

USER MANUAL

OIL LEVEL MONITOR - MNO



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INTRODUCTION

The Oil Level Monitor for Transformers and MNO reactors is a high-precision microprocessor equipment that indicates the oil level on a scale that varies between 0 and 100% and provides this indication on an analog output (0 to 1, 0 to 5, 0 to 10, 0 to 20 or 4 to 20mA), and 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 in compliance with 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 substations yard, energy, offshore platforms and chemical industries. Meets the levels of requirements, supportability and reliability according to IEC, DIN, IEEE, ABNT standards.

As a 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 (measured) value it is possible to make 3 programming levels for actuation of the contacts (Level High, Low Level and Shutdown), 3 independent NAF relay outputs and 1 NC 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 and DNP 3.0 protocol, all parameters can also be configured directly on the front of the equipment or through the RS485 serial output.

MAIN FEATURES

- 13.8mm high 4-digit display with high brightness LED (red);
- Precision of 1 (one) decimal place;
- Level measurement range from 0 to 100%;
- Compensated input for resistive float or 4 to 20mA;
- Universal power supply 48 to 265 Vdc/Vac;
- Rs485 Digital Output (ANSI/TIA/EIA-485-A) with Modbus RTU and DNP 3 (L1) protocol (Level1);
- Analog output of 0a1, 0a5, 0a10, 0a20 and 4a20mA configurable directly on the front end;
- Stores the maximum and minimum levels reached in memory;
- NAF Alarm Contact for maximum level with programmable hysteresis;
- NAF Alarm Contact for minimum level with programmable hysteresis;
- Timed NAF Disconnection Contact, for maximum or minimum level that reaches the configured value;
- Fault Indication Contact (watchdog);
- High mechanical resistance 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 communication network speed);
- Reduced size 48x96x140mm;
- Easy parameterization and use;
- 2 years warranty;

TECHNICAL DATA

Oil Level Monitor	
Operating Voltage	48 to 265 Vdc/Vac 50/60 Hz
Operating Temperature	-40 to +85°C
Consumption	< 15W
Level measurement input	Float (0 to 400 ohms or 4 to 20 mA)
Measurement 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
Analog Output Maximum Error	0.25% of the end of the scale
Output Contacts	4 - Potential Free
Maximum Switching Power	40W / 250VA
Maximum Switching Current	6.0 A
Maximum Conduction Current	RS485 (ANSI/TIA/EIA-485-A)
Serial Communication Port	Modbus RTU and DNP 3.0 (Slave)
Auto Baud Rate	2400 to 57,600 bps
Box (DIN IEC 61554)	48 x 96 x 140 mm - Aluminum
Equipment Fixation	Recessed Panel Mount
Degree of Protection (NBR IEC 60529)	TP40 (front) and IP30 (rear)

TYPE TESTS PERFORMED

- Applied Voltage (IEC 60255-5): 2kV / 60Hz / 1 min. (against land);
Voltage Boost (IEC 60255-5): 1.2/50 □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 radiated electromagnetic disturbance (IEC61000-4-3): 80 to 1000 MHz / 10V/m;
- Fast Electrical Transient Immunity (IEC60255-22-4): Power/Input/Output=4KV/common. 2kV;
- Surge Immunity (IEC60255-22-5): phase/neutral 1KV, 5 per polar. (±) - phase-earth/neutral-ground 2KV, 5 per polar (±);
- Immunity to Conducted Electromagnetic Disturbances (IEC61000-4-6): 0.15 to 80 MHz / 10V/m;
- Climatic 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 at 58 Hz / 1G from 58 to 150 Hz / 8min/axis;

