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# Thermal Protection Relay – EPU-IoT

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MANUAL

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## INTRODUCTION

The EPU IOT **Thermal Protection Relay** was developed to simultaneously supervise up to 16 (sixteen) temperature channels. It is used to protect and monitor dry-type transformers, motors, bearings, machinery, and industrial processes, as specified in the **ANSI table**. The IOT **EPU** is a high precision and reliability instrument, controlling transformer ventilation (ON/OFF), alarms and shutdowns (TRIP), with timing options.

The EPU IOT **Thermal Protection Relay** has been built following strict quality standards and uses high-quality electronic components and state-of-the-art technology (SMD). Its hardware is designed to withstand harsh working conditions and can be installed directly in transformers, panels in power substation yards, offshore platforms and chemical industries. It meets the levels of demand, supportability and reliability established by the IEC, DIN, IEEE and ABNT standards.

With signal inputs, the **EPU IOT** allows the connection of up to 16 PT100 temperature sensors (EN60751-DIN 43760), or up to 9 PT100 temperature sensors (EN60751-DIN 43760) in the version with RJ-45 (Ethernet) input and up to 5 15 VDC 2-wire active analog output universal and configurable, with a range of 0 to 1mA, 0 to 5mA, 0 to 10mA, 0 to 20mA, or 4 to 20mA. This output can be used to reflect the highest temperature recorded at the time. The analog output also has the SCAN function, which simultaneously reflects all the values of the temperature channels. This configuration can be performed directly on the **EPU IOT dashboard** or via the **EPU IOT™ software** with **BLUETOOTH** or **USB connection**.

The EPU IOT **Thermal Protection Relay** has an RJ-45 (Ethernet) input for Wi-Fi connection and an integrated **Wi-Fi** modem with a built-in 3 dBi antenna for wireless connection. When **enabled by the user**, this feature allows the Internet connection. Once the connection is established, the **EPU IOT** immediately makes the collected and measured data available on an **MQTT Broker Server**. This is accessible through the MONITRAFO.com monitoring platform, where users can easily register, choose the plan that best suits their needs, and set up projects with one or multiple substations and transformers. In this way, you get total control to monitor in real time all measured quantities, triggers, alarms, maintenance, transformer health status, among other measures. This can be done using the platform in any internet browser or through the MONITRAFO APP, available on the **Play Store** (Android) and the **App Store** (iOS).

The **IOT EPU** uses the **MQTT** communication protocol, integrating with the **MONITRAFO.com** platform to enable complete online monitoring of your transformer. In addition, it integrates **ARTIFICIAL INTELLIGENCE TOOLS, MACHINE LEARNING, DATABASE, PROGRAMMABLE FUNCTIONS, CALCULATIONS AND NOTIFICATIONS, MAINTENANCE SCHEDULE**. In the event of a loss of internet connection, the **IOT EPU** stores all measurements for the period when communication was unavailable. When the connection is restored, the data is sent to the **MONITRAFO.com** and stored in a database for querying, calculating, and more.

An open API is also available to integrate EPU IoT with platforms such as to integrate **the IOT EPU** with other platforms, such as **Azure, Google Cloud, AWS, IBM, SAP**, among others.

Thanks to the implementation of these advanced technologies, the **transformer becomes a smart device** capable of identifying changes in transformer behavior within its standard operating cycle and sending notifications via email, SMS, and apps whenever the system detects these abnormal variations. This provides you with a robust tool that significantly enhances your ability to make effective decisions.

In addition, the **EPU IOT Thermal Protection Relay** also has an RS-485 digital output with Modbus-RTU protocol and DNP 3\* (L1), which allows access to all parameters, including remote commands for real-time triggers using a SCADA supervisory. 3 independent temperature setpoints are available for each sensor and 4 relays, 3 isolated, independent and potential-free actuation relays (NO) that can be used for alarms, shutdowns (TRIP) and FAN activation (ventilation), and 1 isolated, independent and potential-free relay (NC) to indicate faults (watchdog).

The display mode is fully user configurable, allowing you to maintain the highest temperature on the display at the time, any of the temperatures selected by the operator or use the SCAN function that features a continuous scan of all temperature channels. The front indicator LEDs and the data communication port make it possible to identify the channel that caused the alarm, shutdown or activation of the fans. All functions and parameterizations can be easily configured directly on the device panel or via the **EPU IOT™ software** with **BLUETOOTH** or **USB connection**.

The EPU IOT **Thermal Protection Relay** is built in a high mechanical strength aluminum box, with measurements of 98x98x37mm, following DIN IEC 61554 standards for panel fixing.

## KEY FEATURES

### Communication Protocols

- Modbus RTU
- DNP3
- DNP3 over TCP/IP over IP networks
- Modbus TCP/IP
- MQTT

### Communication Ports

- **Built-in WIFI modem**
  - 802.11 b/g/n/e/i standards;
  - WPA/WPA2/WPA-Enterprise security protocol;
  - AES/RSA/ECC/SHA encryption;
  - Data rate up to 150 Mbps;
  - Built-in 3 dBi antenna (isotropic decibel);
  - Transmit Power up to 21 dBm (decibel milliwatt);
- **Bluetooth**
  - Class 2 – 2.5 mW (4 dBm);
  - FIPS encryption;
  - Version 4.2 BR / EDR and BLE (Low Energy);
- **USB**
  - Version 2.0;
  - Transfer rate 480 Mbps;
  - Type-C connector.
- **RS-485**
  - ANSI/TIA/EIA-485-A standard;
  - Max. 32 equipments;
  - Half Duplex;
  - Multipoints;
  - Max. Distance: 1,200 meters;
  - 2 metallic wires;
  - Automatic speed from 2,400 to 57,600 bps.
- **RJ-45 TCP/IP**
  - TIA/EIA-568-B standard;
  - ISO/IEC 11801 standard;
  - 8 pins;
  - 100 Ohms impedance;
  - Standard 10BASE-T, 100BASE-TX.
  - Max. Distance Cat 5e/6/6a/7: Up to 100 meters for Ethernet.
  - Max. Distance Cat 8: Up to 30 meters for high-speed Ethernet.
  - Return Loss: -18dB minimum @ 1-30MHz -16dB minimum @ 30-60MHz-12dB minimum @ 60-90MHz;
  - Common Mode Rejection Rate: -30dB Minimum @ 1-100MHz;
  - Insulation: 1.5 kV / 60Hz / 1 minute.

### Dimensions and Power

- Compact Equipment with a depth of 37 mm;
- Universal Power Supply 24-275 Vdc / Vac;

**Human Machine Interface (HMI)**

- 4 Navigation keys;
- 9 or 10 LEDs on the front for event indications (see request);
- Intuitive menus for consultation and parameterization;

**Measurement input**

- Up to 16 temperature measurement inputs for sensor type PT100, 100  $\Omega$  0 °C (EN60751 – DIN43760) or Temperature Sensors type Cu10, 10  $\Omega$  to 25 °C;
- 0.5% accuracy (FE);
- Intuitive menus for consultation and parameterization;

**Digital Relay Outputs**

- 01 Relay (NO/NC – Normally Open and Closed) with 10 ampere capacity for Temperature Alarm
- Up to 02 Relays (NO/NC – Normally Open and Closed) with a capacity of 10 amperes for FAN (cooling) with programmable drive timing;
- 01 Relay (NO/NC – Normally Open and Closed) with a capacity of 10 amperes for TRIP (shutdown) with programmable activation timing;
- 01 Relay (NO/NC – Normally Open and Closed) with a capacity of 10 amperes for FAULT with programmable drive timing;
- Intuitive menus for consultation and parameterization.

**Analog Outputs**

- Supports up to 05 (five) analog outputs (Active 15 Vdc) with range options of: 0 to 1 mA, 0 to 5 mA, 0 to 10 mA, 0 to 20 mA and 4 to 20 mA;

**Type trials met**

- Applied Voltage (IEC 60255-5): 2 kV / 60 Hz / 1 min. (Against land);
- Voltage Impulse (IEC 60255-5): 1.2/50  $\mu$ sec. / 5 kV / 3 neg. and 3 pos. / 5 secs. Interval;
- Electrostatic Discharges (IEC 60255-22-2): Air mode = 8 KV / Contact mode = 6 KV;
- Immunity to radiated electromagnetic disturbance (IEC61000-4-3): 80 to 1000 MHz / 10 V/m;
- Fast Electric Transient Immunity (IEC60255-22-4): Input/Outputs = 4 KV / common 2 Kv;
- Surge Immunity (IEC 60255-22-5): phase/neutral 1 KV, 5 per polar ( $\pm$ ) – phase-to-ground/neutral-to-ground 2 KV, 5 per polar ( $\pm$ );
- Immunity to conducted Electromagnetic disturbances (IEC61000-4-6): 0.15 to 80 MHz / 10V/m;
- Climate Test (IEC60068-21-14): – 40 °C + 85 °C / 72 hours;
- Vibration Resistance (IEC 60255-21-1): 3-axis / 10 to 150 Hz / 2 G / 160 min/axis;
- Vibration Response (IEC60255-21-1): 3-axis / 0.075 mm -10 to 58 Hz / 1 G from 58 to 150 Hz / 8min / axis.

