Electron

OIL LEVEL MONITOR - MNO

Catalogue

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INTRODUCTION

The Oil Level Monitor for Transformers and Reactors **MNO,** is a high-precision microprocessed equipment that indicates the oil level in a 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 an RS-485 serial output with Modbus RTU and DNP 3 (L1) protocol 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 yard of power substations, offshore platforms and chemical industries. Meets the levels of demands, 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 1000 ohms, and current signal input from 4 to 20mA, for the monitored value (measured) it is possible to make 3 levels of programming for contact actuation (High Level, 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 RS-485 output with Modbus RTU and DNP 3.0 protocol, all parameters can also be configured directly on the front of the equipment or via the RS-485 serial output.

KEY FEATURES

Communication Protocols

- DNP3 – Level 1 (SERIAL)
- Modbus-RTU (SERIAL)

Communication Ports

- **USB**
  - Version 2.0;
  - Transfer rate 480Mbps;
  - Type-C connector
- **RS 485**
  - ANSI/TIA/EIA-485-A standard;
  - Max. 32 equipments;
  - Half duplex;
  - Multipoint;
  - Max. distance 1,200 meters;
  - 2 metallic wires;
  - Auto speed from 2,400 to 57,600 bps

Feeding

- Universal Power 48-265 Vdc/Vac;

Hardware

- High mechanical resistance case, built entirely in aluminum;
- Degree of protection (NBR IEC 60529), IP40 (Front) and IP30 (rear);
- 48x96x83.5mm;
- 2 years warranty;

Human Machine Interface (HMI)

- 4-digit red high-brightness numeric display;
- 4 Navigation keys;
- 4 LED's on the front for event indications;
- Intuitive menus for consultation and parameterization;
- Accuracy of 1 decimal place;
- Stores in memory the maximum and minimum levels reached;
- Parameterization via software

Measurement Input

- Configurable resistive from 0 to 1000 ohms, and current signal input from 4 to 20mA
- Measurement range from 0 to 100%

Digital Relay Outputs

- 1 Relay (NAF) with a capacity of 10 amps for High level alarm with programmable hysteresis;
- 1 Relay (NAF) with a capacity of 10 amps for Low level alarm with programmable hysteresis;
- 1 Relay (NAF) with a capacity of 10 amps for TRIP (shutdown) low/high level;
- 1 Relay (NAF) with a capacity of 10 amperes for Fault Indication (watchdog);

Analog Output

- 01 Analog output from 0 to 1mA, 0 to 5mA, 0 to 10mA, 0 to 20mA or 4 to 20mA user configurable;

TECHNICAL DATA

Level Monitor - Oil MNO	
Operating Voltage	48 a 265 Vcc/Vca 50/60 Hz
Operating Temperature	-40 to +85°C
Consumption	< 15 W
Level Measurement Input	Float (0 to 1000 ohms and 4 to 20 mA)
Measurement Range	0 to 100%
Analog Output 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 end-of-scale
Maximum Analog Output Error	0.25% of end-of-scale
Outgoing Contacts	4 – Free of Potential
Maximum Switching Power	40W / 250 VA
Maximum Driving Current	6.0 A
Communication Port	RS485; Modbus RTU; DNP3 L1; DNP3 L1
Auto Baud Rate	2,400 to 57,600 bps
Box (DIN IEC 61554)	48 x 96 x 83,5 mm – Aluminium
Equipment Attachment	Flush Panel Mounting
Degree of Protection (NBR IEC 60529)	IP40 (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 sec. / 5kV / 3 sec. and 3 sec. / 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;
- Immunity to Fast Electrical Transients **(IEC60255-22-4):** Alim/Input/Outputs=4KV/common. 2kV;
- Immunity to Surtos **(IEC60255-22-5):** phase/neutral 1KV, 5 per polar. (±) - phase-earth/neutral-earth 2KV, 5 by polar (±);
- Immunity to conducted Electromagnetic disturbances **(IEC61000-4-6):** 0.15 to 80 MHz / 10V/m;
- Climate Ensaio **(IEC60068-21-14):** - 10ºC + 70ºC / 72 hours;
- Vibration Resistance **(IEC60255-21-1):** 3-axis / 10 to 150Hz / 2G / 160min/axis;
- Vibration Response **(IEC60255-21-1):** 3-axis / 0.075mm-10 at 58 Hz / 1G from 58 to 150 Hz / 8min/axis;

