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# EHMI

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Human Machine Interface

**Manual**

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## INTRODUCTION

EHMI - **IoT** is an advanced and flexible monitoring solution capable of integrating industrial equipment and substations into an IoT ecosystem. With its storage capacity, remote communication and compatibility with standard market protocols, it provides **complete and efficient monitoring**, improving **operational safety and optimizing predictive maintenance**.

The **EHMI - IoT** communicates with up to **32 sensors** via the **Modbus RTU protocol**. It processes the received quantities, allowing the application of **mathematical formulas** and the definition of **units of measurement** before presenting them on its **OLED display**. The display organizes the information of up to 32 pieces of equipment in a structured way through pages, facilitating the visualization and monitoring of the monitored data.

The **EHMI - IoT** has a built-in WiFi modem and built-in 3 dBi antenna and an Ethernet port with RJ45 connector. This feature, when enabled, allows you to connect to the Internet and immediately send the collected and measured data to an **MQTT Broker Server**. The data is accessible through the **MONITRAFO.com** platform, allowing remote monitoring of equipment and substations.

**EHMI** uses **MQTT protocol** and integrates advanced tools such as **Artificial Intelligence, Machine Learning, Database, Programmable Functions, Automatic Calculations and Notifications**. In the event of a loss of connection, the data is stored locally and later sent to the server.

With the **MONITRAFO** platform, users can set up custom designs, track measurements in real-time, and access detailed reports of monitored quantities, triggers, alarms, and predictive maintenance. Monitoring can be done via **internet browser or MONITRAFO app**, available for Android and iOS.

When integrated with the **MONITRAFO** platform, **EHMI - IoT** offers a complete ecosystem for monitoring and managing electrical assets, significantly expanding its functionalities:

- **Efficient Monitoring:** Access to advanced monitoring, diagnosis, and fault prevention tools directly from the cloud, allowing flexibility and operation from anywhere with internet access.
- **Real-Time Alerts:** Immediate notifications of faults and alarms via SMS, WhatsApp, and email, ensuring quick responses to critical events.
- **Reports with Artificial Intelligence:** Generation of detailed reports with accurate diagnoses, assisting in preventive maintenance and identifying potential problems before they become critical.
- **Interactive Dashboards:** Personalized visualization of projects through modes such as Dashboard, Overview and Map, facilitating the identification of active events and the efficient management of monitored assets.
- **Event Announcer:** Real-time notification to the entire team of substation incidents, promoting effective collaboration and ongoing equipment maintenance.
- **Maintenance Schedule:** Periodic maintenance recommendations generated by IEDs and artificial intelligence, ensuring the best performance and extending the useful life of sensors and electrical assets.
- **Team Communication:** Integration and facilitated communication between team members through notifications and chat on the platform, optimizing maintenance management and maintaining a history of actions.
- **API and Integrations:** Support for various programming languages and integration with ERP systems and IoT platforms, such as SAP, Oracle, Totvs, AWS, Google Cloud, Azure and IBM Watson, providing flexibility and versatility in meeting the specific needs of users.

## COMMUNICATION AND PROCESSING FEATURES

- **Modbus RTU Protocol:** Allows integration and efficient communication with up to 32 sensors or equipment, ensuring real-time data collection and processing.
- **Protocol Gateway:** Variables received through the RS485 Modbus Master port are transparently available to the RS485 Slave port and Ethernet port (RJ45) and can be sent to SCADA systems using the Modbus RTU and/or DNP3 protocols that are native to EHMI.
- **Treatment of Quantities:** The variables received can be manipulated with mathematical formulas and adjusted for specific units of measurement, providing flexibility and precision in the presentation of data.
- **OLED Display:** Displays information on up to 32 devices organized by pages, facilitating navigation and monitoring of measured quantities.

## CONTROL AND SAFETY FUNCTIONS

- **Communication Relays:** It has relays that indicate communication failures between sensors or equipment in the network, ensuring the integrity and reliability of the monitoring system.
- **Relay Programming:** Relays can be configured to act on specific events based on the variables read by RS485, allowing for automated actions and quick responses to pre-defined conditions.

