



OIL LEVEL MONITOR - MNO

Manual

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INTRODUCTION

The Oil Level Monitor for Transformers and Reactors MNO, is a microprocessed equipment of high precision that indicates the level of oil in scale that varies between 0 and 100 %, and provides this indication in an analog output (0 to 1, 0 to 5, 0 to 10, 0 to 20 or 4 to 20mA), and in an Rs485 serial output with Modbus RTU protocol and DNP 3 (L1) allowing remote access to the Monitor through a supervisory system.

The MNO was built obeying strict quality standards and uses state-of-the-art electronic components (SMD), its hardware was designed to withstand severe working conditions, and can be installed directly in power transformers and reactors, in panels in the yard of power substations, offshore platforms and chemical industries. Meets the levels of requirements, supportability and reliability according to IEC, DIN, IEEE, ABNT standards.

As signal input the MNO has 1 input for configurable resistive signal from 0 to 5000 ohms, or current signal input from 4 to 20mA, for the monitored value (measured) it is possible to make 3 levels of programming for actuation of the contacts (High Level, Low Level and Shutdown), 3 outputs of independent NAF relays and 1 NF fault signaling relay, 1 configurable analog output that can be from 0 to 10; 0 to 20 or 4 to 20mA, 1 Rs485 output with Modbus RTU protocol and DNP 3.0, all parameters can also be configured directly on the front of the equipment or through the RS485 serial output.

MAIN FEATURES

- 4-digit display of 13.8mm high high LED high (red);
- Precision of 1 (one) decimal place;
- Level measurement range from 0 to 100%;
- Compensated input for resistive buoy or in 4 to 20mA;
- Universal power supply 48 to 265 Vdc/Vac;
- Digital output Rs485 (ANSI/TIA/EIA-485-A) with Modbus RTU protocol and DNP 3 (L1) (Level1);
- Analog output of 0a1, 0a5, 0a10, 0a20 and 4a20mA configurable directly on the front;
- Stores in memory the maximum and minimum levels reached;
- NAF Alarm Contact for maximum level with programmable hysteresis;
- NAF Alarm Contact for minimum level with programmable hysteresis;
- Timed NAF Shutdown Contact, to maximum and/or minimum level that reaches the configured value;
- Contact for Fault Indication (watchdog);
- High mechanical strength box, built entirely in aluminum;
- Degree of protection (NBR IEC 60529) IP40 (Front) and IP30 (Rear);
- Auto Baud Rate from 2,400 to 57,600 bps (Automatically Detects the speed of the Communication network);
- Reduced size 48x96x140mm;
- Easy parameterization and use;
- 2 years warranty;

TECHNICAL DATA

Operating Voltage	48 to 265 Vdc/Vac 50/60 Hz
Operating Temperature	-40 to + 85°C
Consumption	< 15 W
Level Measurement Input	Boia (0 to 5000 ohms or 4 to 20 mA)
Measuring Range	0 to 100%
Analog Outputs and Maximum Load Options *	0 ... 1 mA – 8000 Ohms*
	0 ... 5 mA – 8000 Ohms
	0 ... 10 mA – 8000 Ohms
	0 ... 20 mA – 8000 Ohms
	4 ... 20 mA – 8000 Ohms
Maximum Error of Measurement Inputs	0.25% of the end of the scale
Maximum Analog Output Error	0.25% of the end of the scale
Outgoing Contacts	4 – Free of Potential
Maximum Switching Power	40W / 250 VA
Maximum Switching Current	6.0 A
Maximum Driving Current	RS485 (ANSI/TIA/EIA-485-A)
Serial Communication Port	Modbus RTU and DNP 3.0 (Slave)
Auto Baud Rate	2,400 to 57,600 bps
Box (DIN IEC 61554)	48 x 96 x 140 mm – Aluminium
Equipment Fixation	Built-in Panel Mount
Degree of Protection (NBR IEC 60529)	TP40 (front) and IP30 (rear)

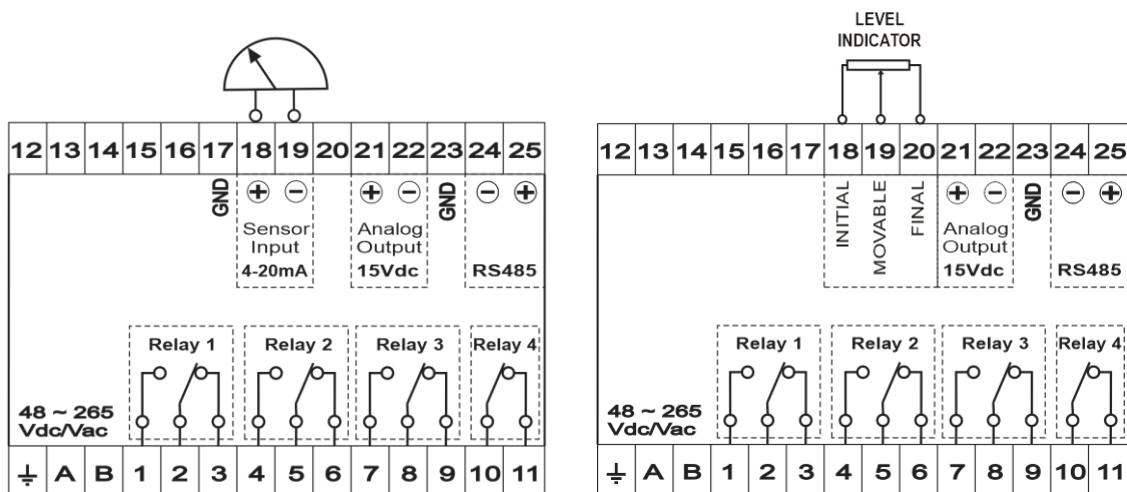
Table 1 – Technical data of the MNO.