**TECHNICAL DATA**

<b>EPU - UNIVERSAL THERMAL PROTECTION RELAY</b>	
<b>Operating Voltage</b>	24 to 275 Vdc/VAC 50/60 Hz
<b>Operating Temperature</b>	-40 °C to +85 °C / -10 °C to +70 °C
<b>Power Consumption</b>	< 15 W
<b>Temperature Measurement Input</b>	Up to 16 Sensors - PT100 Ohm at 0°C, 2 and 3 wires (EN 60751 - DIN 43760) / Cu10 10 Ω at 25 °C.
<b>Measurement Range</b>	-50 °C to 250 °C
<b>Active Analog Output 15 Vdc and Maximum Load.</b>	0 ... 1 mA - 8000 Ohms
	0 ... 5 mA - 1600 Ohms
	0 ... 10 mA - 800 Ohms
	0 ... 20 mA - 400 Ohms
	4 ... 20 mA - 400 Ohms
<b>Maximum Measurement Input Error</b>	0.5 % end of scale
<b>Maximum Analog Output Error</b>	0.5 % end of scale
<b>Outgoing Contacts</b>	4 (NAF) – Potential Free
<b>Maximum Switching Power</b>	70 W / 250 VA
<b>Maximum Switching Voltage</b>	250 Vac/125 Vdc
<b>Maximum Driving Current</b>	10 Amps
<b>Front Communication Port</b>	Type-C connector
<b>Serial Communication Port</b>	RS 485 – 2 wires (ANSI/TIA/EIA-485A)
<b>WI-FI</b>	Standards B/G/N/E/I
	WPA/WPA2/WPA - Enterprise
	Up to 150 Mbps data rate
	Built-in 3 dBi antenna
	Up to 21 dBm transmit power
	RJ-45 TIA/EIA-568-B Standard
<b>Bluetooth</b>	Version 4.2 BR/EDR and BLE (Low Energy)
<b>Communication Protocol</b>	Modbus RTU; DNP3; DNP3 over TCP/IP over IP networks; Modbus TCP/IP; MQTT
<b>Auto Baud Rate</b>	2,400 to 57,600 bps
<b>IEC 61554 DIN Box</b>	98 x 98 x 98 mm
<b>Fixation</b>	Panel Door with Steel Clip
<b>Relative humidity</b>	10 to 95%, non-condensing
<b>Protection</b>	IP54 (Front)

*Table 1 – Technical Data of the EPU-IOT Thermal Protection Relay*

## TYPE TRIALS MET

- Applied Voltage (IEC 60255-5): 2 kV / 60 Hz / 1 min. (against land);
- Voltage Impulse (IEC 60255-5): 1.2/50  $\mu$ sec. / 5 kV / 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 / 10 V/m;
- Immunity to Fast Electrical Transients (IEC60255-22-4): Alim/Input/Outputs=4 KV/common 2Kv;
- Surge Immunity (IEC60255-22-5): phase/neutral 1 KV, 5 per polar ( $\pm$ ) - phase-to-ground/neutral-to-ground 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): - 40 °C + 85 °C / 72 hours;
- Vibration Resistance (IEC60255-21-1): 3-axis / 10 to 150 Hz / 2G / 160min/axis;
- Vibration Response (IEC60255-21-1): 3-axis / 0.075 mm -10 to 58 Hz / 1G from 58 to 150 Hz / 8min/axis;

## DIMENSIONS

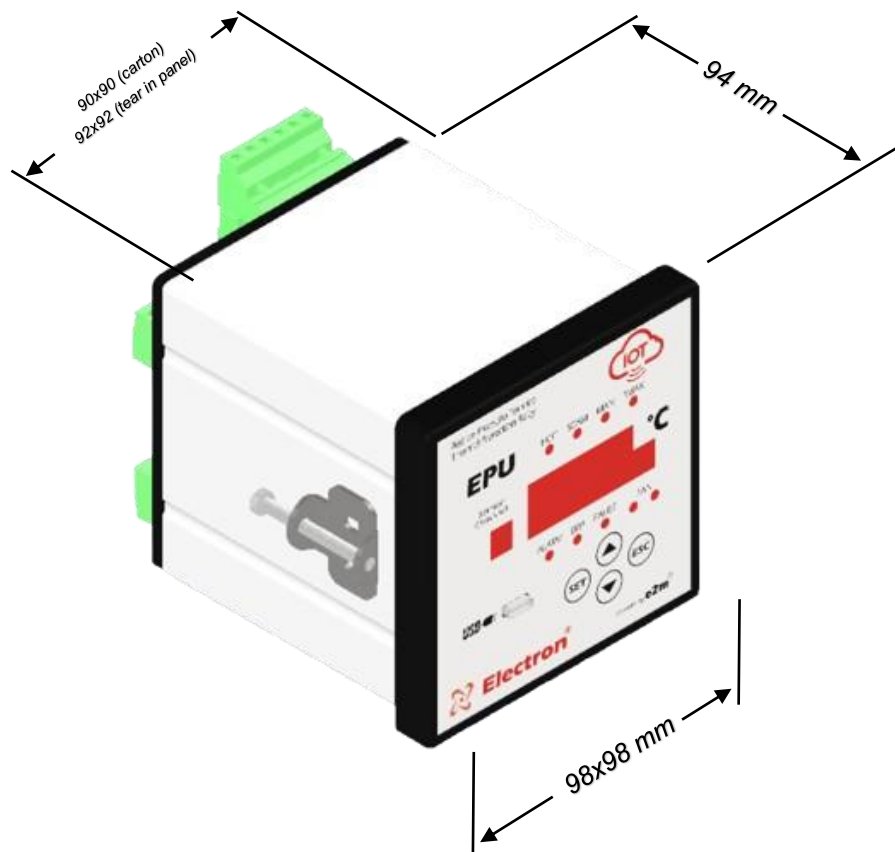
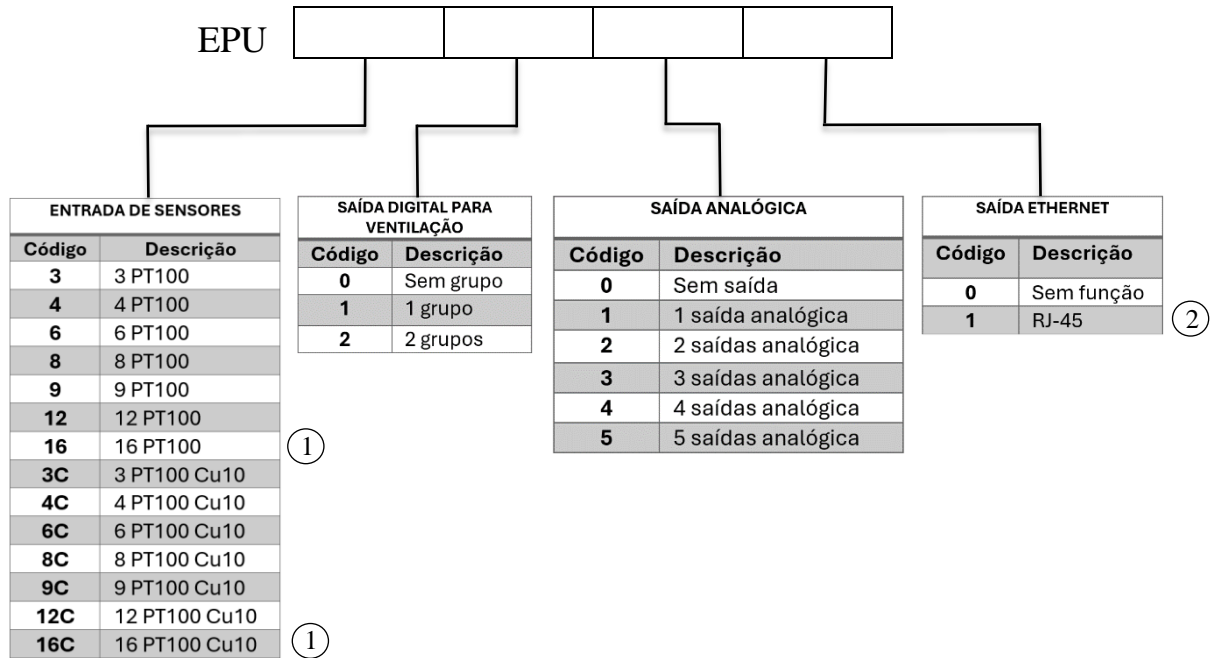


Fig. 1 - EPU Dimensions

PURCHASE ORDER GUIDE



① For 16 sensors, you can only choose up to 1 fan group and it is not possible to choose an analog output and RJ45 port (Ethernet).

② For all cases where there is an RJ45 (Ethernet) output, only 1 analog output and a maximum of 9 sensors will be possible.

EPU CONNECTION DIAGRAM WITHOUT ETHERNET (RJ-45)

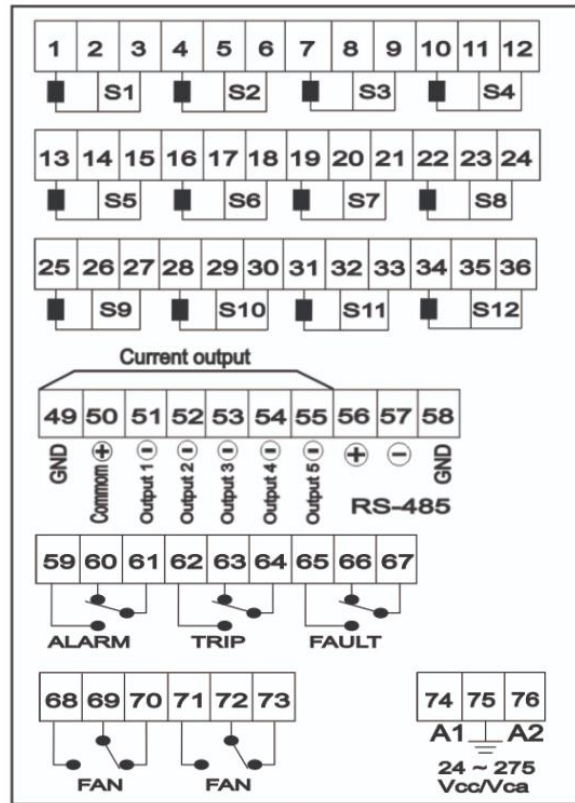


Figure 2 – Diagram of 3 to 12 PT100 sensor inputs with all EPU options

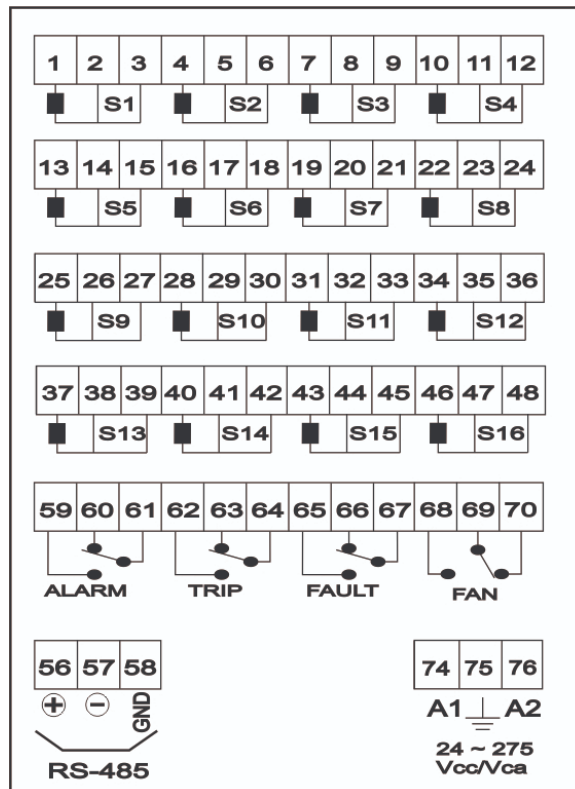


Figure 3 – Diagram of 16 PT100 sensor inputs

EPU CONNECTION DIAGRAM WITH ETHERNET (RJ-45)