## COMMUNICATION AND POWER INTERFACE

- **2 RS-485 Ports:**
  - ANSI/TIA/EIA-485-A Standard
  - Half-duplex, multipoint, up to 32 devices
  - Maximum distance: 1,200 meters
  - Speed from 1,200 to 57,600 bps
  - SLAVE: Modbus RTU, DNP3 Level 2, transmission of received data
    - MASTER: Modbus RTU, configurable, with handling of variables and mathematical formulas
    - Capacity for up to 32 sensors
    - Treatment of received variables with the application of mathematical formulas and configurable units of measurement
    - Smart organization on the OLED display
    - Programmable relays for event-based triggering of RS-485

- **WiFi modem:**
  - Connection via 802.11 b/g/n/e/i
  - WPA/WPA2/WPA-Enterprise Security Protocol
  - AES/RSA/ECC/SHA Encryption
  - Up to 150 Mbps transmission with built-in 3 dBi antenna
- **Ethernet TCP/IP (RJ-45):**
  - Modbus TCP, Modbus RTU and MQTT support
  - Integration with servers and remote monitoring systems
- **USB Type-C:**
  - Version 2.0, 480 Mbps throughput
  - Compatible with Use Easy software for parameterization
- **High Visibility OLED Display:**
  - Resolution 128 x 64 pixels
  - Contrast adjustment and color inversion
  - Organized display of up to 32 devices on pages
  - IPD (Intelligent Presence Detector): activates the display automatically when detecting the user at 1.5m
- **High Reliability Internal Clock:**
  - HMS indication (hours, minutes, seconds)
  - Supercapacitor power backup (withstands high temperatures, no need for replacement)
- **Programmable relays:**
  - Indicate communication failures between sensors
  - Configurable for RS-485 event-based actuation
- **Auxiliary Output:**
  - 18Vdc Auxiliary Output.
- **Power Supply:**
  - Universal Power: 24-275 Vdc/Vac.

TECHNICAL DATA

EHMI – TECHNICAL DATA	
<b>Feeding</b>	24 to 275 Vdc/Vac 50/60 Hz
Relay Output	70W/250VA
<b>Maximum Driving Current</b>	10 Amps
<b>Outbound Contact</b>	3 NOC
<b>Serial Communication Port</b>	1 RS-485 (Slave) and 1 RS-485 (Master)
<b>Auxiliary Output</b>	18VDC
<b>Communication Protocol</b>	MODBUS-RTU, DNP3.0 Lv.1 and MQTT – TLS/SSL
<b>Auto Baud Rate (automatic detection and selection)</b>	2,400 to 57,600 bps
<b>Communication port</b>	USB Type-C for parameterization via UseEasy software
<b>Box</b>	48x48x54mm