• TYPE TESTS

- Applied Voltage (IEC 60255-5): 2kV / 60Hz / 1 min. (against land);
- Voltage Impulse (IEC 60255-5): 1.2/50 μ sec. / 5kV / 3 neg. and 3 pos. / 5 sec. Interval;
- Electrostatic Discharges (IEC 60255-22-2): Air mode = 8kV / Counted mode = 6 kV;
- Immunity to irradiated electromagnetic disturbance (IEC61000-4-3): 80 to 1000 MHz / 10V/m;
- Immunity to Fast Electrical Transients (IEC60255-22-4): Alim/Entr./Outputs=4KV/common. 2kV;
- Surge Immunity (IEC60255-22-5): phase/neutral 1KV, 5 per polar. (\pm) - phase-earth/neutral-earth 2KV, 5 per polar (\pm);
- Immunity to Conducted Electromagnetic Disturbances (IEC61000-4-6): 0.15 to 80 MHz / 10V/m;
- Climate Test (IEC60068-21-14): - 10°C + 70°C / 72 hours;
- Vibration Resistance (IEC60255-21-1): 3 axes / 10 to 150Hz / 2G / 160min/axis;
- Vibration Response (IEC60255-21-1): 3 axes / 0.075mm-10 to 58 Hz / 1G from 58 to 150 Hz / 8min/axis;

CONNECTION DIAGRAMS

MNO - 2 - mA signal input (active 15Vdc) MNO - 1 - Resistive signal input



MNO - 3 - mA signal input (passive 24Vdc)

