When the “Esc” button is pressed, the screen returns to the "Main Page".

5.2. Reset Faults Page



In the case of a fault condition, the fault can be reset manually by entering the “Reset Faults” page and pressing the “enter” button.

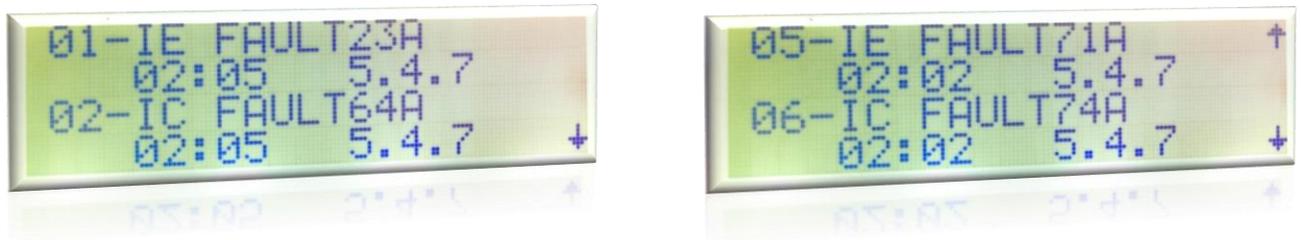
When the “esc” button is pressed, the menu page opens.

5.3. Measurements Page



The "Measurements" page displays the current values of the network. When the “Esc” button is pressed, the menu page opens.

5.4. Events Page



The dates and times of the latest faults are listed on this page, together with the fault current values. The list scrolled up and down with the “up” and “down” direction buttons. The list is sorted from the newest to the oldest faults.

5.5. Settings Page

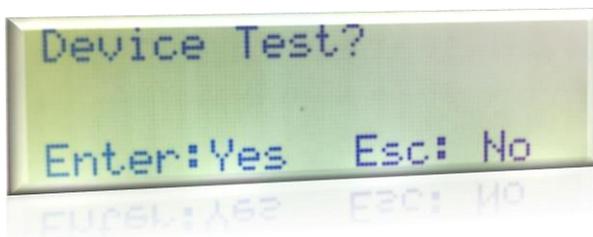


In this page, the fault current values and the time required for the fault condition to occur, auto reset time, time-date settings and Modbus parameters can be set.

With the “up” and “down” direction buttons, parameters to be changed can be selected and pressing the “enter” button, a new page opens.

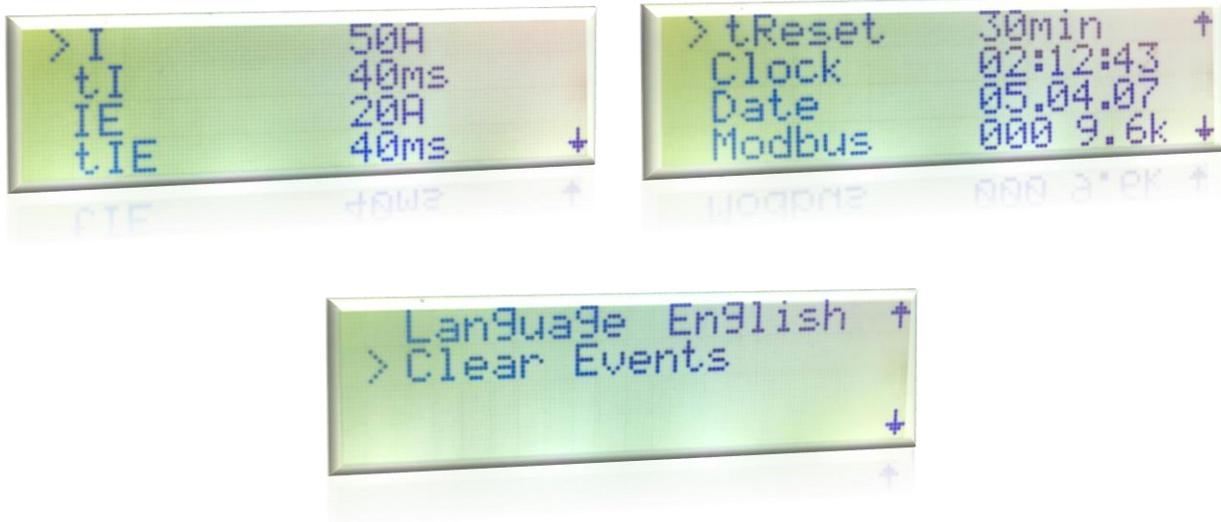
“The esc” button is pressed to return to the main menu.