Table 1 – Technical Data

CONNECTION DIAGRAM

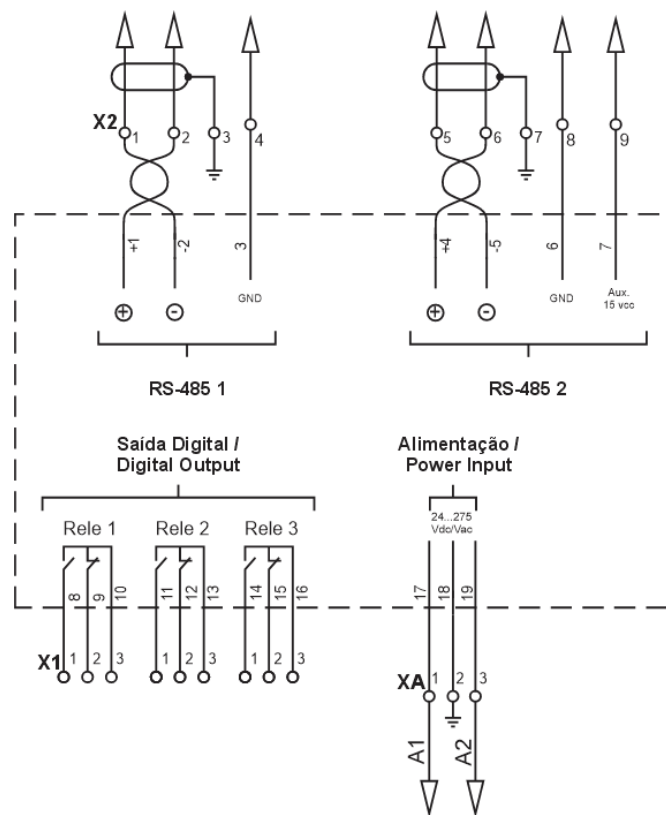


Fig 1 – Connection diagram image