CONNECTION DIAGRAMS

MNO – mA signal input **(ACTIVE 15Vdc)** MNO – mA signal input **(PASSIVE 24Vdc)**

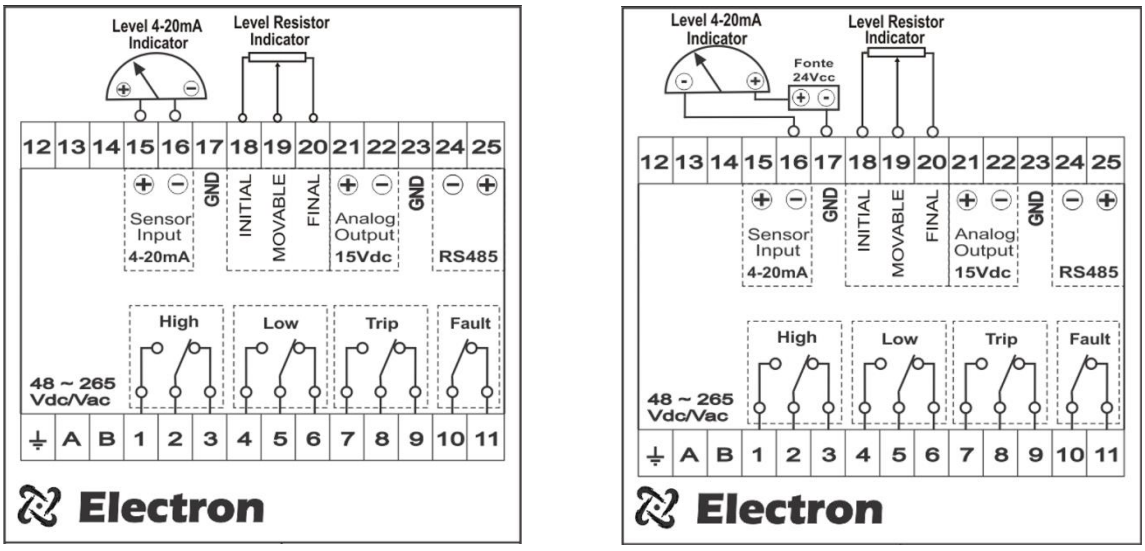
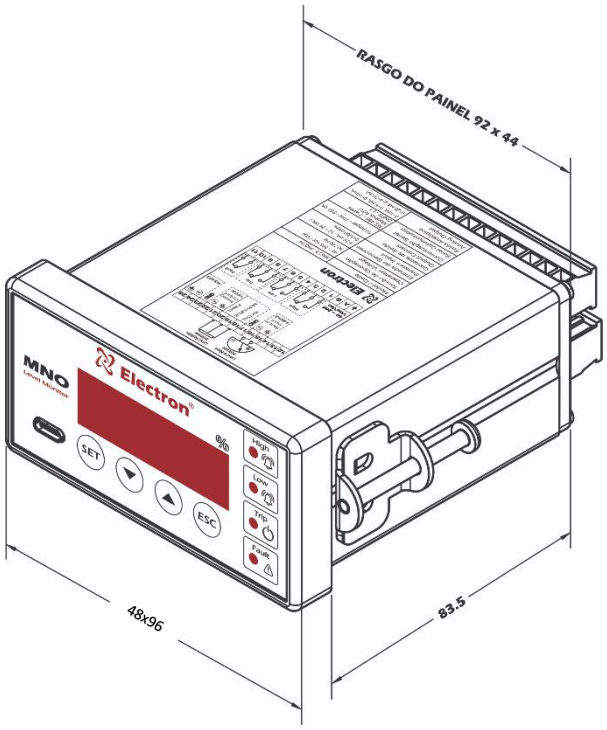