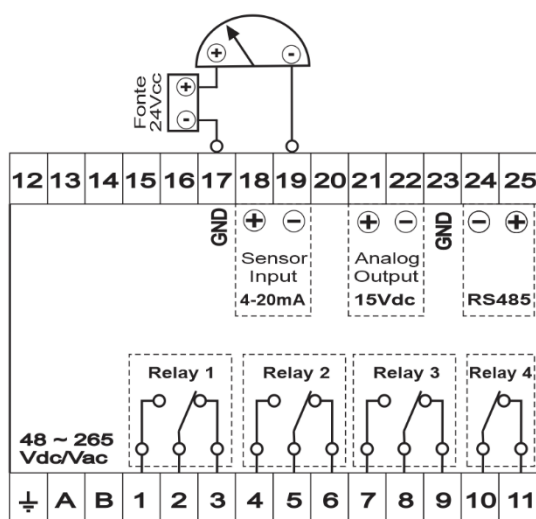


Figure 1 – Connection diagrams

DIMENSIONS

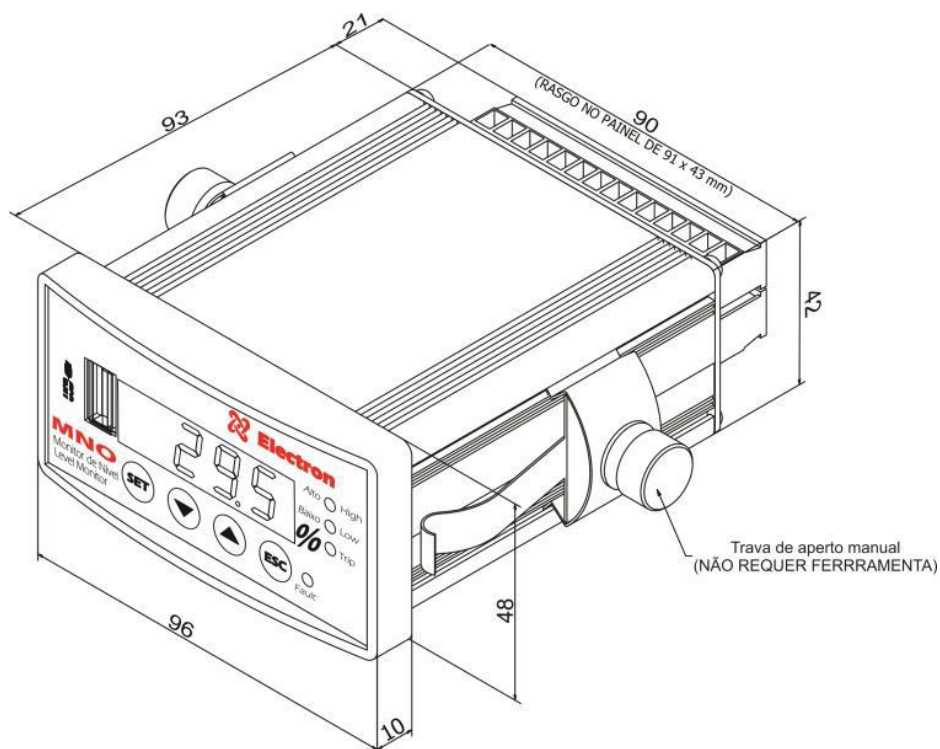


Figure 2 – Dimension

APPLICATION EXAMPLE

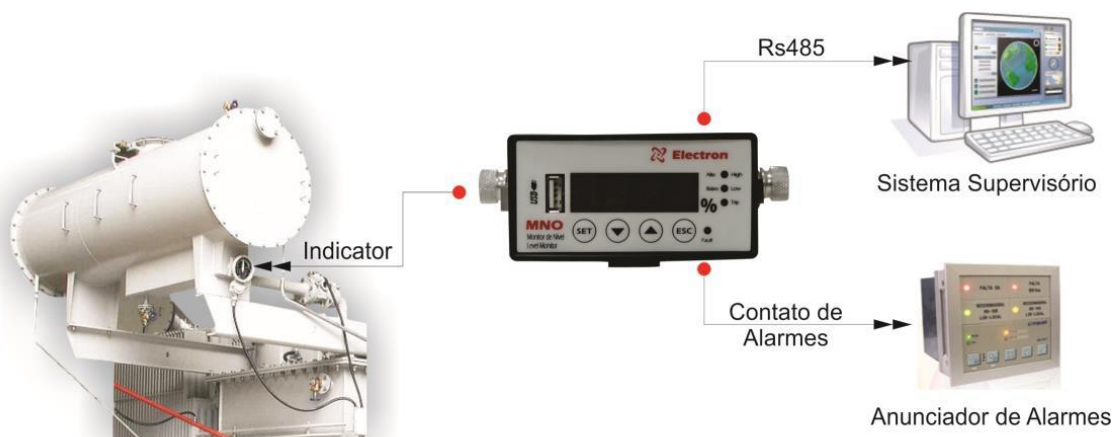


Figure 3 – Application Example

OPERATION CHART

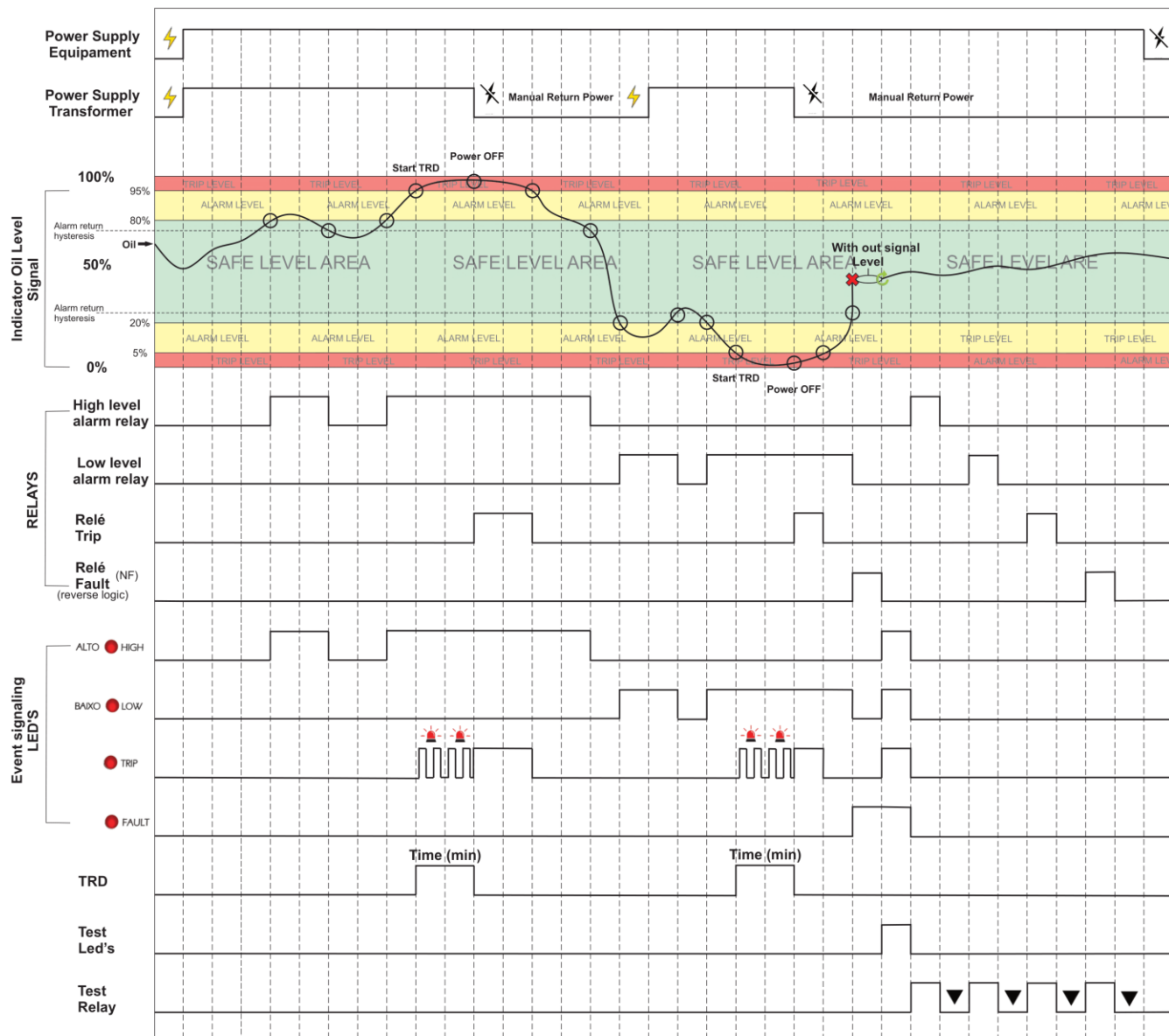


Figure 4 – Operation Chart

PREVENTIVE MAINTENANCE


PREVENTIVE AND CORRECTIVE MAINTENANCE							
Items to be checked preemptively			Scan Frequency				Corrective action
SHARE	Verification Elements	ACTIVITIES	Every Month	Every 3 Months	Every 6 Months	Every 1 Year	When Needed
VERIFICATION	Fastening and fitting clip on the rail	Attachment to panel door or panel bottom		X			Retightening, Fitting, terminal exchange or screw exchange
	Terminals and Connector Comb	Fastening and fitting into the equipment		X			
		Tightening of the screws in the attachment of the conductors		X			
	Indicators	Integrity / Positioning / Fastening			X		Replacement, Repositioning and/or fixing of indicators
	Sensor well in Oil Transformers	Oil level in the well			X		Filling with oil up to the indicated level
TESTS & MEASUREM ENTS	Relays and Digital Outputs	Individual drive test			X		Forward to technical assistance of Electron do Brasil
	Led's and Displays	Test drive Led's and display segments			X		
	Navigation buttons	Navigation test of navigation buttons			X		
	Input of Indicators	Measure indicator entries using a pattern				X	
	Input Supply Voltage of the equipment	Measure Power Input Voltage			X		Replace voltage input values according to equipment model
	RS-485 communication outputs	Communication and command testing in the supervisory system			X		Forward to technical assistance of Electron do Brasil
	Milliampere Current Signal Inputs	Measure, compare, and measure input signal in passive and/or active mode			X		
	Milliampere Current Signal Outputs	Measure, compare, and measure input signal in passive and/or active mode			X		
CLEANING	Terminals and Comb of connectors and connection box	Debris, Impurities and Moisture	X				Cleaning with dry cloth, compressed air and vacuum cleaner
	Aluminum equipment enclosure		X				