DIMENSIONS

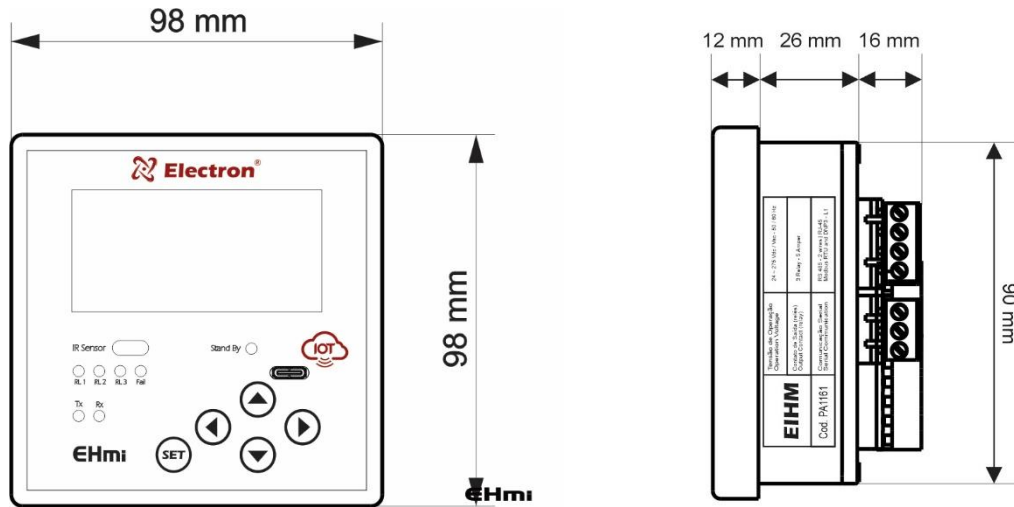


Fig 2 – Image dimensions

APPLICATION EXAMPLE