Figure 1 – Connection diagrams

DIMENSIONS



Note: Slot in the panel must be 92x44mm

Figure 2 – Dimension

APPLICATION EXAMPLE

Figure 3 – Application Example

OPERATION CHART

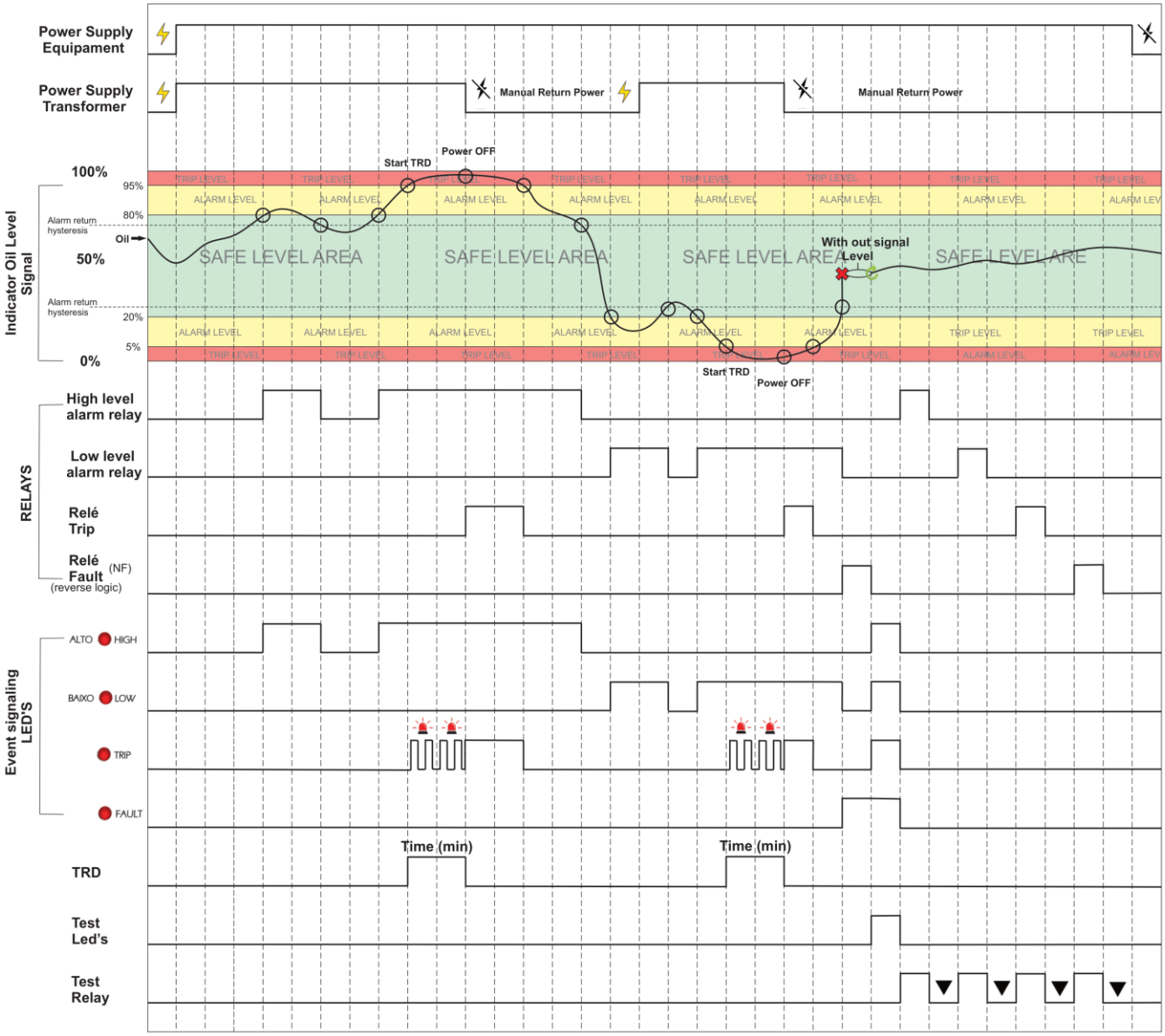


Figure 4 – Operation Graph

PREVENTIVE MAINTENANCE

PREVENTIVE AND CORRECTIVE MAINTENANCE							
Items to be checked preventively			Verification Frequency				Corrective action
SHARE	Verification Elements	ACTIVITIES	Every Month	Every 3 Months	Every 6 Months	Every 1 Year	When Needed
VERIFICATION	Fastening clip and snapping to the rail	Fixing to the panel door or panel bottom		X			Retightening, Fitting, Terminal Change, or Screw Change
	Terminal blocks and connector pente	Attachment and attachment to equipment		X			
		Tightening of the screws in the fastening 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		Oil filling to indicated level
TESTS & MEASUREMENTS	Relays and Digital Outputs	Individual drive test			X		Forward to Electron do Brasil technical assistance
	Led's e Displays	Test Triggering Led's and Display Segments			X		
	Navigation buttons	Navigation test of the navigation buttons			X		