5.6. Test Page



When the test page is entered, a fault signal is generated by pressing the “enter” button. When the “enter” button is pressed, the output dry contact activates, the main page opens on the LCD and the fault symbols flash, the LED on the device flashes. The generated fault signal is reset after 4 seconds.

6. SETTINGS PAGE



There are 9 submenus on the “Settings Page”. The desired setting page is selected with the “up” and “down” buttons.

When the “enter” button is pressed, a new page is displayed on the screen where the selected parameters are set.

When the “esc” button is pressed, the main menu page opens.

6.1. I - Phase Current Threshold Value



The phase current threshold value is set in this page. The desired value is set between 50 and 1000A with 50A steps with the “up” and “down” direction buttons. Pressing the “enter” button, the value is saved and page is returned to the settings page.

6.2. t_I - Phase Current Detection Time



The detection time is set between 40 and 800 ms in 40 ms steps. The value is changed by the “up” and “down” direction buttons. The value is saved when the “enter” button is pressed.

6.3. I_E - Earth Current Threshold Value



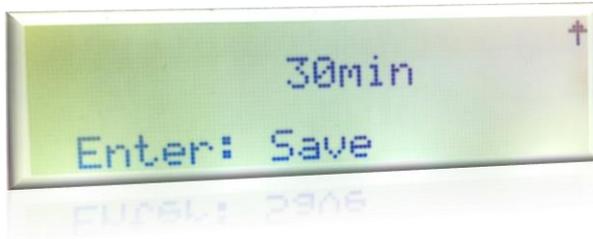
The earth current threshold value is set in this page. The desired value is set between 20 and 200A with 20A steps with the “up” and “down” direction buttons. Pressing the “enter” button, the value is saved and the page returns to the settings page.

6.4. t_{IE} - Earth Current Detection Time



The detection time is set between 40 and 800 ms in 40 ms steps. The value is changed by the “up” and “down” direction buttons. The value is saved when the “enter” button is pressed.

6.5. Reset Time



The reset time can be set from 30 to 240 minutes in 30 minutes steps. The value is changed by the “up” and “down” direction buttons. The value is saved when the “enter” button is pressed.

6.6. Time Settings



The time is set starting from the leftmost digit. The digit set by the “up” and “down” direction buttons is saved when the “enter” button is pressed and the cursor moves to the next digit.

When the cursor reaches the rightmost digit, pressing the input button ends the time setting and the setting page opens.

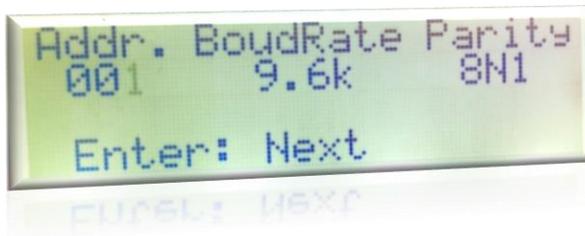
6.7. Date Settings



The date is set starting from the leftmost digit. The digit set by the “up” and “down” direction buttons is saved when the “enter” button is pressed and the cursor moves to the next digit.

When the cursor reaches the rightmost digit, pressing the “enter” button ends the date settings and the setting page opens.