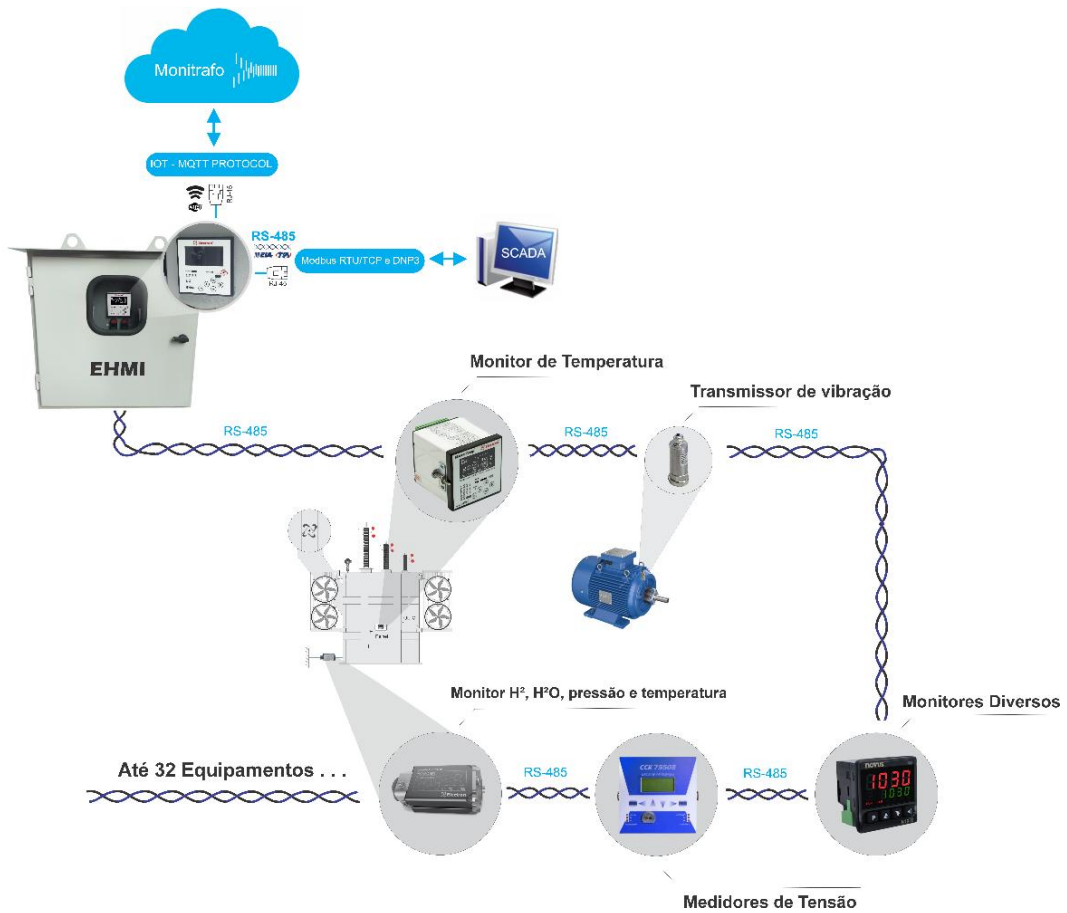


Fig 3 – Application Example

GETTING TO KNOW EHMI