	Front of the Equipment Display		X				
 ATENÇÃO	<div><div>1 - Keeping the equipment within the ideal working temperature (50°C to 60°C) prolongs the useful life and avoids corrective maintenance.</div><div>2 - The accumulation of dust and impurities in the installations can cause short circuit and burning of equipment and sensors.</div><div>3 - After 10 years of use it is recommended to replace the equipment.</div></div>						

Table 2 – Preventive maintenance

INSTALLATION SOFTWARE FOR PARAMETERIZATION - USEEASY

- 1) Access the software page on our Website <https://electron.com.br/site/software/>
- 2) Find your equipment and download the corresponding software

MNO - Monitor de Nível de Óleo



Solicite Orçamento

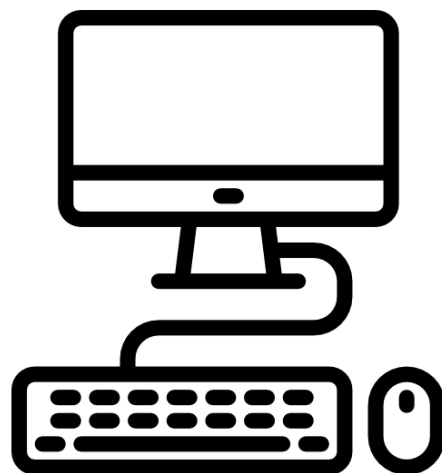
SOFTWARE USE EASY



Use_Easy_Cloud

Versão: 1.0
Tamanho: 286.83 KB
Data de modificação
12/04/2023

Baixar



ACCESSORIES FOR INSTALLATION

Electron do Brasil has a line of accessories that can be purchased together in order to offer a complete solution to meet your application with practicality. We have listed some of the main accessories that can be used for MNO operation.



Double door panel for outdoor/outdoor use: Box for external use with double door for mounting instruments, accessories and passage of control wires and power of the power transformer. The external door contains glass display with UV protection for viewing the quantities measured by the temperature monitor and the panel contains special paint that is weather resistant and its degree of protection is IP 55, as NBR IEC 60529:2017.

Link to the page of the double port panel for external use – IP 55:
<https://electron.com.br/site/produtos/painel-para-uso-externo-ip55/>

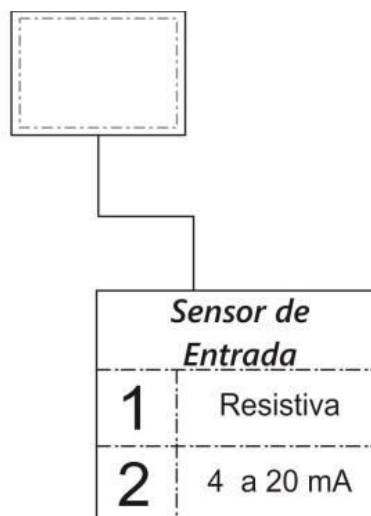


Reference card for PT-100 signal: This accessory was developed to perform the verification of the temperature value displayed by equipment with input of RTD PT-100 sensors of 3 wires. It consists of precision resistors that send an equivalent fixed and constant resistance signal for selection between 3 different ranges, 0 °C (100 Ohms), 26 °C (110.9 Ohms) and 200 °C (175.86 Ohms).

