

USER MANUAL

Thermal Protection Relay – EP3



SUMMARY

SUMMARY	1
INTRODUCTION	2
MAIN CHARACTERISTICS	3
TECHNICAL DATA	4
TYPE TESTS ATTENDED	4
DIMENSIONS	5
EP3 DIAGRAM CONNECTIONS	6
SENSOR INPUTS – SENSORS CIRCUITS (EM 60751 – DIN 43760)	6
EXAMPLES	7
INSTALLATION ACCESSORIES	7
TECNOLOGIA - DISPLAY	8
SPECIFICATION ORDER	8
KNOWING THE EP3	9
CONSULT MENU FLUXOGRAM	10
CONSULT MENU	10
CONFIGURATION MENU FLUXOGRAM	11
CONFIGURATION MENU	12
DEFECT SOLUTION	15
IMPORTANT RECOMMENDATIONS	15
WARRANTY TERM	15
WARRANTY EXCLUSION	15
WARRANTY LOSS	16
WARRANTY UTILIZATION	16

INTRODUCTION

Thermal Protection Relay **EP3** was developed to supervise up to 4 (four) temperature channels simultaneously to protect and monitor dry transformers, Motors, Bearings, Machines and industrial process as established by ANSI table. The **EP3** is reliable and a highly precision instrument, it commands the ventilation (ON/OFF). Alarms and TRIP (Shutdown), with a programmable timer option.

The Thermal Protection Relay **EP3** was built obeying to strict quality patterns and uses last generation high quality electronic components (SMD), its hardware was designed to endure severe work conditions, it can be installed direct on transformers panel on substation courtyard, Maritimes platforms and chemical plants. Attend to the highest levels of supportability and reliability according IEC, DIN, IEE and ABNT.

As signal input 4 PT-100 temperature sensors (EN60751-DIN 43760) up to 3 active and configurable analog output 15 Vdc to 2 universal wires with 0 to 1mA, 0 to 5mA, 0 to 10mA, 0 to 20mA and 4 to 20 ma as reading range option that can be used to reflect the higher temperature read At the SCAN function, when the monitor has just 1 analog output simultaneously.

The Thermal Protection Relay **EP3** also has a RS-485 analog output with DNP3 (Level 1) and Modbus RTU digital output that allows access to all parameters including real-time remote commands of the electric drives, it has 3 independent temperature setpoints to each sensor and 4 (four) isolated activation Relays (NOC) independent and potential free to failure indication (watchdog).

The display presentation mode is totally configurable by the user, it can keep the current highest temperature fixed on display, and any temperature that the operator selects. Or, through the SCAN function that presents a complete sweep of all measure channels continuously. Through Frontal indicatives LED's and also through the data communication doors is possible to identify which of the channel caused the Alarm, TRIP (Shutdown) or the ventilation activation, all this function and parametrization are easy configured directly on the equipment frontal or by **UseEasy™** software for version that has USP port or through the RS-485 communication door.

Thermal Protection Relay **EP3** is built in an aluminum enclosure of high mechanical resistance with 98x98x37mm, according with DIN IEC 61554 for panel fixation patterns.

MAIN CHARACTERISTICS

- Compact Equipment with 37mm depth;
- Numerical Display of high red brightness with 3 and 4 digits;
- 0,5% (FS) precision;
- Temperature measurement Range of 0°C to 200°C or -50°C to 250°C;
- Compensated inputs for PT-100 2 or 3 wires sensors (EN 60751 - DIN 43760);
- 24-275 Vdc / Vac Power Supply;
- 2.0 USB Frontal Input to configuration through **UseEasy™** software;
- Digital output (ANSI/TIA/EIA-485-A) RS-485 with Modbus RTU Protocol and/or DNP3 Level 1;
- Auto Baud Rate 1,200 to 57,600 bps (It automatically detects the serial network speed);
- Analog Outputs (15 Vdc Outputs) of 0 to 1mA, 0 to 5mA, 0 to 10mA, 0 to 20mA and 4 to 20mA configurable by the user;
- Ventilation Activation Directly on the equipment frontal. It can be done automatically or by communication protocol command.
- Ventilation Exercise with daily operation programming (5 minutes per day);
- It memorizes the maximum temperature reached by each Sensor;
- 01 Relay (NOC) with 10 ampere capacity for temperature Alarm;
- 01 Relay (NOC) with 10 amperes capacity for temperature TRIP (Shutdown) with programmable operation timer;
- 01 Relay (NOC) with 10 amperes capacity for Failure Indication (watchdog);
- Easy to use and to program;
- 2 Years Warrant;

