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## **THERMAL PROTECTION RELAY EP3**

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Catalogue

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## INTRODUCTION

The EP3 Thermal Protection Relay, manufactured by Electron do Brasil, is a microprocessor digital monitor widely used by designers in the temperature monitoring and thermal protection system of dry-type transformers of the main manufacturers in Brazil and the World.

The **EP3** of Electron do Brasil monitors and protects dry-type transformers that integrate the power system in electrical installations in Brazil and several countries, such as:

- Industrial Plants,
- Oil platforms,
- Electric power substations (Low, Medium and High Voltage),
- Commercial Buildings,
- Shopping Malls,
- Hospitals
- Football stadiums,
- Medium voltage cabins,
- Hydroelectric Power Plants,
- Photovoltaic Power Plants,
- Wind Farms,

The EP3 **Thermal Protection Relay** is a reference among professionals and scholars of the electricity sector and is in accordance with the technical specifications of the main electric power utilities in the world and in compliance with the requirements of ABNT NBR 5356-11, IEC 60076-11 and IEEE C57.12.01 that regulate the use of accessories in the temperature monitoring system and thermal protection of dry-type transformers and / or with windings encapsulated in resin epoxy.

The EP3 **Thermal Protection Relay** is produced strictly obeying the standards of national and international quality standards, its hardware is designed to withstand severe working conditions, inclement weather, noise, electromagnetic disturbances, tested and approved by specialized laboratories and with accreditation of standards such as IEC, DIN, IEEE and ABNT.

Its enclosure consists of aluminum with electrostatic ink paint to protect the printed circuit boards from electromagnetic noise and disturbances, the front (IP 40) and connectors (IP 20) comply with the standard of degree of protection for electrical equipment NBR IEC 60529. Electronic components of the highest quality and state-of-the-art technology (SMD) are used in the EP3 hardware boards that are stored, handled according to the international standard JEDEC/ESDA JESD625 of control for the manufacture and handling of electronic components.

As signal input allows up to 3 temperature sensors RTD PT-100 (EN 60751 - DIN 43760), also has a digital output RS-485 with protocol Modbus RTU and DNP 3.0 (L1) that allows access to all parameters and even remote commands of the drives in real time, also has 2 setpoints (Alarm and Shutdown) of independent temperature for each sensor and 3 (three) relays (NAF) of isolated drive, independent and free of potential that can be used for alarm, TRIP (shutdown) still has 1 (One) relay (NAF) isolated, independent and free of potential for indication of failures (FAULT - Watchdog).

The display mode is fully configurable by the user, being able to keep fixed on the display the highest temperature at the moment, the temperature that the operator selects, or else using the SCAN function that presents a complete scan of all channels continuously. Through the front indicative LEDs and through the data communication port it is possible to identify which of the channels caused the alarm, TRIP (Shutdown), all functions and parameterizations are easily configured directly on the front of the equipment. The **EP3** Thermal Protection Relay is built in an aluminum box of high mechanical resistance, in the measures of 98x98x37mm, within the DIN IEC 61554 standards for panel fixation.

**MAIN FEATURES**

- Universal Power Input 24-275 Vdc / Vac.
- 3-digit luminous red numeric display 14 mm high.
- 3-digit red high-brightness numeric display.
- Reading accuracy of 0.25% (FS).
- Temperature measuring range from 0 °C to 200 °C.
- Compensated input for PT100 2 or 3 wire sensors (EN 60751 - DIN 43760).
- Digital Output RS-485 (ANSI/TIA/EIA-485-A) with option of selecting communication protocol Modbus RTU or DNP 3 Level 1;
- Auto Baud Rate 1,200 to 57,600 bps (Automatically detects the speed of the communication network);
- Stores in memory the value of maximum temperatures reached by each sensor.
- 01 Relay (NAF) with a capacity of 10 amps for high temperature alarm.
- 01 Relay (NAF) with capacity of 10 amps for TRIP (Shutdown) with programmable drive timing.
- 01 Relay (NAF) with capacity of 10 amps for Failure Indication (Watchdog).
- Didactic interface for easy use and parameterization.
- 2 Years Warranty.