CONNECTION DIAGRAMS

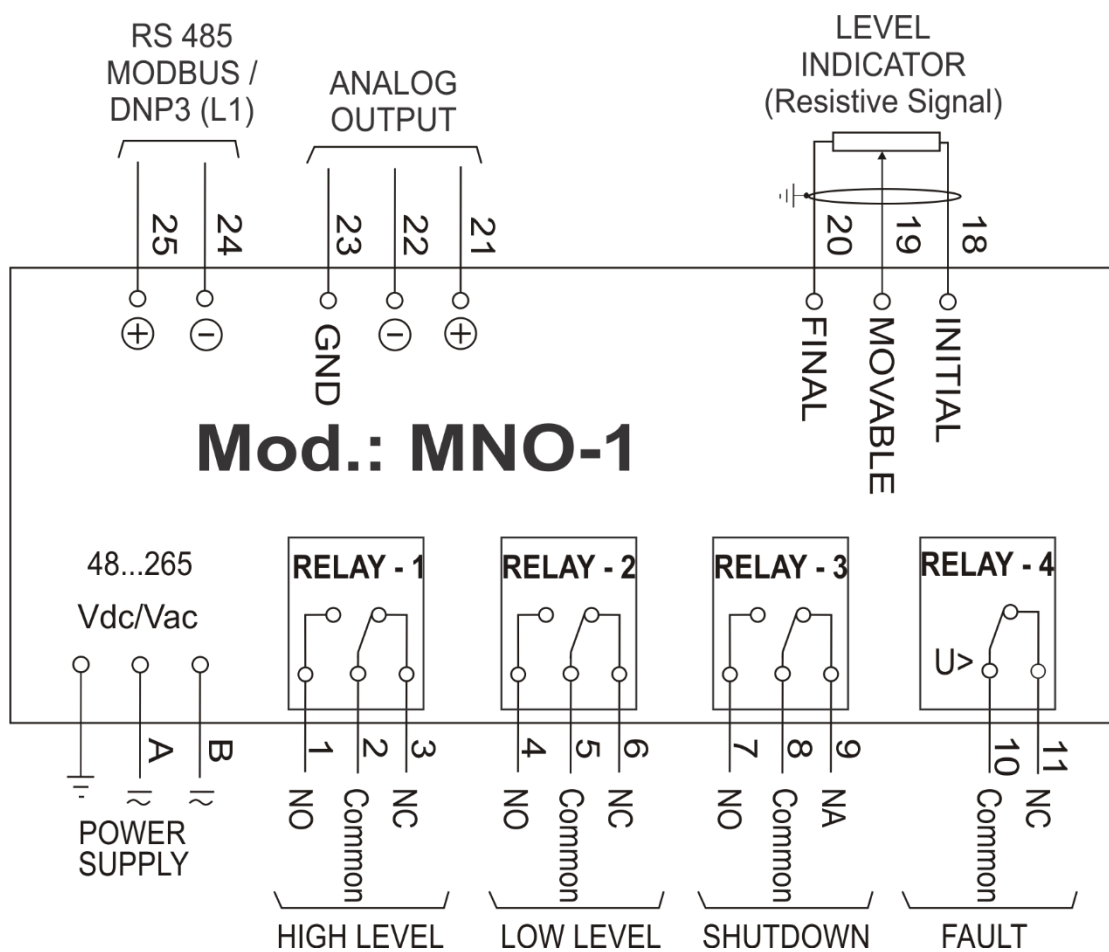


Figura 1 - MNO with resistive input

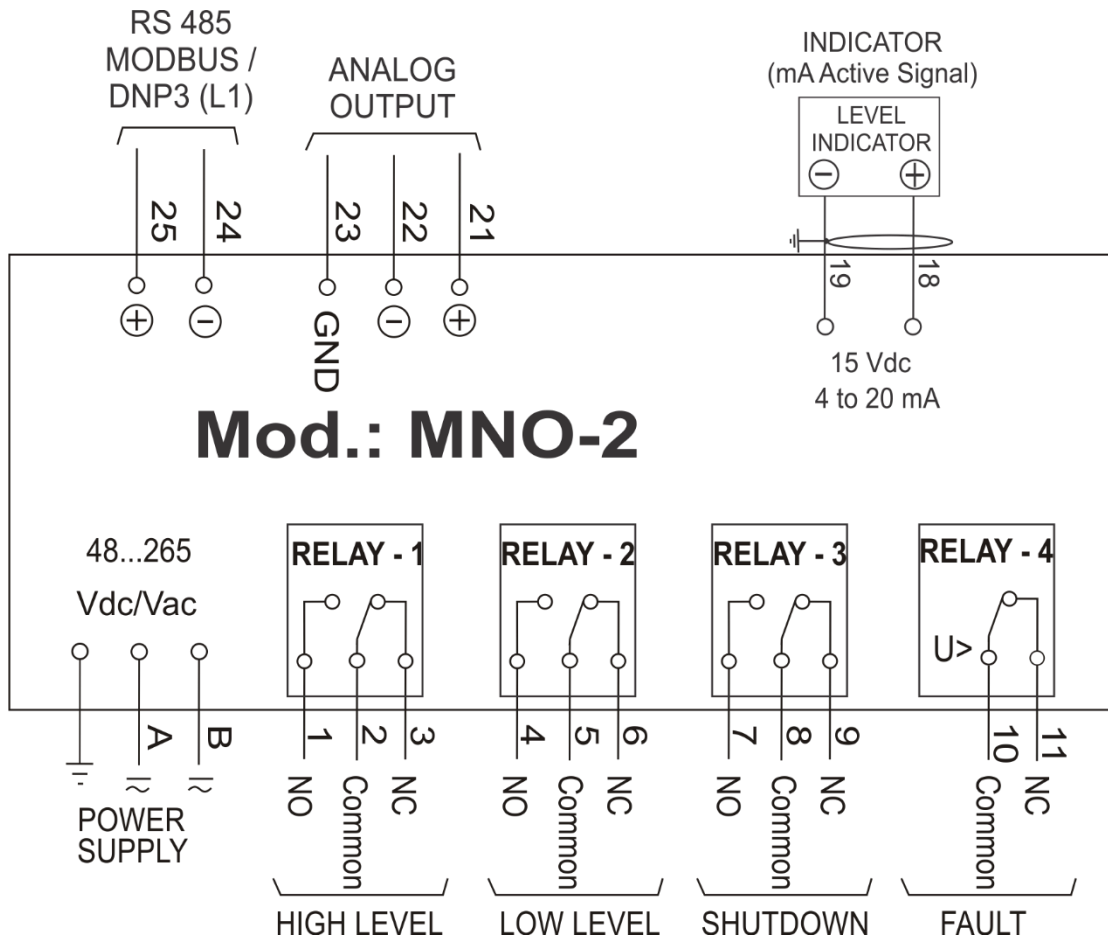