TECHNICAL DATA

Thermal Protection Relay EP3	
Operation Voltage	24 to 275 Vdc/Vac 50/60 Hz
Temperature Operation	-40°C to + 85°C / -10°C to +70°C
Energy Consumption	< 15 W
Temperature Measurement Input	Until 3 Sensors - PT100 Ohm to 0°C, 2 and 3 wires (EN 60751 - DIN 43760)
Measurement Range	0°C a 200°C or -50°C to 250°C
Active Analog Output 15Vdc and Maximum Load.	24 to 275 Vdc/Vac 50/60 Hz
	0 ... 5mA - 1600 Ohms
	0 ... 10mA - 800 Ohms
	0 ... 20mA - 400 Ohms
	4 ... 20mA - 400 Ohms
Measurement Input Maximum Error	Measurement Input Maximum Error
Analog output maximum	Analog output maximum
Output Contact	Output Contact
Maximum Switching Power	Maximum Switching Power
Maximum Switching	250 Vac/125Vdc
Maximum Driving Current	10 Amperes
Digital Communication Port	USB 2.0 – Type A Male Connector
Serial Communication Port	RS 485 – 2 wires (ANSI/TIA/EIA-485A)
Communication Protocol	Modbus RTU or DNP 3.0 - Level 1
Auto Baud Rate (It automatically detects the network communication Speed)	1.200 to 57.600bps
Enclosure DIN IEC 61554	98 x 98 x 37 mm ou 98 x 98 x 57 mm
Fixation	Panel Door with steel clip
Protection	IP40 (Frontal), IP 20 (Connectors)

TYPE TESTS ATTENDED

- Applied Voltage (**IEC 60255-5**): 2kV / 60Hz / 1 min. (Against earth);
- Voltage Impulse (**IEC 60255-5**): 1,2/50 µsec. / 5kV / 3 neg. and 3 pos. / 5 seconds. Interval;
- Electrostatic Discharge (**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 Transients immunity (**IEC60255-22-4**): Power Supply/Input/Output = 4KV/common 2Kv;
- Electrical Surges immunity (**IEC60255-22-5**): Phase/neutral 1KV, 5 by Polar (±) - phase-earth/neutral-earth 2KV, 5 by polar (±);
- Driven Electromagnetic Surges Immunity (**IEC61000-4-6**): 0,15 to 80 MHz / 10V/m;
- Climatic Test (**IEC60068-21-14**): - 40°C + 85°C / 72 hours;
- Vibration Endurance (**IEC60255-21-1**): 3 axis / 10 a 150Hz / 2G / 160min/axis;
- Vibration Response (**IEC60255-21-1**): 3 axis / 0,075mm-10 to 58 Hz / 1G of 58 to 150 Hz / 8min/axis;