**TECHNICAL DATA**

THERMAL PROTECTION RELAY – EP3	
Operating voltage range	24 to 275 Vdc/Vac.
Operating frequency range	50/60 Hz.
Operating temperature	-40°C to 85°C
Power Consumption	< 15 Watts.
Temperature measurement input	Supports up to 3 RTD PT-100 sensors of 2 and 3 wires (EN 60751 - DIN 43760).
Measuring range	0 °C to 200 °C.
Maximum measurement input error	0.25% end of scale.
Relay output contacts	3 (PAL) Potential Free for Alarm, Shutdown and Failure indication.
Maximum Switching Power	70 W / 250 VA.
Maximum Switching Voltage	125 Vdc / 250 Vac.
Maximum Driving Current	10 Amps.
Serial Communication Port	2-wire RS-485 standard (ANSI/TIA/EIA-485-A).
Serial Communication Protocol	Modbus RTU/DNP 3.0 Level 1.
Auto Baud Rate (Automatic Network Speed Detection)	1,200 to 57,600bps.
Physical dimensions of the enclosure (DIN IEC 61554)	98 x 98 x 37 mm.
Fastening accessory	2 Steel clips.
Degree of Protection (NBR IEC 60529:2017)	Front = IP 40 / Connectors = IP 20.

*Table 1 – Technical data of the thermal protection relay EP3.*

## TYPE TESTS ATTENDED

- 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 / Counted mode = 6 kV,
- Immunity to irradiated electromagnetic disturbance (IEC61000-4-3): 80 to 1000 MHz / 10 V/m,
- Immunity to Fast Electrical Transients (IEC 60255-22-4): Alim/Entr./Outputs = 4 kV/common 2 Kv,
- Surge immunity (IEC 60255-22-5): phase/neutral 1 kV, 5 per polar ( $\pm$ ) - phase-earth/neutral-earth 2 kV, 5 per polar ( $\pm$ ),
- Immunity to conducted electromagnetic disturbances (IEC 61000-4-6): 0.15 to 80 MHz / 10 V/m,
- Climate Test (IEC 60068-21-14): - 40°C + 85°C / 72 hours,
- Vibration Resistance (IEC 60255-21-1): 3 axes / 10 to 150 Hz / 2G / 160 min/axis,
- Vibration Response (IEC 60255-21-1): 3 axes / 0.075 mm-10 to 58 Hz / 1G from 58 to 150 Hz / 8min/axis.

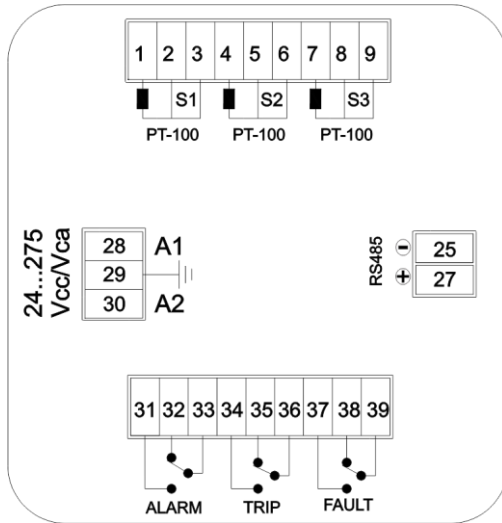
## ANSI/IEEE FUNCTION CODES SERVED

The EP3 Thermal Protection Relay is designed to meet the following functions and device acronyms (IED) specified by the Electrical Power System Device Function Numbers Standard, ANSI/IEEE C37.2–2008 Contact Acronyms and Designation Standards.

FUNCTION NUMBER/ACRONYM	FUNCTION NAME/ACRONYM
2	Timed Start or Close Relay
11	Multifunction Device.
16S	Serial Data Communication Device.
23	Temperature Control Device.
26	Thermal Device of the Equipment.
30	Announcer relay.
49	Thermal Relay.
74	Alarm Relay.
77	Telemetry Device.
94	Digital output to TRIP.
HMI	Human Machine Interface.
TCM	TRIP monitoring scheme.