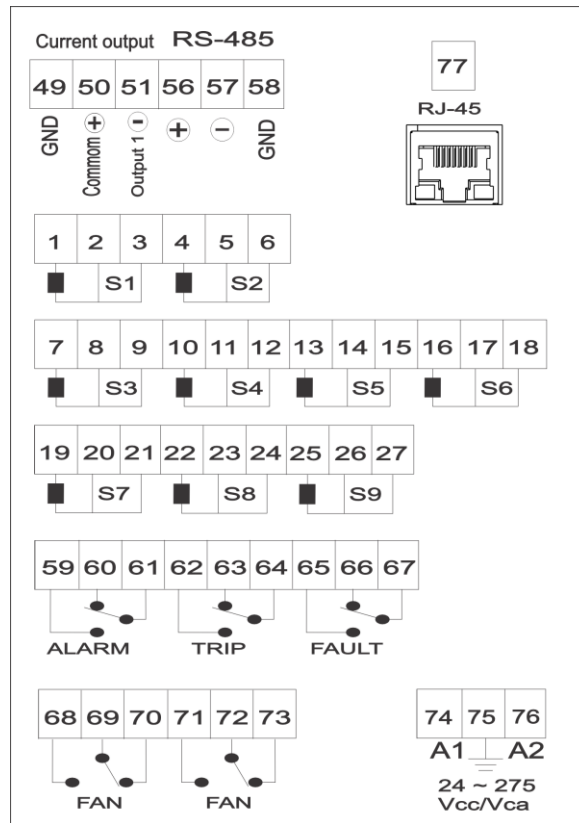


Figure 4 – 3 to 9 PT100 sensor inputs EPU with all optional

SENSOR INPUT - SENSOR CIRCUIT (IN 60751 – DIN 43760)

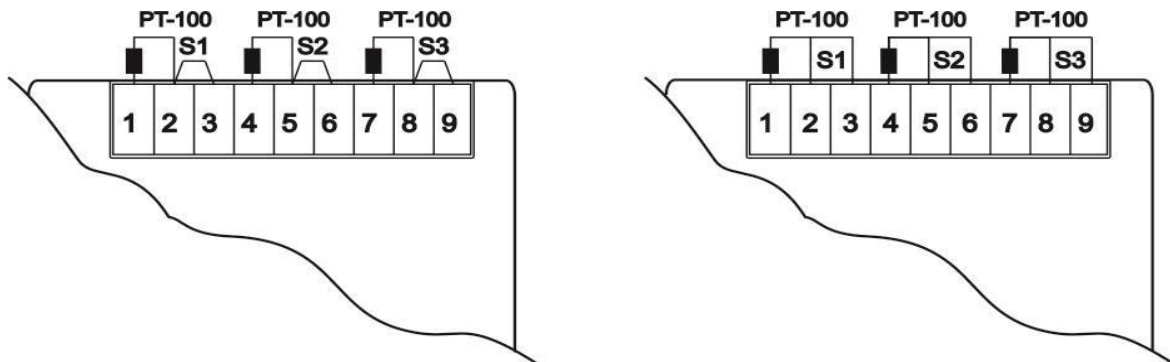


Figure 5 - Diagram with 2-wire sensor and 3-wire sensor connections

**APPLICATION EXAMPLE WITH 4 TEMPERATURE CHANNELS – TRAFÓ SECO**

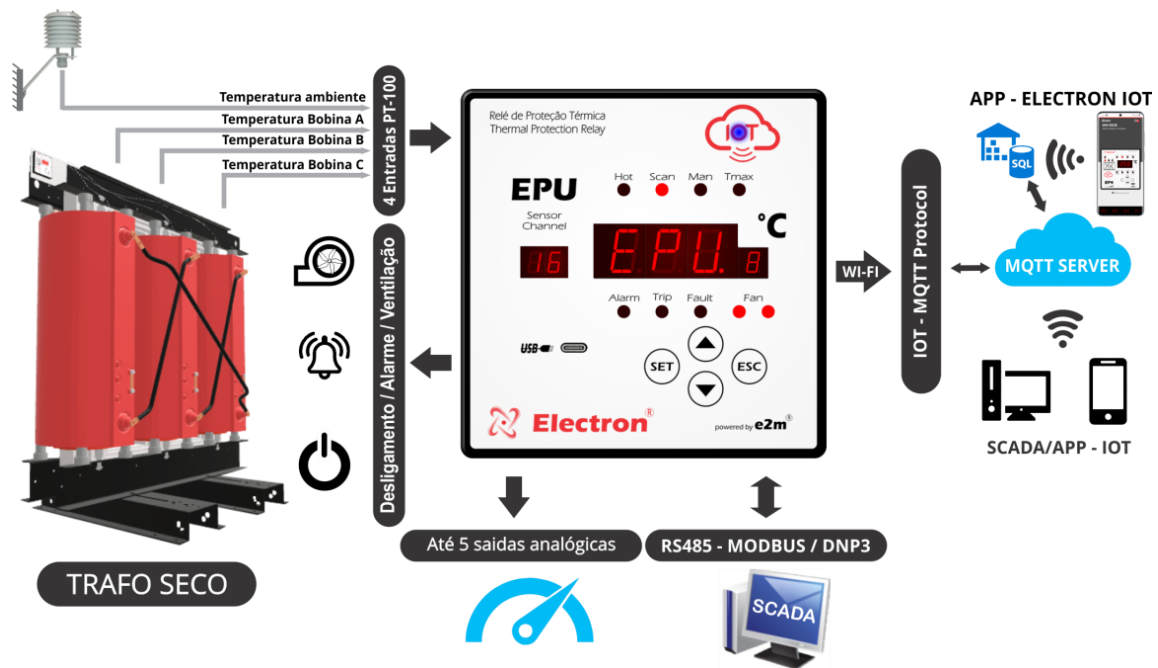


Figure 6 – EPU monitoring dry-type transformer

**APPLICATION WITH UP TO 16 TEMPERATURE CHANNELS – INDUCTION MOTOR**

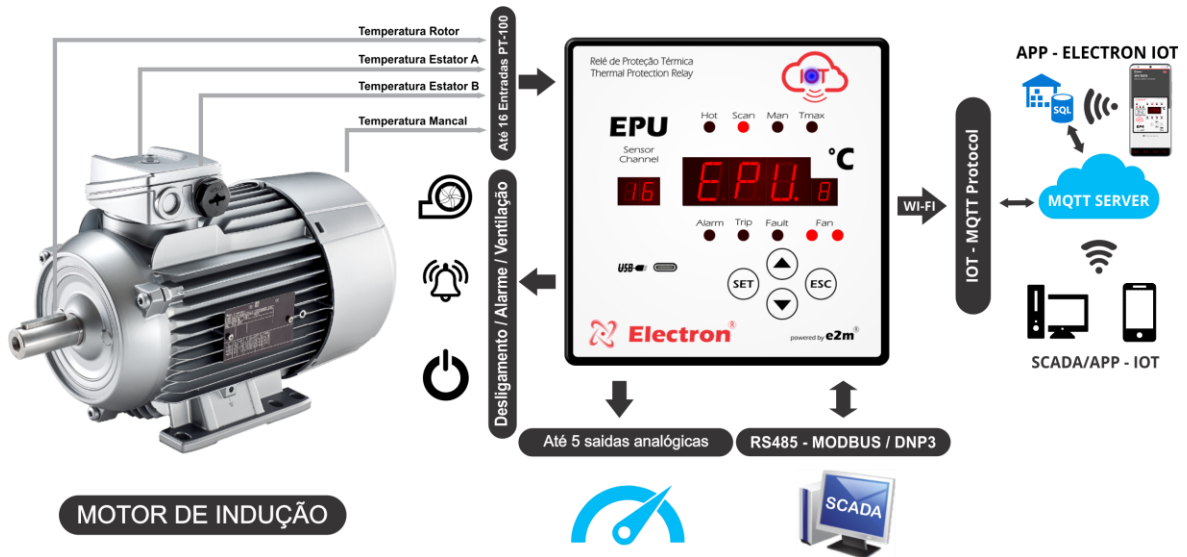


Figure 7 – EPU with up to 16 Temperature Channels Monitoring Induction Motor

APPLICATION WITH UP TO 16 TEMPERATURE CHANNELS – CCM

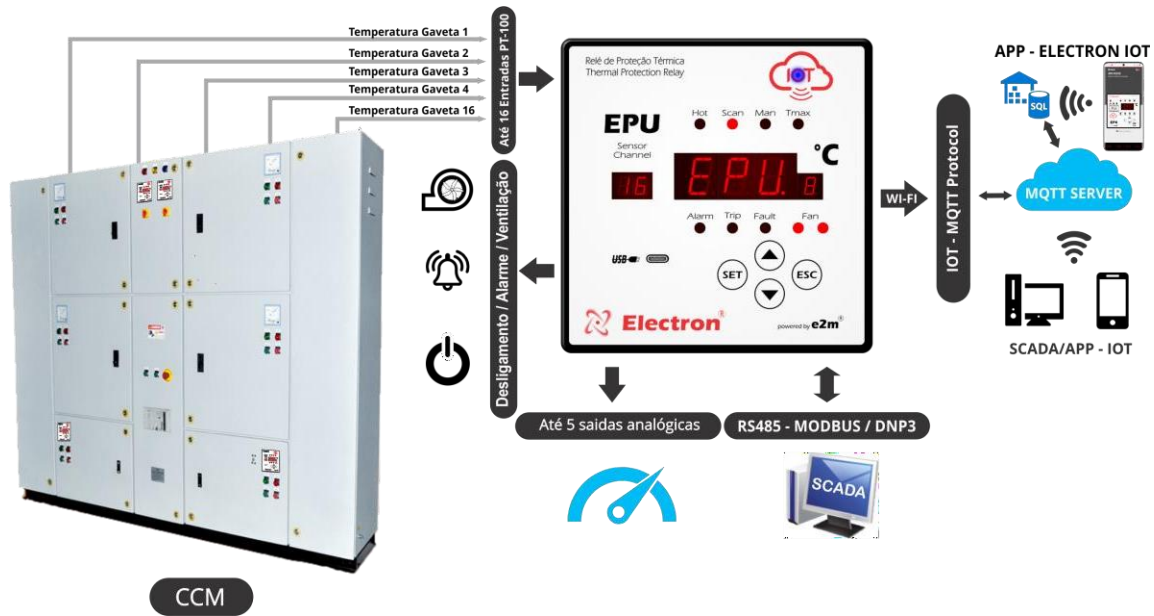


Figure 8 - EPU with up to 16 temperature channels monitoring Central Motor Control (MCC)