DIMENSIONS

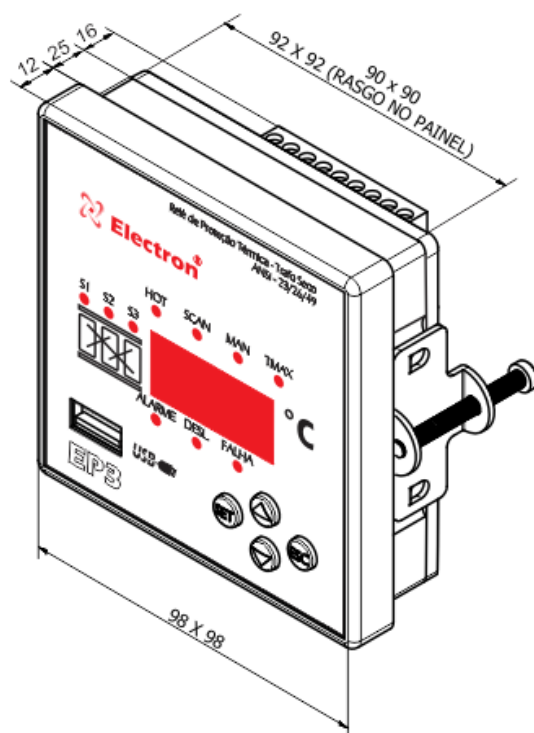


Fig. 1 – Slim Model with USB Dimensions

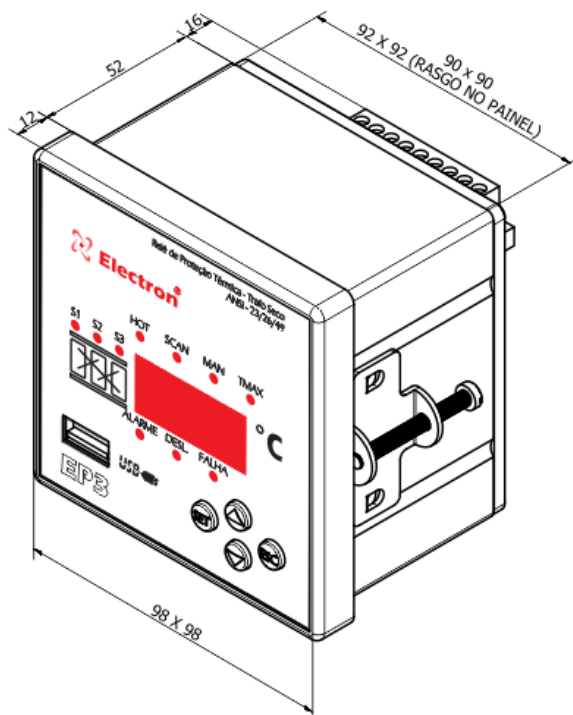


Fig. 2 - DIMENSIONS para equipamentos modelo com USB

EP3 DIAGRAM CONNECTIONS

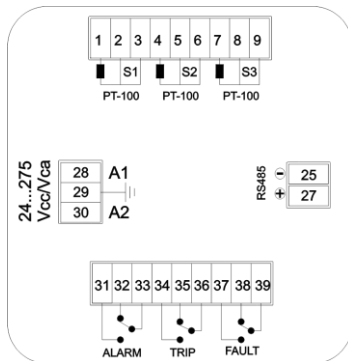


Fig. 3 – EP3 with 1 serial output
Order - 3110001

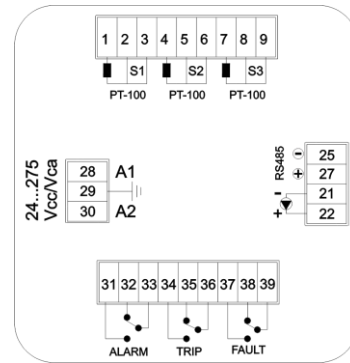


Fig. 4 – EP3 with 1 serial output and 1 analog output
Order - 3110011

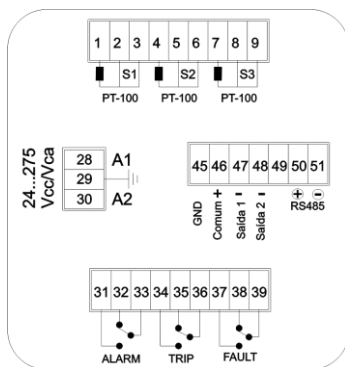


Fig. 5 – EP3 with 1 serial output and 2 analog output
Order - 3110021

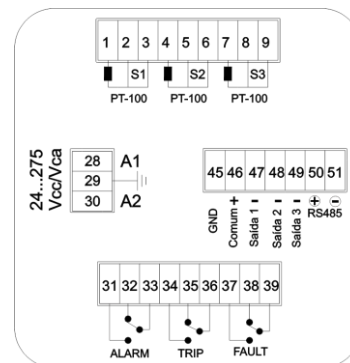


Fig. 6 – EP3 with 1 serial output and 3 analog output
Order - 3110031

SENSOR INPUTS – SENSORS CIRCUITS (EM 60751 – DIN 43760)