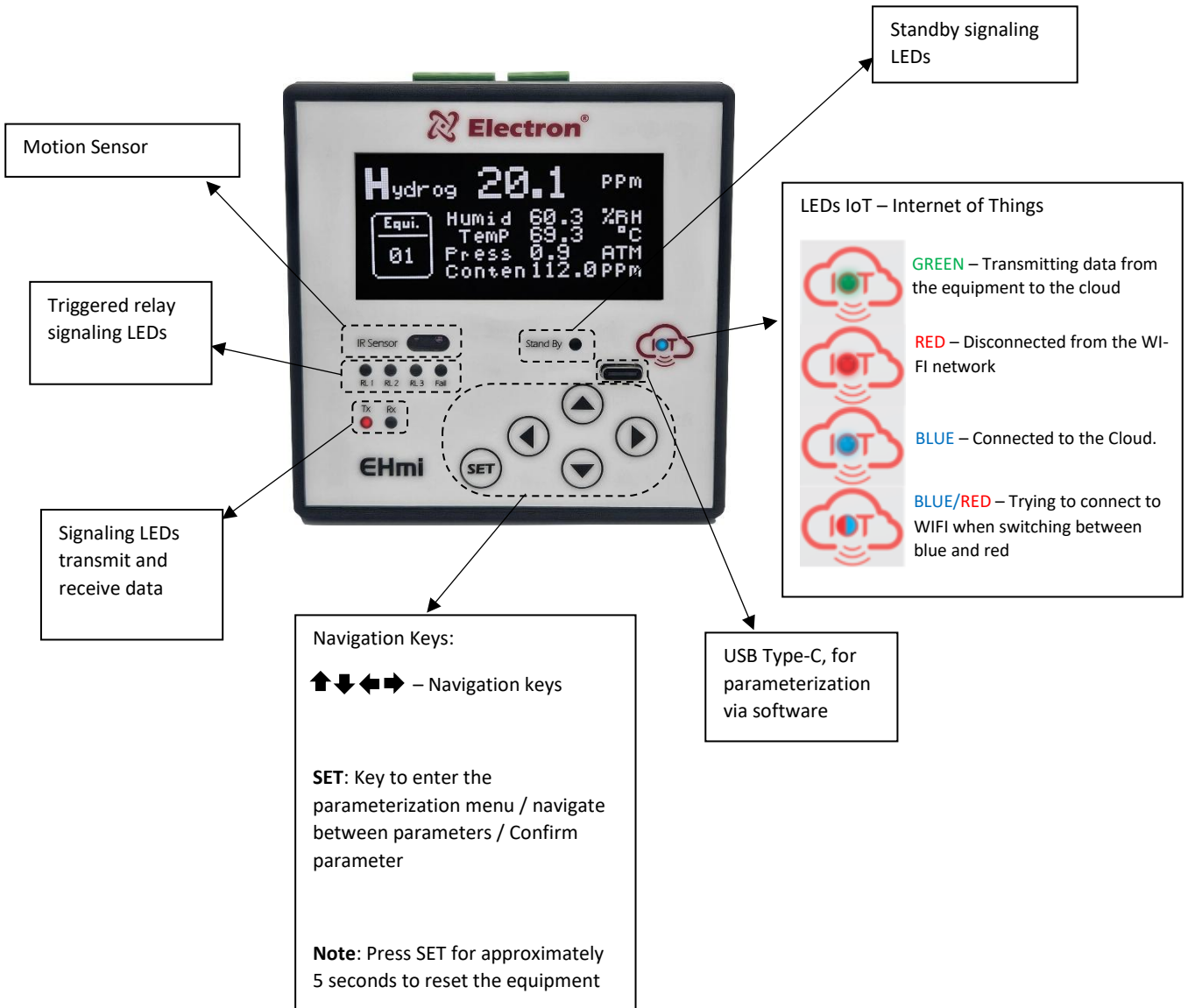
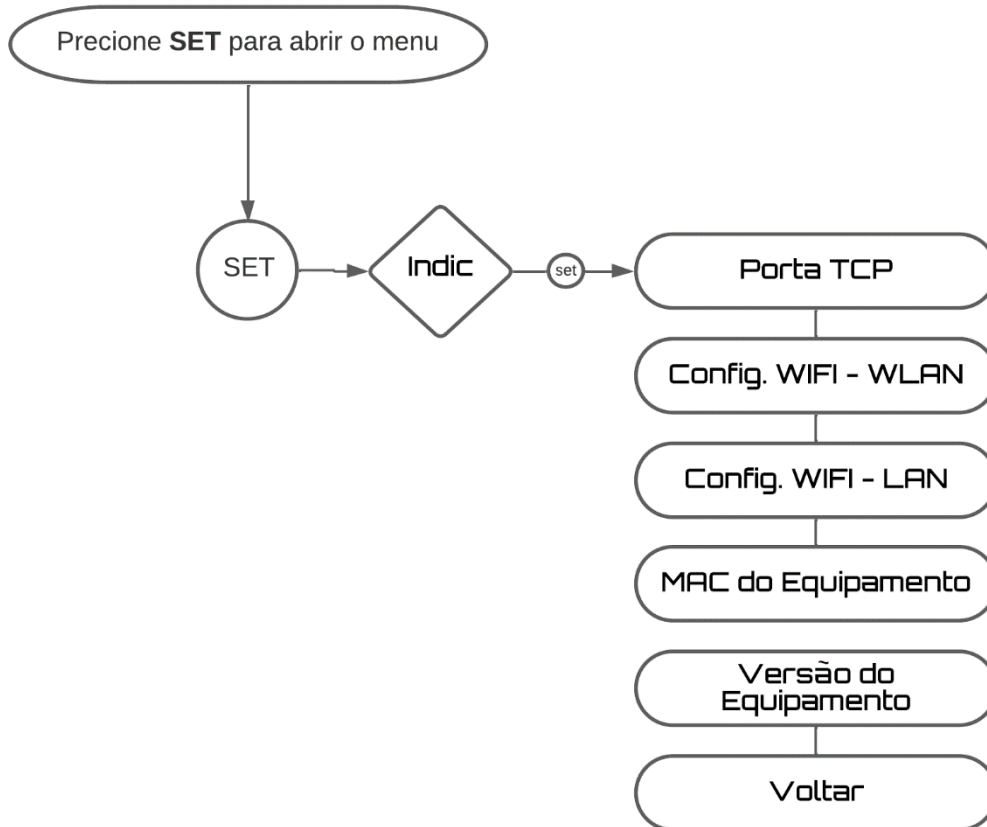
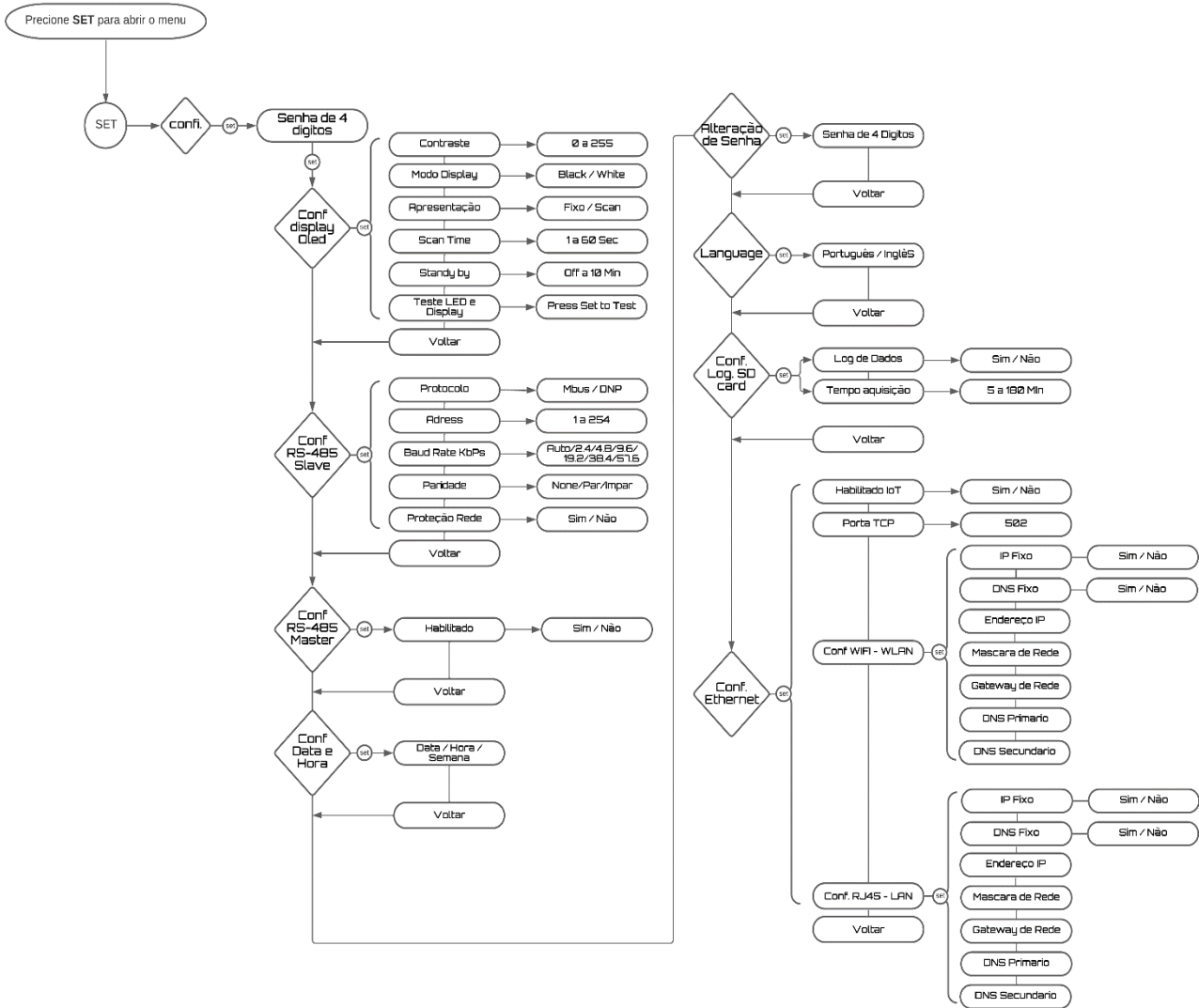