Figura 2 - MNO with mA active signal input

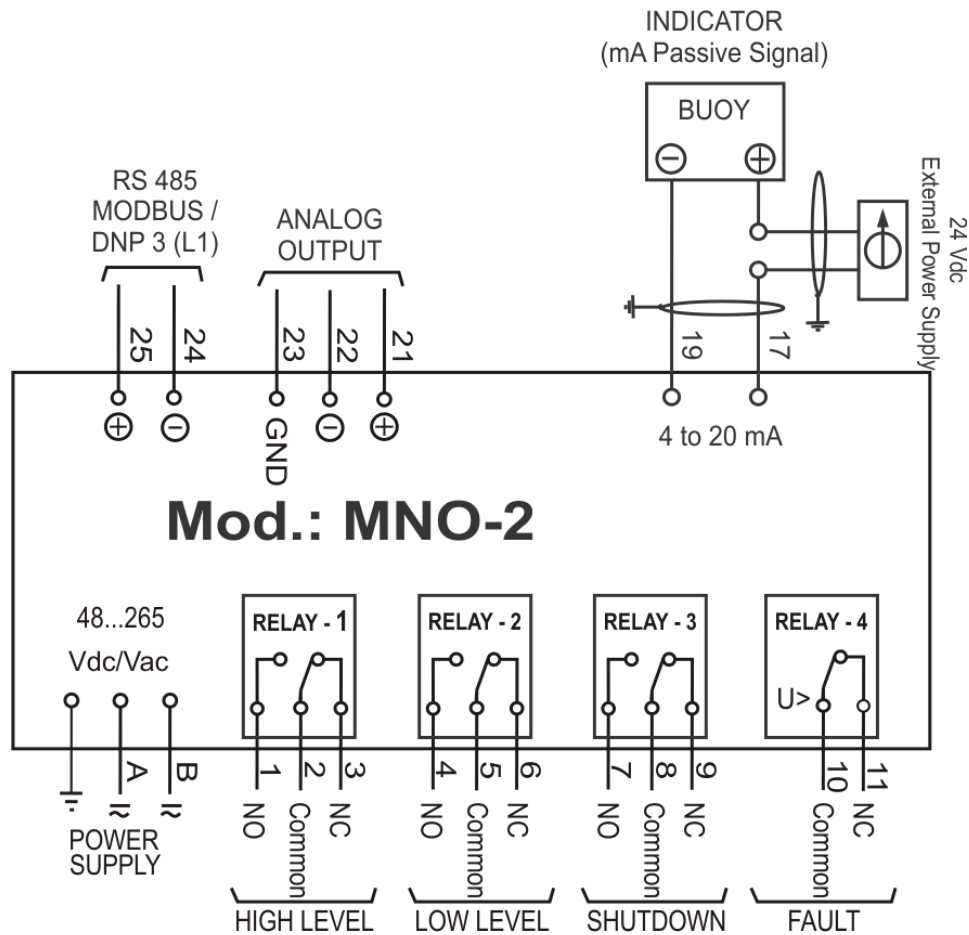
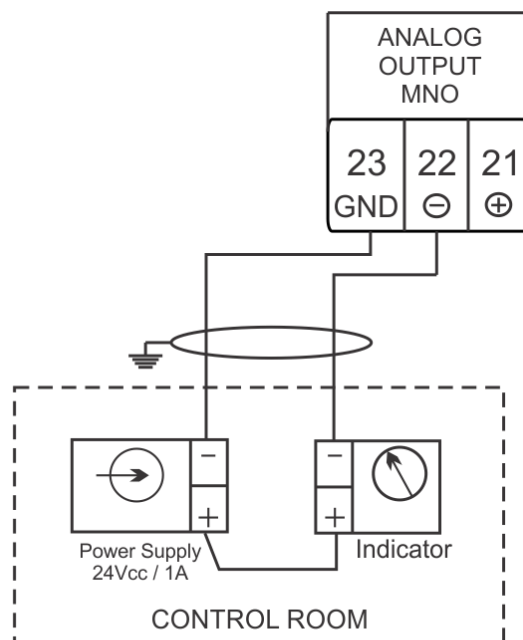