Table 2 – ANSI/IEEE codes served by EP3

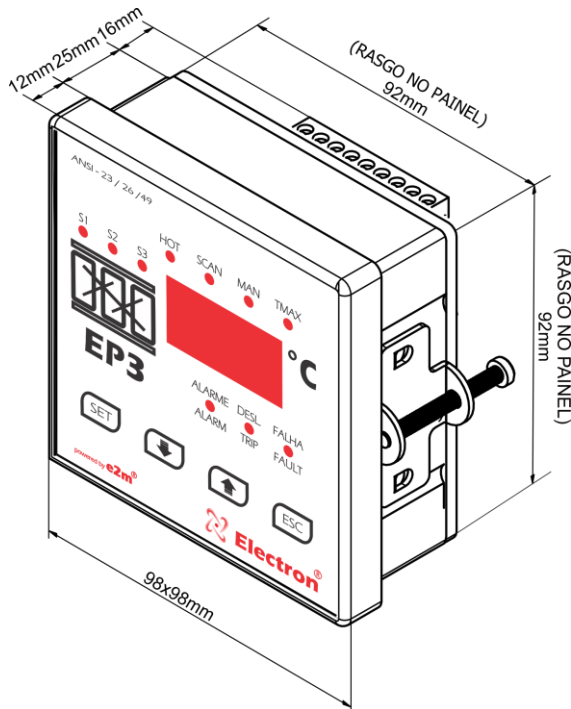
## EP3 CONNECTION DIAGRAM



Page link to download the drawing file in DWG:  
<https://electron.com.br/site/produtos/ep3/>

Figure 1 – Diagram EP3.

## PHYSICAL DIMENSIONS



Page link to download the drawing file in DWG:  
<https://electron.com.br/site/produtos/ep3/>

Figure 2 - Illustration of physical dimensions of EP3.

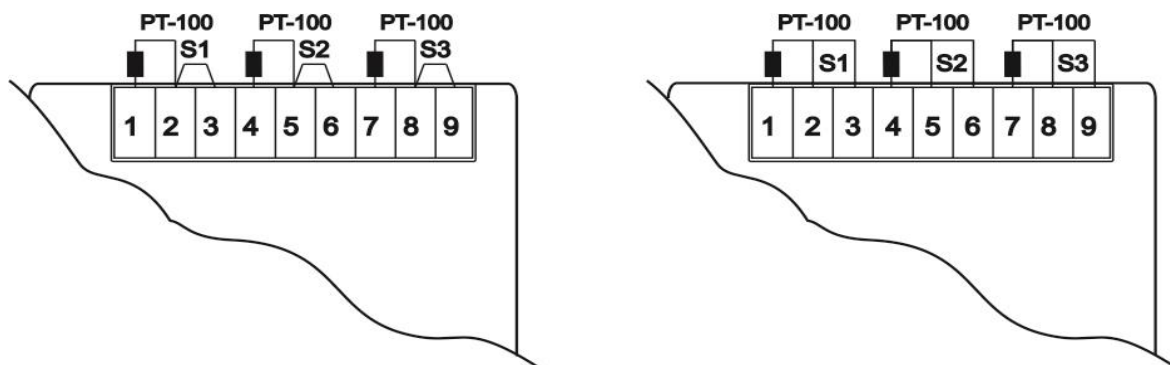
**SENSOR INPUT - SENSOR CIRCUIT (EM 60751 – DIN 43760)**

Figure 3 – Connection diagrams for RD PT-100 of 2 and 3 wires.

Link to Electron's PT100 STFE temperature sensor page:  
<https://electron.com.br/site/produtos/rtd-pt100-2/>