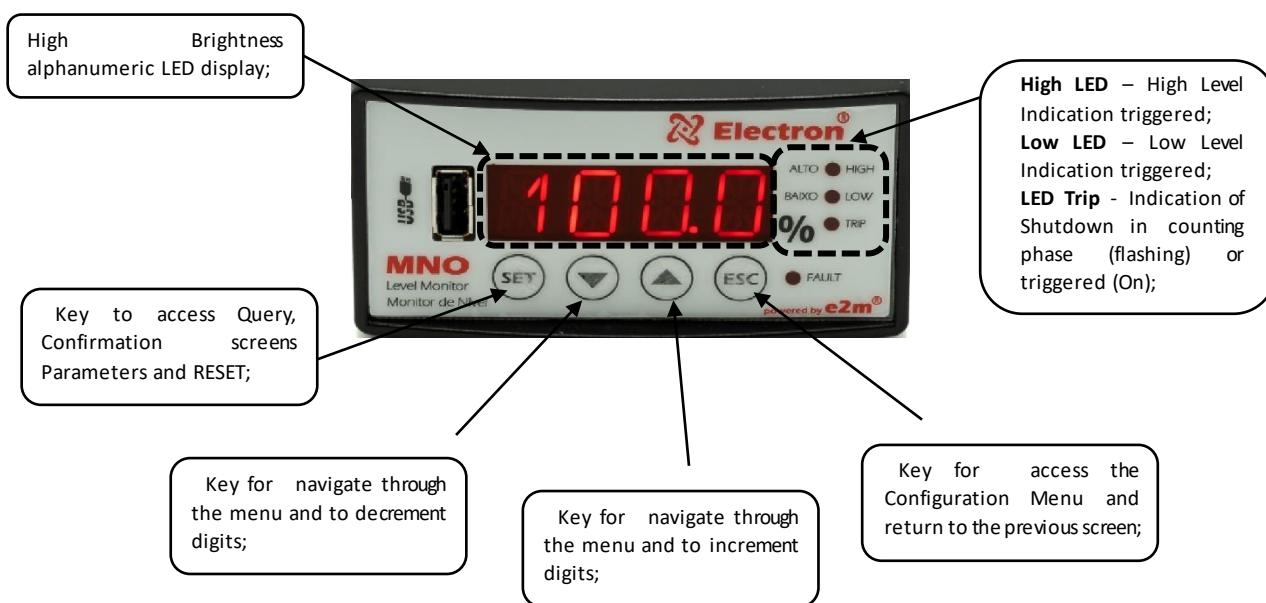
Link to the Reference Card page for PT-100 sign:
<https://electron.com.br/site/produtos/>

ORDER SPECIFICATION

Monitor de Nível de Óleo- MNO



GETTING TO KNOW MNO

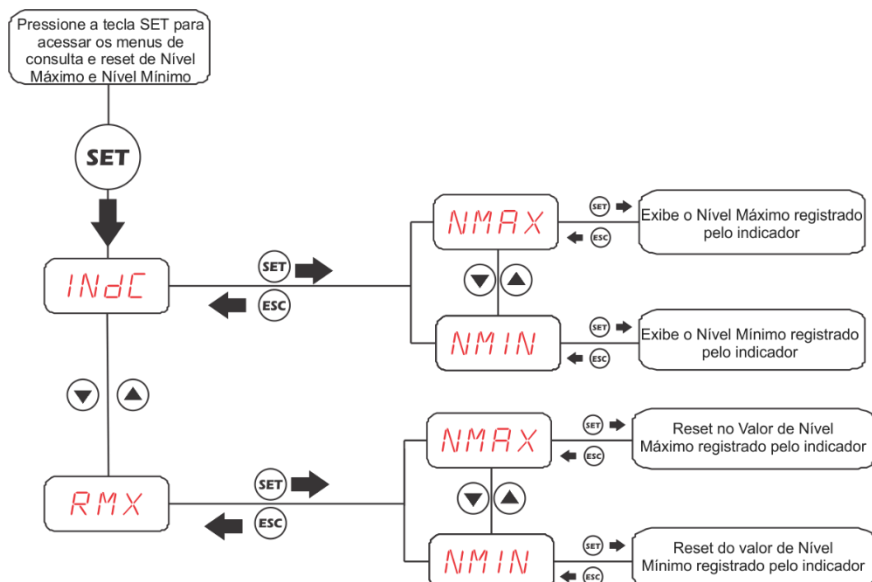


QUERY MENU

To view the Maximum Level and the Minimum Level reached by the indicator, press the SET key and then use the increment key or the decrement key to navigate the menu, to see the desired parameter, press the SET key, to return to the previous menu press the ESC key.

Menu	Parameter	Description
<i>INDC</i>	→ Menu to consult the maximum and minimum level recorded by the indicator;	
	<i>NMAX</i>	Screen to consult the Maximum Level recorder by the indicator. To return to the root menu, press the ESC key;
	<i>NMIN</i>	Screen to consult the Minimum Level register by the indicator. To return to the root menu, press the ESC key;
<i>RMX</i>	→ Menu to delete the Maximum and/or Minimum Level record; NOTE: By deleting the current maximum and/or minimum values automatically, the current record becomes the stored value.	
	<i>NMAX</i>	Press SET and the equipment will perform a RESET of the current value of the Maximum Level recorded by the indicator;
	<i>NMIN</i>	Press SET and the equipment will perform a RESET of the current value of the Minimum Level recorded by the indicator;

QUERY MENU FLOWCHART



CONFIGURATION MENU

Pressing the SET key in the CONF option will appear on the display a four-digit number that is the reminder of the password that is configured on the equipment and soon after 0000 will appear. Use the increment and or decrement key to enter the password, to confirm the chosen number and move to the next house press the SET key, To return to the previous number, press the ESC key. Confirming the four digits if the password is correct will enter the configuration menu presenting on the display the acronym RESI. Otherwise it will come back on the 0000 display.