Figura 3 - MNO with mA Passive signal input



Analog indicators connections diagram
with external power supply.

Figura 4 - MNO Analog output connections

ORDER SPECIFICATION

MNO -



LEVEL INDICATOR SIGNAL INPUT	
1	4 ... 20mA
2	Resistive

DIMENSIONS

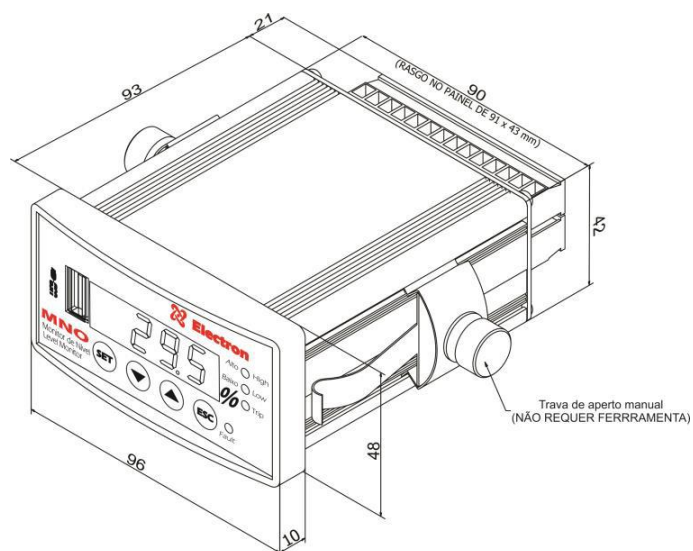
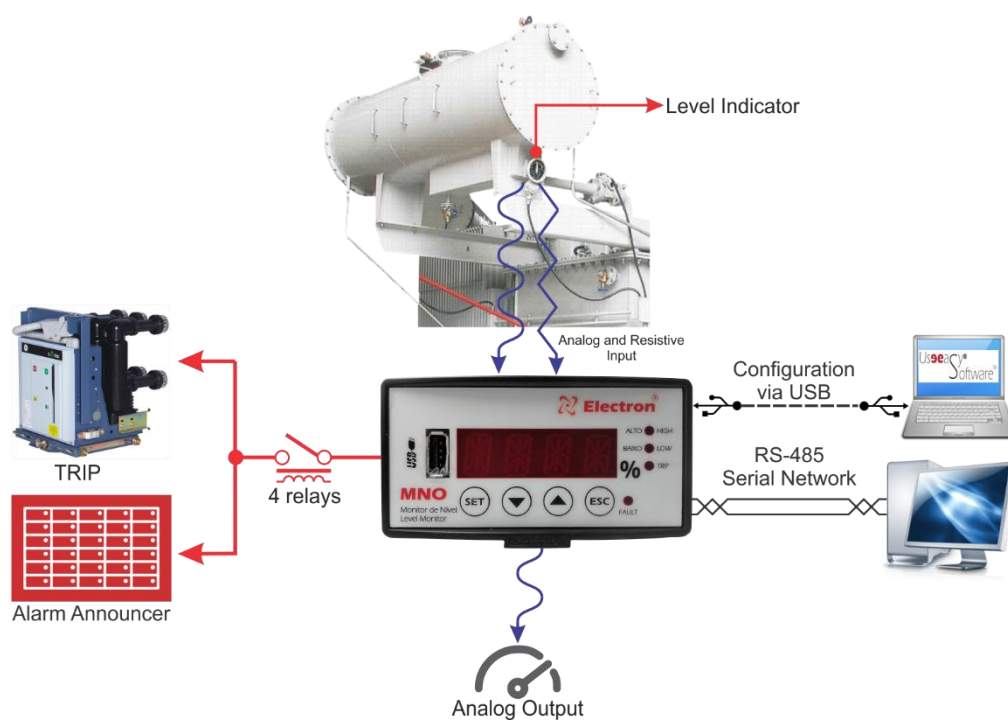