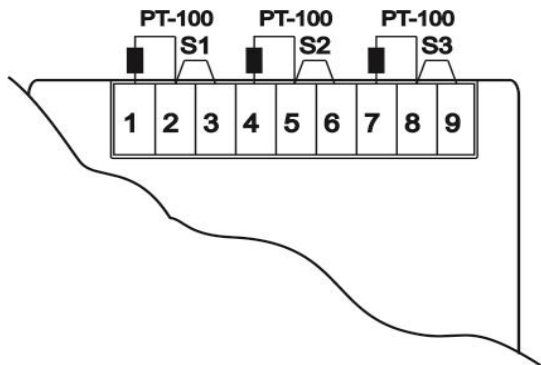


Fig. 7 – 2 wires connection diagram

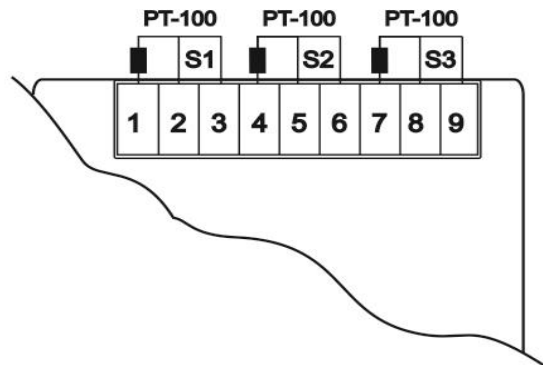


Fig. 8 – 3 wires connection diagram

EXAMPLES

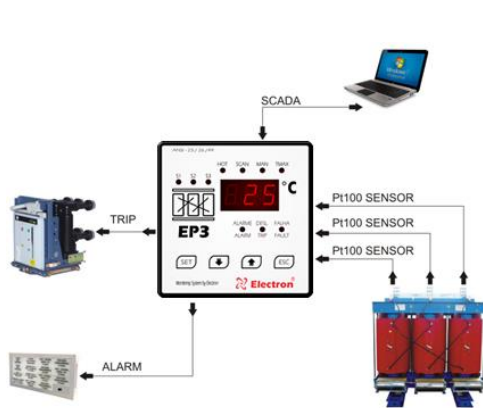


Fig. 9 – EP3 monitoring dry transformer with serial output

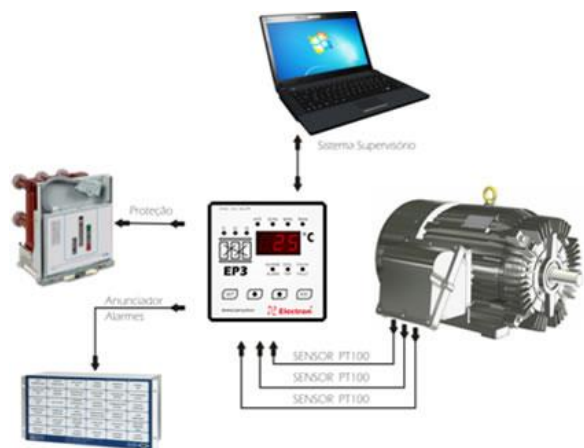


Fig. 10 – EP3 monitoring dry transformer with serial output



Fig. 11 – UseEasy™ Configuration Software, Totally Free.

INSTALLATION ACESSORIES



Fig. 13 – EP3 Box Mounted for Hazardous Area - EX



Fig. 14 – Outdoor Box IP54



Fig. 15 – Fixing bracket for panel bottom.

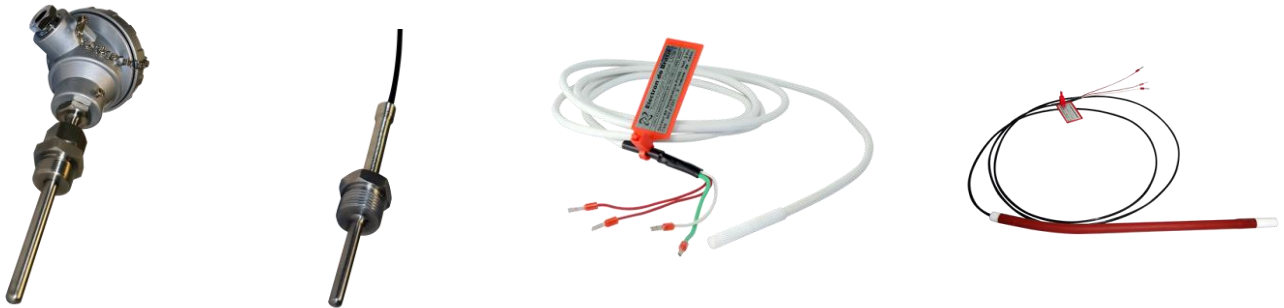


Fig. 16 – Temperature Sensors PT-100 – To Dry Transformer, motor and bearings up to 30 KV