NOTE. The factory password is 0000 and the reminder number is 1807, if the user changes this password in the PASS menu and forgets just send the reminder number to ELECTRON and the product password will be reset.

Menu	Parameter	Variable	Description
RESI	→ Menu to Configure the Initial and Final Resistance of the Buoy NOTE: When the float is at 0% of the level has in the resistive output 5 ohms and when it is in 100% of the level the resistive output is in 45 Ohms, in this case the user must configure the initial value in 5 and configure in the final value 45, automatically the MNO recognizes that this is the range of action between 0 and 100 % and the other values are indicated proportionally in this variation. This Menu is only applied when using MNO with Resistive input		
	INIC	0 a 5000 ohms	Use the increment or decrement key to set the Initial Resistance value and confirm it by pressing SET.
	FINL	0 a 5000 ohms	Use the increment or decrement key to set the Initial Resistance value and confirm it by pressing SET.

CONFIGURATION MENU

Menu	Parameter	Variable	Description
OFF	→ Menu to Configure Float Level Reading OFFSET. Allows you to make a correction in the presentation of the Float Level by adding or subtracting the configured value. WARNING: Before making any changes to the offset of the Float Level check: Whether the Initial and Final Resistance setting is correctly configured (For Monitor with Resistive Input). In order to make this correction adjustment in the Level reading, the deviation has to be linear i.e. the same deviation from the beginning to the end of the scale.		
	---	-10 to 10	Using the increment and decrement keys, adjust the OFFSET of the Float Reading Level.
	→ Menu to Configure Current Output OFFSET. Allows you to make a correction in the current outputs by adding or subtracting the configured value. WARNING: Before making any changes to the offset of the current output check: If the configuration of the RASA menu is correctly configured - 0-1 mA, 0-5 mA, 0-10 mA, 0-20 mA or 4-20 mA.		

OFF	In order for this correction adjustment to be made, the deviation has to be linear, that is, the same deviation from the beginning to the end of the scale.		
	---	-10 to 10	Using the increment and decrement keys, adjust the Float Reading Level OFFSET and confirm it by pressing SET.
NIV	→ Menu to configure the High Level Alarm.		
	---	00.0 to 100.0	Parameterize the value in percentage (%) to trigger the High Level Alarm to trigger Relay 1 (terminals 1, 2 and 3) as soon as the tank reaches the parameterized value.
NIV-	→ Menu to configure the Low Level Alarm.		
	---	00.0 to 100.0	Parameterize the value in percentage (%) to trigger the Low Level Alarm to trigger Relay 2 (terminals 4, 5 and 6) as soon as the tank reaches the parameterized value.

CONFIGURATION MENU

Menu	Parameter	Variable	Description
HDN	→ Menu for Hysteresis adjustment, level difference between turning the Alarm on and off. Example: If the NIV+ is programmed at 65% and the HDN programmed with 5, the Alarm will turn off only when the level reaches 59.9%, i.e. with 5% below the NIV+ parameter If the NIV- is programmed at 20% and the HDN programmed with 5, the Alarm will turn off only when the level reaches 25.1%, i.e. with 5% above the NIV- parameter.		
	---	0.0 to 30.0	Use the increment key or the decrement key to configure the Alarm Shutdown Hysteresis value. Confirm by pressing the SET key.
DES+	→ Menu to configure High Level Shutdown.		
	---	00.0 a 100.0	Parameterize the value in percentage (%) to trigger the High Level Shutdown to trigger Relay 3 (terminals 7, 8 and 9) as soon as the tank reaches the parameterized value. Confirm by pressing the SET key.
DES	→ Menu to configure Low Level Shutdown.		
	---	00.0 a 100.0	Parameterize the value in percentage (%) to trigger the High Level Shutdown to trigger Relay 3 (terminals 7, 8