Figura 5 - Equipment Dimensions

APPLICATION EXAMPLES



INSTALLATION ACESSORIES



Magnetic Indicator

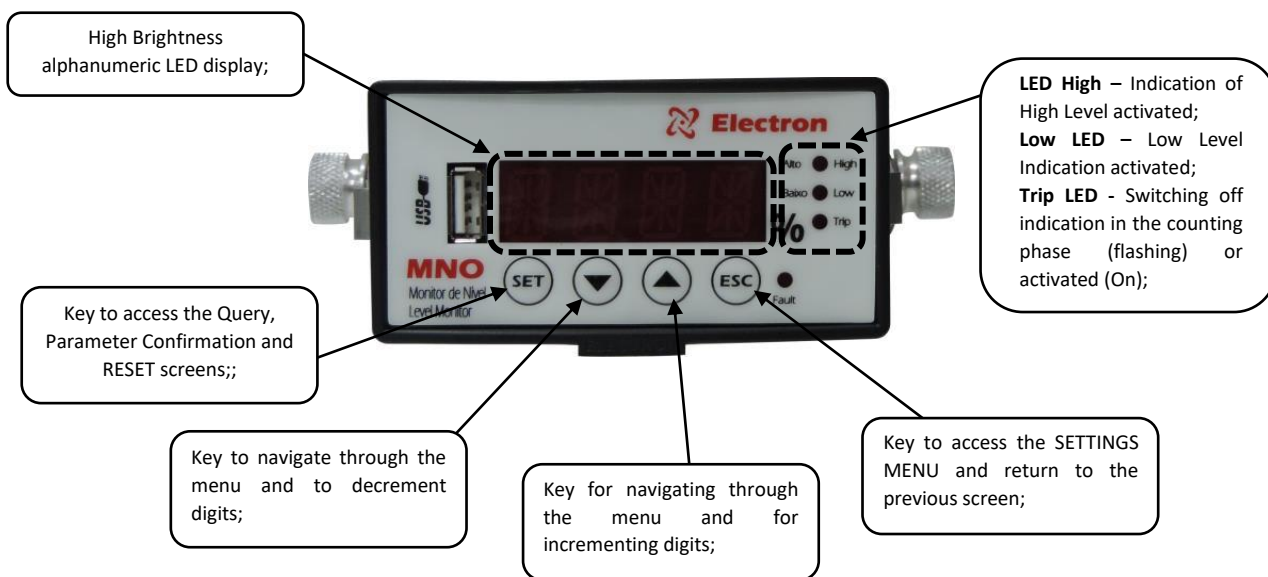


Adaptative cover
96x96 p/ 48x96



Output panel

KNOWING THE MNO

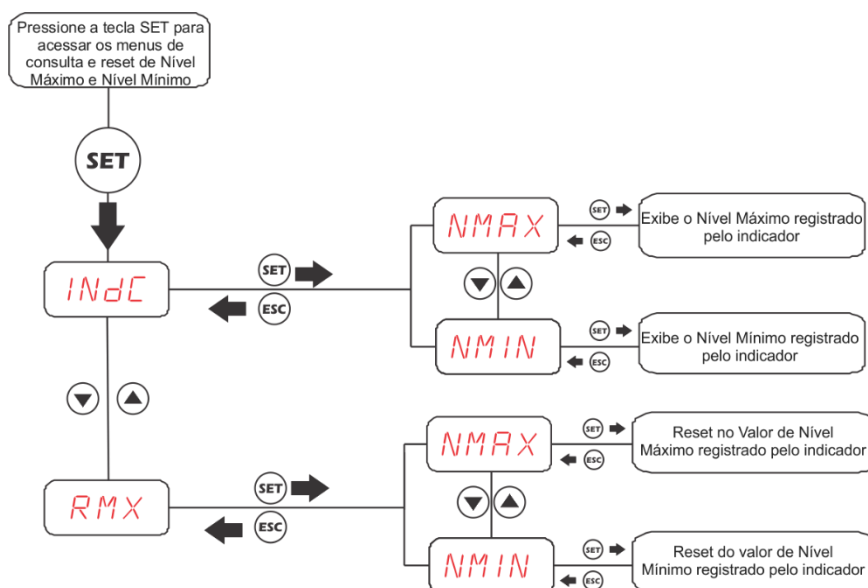


QUERY MENU

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

Menu	Parameter	Description
INDC		→ Menu to consult the maximum and minimum level recorded by the indicator;
	NMAX	Screen to consult the Maximum Level register by the indicator. To return to the root menu, press the ESC key;
	NMIN	Screen to consult the Register Minimum Level by the indicator. To return to the root menu, press the ESC key;
RMX		→ Menu to clear the High and/or Low-Level record. OBS: When erasing the current maximum and/or minimum values automatically the current record becomes the memorized value.
	NMAX	Press SET and the equipment will perform a RESET of the current value of the Maximum Level registered by the indicator;
	NMIN	Press SET and the equipment will perform a RESET of the current value of the Minimum Level registered by the indicator;

QUERY MENU FLOWCHART



SETTINGS MENU

Pressing the SET key on the option **CONF** A four-digit number will appear on the display, which is a reminder of the password that is set on the equipment, and then 0000 will appear. Use the increment and or decrement keys to enter the password, to confirm the chosen number and move to the next box press the SET key, to return to the previous number press the ESC key. Confirming the four digits, if the password is correct, you will enter the SETTINGS MENU, showing the abbreviation RESI on the display. Otherwise, it will return to the display. 0000.

PS. The equipment default password is 0000 and the reminder number is 1807, in case the user changes this password in the menu **PASS** and forget it, just send the reminder number to ELECTRON and the product password will be reset.