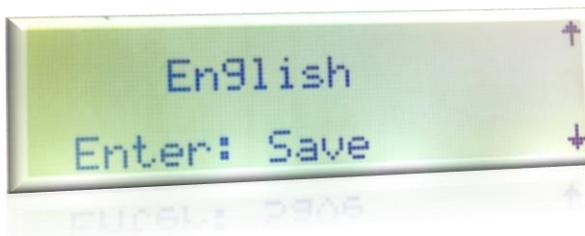
6.8. Communication Settings



The communication settings are set starting from the leftmost digit. The digit set by the “up” and “down” direction buttons is saved when the “enter” button is pressed and the cursor moves to the next digit.

When the cursor reaches the rightmost digit, pressing the “enter” button ends the communication setting and the setting page opens.

6.9. Language Setting



The direction buttons change the language setting of the device and the language setting is saved when the “enter” button is pressed.

6.10. Clear Event

To clear the records listed on the events page, go to the "Clear Events" page and press the "Enter" button.



APPENDIX

a. Measurements

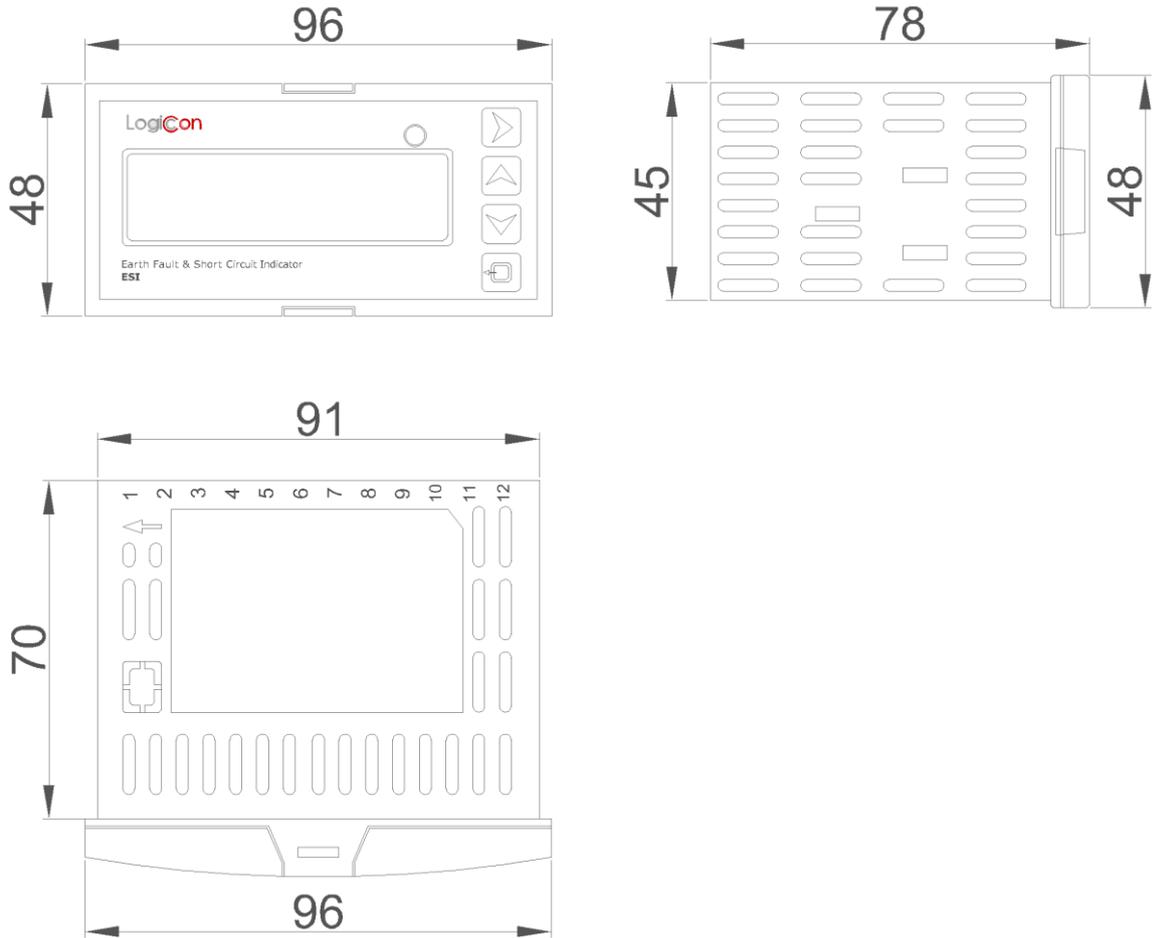
Measurements	Interval	Step	Sensitivity
Current (A)	[0 – 65000]	1	%3