TECNOLOGIA - DISPLAY



Fig. 17 – Model without USB

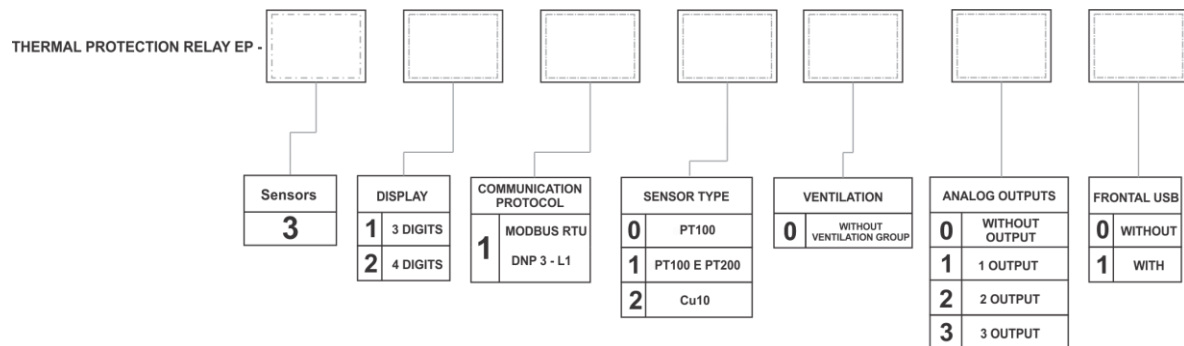


Fig. 18 – USB with USB



Fig. 19 – 3 (three) Model digits with USB

SPECIFICATION ORDER



KNOWING THE EP3

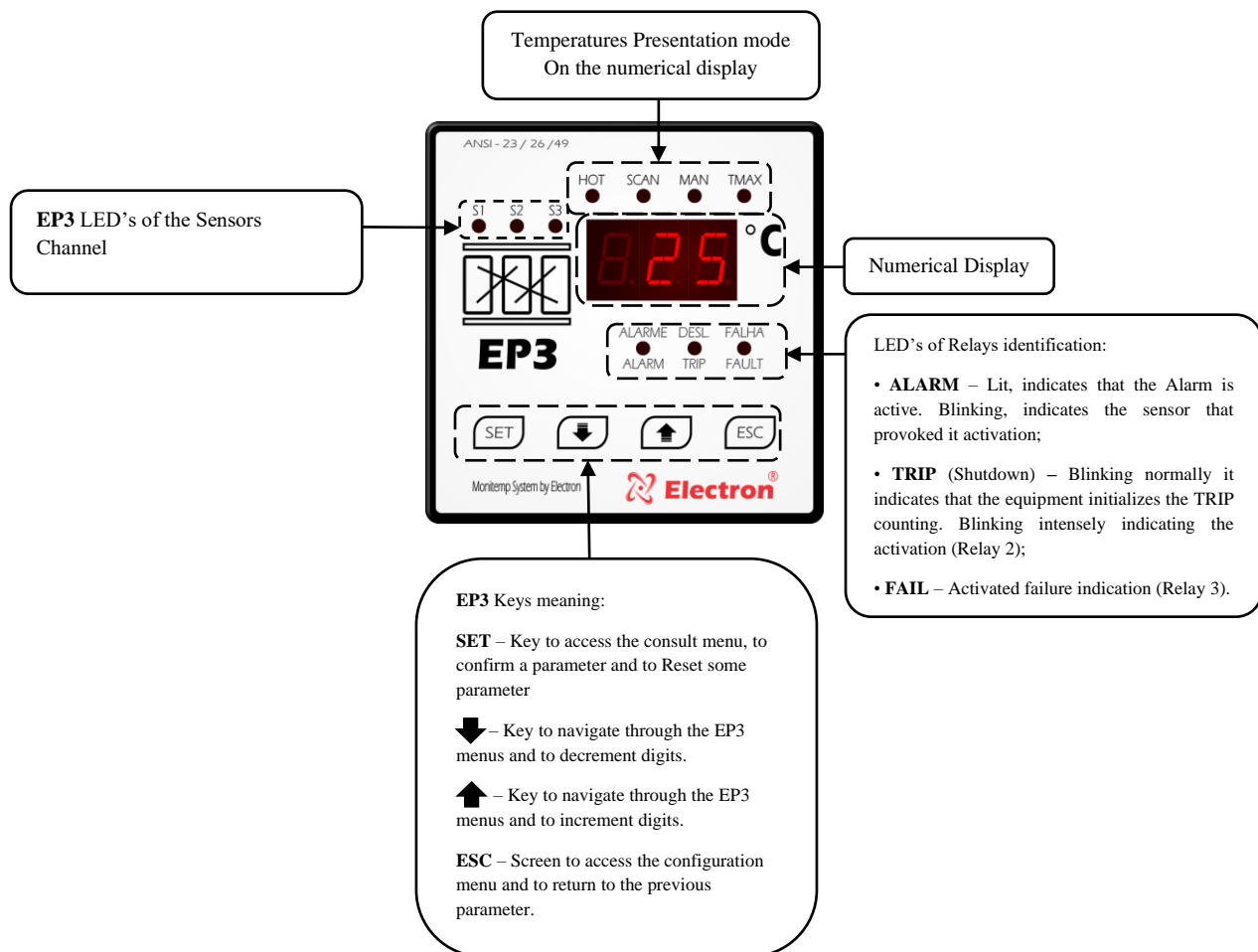
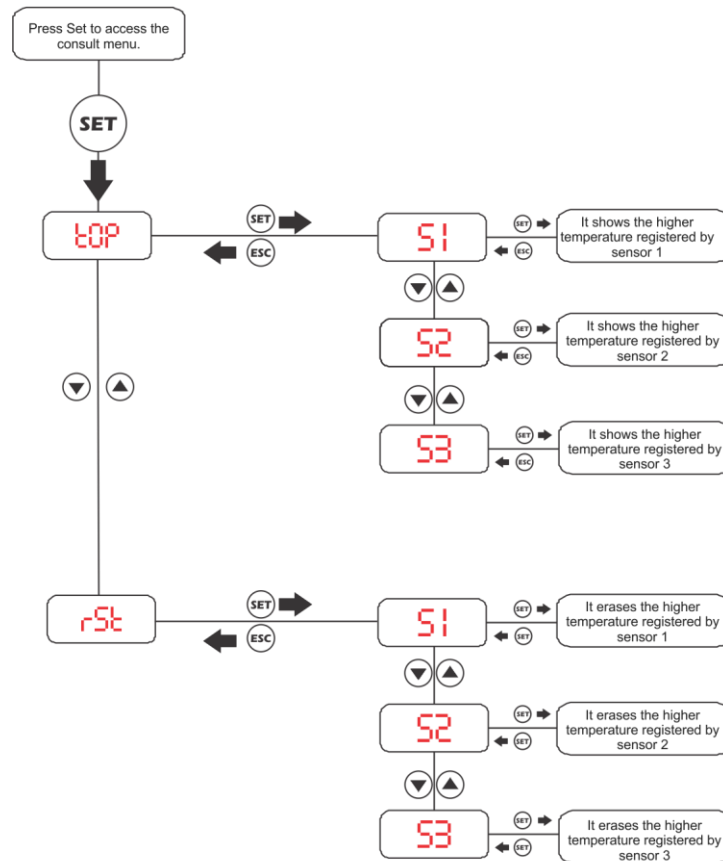