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

SETTINGS MENU

Menu	Parameter	Variable	Description
OF7N	→ Menu to Configure the Float Level Reading OFFSET. Allows you to make a correction in the Float Level display by adding or subtracting the configured value. WARNING: Before making any changes to the Float Level offset, check: Whether the Initial and Final Resistance setting is correctly configured (For Monitor with Resistive Input). In order for this correction adjustment to be made in the Level reading, the deviation must 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 OFFSET of the Float Reading Level.
OF7C	→ Menu to Configure the Current Output OFFSET. Allows you to correct the current outputs by adding or subtracting the configured value. WARNING: Before making any changes to the current output offset, check: Whether the RASA menu setting is correctly configured - 0-1 mA, 0-5 mA, 0-10 mA, 0-20 mA or 4-20 mA. In order for this correction adjustment to be made, the deviation must be linear, that is, the same deviation from the beginning to the end of the scale.		
	---	-10 a 10	Using the increment and decrement keys, adjust the OFFSET of the Float Reading Level and confirm it by pressing SET.
NIV+	→ Menu to configure High Level Alarm.		
	---	00.0 to 100.0	Parameterize the value in percentage (%) to activate the High-Level Alarm to activate Relay 1 (terminals 1, 2 and 3) as soon as the tank reaches the parameterized value.
NIV-	→ Menu to configure Low Level Alarm.		
	---	00.0 to 100.0	Parameterize the value in percentage (%) to activate the Low Level Alarm to activate Relay 2 (terminals 4, 5 and 6) as soon as the tank reaches the parameterized value.