APPLICATION WITH UP TO 16 TEMPERATURE CHANNELS – GENERATORS

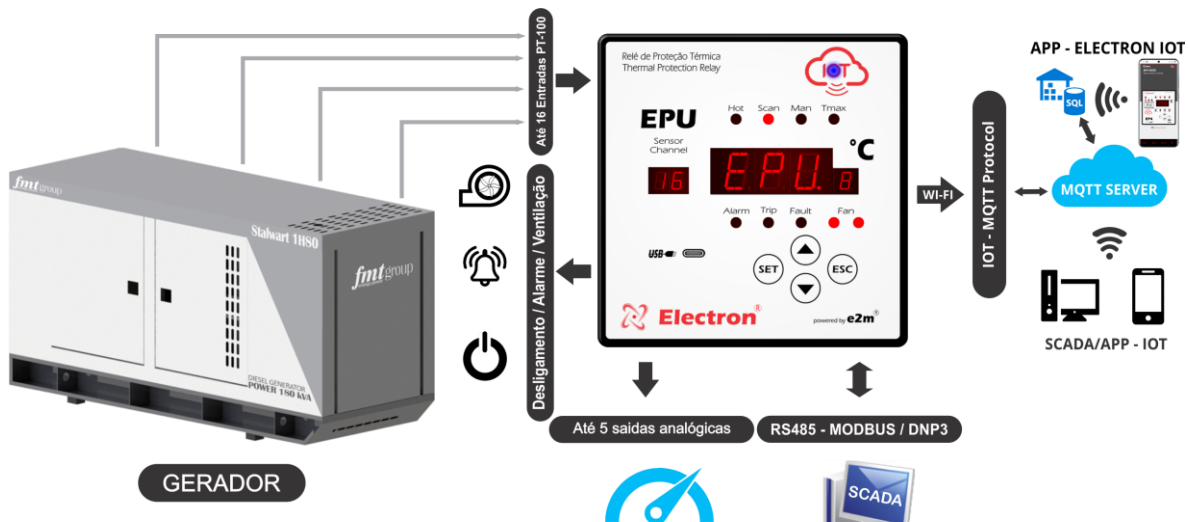


Figure 9 – EPU with up to 16 channels of temperature monitoring generator

APPLICATION WITH UP TO 16 TEMPERATURE CHANNELS – HYDROELECTRIC TURBINE

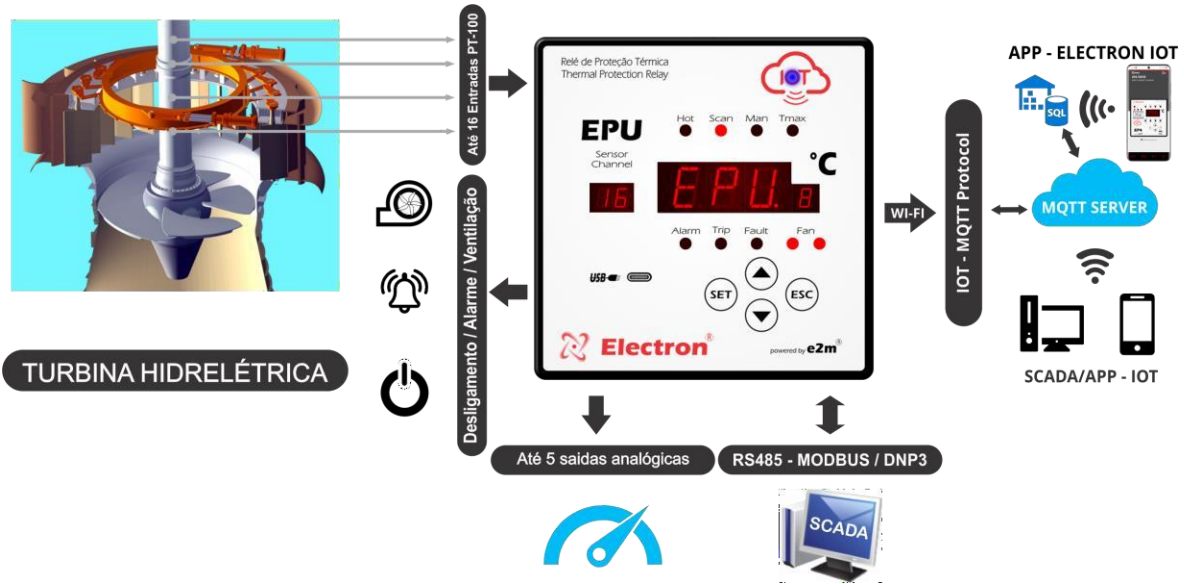


Figure 10 – EPU with up to 16 temperature channels monitoring Hydroelectric Turbine