b. Parameter Table

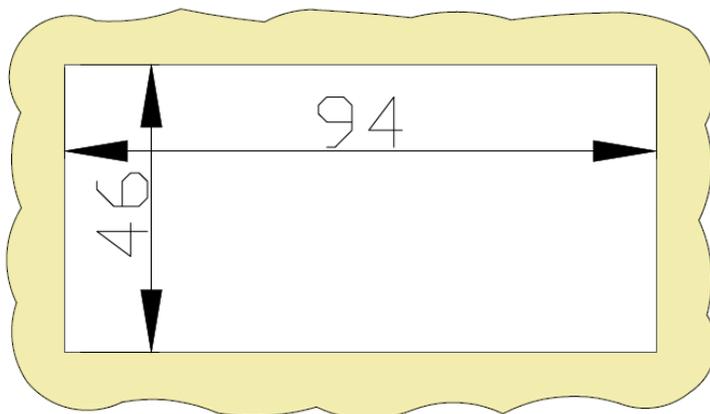
Control Parameters	Adjustable	Interval Steps
I_SET (A)	[50 – 1000]	50
tI_SET (ms)	[40 – 800]	40
IE_SET (A)	[20 – 200]	20
tIE_SET (ms)	[40 – 800]	40
tReset (min)	[30 – 240]	30