Fig 4 – Getting to know EHMI

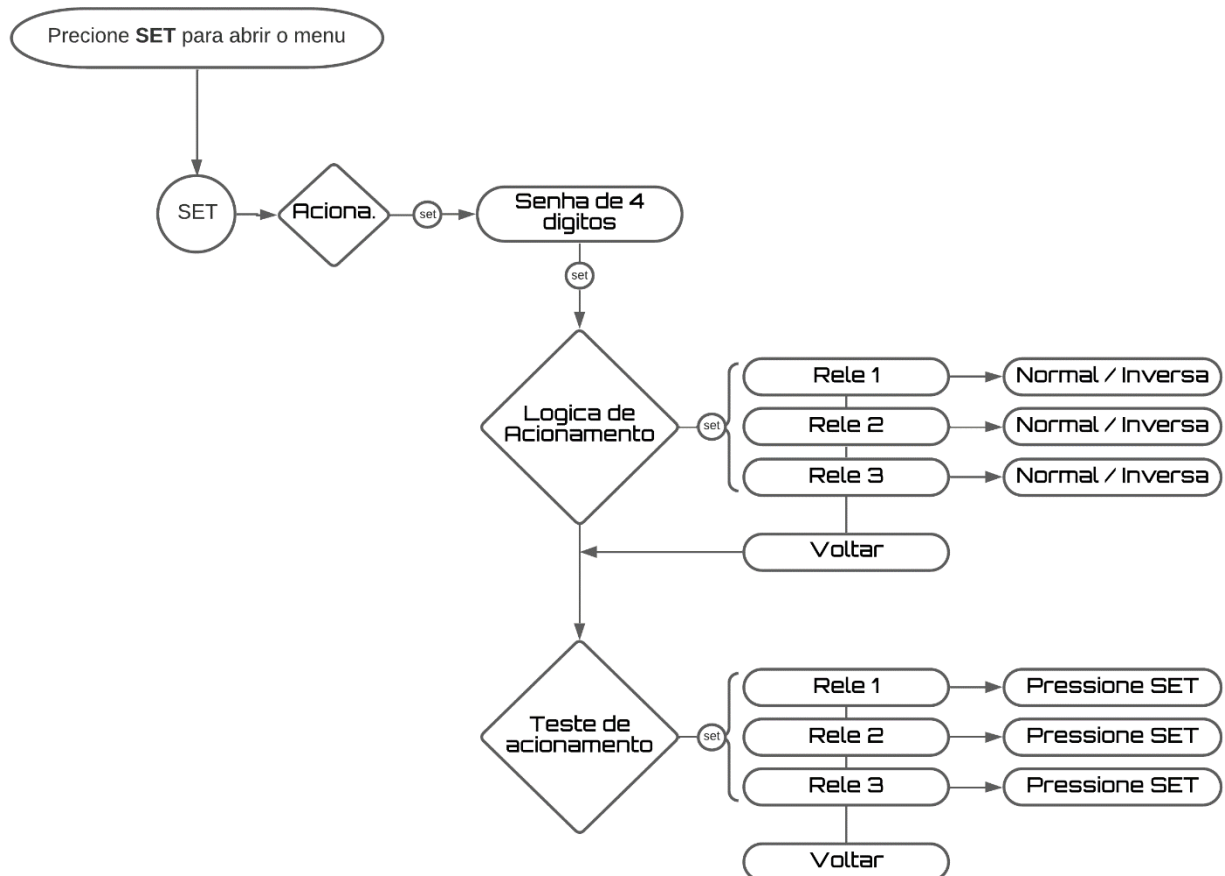
QUERY MENU FLOWCHART



CONFIGURATION MENU FLOWCHART



RELAY DRIVE CONFIGURATION FLOW CHART



**CONSULTATION MENU**

To enter the configuration menu, press the "SET" key, and go to the "Indica" menu.

→ Menu for consultation		
Menu	Parameter	Description
<b>Config.</b>	<b>TCP port</b>	Check the configured TCP port.
	<b>Config. WIFI - WLAN</b>	Check the settings applied on WLAN.
	<b>Config. WIFI - LAN</b>	Check the settings applied on LAN.
	<b>MAC Equipment</b>	Check MAC Address of the machine.
	<b>Equipment Version</b>	Check the firmware version of the equipment.

**SETTINGS MENU**

To enter the configuration menu, press the "SET" key, and go to the "Config." menu will appear on the display for you to enter the password to enter the menu, the default factory password is '0000'.

→ Menu for configuring the OLED display;		
Menu	Parameter	Description
<b>Config.</b>	<b>Contrast</b>	Set a contrast value so that the preview is most visible.
	<b>Display Mode</b>	Display of Black or White.
	<b>Presentation</b>	Presentation of variables in fixed or scanning.
	<b>SCAN Weather</b>	Screen time in seconds for presentation of variables in SCAN.
	<b>Standby</b>	Time the screen remains active in minutes without user interaction.
	<b>LED Test &amp; Display</b>	Test to verify that all LEDs are working.

→ RS485 (SLAVE) Configuration Menu.		
Menu	Parameter	Description
<b>Config.</b>	<b>Protocol</b>	Set the ModBus or DNP communication protocol.
	<b>Address</b>	Set the address of the equipment on network 1 to 254.
	<b>Baud Rate KbPS</b>	Set communication speed: Auto / 2.4 / 4.8 / 9.6 / 19.2 / 38.4 / 57.6.
	<b>Parity</b>	Set the parity to: None / Even / Odd.
	<b>Network protection</b>	Enable parameter change protection in Yes or No.