## OPERATION CHART

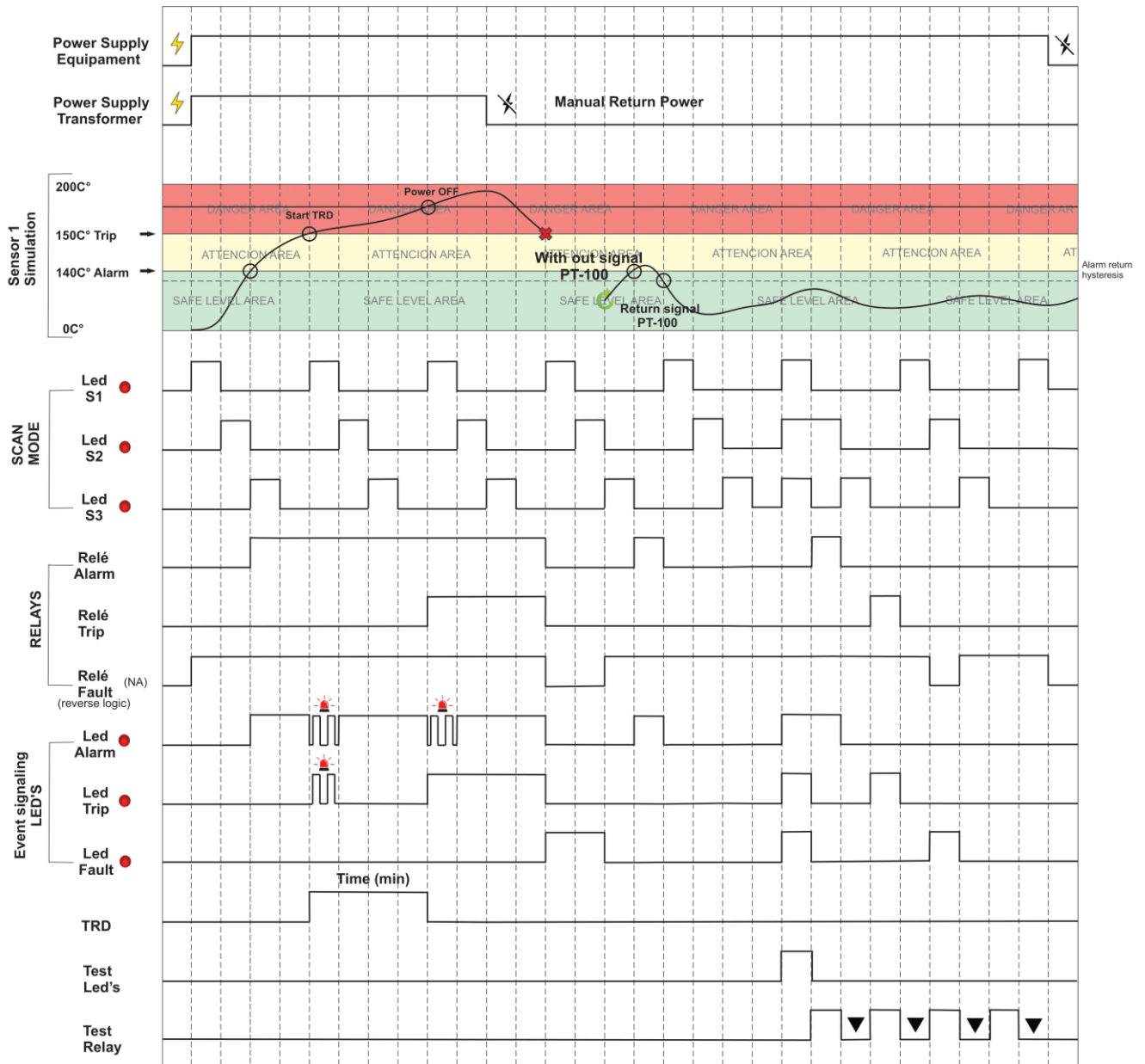



Figure 4 – Operation chart



## PREVENTIVE MAINTENANCE

PREVENTIVE AND CORRECTIVE MAINTENANCE							
Items to be checked preemptively			Scan Frequency				Corrective action
SHARE	Verification Elements	ACTIVITIES	Every Month	Every 3 Months	Every 6 Months	Every 1 Year	When Needed
VERIFICATION	Fastening and fitting clip on the rail	Attachment to panel door or panel bottom		X			Retightening, Fitting, terminal exchange or screw exchange
	Terminals and Connector Comb	Fastening and fitting into the equipment		X			
		Tightening of the screws in the attachment of the conductors		X			
	Sensors	Integrity / Positioning / Fastening			X		Replacement, Repositioning and/or Fixing of Sensors
	Sensor well in Oil Transformers	Oil level in the well			X		Filling with oil up to the indicated level
TESTS & MEASUREMENTS	Relays and Digital Outputs	Individual drive test			X		Forward to technical assistance of Electron do Brasil
	Led's and Displays	Test drive Led's and display segments			X		
	Navigation buttons	Navigation test of navigation buttons			X		
	Sensor Input	Measure sensor inputs using a pattern				X	
	Input Supply Voltage of the equipment	Measure Power Input Voltage			X		Replace voltage input values according to equipment model
	RS-485 communication outputs	Communication and command testing in the supervisory system			X		Forward to technical assistance of Electron do Brasil
	Milliampere Current Signal Inputs	Measure, compare, and measure input signal in passive and/or active mode			X		