	Entry of Indicators	Measure indicator inputs using a standard				X	
	Input voltage of equipment supply	Measure Supply Input Voltage			X		Override voltage input values according to equipment model
	RS-485 Communication Outputs	Communication and command testing in the supervisory system			X		Forward to Electron do Brasil technical assistance
	Milliampere running Sinal inputs	Measure, compare and measure input signal in passive and/or active mode			X		
	Signal Outputs of milliampere current	Measure, compare and measure input signal in passive and/or active mode			X		
CLEANING	Terminal blocks and connector comb and connection box	Debris, Impurities and Moisture	X				Cleaning with a dry cloth, compressed air and vacuum cleaner
	Aluminum Equipment Enclosure		X				
	Front of the Equipment Display		X				

1 - Keeping the equipment within the ideal working temperature (50°C to 60°C) extends the useful life and avoids corrective maintenance.

2 - The accumulation of dust and impurities in the facilities can cause short-circuiting and burning of equipment and sensors.

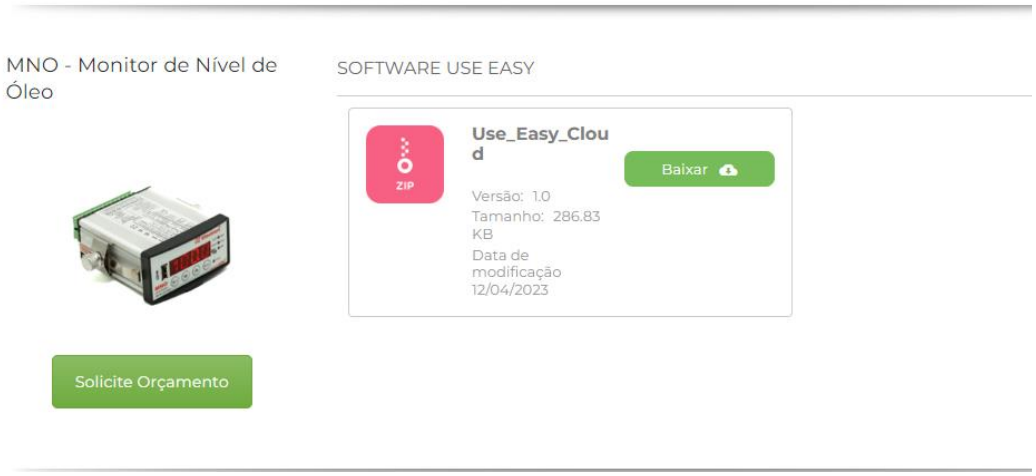
3 - After 10 years of use, it is recommended to replace the equipment.