→ RS485 (Master) Configuration Menu.		
Menu	Parameter	Description
<b>Config.</b>	<b>Qualified</b>	Enable/Disable RS485 output in master: Yes or No.

→ Menu for setting the date and time	
Menu	Description
<b>Config.</b>	Set date/time and week.

→ Password Setting Menu	
Menu	Description
<b>Config.</b>	Set a 4-digit passcode.

→ SET the Language Menu	
Menu	Description
<b>Config.</b>	Set the Language: Portuguese or English

→ SD Card Log Configuration Menu		
Menu	Parameter	Description
<b>Config.</b>	<b>Data Logging</b>	Set to: Yes or No.
	<b>Acquisition Time</b>	Data acquisition time, set at: 5 to 180 minutes.
→ Ethernet Configuration Menu		
Menu	Parameter	Description
<b>Config.</b>	<b>IoT enabled</b>	Set to: Yes or No.
	<b>TCP port</b>	Data acquisition time, set at: 5 to 180 minutes.
	<b>Confi WIFI - WLA</b>	Configure your network's WLAN data
	<b>Conf WIFI - LAN</b>	Configure your network's LAN data

## DRIVE SETTINGS MENU

To enter the configuration menu, press the "SET" key, and go to the "activate" menu. will appear on the display for you to enter the password to enter the menu, the default factory password is '0000'.

→ Menu for Configuration for Trigger Logic		
Menu	Parameter	Description
<b>Config.</b>	<b>Relay 1</b>	Set Normal or Reverse trigger logic.
	<b>Relay 2</b>	Set Normal or Reverse trigger logic.
	<b>Relay 3</b>	Set Normal or Reverse trigger logic.

→ Relay Trigger Test Menu		
Menu	Parameter	Description
<b>Config.</b>	<b>Relay 1</b>	Press SET to test relay 1.
	<b>Relay 2</b>	Press SET to test relay 2.
	<b>Relay 3</b>	Press SET to test relay 3.

## CERTIFICATIONS AND COMPLIANCE

- **Applied Voltage (IEC 60255-5):** 2kV / 60Hz / 1 min.
- **Voltage Impulse (IEC 60255-5):** 1.2/50  $\mu$ sec / 5kV / 3 negative and 3 positive / 5 sec. interval
- **Electrostatic Discharges (IEC 60255-22-2):**
  - Air Mode: 8kV
  - Contact Mode: 6kV
- **Immunity to Electromagnetic Disturbances:**
  - **Spoked (IEC 61000-4-3):** 80 to 1000 MHz / 10V/m
  - **Fast Electrical Transients (IEC 60255-22-4):** Input/Outputs = 4kV / Common = 2kV
  - **Surges (IEC 60255-22-5):**
    - Phase/Neutral: 1kV, 5 per polarity ( $\pm$ )
    - Phase-to-ground/neutral-to-ground: 2kV, 5 per polarity ( $\pm$ )
  - **Conducted (IEC 61000-4-6):** 0.15 to 80 MHz / 10V/m
- **Climate Test (IEC 60068-21-14):** -40°C to +85°C / 72h
- **Vibration Resistance (IEC 60255-21-1):**
  - 3-axis / 10 to 150Hz / 2G / 160 min/axis
  - Response: 0.075mm-10 at 58Hz / 1G from 58 to 150Hz / 8 min/axis

## ORDER SPECIFICATION

**Code:** PA-1161

**Name:** EHMI – HUMAN MACHINE INTERFACE

**Product Description:** EHMI - IOT is capable of communicating with up to 32 sensors via Modbus RTU protocol, processes the received data, allowing the application of mathematical formulas and the definition of units of measurement before displaying them on your OLED display. Equipped with an integrated WiFi modem, built-in 3 dBi antenna and an Ethernet port with RJ45 connector, the device enables Internet connection and immediate sending of the collected data to an MQTT Broker Server, when this function is enabled, the data is accessible through the MONITRAFO.com platform, allowing remote monitoring of equipment and substations in a practical and efficient way.

## WARRANTY TERM

EHMI Electron has a warranty period of two years from the date of sale stated on the invoice, with coverage for any manufacturing defects that make it unsuitable or unsuitable for the applications for which it is intended.

### 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;
- Violated 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 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 an emergency service, it is recommended to send as much information as possible, regarding the defect detected. This will be analyzed and subjected to full functional tests.

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