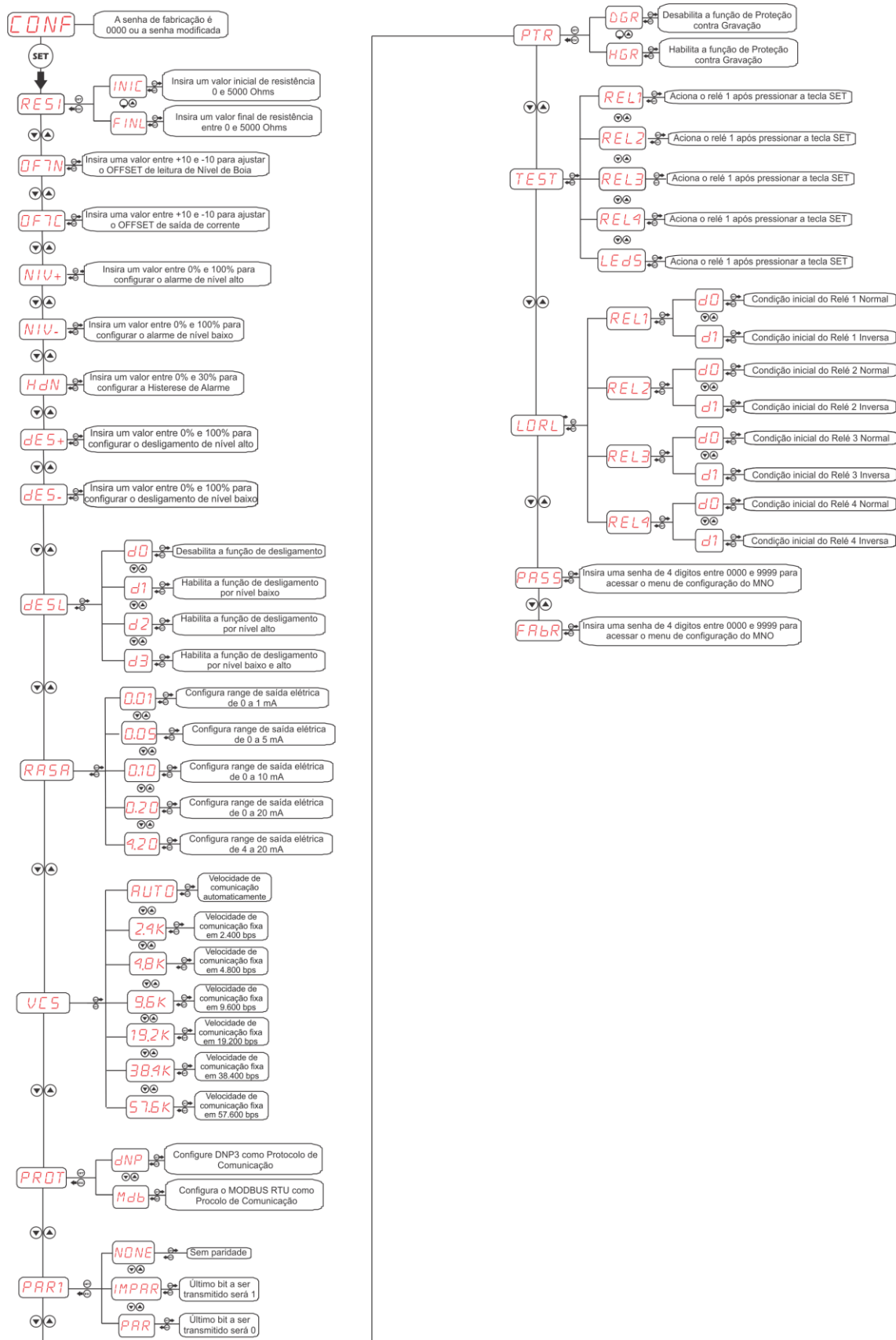
SETTINGS MENU

Menu	Parameter	Variable	Description
HdN	→ Menu for Hysteresis adjustment, level difference between alarm on and off. Example: If NIV+ is set to 65% and the HdN programmed with 5, the Alarm will only go off when the level reaches 59.9%, that is, with 5% below the parameter NIV+ . If the NIV- is programmed to 20% and the HdN is programmed to 5, the Alarm will only turn off when the level reaches 25.1%, that is, with 5% above the parameter NIV- .		
	---	0.0 to 30.0	Use the increment key or the decrement key to configure the value of Alarm shutdown Hysteresis. Confirm by pressing the SET key.
dES+	→ Menu to configure High Level Shutdown.		
	---	00.0 to 100.0	Parameterize the value in percentage (%) to activate the High-Level Shutdown to activate 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 to 100.0	Parameterize the value in percentage (%) to activate the High-Level Shutdown to activate Relay 3 (terminals 7, 8 and 9) as soon as the tank reaches the parameterized value. Confirm by pressing the SET key.
dESL	→ Menu to enable or disable the Shutdown function.		
	d1	---	Disables the Shutdown function;
	d2	---	Enables the high level shutdown function;
	d3	---	Enables the Low Level Shutdown function;
	d4	---	Enables the Shutdown function by low or high level;
RASA	→ Menu for selecting the current output value (Terminals 21 and 22). Select the Output option and confirm by pressing the SET key;		
	0.1	---	Enables the current output for 0 to 1mA;
	0.5	---	Enables the current output for 0 to 5mA;
	0.10	---	Enables the current output for 0 to 10mA;
	0.20	---	Enables the current output for 0 to 20mA;
	4.20	---	Enables the current output for 4 to 20mA;
ERS	→ Select a single device address on the serial network (which is different from the others).		
	---	1-254	Select a number between 1 and 254 to be the machine's network address
VCS	→ Menu to configure the Serial Communication Speed;		
	AUTO	---	Automatically detects communication speed;
	2.4	---	Fixed communication speed at 2,400 bps;
	4.8	---	Fixed communication speed at 4,800 bps;
	9.6	---	Fixed communication speed at 9,600 bps;
	19.2	---	Fixed communication speed at 19,200 bps;
	38.4	--	Fixed communication speed at 38,400 bps;
	57.6	--	Fixed communication speed at 57,600 bps;

SETTINGS MENU

Menu	Parameter	Variable	Description
PROT	→ Communication Protocol setting menu.		
	dNP	---	Configures the DNP3 LV.1 Communication Protocol;
	Mdb	---	Configures the Modbus Communication Protocol;
PARI	→ Menu for choosing Parity, that is, the last bit to be transmitted in the message for Data integrity verification;		
	NONE	---	No Parity;
	IMPAR	---	Last bit of message to be transmitted will be 1;
	PAR	---	Last bit of message to be transmitted will be 0;