Table 2 – Preventive maintenance

INSTALLATION SOFTWARE FOR PARAMETERIZATION - USEEASY

1) Go to the software page on our Website https://electron.com.br/site/softwares/

2) Find your equipment and download the corresponding software



INSTALLATION ACCESSORIES

Electron do Brasil has a line of accessories that can be purchased together aiming 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 outdoor use with double port for mounting instruments, accessories and passing control wires and power of the power transformer. The external door contains a glass display with UV protection for viewing the quantities measured by the temperature monitor and the panel contains special paint that is resistant against weather and its degree of protection is IP 55, as per NBR IEC 60529:2017.

Dual Port Panel for Outdoor Use – IP 55 Page Link:
https://electron.com.br/site/produtos/painel-para-uso-externo-ip55/

IMPORTANT RECOMMENDATIONS

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

1. All sensors as well as the equipment must be grounded, not use the same grounding point for power supply and for the sensor so that there is no difference in potential. Properly grounded sensors and power prevent malfunctions or damage in cases of disturbances, surges, and inductions in the equipment.

2. Use 120 Ohm resistors in the communication network (Rs485) at the 2 ends of the transmission line (start 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 on 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 front polycarbonate are filtered, in this way the life of the equipment will be prolonged.

IMPORTANT RECOMMENDATIONS CABLING

Recommended Cabling for connection (NBR-5410 and NBR-14039 Standards)		
Connection	**Material**	**Quality**
Grounding	NU Copper	High Electrical Conductivity.
	Tinned Copper	Corrosion resistance.
	Copper Tape	Lightning Protection.
	Grounding Mesh	Uniform fault current distribution.
	Grounding Rod	Creates a path of Low resistance to the earth.
RS-485 Communication	Belden 9841 (24AWG)	Twisted pair, shielded and Low Capacitance.
	Alpha Wire (22AWG)	
Feeding	EPR	Resistance to heat, humidity, chemical agents and withstand up to 90°C.
	XLPE	
Sensors	PT-100 Blindado (3x24 AWG) - Electron	Mechanical resistance and noise protection.
Relay Output	Armored Multiway Rope	Mechanical resistance and noise protection.

Cabling Recommended for connecting current inputs/outputs					
Connection	**Material**	**Range**	**Impedance**	**Distance**	**Minimum Gauge**
Analog Outputs / TC / Tap Inputs	Armored Multiway Rope	0...1mA	8kΩ	<100m	0.14 to 0.25mm²
				>100m	0.35 to 0.5mm²
		0...5mA	1.6kΩ	<100m	0.2 to 0.35mm²
				>100m	0.5 to 0.75mm²
		0...10mA	800Ω	<100m	0.25 to 0.5mm²
				>100m	0.75 to 1.0mm²
		0...20mA	400Ω	<100m	0.5 to 0.75mm²
				>100m	1.0 to 1.5mm²
		4...20mA	400Ω	<100m	0.5 to 0.75mm²
				>100m	1.0 to 1.5mm²

Table 3 – Cabling Recommendation

WARRANTY TERM

The Electron Oil Level Monitor has a warranty period of two years from the date of sale recorded 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 a product with evidence of defect or malfunction. The following events are also not covered: Natural wear and tear of parts due to continuous and frequent use, damage to the outside caused by falls or improper packaging; attempt to repair/break a seal with damage caused by persons not authorized by Electron and in disagreement with the instructions that are part of the technical description.

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 the NBR 5410 Standard are not observed;

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

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

The damage is caused by a drop or impact;

Infiltration of water or any other liquid occurs;

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

Use of the Warranty

To enjoy this warranty, the customer must send the product to Electron along with a copy of the purchase invoice properly packaged so that there is no damage in transport.

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

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