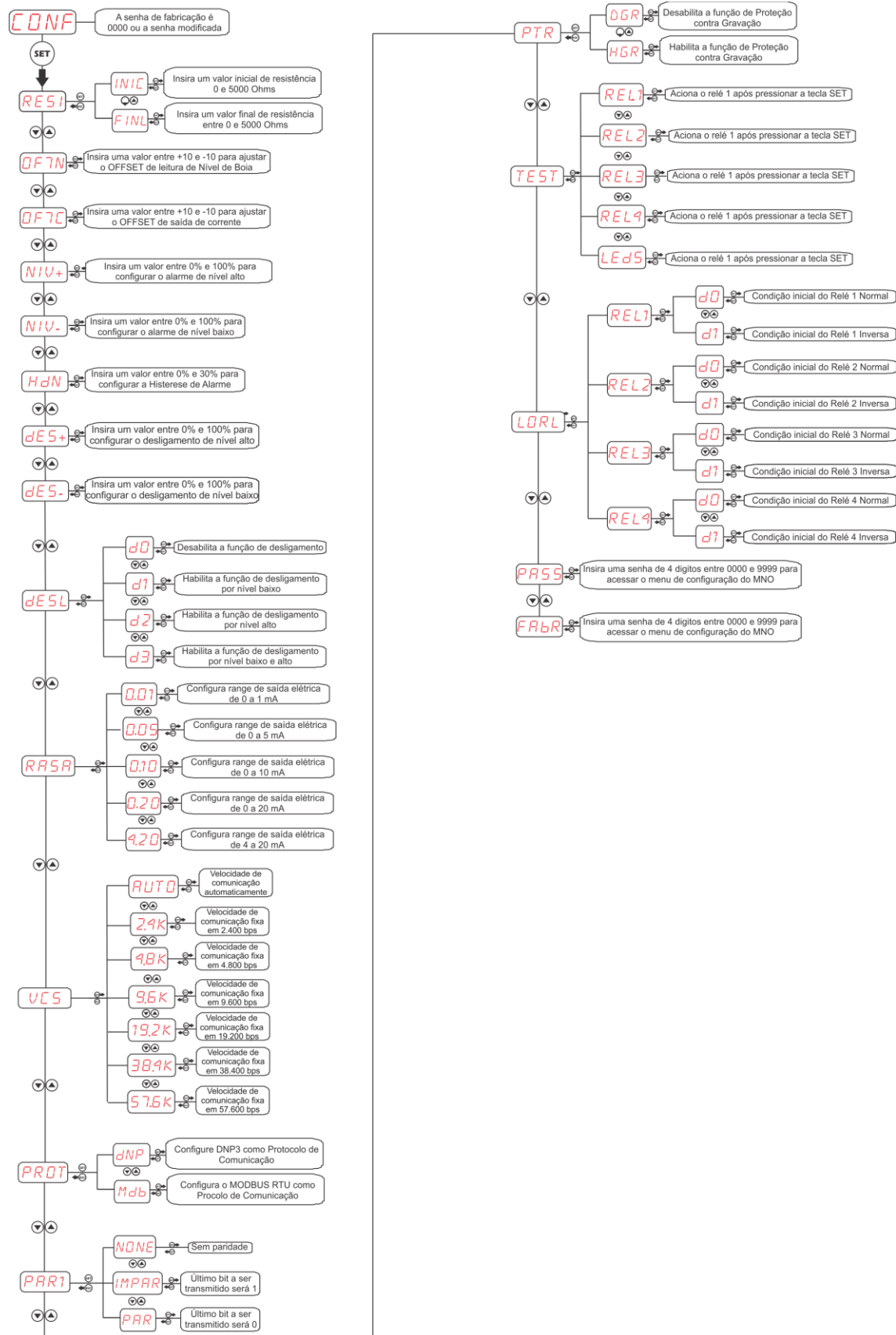
			and 9) as soon as the tank reaches the parameterized value. Confirm by pressing the SET key.
<i>DES L</i>	→ Menu to enable or disable the Shutdown function.		
	<i>d1</i>	---	Disables the Shutdown function;
	<i>d2</i>	---	Enables the High Level Shutdown function;
	<i>d3</i>	---	Enables the Low Level Shutdown function;
	<i>d4</i>	---	Enables the Low or High Level Shutdown function;
<i>TASTE</i>	→ Menu for selecting current output value (Terminals 21 and 22). Select the Output option and confirm by pressing the SET key;		
	<i>0.1</i>	---	Enables current output to 0 to 1mA;
	<i>0.5</i>	---	Enables current output to 0 to 5mA;
	<i>0.10</i>	---	Enables current output for 0 to 10mA;
	<i>0.20</i>	---	Enables current output for 0 to 20mA;
	<i>4.20</i>	---	Enables current output to 4 to 20mA;
<i>ERS</i>	→ Select a single machine address on the serial network (that is different from the others).		
	---	<i>1 -254</i>	Select a number between 1 and 254 to be the machine's network address
<i>VCS</i>	→ Menu to configure the Serial Communication Speed;		
	<i>CAR</i>	---	Automatically detects the speed of communication;
	<i>2.4</i>	---	Fixed communication speed at 2,400 bps;
	<i>4.8</i>	---	Fixed communication speed at 4,800 bps
	<i>9.6</i>	---	Fixed communication speed at 9,600 bps;
	<i>19.2</i>	---	Fixed communication speed at 19,200 bps;
	<i>38.4</i>	--	Fixed communication speed at 38,400 bps;
	<i>57.6</i>	--	Fixed communication speed at 57,600 bps;

CONFIGURATION MENU

Menu	Parameter	Variable	Description
<i>PROT</i>	→ Communication Protocol definition menu.		
	<i>dNP</i>	---	Configures the DNP3 LV.1 Communication Protocol;
	<i>Mdb</i>	---	Configures the Modbus Communication Protocol;
<i>PARI</i>	→ Menu for choosing Parity, that is, the last bit to be transmitted in the message for verification of data integrity;		
	<i>NONE</i>	---	No Parity;
	<i>ODD</i>	---	Last bit of the message to be transmitted will be 1;
	<i>BY</i>	---	Last bit of the message to be transmitted will be 0;
<i>PTR</i>	→ Parameter Write Protection Menu;		
	<i>dGR</i>	---	Disables write protection;
	<i>HGR</i>	---	Enables write protection;
<i>TEST</i>	→ Menu to perform tests on the Relays and LED's.		
	<i>REL1</i>	---	Triggers Relay 1 by pressing the SET key;
	<i>REL2</i>	---	Triggers Relay 2 by pressing the SET key;
	<i>REL3</i>	---	Triggers Relay 3 by pressing the SET key;
	<i>REL4</i>	---	Triggers Relay 4 by pressing the SET key;