APPLICATION WITH UP TO 16 TEMPERATURE CHANNELS – BOW THRUSTERS

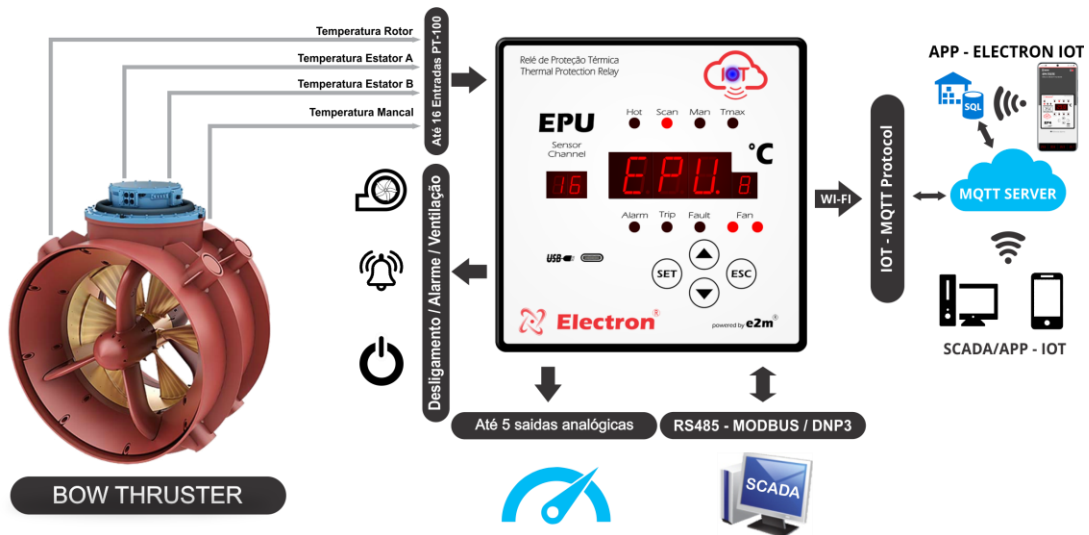


Figure 11 – EPU with up to 16 temperature channels monitoring Bow Thruster



Figure 12 – Data MONITRAFO.com

OPERATION CHART

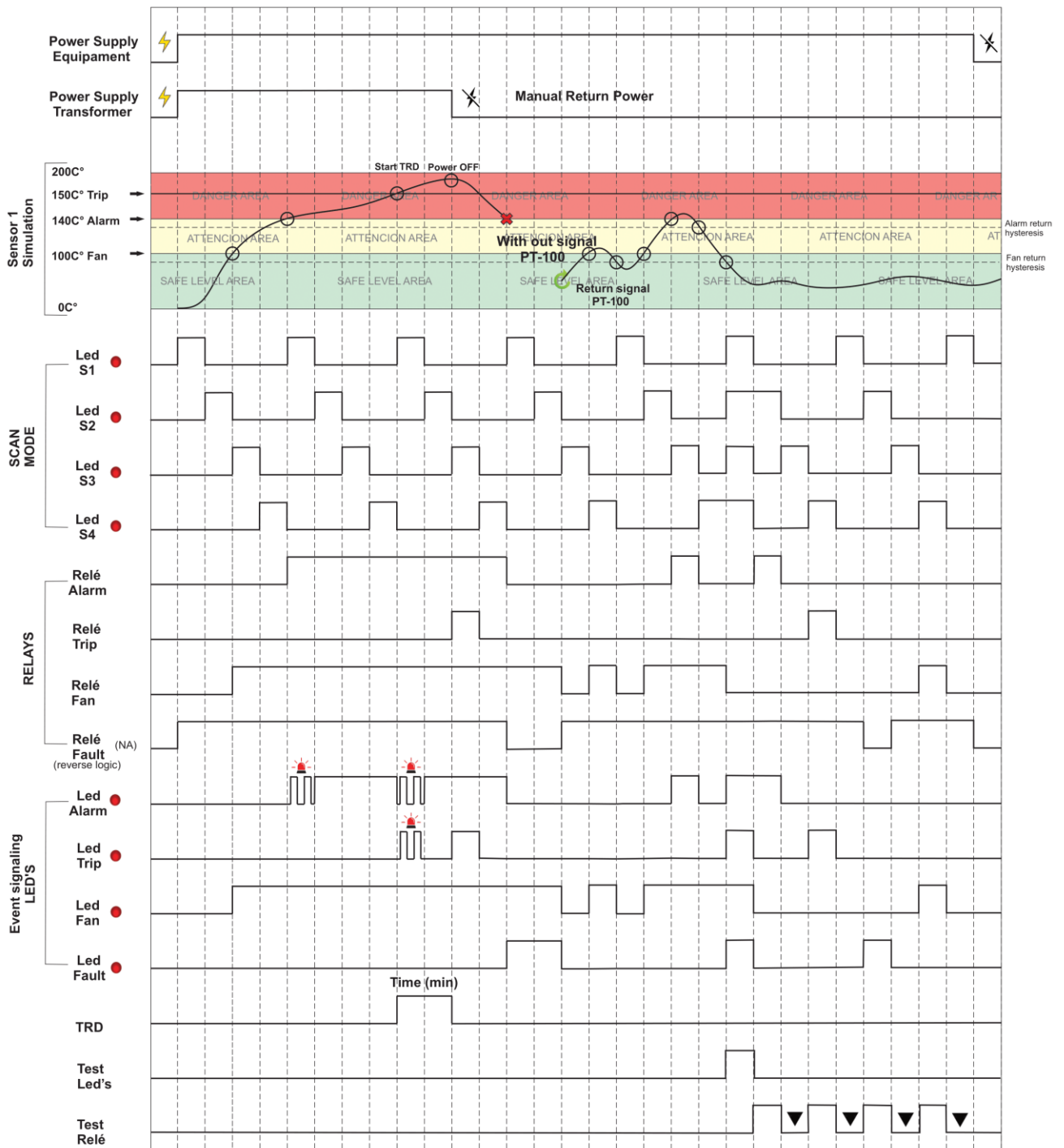



Figure 13 – Operation Chart

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	
<b>VERIFICATION</b>	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 Comb	Attachment and attachment to equipment		X				
		Tightening of the screws in the fastening of the conductors		X				
	Sensors	Integrity / Positioning / Fastening				X	Replacement, repositioning and/or fixing of sensors	
	Sensor well (for oil transformers)	Oil level in the well				X	Oil filling to indicated level	
<b>TESTS &amp; MEASUREMENTS</b>	Relays and Digital Outputs	Individual drive test			X		Forward to Electron do Brasil technical assistance	
	LEDs and Displays	Test Triggering LEDs and Display Segments			X			
	Navigation buttons	Navigation test of the navigation buttons			X			
	Sensor Input	Gauge sensor inputs using a standard					X	Adjust voltage input values according to equipment model
	Input voltage of equipment supply RS-485 Communication Outputs	Measure Supply Input Voltage				X		Forward to Electron do Brasil technical assistance
	Milliamperere Current Signal Inputs	Communication and command testing in the supervisory system				X		
	Signal Outputs of milliamperere current	Measure, compare and measure input signal in passive and/or active mode				X		
<b>CLEANING</b>	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					
 <b>ATENÇÃO</b>	<p><b>1 - Keeping the equipment within the ideal working temperature (50°C to 60°C) extends the useful life and avoids corrective maintenance.</b></p> <p><b>2 - The accumulation of dust and impurities in the facilities can cause short-circuiting and burning of equipment and sensors.</b></p> <p><b>3 - After 10 years of use, it is recommended to replace the equipment.</b></p>							

*Table 2 – Preventive maintenance*

## 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 **EPU-IoT operation**.



**PT100 STFE Temperature Sensor:** This sensor can be constructed with silicone, stainless steel, or Teflon bulb. With electrical insulation capacity options of 2 kV, 10 kV or 15 kV. The PT100 STFE temperature sensor has as its measurement principle to evaluate the variation of electrical resistance with temperature using the temperature coefficient of pure platinum (0.385 Ohm/K), according to IEC 751 (DIN 43760). Ideal for temperature monitoring of windings of dry-type transformers due to its high precision and quality of materials, the PT100 3-wire sensor is widely used in the market, as it greatly reduces the possibility of measurement error due to the compensation principle of the third terminal of the sensor.

Electron PT100 STFE Temperature Sensor Page Link:  
<https://electron.com.br/site/produtos/rtd-pt100-2/>



**PT100 STE Temperature Sensor:** This sensor is constructed of AISI-304 stainless steel bulb, injected aluminum terminal head (IP 65) and adjustable gland with 3/4" and 1/2" BSP threads, or can be manufactured according to design. Its measurement principle is to evaluate the variation of electrical resistance with temperature using the temperature coefficient of pure platinum (0.385 Ohm/K), according to IEC 751 (DIN 43760). Ideal for installations subject to weather and electrical disturbances for temperature monitoring of transformers and machines that require high measurement accuracy in environments subjected to electrical noise and weather. The PT100 3-wire sensor is widely used in the market, as the possibility of measurement error is greatly reduced due to the compensation principle of the third terminal of the sensor.

Electron PT100 STFE Temperature Sensor Page Link:  
<https://electron.com.br/site/produtos/rtd-pt100/>



**Outdoor/Outdoor Double Door Panel:** Outdoor box with double door for mounting instruments, accessories and power transformer control and power wires. The external door contains a glass viewer 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, according to 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/>



**PT100 signal reference card:** This accessory was developed to verify the temperature value displayed by equipment with PT100 3-wire RTD sensor input. 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).

Reference Card page link for PT-100 signal:  
<https://electron.com.br/site/produtos/>

GETTING TO KNOW THE EPU

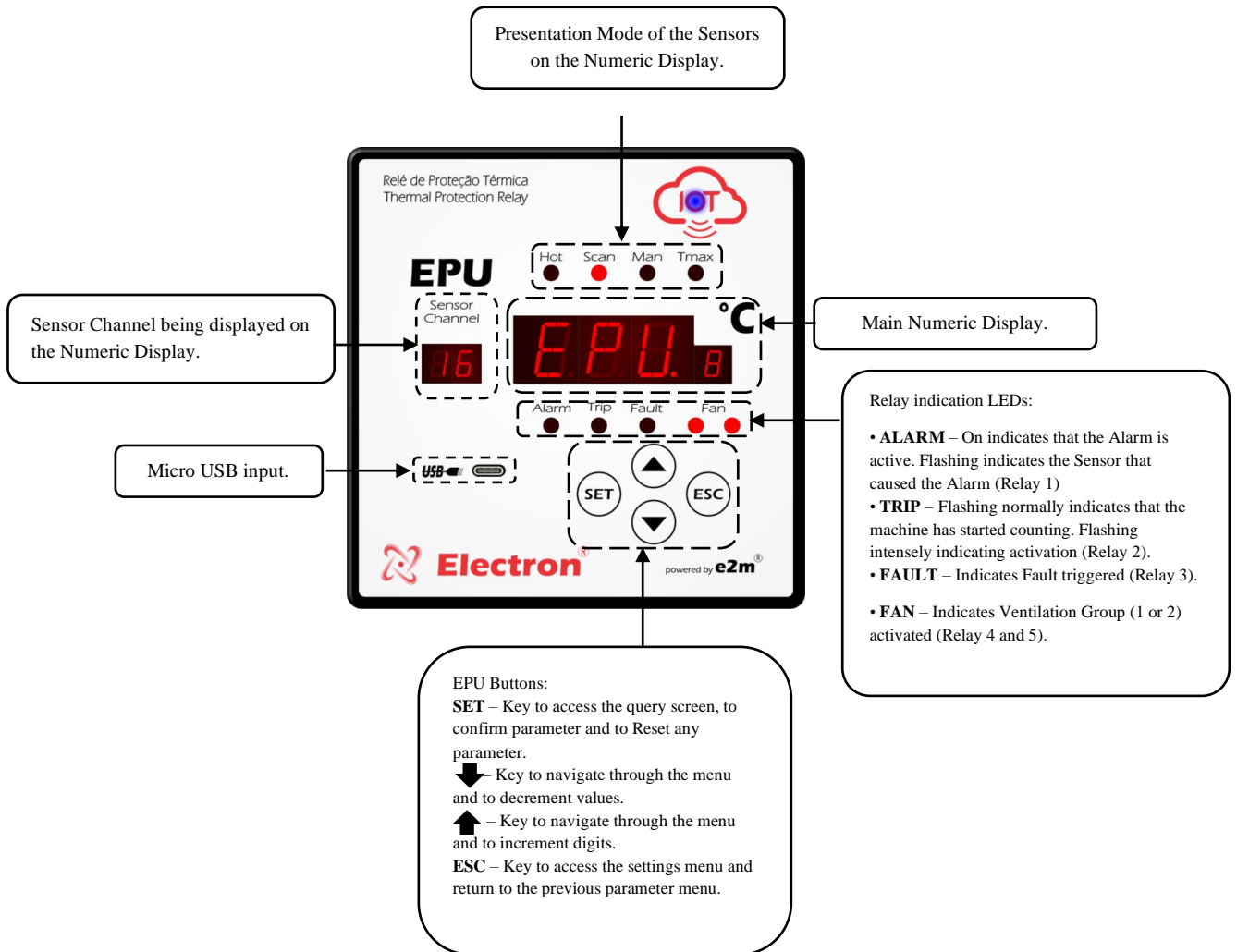


Figure 14- Human-Machine Interface

QUERY FLOWCHART AND RESET

In the query and parameterization menu, use the **SET** key to confirm, the **ESC** key to go back/out, and the increment and decrement keys"  $\downarrow$   $\uparrow$  to navigate.