Fig. 20 – EP3 Frontal with serial input.

CONSULT MENU FLUXOGRAM

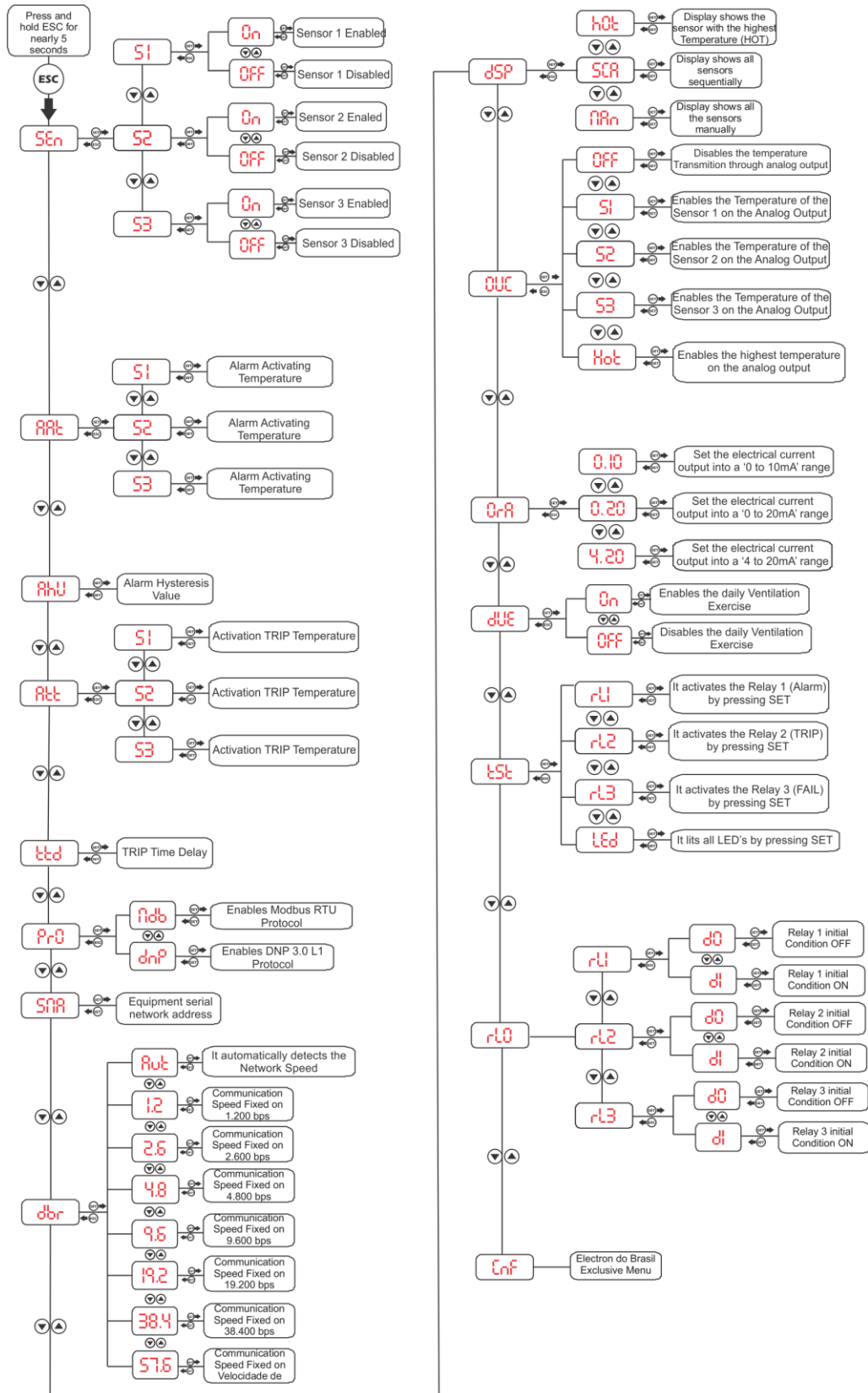
To visualize the highest temperature values of each sensor. Press **SET** and use the increment and decrement keys to navigate through this menu. To check the selected parameter, press **SET** just once. To Return to the previous parameter, press **ESC** just once.