	<i>Leds</i>	---	Triggers all the LED's of the equipment by pressing the SET key;
<i>LORL</i>	→ Relay Drive Logic definition menu.		
	<i>REL1</i>	<i>d0</i>	Initial Relay Condition 1 "Normal";
		<i>d1</i>	Initial Relay Condition 1 "Inverse";
	<i>REL2</i>	<i>d0</i>	Initial Relay Condition 2 "Normal";
		<i>d1</i>	Initial Condition of Relay 2 "Inverse";
	<i>REL3</i>	<i>d0</i>	Initial Relay Condition 3 "Normal";
		<i>d1</i>	Initial Condition of Relay 3 "Inverse";
	<i>REL4</i>	<i>d0</i>	Initial Condition of Relay 4 "Normal";
		<i>d1</i>	Initial Condition of Relay 4 "Inverse";
<i>PASS</i>	→ Menu to change the four-digit password. This password will be used to access the Configuration Menu (<i>CONF</i>) WARNING: The MNO factory password is 0000. In case of loss or forgetting of the password contact Electron do Brasil and inform the password reminder number.		
	---	0000 to 9999	To change the password digits, use the increment and decrement keys, and to confirm press SET, to return the previous digit press the ESC key.
<i>FABR</i>	---	---	Menu for exclusive use of Electron do Brasil

CONFIGURATION MENU FLOWCHART



DEFECT SOLUTION

Display	Cause	Solution
SOFF	There is no reliability in the signal Received by the MNO sensor	Check and replace if the sensor cable is not shielded.
		Check grounding of the sensor cable.
		Check and correct possible bad contact.

The MNO automatically returns to reading mode when normalized, to reset the MNO press the SET Key for approximately 5 seconds, until the word REST appears on the display, then release and the equipment will restart.

The MNO has a fault contact (relay 4), it will act in case of **SOOF** or if there is a power outage.

IMPORTANT RECOMMENDATIONS

Before putting into operation the equipment check the following recommendations:

1. All sensors as well as the equipment must be grounded, do not use the same grounding point for power and for the sensor so that there is no potential difference. Properly grounded sensors and power supply prevent malfunction or damage in cases of disturbances, surges, and inductions in the equipment.
2. Use in the communication network (Rs485) resistors of 120 Ohms at the 2 ends of the transmission line (beginning and end) in order to generate potential difference necessary for the correct functioning of the communication network.
3. Do not use the MNO directly in the SOL, whenever it is urged in the field it is important to have a panel with smoked glass, in order to filter the ultraviolet rays that attack the frontal polycarbonate, in this way the life of the equipment will be prolonged.

WARRANTY TERM

The Electron Oil Level Monitor has a warranty period of two years from the date of sale consigned on the invoice, with coverage for any manufacturing defects that make it unsuitable or unsuitable for the applications it is intended for.

Disclaimer of Warranty

The warranty does not cover transportation expenses for technical assistance, freight and insurance for shipment of product with evidence of defect or malfunction. The following events are also not covered: Natural wear of parts by continuous and frequent use, damage to the outside caused by falls or improper packaging; attempted repair / violation of seal with damage caused by persons not authorized by Electron and in disagreement with the instructions that are part of the technical description.

WARRANTY TERM

Loss of Warranty

The product will automatically lose its warranty when:

The instructions for use and assembly contained in this manual and the installation procedures contained in Standard NBR 5410 are not observed;

Subjected to conditions outside the limits specified in the respective technical descriptions.

Breached or repaired by a person other than Electron's technical team;

the damage is caused by a fall or impact;

Infiltration of water or any other liquid occurs;

Overload occurs that causes degradation of components and parts of the product.

Use of the Warranty

To take advantage of this guarantee the customer must send the product to Electron along with a copy of the purchase invoice duly packed so that there is no damage in transport.

For an emergency service it is recommended to send as much information as possible regarding the defect detected. It will be analyzed and subjected to full tests of operation.

The analysis of the product and its eventual maintenance will only be carried out by the technical team of Electron do Brasil at its headquarters.

DECLARATION OF CONFORMITY

Available for Downloads on the Website:

<http://electron.com.br/wp/wp-content/uploads/2014/09/CARTA-DE-CONFORMIDADE-PORTUGUÊS.pdf>

REVISION CONTROL

Revision No. 0 - July 2009.

-Emission;

Revision No. 1.0 - February 2014.

- Change of Format;

Revision No. 1.1 - May 2014.

- Change in the link diagram;

Revision No. 1.2 - July 2015.

- Added password for equipment configuration;

-Added menu for password change;

-Added menu for protocol change;

-Added menu for parity change;

-Update of the register map;

Revision N° 2.0 - February 2017

- Added Boia Level Off Set menu;

- Added Current Output Off Set menu;

- Added the current output option for 0 to 1mA;

- Added Parameter Write Protection menu;

- Update of the register map;

Revision No. 2.1 - October 2019

- Spelling Review;

- Formatting Review;

- Addition of Flowcharts to the Query Menu;

- Addition of Flowcharts to the Configuration Menu;

Revision N° 2.3 – General Review 14/07/2023.