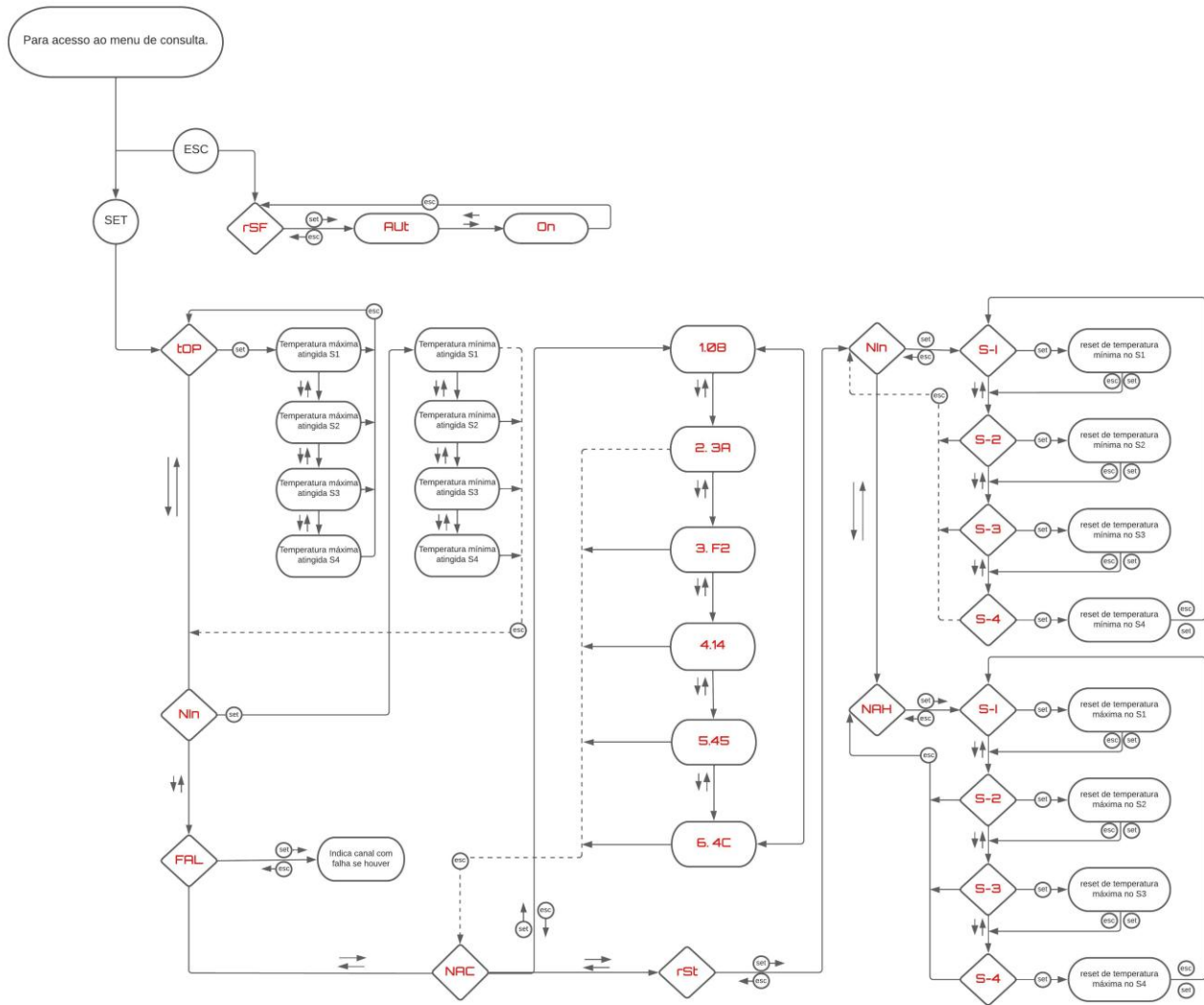


Fig. 14 - Query and reset flowchart

## QUERY MENU AND RESET

<b>Consultation Menu</b>		
<b>Parameter</b>	<b>Variable</b>	<b>Description</b>
<b>TOP</b>	<b>S1/S16</b>	Menu to view the maximum temperature reached by each sensor. Use the increment and decrement keys to select the desired sensor and view its maximum temperature.
<b>Nin</b>	<b>S1/S16</b>	Menu to view the minimum temperature reached by each sensor. Use the increment and decrement keys to select the desired sensor and view its minimum temperature.
<b>FAL</b>	-----	Menu to view which temperature channel is failing.
<b>NAC</b>	-----	Displays the MAC number of the equipment that identifies your network card.
<b>rSt</b>	-----	Menu to reset the maximum temperatures reached.
➤ To access the menu (RSF) Press the ESC key.		
<b>RSF</b>	-----	Enable/Disable

DISPLAY SETTINGS FLOWCHART

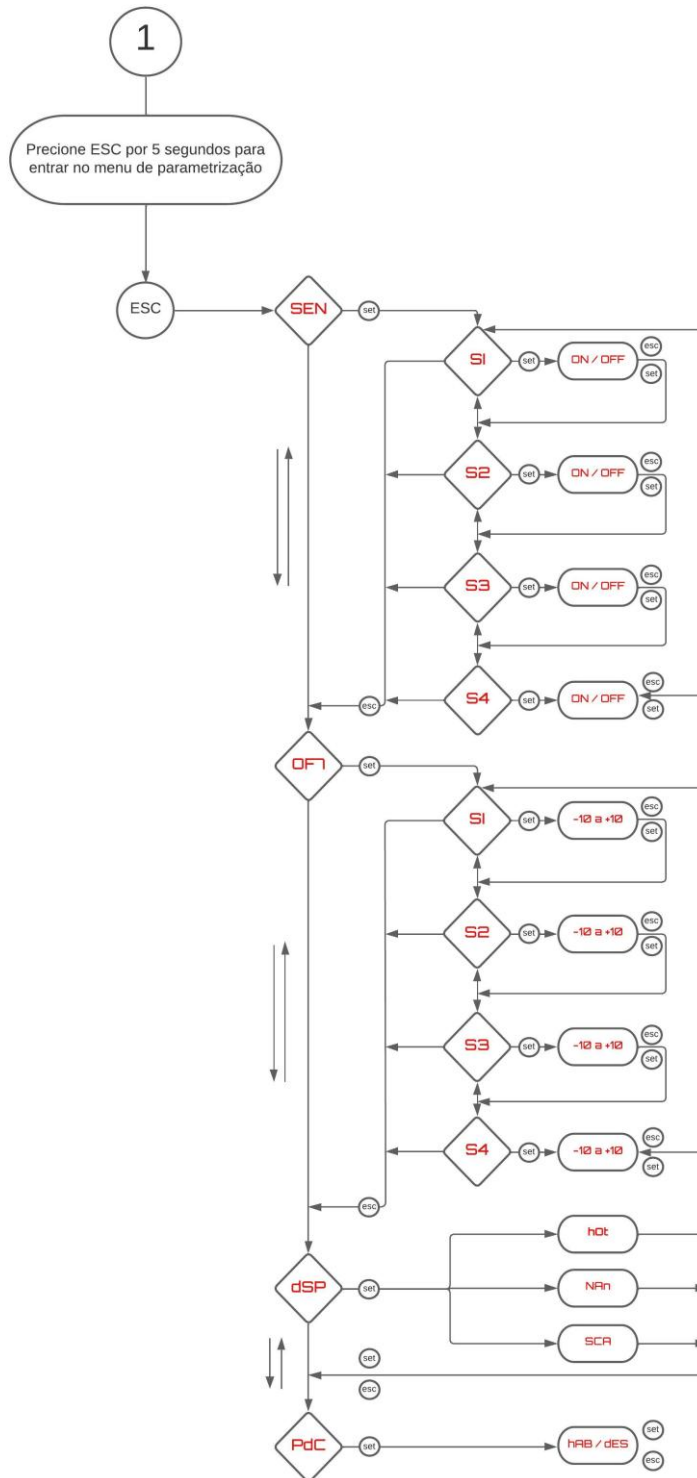


Fig. 15 - Fluxograma 1

**DISPLAY CONFIGURATION MENU**

To access the configuration menu, press and hold the ESC telca for approximately 5 seconds.

<b>Parameter</b>	<b>Variable</b>	<b>Description</b>
<b>SEn</b>	<b>S1/S16</b>	Menu to enable or disable the temperature channel for sensor reading (ON/OFF).
<b>Of7</b>	<b>S1/S16</b>	Parameterization menu to set temperature deviation correction. (-10 to +10).
<b>Dsp</b>	<b>Hot</b> <b>Sca</b> <b>In</b>	Temperature channels display mode. <ul style="list-style-type: none"><li>➤ Hot – Viewing the channel with the highest temperature.</li><li>➤ Nan – Viewing the temperature channels manually.</li><li>➤ SCA – Scan mode that scans all temperature measurement channels.</li></ul>