CONSULT MENU

Menu	Parameter	Description
top	S1 S2 S3	Menu to check the maximum temperature reached by each sensor. use the increment and decrement keys to navigate through this menu. To check the selected parameter, press SET just once. To Return to the previous parameter, press ESC just once.
rst	S1 S2 S3	To Reset (erase) the selected sensor last maximum temperature recorded register. Confirm the Reset command pressing SET for each sensor. To leave this menu and return to the previous, press ESC .


CONFIGURATION MENU FLUXOGRAM



CONFIGURATION MENU

Menu	Parameter	Variable	Description
SEn	S1 S2 S3	ON - OFF	Menu to enable and/or disable the sensors input. Select ON or OFF and confirm it pressing SET .
ARt	S1 S2 S3	0°C / 200°C	Menu to configure the Alarm activating (Alarm By high temperature). When a sensor reaches the configured temperature, the ALARM relay is activated (connections 31, 32 and 33) and the ALARM LED on equipment frontal starts to blink signaling the ALARM activation. Set the activation temperature to activate the ALARM desired to each sensor and confirm it pressing SET
ARH	- - -	0°C / 10°C	Hysteresis configuration Menu (Alarm TRIP Hysteresis) Example: If the temperature (ARt) is programmed with 100°C and the difference (ARH) programmed with 5°C, the LED of the ALARM relay will be blinking between 95°C and 100°C and will be OFF only when the temperature reach any value below 94°C. Set the Alarm Hysteresis wanted difference and confirm it by pressing SET .
ARt	- - -	0°C / 200°C	Menu to Set the TRIP temperature (TRIP by High Temperature). When the sensor reaches the temperature configured on this menu (ARt) the EP3 frontal TRIP Relay (connections 34, 35 and 36) will start to blink initializing the Shutdown counting time. During the counting, the configured time on tTd Example: If the display shows 01 it means that the TRIP (Shutdown) will occur in 1 minute. At the end of the counting, the TRIP Relay LED will intensely blink on the EP3 frontal and protected equipment will be turned off. If the TRIP counter parameter is set in 0' , the TRIP Relay will immediately activate. Configure the TRIP (shutdown) temperature and confirm it pressing SET .
tTd	- - -	0 - 20	Menu to Set the shutdown timer over a range of 0 to 20 minutes. When the sensors temperature S1, S2, S3 or S4 of ARt reaches the configured value, the EP3 will start the counting to shut the protected equipment off. If the timer is set in 0 (zero) the TRIP Relay will activate immediately Choose the timer and confirm it pressing SET .