PTR	→ Parameter Write Protection Menu;		
	dGR	---	Disable write protection;
	HGR	---	Enable write protection;
TEST	→ Menu to perform tests on Relays and LEDs.		
	REL1	---	Activates Relay 1 by pressing the SET key;
	REL2	---	Activates Relay 2 by pressing the SET key;
	REL3	---	Activates Relay 3 by pressing the SET key;
	REL4	---	Activates Relay 4 by pressing the SET key;
	LED5	---	It activates all the LEDs of the equipment when pressing the SET key;
LORL	→ Relay Trigger Logic definition menu.		
	REL1	d0	Relay 1 Initial Condition "Normal";
		d1	Relay 1 Initial Condition "Inverse";
	REL2	d0	Relay 2 Initial Condition "Normal";
		d1	Relay 2 Initial Condition "Inverse";
	REL3	d0	Relay 3 Initial Condition "Normal";
		d1	Relay 3 Initial Condition "Inverse";
	REL4	d0	Relay 4 Initial Condition "Normal";
		d1	Relay 4 Initial Condition "Inverse";
PASS	→ Menu to change four-digit password. This password will be used to access the SETTINGS MENU (CONF). WARNING: The MNO factory password is 0000. In case of loss or forgetfulness 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 to the previous digit press the ESC key.
	FAbR	---	Menu for exclusive use by Electron do Brasil

SETTINGS MENU FLOWCHART



TROUBLE SHOOTING

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

The MNO automatically return to read mode when normalized, to reset the MNO press the SET key for approximately 5 seconds, until the word **REST**, then release and the equipment will restart.

The MNO has a fault contact (relay 4), it will trip in case of **SOFF** or if there is a power failure.

IMPORTANT RECOMMENDATIONS

Before putting the equipment into operation, check the following recommendations:

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

TERMO DE GARANTIA

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

Exclusão da Garantia

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

WARANTY TERM***Waranty Loss***

The product will automatically void the warranty when:

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

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

Violated or repaired by a person other than Electron's technical staff;

The damage is caused by a fall or impact;

Infiltration of water or any other liquid occurs;

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

Use of Warranty

To take advantage of this warranty, the customer must send the product to Electron together with a copy of the purchase invoice, properly packaged, so that no transport damage occurs.

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

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

COMPLIANCE LETTER

Available for Downloads on the Website:

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