*The equipment has menus that depend on the model purchased to be available.*

DRIVE SETTINGS FLOWCHART

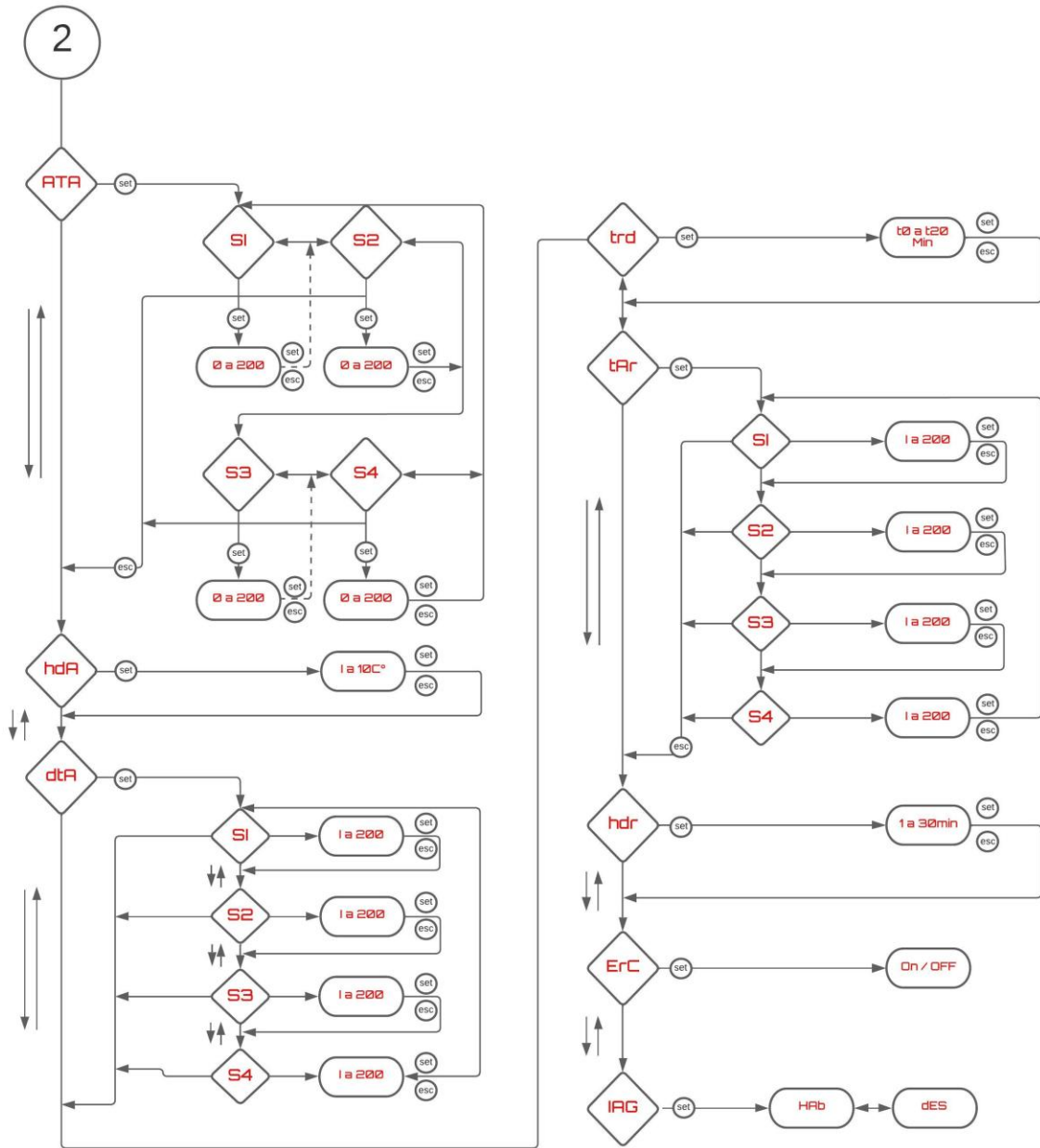


Fig. 16 - Fluxograma 2

**DRIVE SETTINGS MENU**

<b>ATA</b>	<b>S 1/S16</b>	Menu to configure the Alarm activation temperature (High Temperature Alarm). When any sensor reaches the set temperature, the ALARM relay is activated and the ALARM LED on the front of the equipment starts flashing indicating that the alarm is active. Set the desired ALARM relay trigger temperature for each sensor and confirm it by pressing the SET key.
<b>Hda</b>	-----	Menu for setting Hysteresis (Alarm Off Hysteresis). Temperature difference to deactivate the ALARM relay can be adjustable with values between 0°C and 10°C. Example: If the temperature (AtA) is programmed at 100°C and the difference (hdA) programmed at 5°C, the ALARM relay LED will be flashing between the 95°C and 100°C ranges and will turn off only when the temperature reaches any value below 94.9°C. Set the desired Alarm Hysteresis value and confirm it by pressing the <b>SET key</b> .
<b>dTA</b>	<b>S1/S16</b>	Menu for setting Shutdown Temperature (High Temperature Shutdown). When the sensor reaches the temperature set in this menu (dtA), the TRIP relay LED will start flashing, starting the time count (trd) for the shutdown. During counting, the time set in trd will also be shown on the numeric display. Example: If the Display displays d 1, it means that the shutdown will occur within 1 minute. At the end of the count, the TRIP relay LED will be flashing intensely on the front of the equipment indicating its activation and the equipment that the system is protecting will be turned off. If the configured value is 0', the TRIP relay will trigger immediately. Set the shutdown temperature of each sensor and confirm by pressing the <b>SET key</b> .
<b>trd</b>	-----	Menu to adjust the Timing for the shutdown from 0 to 20 minutes. When the temperature of the dtA sensors reaches the configured value, the EPU will start counting the time to effect the shutdown. If the value set is '0', the TRIP relay will trigger immediately. Set the desired Shutdown time and confirm by pressing the <b>SET key</b> .
<b>tar</b>	<b>S1/S16</b>	Menu to adjust the Cooling Drive Temperature (Ventilation). When the value programmed in this parameter is reached, the FAN Relay will activate and its respective LED will light up, indicating the activation of cooling.
<b>Hdr</b>	-----	Cooling Hysteresis Menu, temperature difference to turn the Chiller on and off. Example: If the temperature set in the TAR menu is 65°C and this menu, hdr, is with the value of 5°C the chiller will deactivate when the temperature is less than or equal to 59.9°C. That is, with exactly 5°C difference less than the value parameterized in the TAR menu.
<b>ERC</b>	-----	Menu Ventilators daily exercise schedule. On Daily exercise disabled; OFF Enabled daily exercise; Select the desired option and confirm by pressing the <b>SET key</b> . After 1 minute of the confirmation of programming at On, the Ventilation Exercise will be triggered for the first time for 5 minutes (FAN LED flashing), this cycle will be repeated at every 24-hour interval after the first activation. NOTE: If the equipment is de-energized, the cycle will repeat.
<b>IAG</b>	<b>Hab/Des</b>	To enable or disable automatic reversing of cooling groups <ul style="list-style-type: none"> <li>➤ D0 – Disable group inversion;</li> <li>➤ D1 – Enabled inversion of groups;</li> <li>➤ D2 – 2 simultaneous groups.</li> </ul>

FLOWCHART OF THE COMMUNICATION MENU

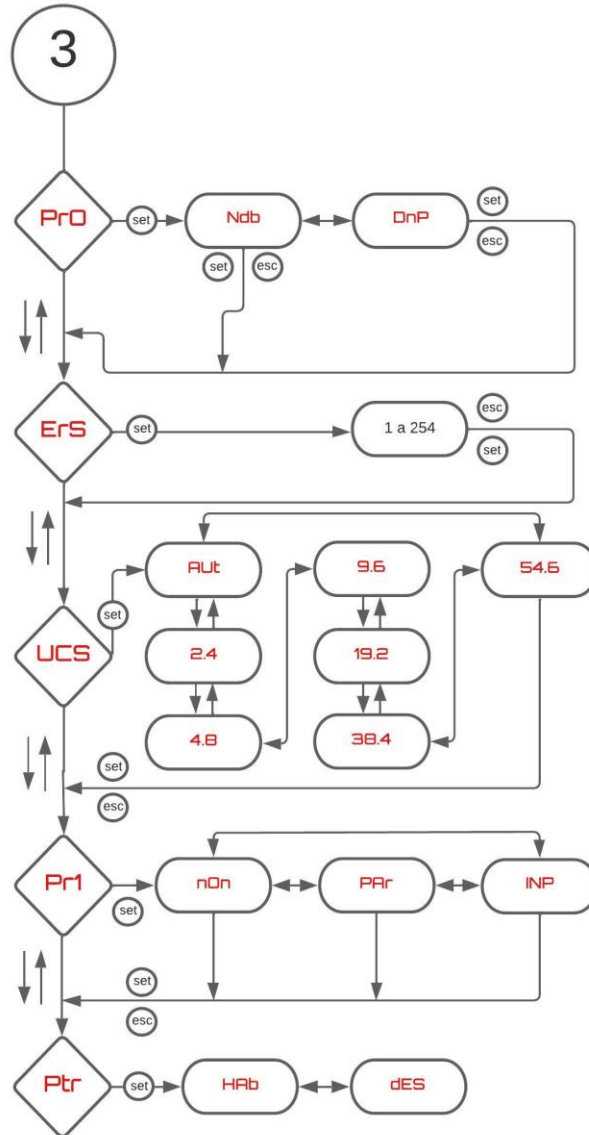


Fig. 17 - Fluxograma 3

COMMUNICATION MENU

<b>PrO</b>	<b>Ndb DnP</b>	Menu to enable one of two Communication Protocol options: - Press the SET key on Mdb to enable the Modbus RTU communication protocol. - Press the SET key in DnP to enable DNP 3.0 communication protocol
<b>ERS</b>	-----	Serial Network Parameterization Menu
<b>UCS</b>	<b>Car specs 2,4 4,8 9,6 19,2 38,4 57,6</b>	Communication speed parameterization menu. <ul style="list-style-type: none"> <li>➤ Automatic;</li> <li>➤ 2.400;</li> <li>➤ 4.800;</li> <li>➤ 9.600;</li> <li>➤ 19.200;</li> <li>➤ 38.400;</li> <li>➤ 57.600.</li> </ul>
<b>PRI</b>	<b>Not BY INP</b>	Parameterization menu and communication parity. <ul style="list-style-type: none"> <li>➤ Not = nenhuma</li> <li>➤ By</li> <li>➤ Odd</li> </ul>
<b>ptr</b>	<b>Have SOME</b>	Parameters Write Protection Menu: Enables write-protect Disables write-protect Select the Output option and confirm it by pressing SET.