PrO	---	Modb dnp	Menu to enable one of the Communication Protocol options: - Press SET key on Modb to choose the Modbus RTU Protocol. - Press SET key on dnp to choose the DNP3 Level 1 Protocol.
SNA	---	---	Serial Network Address.
UCS	Aut 12 2.4 48 96 192 38.4 576	---	Serial Communication Speed Menu (Baud Rate): Aut It automatically detects the communication speed; 12 Communication Speed fixed on 1.200bps; 2.4 Communication Speed fixed on 2.400bps; 48 Communication Speed fixed on 4.800bps; 96 Communication Speed fixed ON 9.600bps; 192 Communication Speed fixed on 19.200bps; 38.4 Communication Speed fixed on 38.400bps; 576 Communication Speed fixed on 57.600bps;
dSP	hOt SCA nAn	---	Menu to select the temperature display mode: hOt At the HOT mode, it shows only the sensor with the highest temperature SCA At the Scan mode, it shows the 4 sensors temperature at sequential and automatic; nAn At the manual mode, it shows the 4 sensors temperatures only through the navigation Keys;

<p>test</p>	<p>rl1 rl2 rl3 led</p>	<p>---</p>	<p> Attention to to use this Test menu, it activates all EP3 Relays and it lits the Frontal LED's that the user check its operation. However, in case of EP3 operation, if the TRIP (Shutdown) relay is connected to the transformer protection system, the relay will activate the Transformer Shutdown circuit breaker.</p> <p>rl1 - Activates the relay 1 pressing SET (Relay Alarm)”</p> <p>rl2 - Activates the relay 2 pressing SET (Relay TRIP)”</p> <p>rl3 - Activates the relay 3 pressing SET (Relay TRIP)”</p> <p>led - It activates all LED's by pressing SET key</p>
<p>lor</p>	<p>rl1 rl2 rl3</p>	<p>do di</p>	<p>Relays Logic selection Menu.</p> <p>do – Relay Initial conditions “OFF”.</p> <p>di – Relay Initial conditions “ON”.</p> <p>Select the desired Logic and confirm it by pressing SET</p>
<p>Cnf</p>	<p>---</p>	<p>---</p>	<p>Menu de Exclusividade Electron do Brasil.</p> <p>Para sair do menu pressione a tecla SET.</p>

DEFECT SOLUTION

The sensor returns automatically to the reading mode when the error is normalized, to reset the **EP3** press and hold **SET** for nearly 5 seconds until **rSt** (Reset) appears at the display, then, release the **SET** key and the **EP3** shall reset itself automatically. The **EP3** will activate the **FAIL** relay (connections 37,38 and 39) when **OFF** is being displayed by the **EP3** screen or if its power supply is off

Display	Cause	Solution
OFF	The EP3 are not receiving a reliable signal	<ul style="list-style-type: none">• Check the Sensor cable has shielding. If not, replace it by a shielded cable;• Check the Sensor cable grounding.• Check and eliminate any possible connector bad connection;• Temperature sensor replacement, If the Sensor is damaged

IMPORTANT RECOMMENDATIONS

Before putting the EP3 to operate, please make sure to check the following recommendations:

1. All the sensors as the equipment as well must be grounded. Do not use the same grounding point for the power supply and for the sensor to ensure that there will no be a potential differential between them. The Sensors and the power supply correctly grounded protect the equipment against bad-functioning or damages caused by electrical disturbances, surges and inductions.
2. Do not use the **EP3** under directly sunlight, whenever when it is installed at the field, its important that it has a smoked panel, in order to filter the ultraviolet rays that damages the EP3 frontal polycarbonate, extending the equipment life

WARRANTY TERM

The **EP3** has a 2 years warranty time counted from the sale consigned date on the invoice, to cover manufacturing defects that turns it inappropriate to its applications.

WARRANTY EXCLUSION

The warranty does not cover transportation costs to the technical assistance, Freight and insurance for shipment of product with indication of defect or malfunction. The following event are also not covered by this warranty:

Pieces natural wear inflicted by continuous and frequent work, External damages inflicted by falls or improper packaging; Fixing attempt / Sealing violation with damages made by unauthorized people by Electron and with disagree with its instruction that are part of the technical description.

WARRANTY LOSS

This product will automatically lose its guarantee when:

- If the instruction is not observed and the procedure and assemblies of this user manual;
- Submit to the conditions out of the limits specified on the respective technical description;
- Violated or fixed by someone who doesn't belong to Electron Technical Staff;
- Damage inflicted by crash or impact;
- If occurs water or any other liquid infiltration;
- If occurs an overload that cause component degradation and product parts;

WARRANTY UTILIZATION

To use this warranty the customer should send this product to Electron with an invoice buying copy properly packed with the equipment to avoid any transportation damage. To a quick treatment is recommended to report a high information volume possible related to the defect or problem. The reported problem will be analyzed and submitted to full operational tests.

The product analysis and its respective maintenance should be made only by the Electron do Brasil technical Staff in its Corporate Headquarters.