c. Dimensions

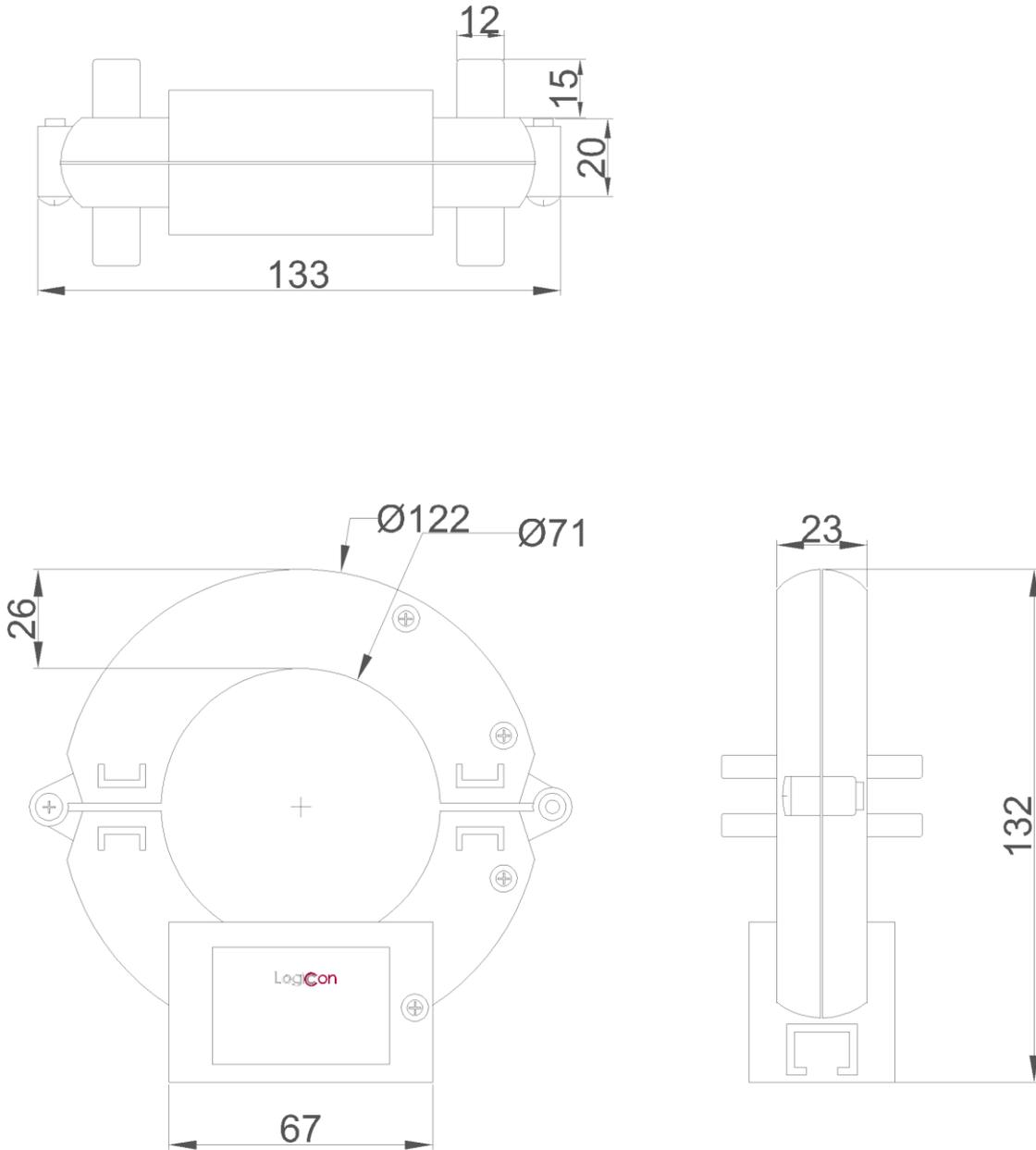
Main Device Dimensions



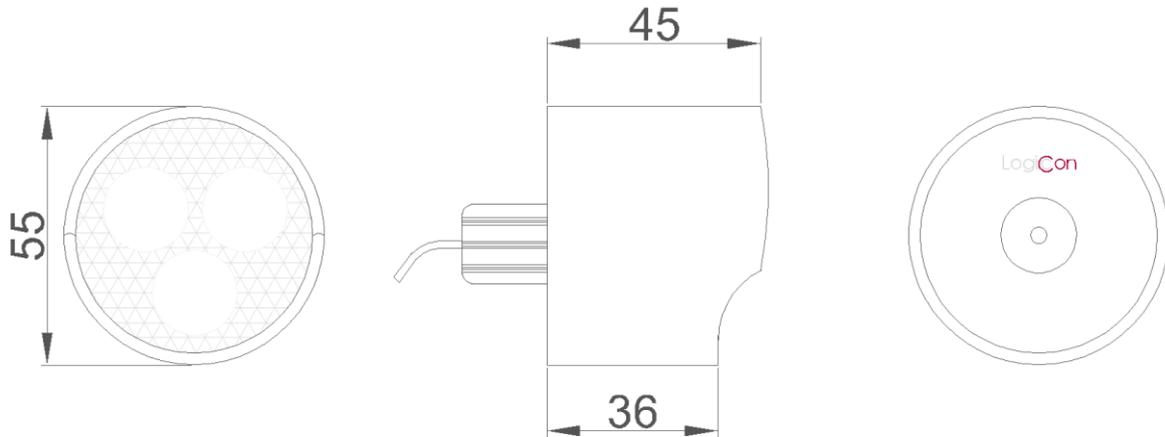
Panel Cross-Sectional Area



Current Transformers Dimensions



External Signal Lamps Dimensions



d. Ordering Coding