*The equipment has menus that depend on the model purchased to be available.*

FLOW CHART OF THE CURRENT OUTPUT CONFIGURATION MENU

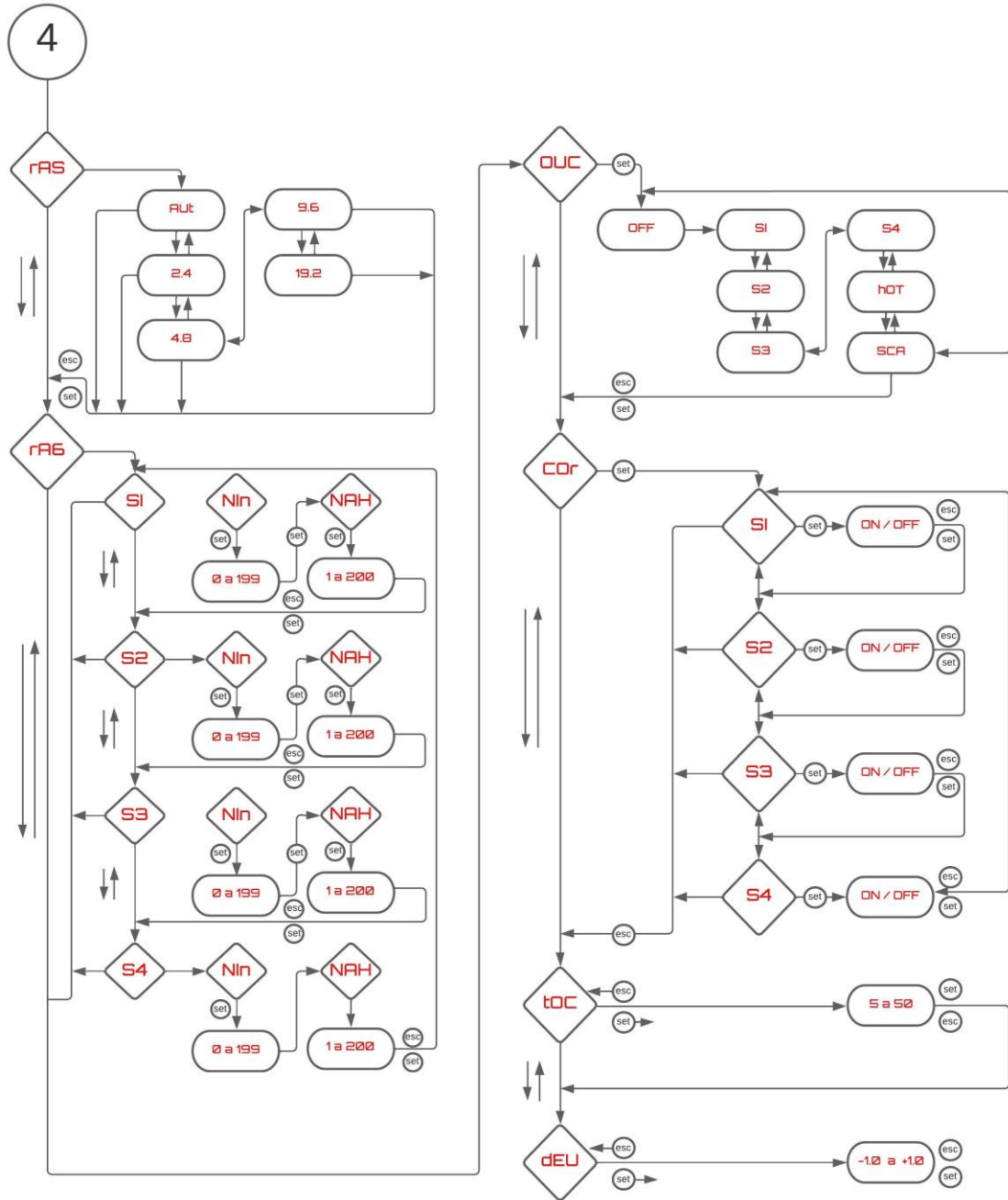


Fig. 18 - Fluxograma 4

**POWER OUTPUT CONFIGURATION MENU**

<b>RAS</b>	-----	Menu to set the scale at the current output: ➤ 4.20 ➤ 0.20 ➤ 0.10 ➤ 0.5 ➤ 0.1
<b>RA6</b>	<b>S1/S16</b>	Maximum current output range setting menu and minimum to mirror the Read Temperature.
<b>OUC</b>	<b>OFF</b> <b>S1</b> <b>S2</b> <b>S3</b> <b>S4</b> <b>Hot</b> <b>Sca</b>	Menu to adjust the channel to be transmitted in the analog output: OFF Disables analog temperature transmission output; S1 Enables Sensor 1 temperature on Analog Output; S2 Enables Sensor 2 temperature on Analog Output; S3 Enables Sensor 3 temperature on Analog Output; S4 Enables the temperature of Sensor 4 on the Analog Output; hOT Enables the highest temperature on the Analog Output; SCA Enables the mirroring of the analog output in scan mode, to enable the sensors see the "lot" menu. And setup presentation time in the "tOC" menu.
<b>Cor</b>	<b>S1/S16</b>	Enable/Disable.
<b>tOC</b>	-----	Parameterization menu to configure the time (Seconds) of stabilization of the analog output, when using the "OUC" menu in "SCA" mode.
<b>dEU</b>	-----	Menu to adjust the deviation of the current output. Allows you to make a correction to the current outputs by adding or subtracting the configured value. ut1 - Set the value to add or subtract from the quantity mirrored by current output Before making any changes to the offset of the output of Current Check: If the rAS menu setting is correct 0-1 mA, 0-5 mA, 0-10 mA, 0-20 mA or 4-20 mA, if menu the rA6 is configured with the correct start and end of scale and if in the Ra6 menu is configured to mirror the correct sensor. So that this correction parameterization can be done The deviation has to be linear



*The equipment has menus that depend on the model purchased to be available.*

MISCELLANEOUS CONFIGURATION FLOW CHART

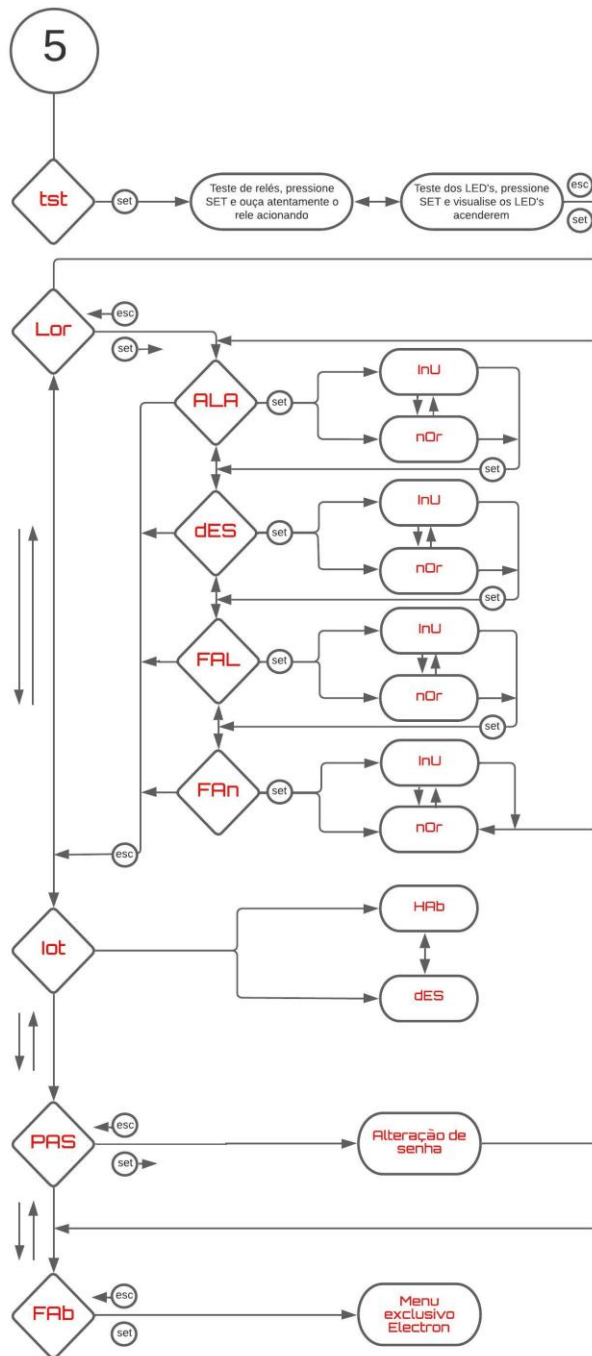



Fig. 19 Fluxograma 5

MISCELLANEOUS CONFIGURATION MENU

	<b>LED'S</b>	Press the SET key and watch all the led's light up.
<b>Tst</b>	<b>RELES</b>	 Attention when using this menu, it activates the relay outputs and lights up the LEDs of the EPU IOT SO THAT THE OPERATOR can make sure they work. However, if the monitor is in operation and the TRIP relay (shutdown) is connected to the system protection, it will activate and the protection and the system will operate by turning off the transformer or the machine it is protecting. RL 1 - "Activates relay 1 after pressing the SET button " (ALARM Relay). RL 2 - "Activates relay 2 after pressing the SET button" (TRIP Relay). RL3 - "Activates relay 3 after pressing the SET button " (Relay FAULT). RL4 - "Activates relay 4 after pressing the SET button " (Relay FAN 1). RL5 - "Activates relay 5 after pressing the SET button " (Relay FAN 2).
<b>Lor</b>	<b>ALA DES Fal Fan</b>	Menu for choosing Relay Activation Logic.  nOr – Initial Conditions of the "Normal" Relay.  inU – Initial Conditions of the "Inverse" Relay.  Select the desired Logic and confirm by pressing the SET key.
<b>Iot</b>	<b>Hab DES</b>	Parameterization menu for Enables/Disables Communication Wifi communication
<b>Pas</b>	-----	Parameterization menu for changing password.
<b>Fab</b>	-----	Exclusive Electron menu.



*The equipment has menus that depend on the model purchased to be available.*

DEFECT SOLUTION

The sensor will automatically return to reading mode when the error is normalized, to reset the **EPU** press the **SET** key for approximately 5 seconds until the word rST appears on the display, then release and the **EPU Protection Relay** will restart. The **EPU** will trigger the **FAIL** relay (terminals 37, 38 and 39) in case the display shows the **OFF** parameter or if there is a power drop

Display	Cause	Solution
<b>Off</b>	The equipment does not receive a signal Reliable sensor	<ul style="list-style-type: none"> <li>Check and Replace the sensor cable if it is not shielded.</li> <li>Check the grounding of the sensor cable.</li> <li>Check and eliminate possible bad contact in the connectors.</li> <li>Replacement of the temperature sensor, if it is damaged.</li> </ul>

**SPECIFICATIONS FOR ORDER**

- Temperature Monitor for Dry Type Transformer Model : **EPU-IOT**

**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 if it is used, ensure that there is no potential difference between them. Properly grounded sensors and power prevent malfunctions or damage in cases of disturbances, surges, and inductions in the equipment.
2. Do not use the Universal Thermal Protection Relay **EPU** directly in the sun, whenever it is installed in the field it is important to have a panel with tinted glass, in order to filter the ultraviolet rays that attack the front polycarbonate, in this way the life of the equipment will be prolonged.

**WARRANTY TERMS**

The EPU **Electron Universal Thermal Protection Relay** 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 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;
- 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.

**Warranty Utilization**

The warranty of Electron do Brasil technical assistance only includes the equipment repair service. That is, the costs of sending and receiving the equipment are borne by the customer.

To take advantage of 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. The equipment 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 at the headquarters of Electron do Brasil.

**DECLARATION OF CONFORMITY**

Available for download at the following electronic address:

<https://electron.com.br/pt-br/produtos/epu>