	Milliampere Current Signal Outputs	Measure, compare, and measure input signal in passive and/or active mode			X		
CLEANING	Terminals and Comb of connectors and connection box	Debris, Impurities and Moisture	X				Cleaning with dry cloth, compressed air and vacuum cleaner
	Aluminum equipment enclosure		X				
	Front of the Equipment Display		X				
	<div><div><div>ATENÇÃO</div></div><div><p>1 - Keeping the equipment within the ideal working temperature (50°C to 60°C) prolongs the useful life and avoids corrective maintenance.</p><p>2 - The accumulation of dust and impurities in the installations can cause short circuit and burning of equipment and sensors.</p><p>3 - After 10 years of use it is recommended to replace the equipment.</p></div></div>						
Table 3 – Preventive maintenance							

## EP3 INFORMATION LABELS

The EP3 Thermal Protection Relay of Electron do Brasil contains two laser engravings around the aluminum with important information that aims to facilitate its identification and characteristics and figures 4 and 5 illustrate the location of each label. The technical data label, which is engraved on the top of the relay, contains the important technical information, and the serial number label is engraved on the bottom of the housing, as illustrated in Figures 4 and 6.



Figure 4 – Location of the technical data label.

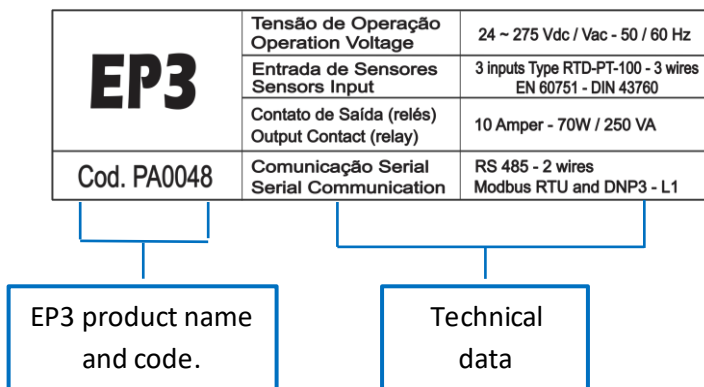


Figure 5 – Detail of the EP3 technical data label



Figure 6 – Location of the QR Code label

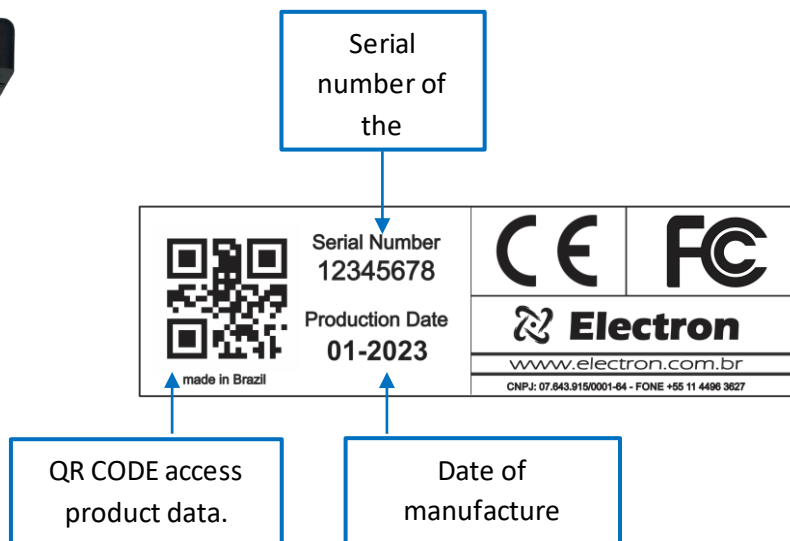


Figure 7 – Label of serial number and date of manufacture of EP3.

## APPLICATION EXAMPLE

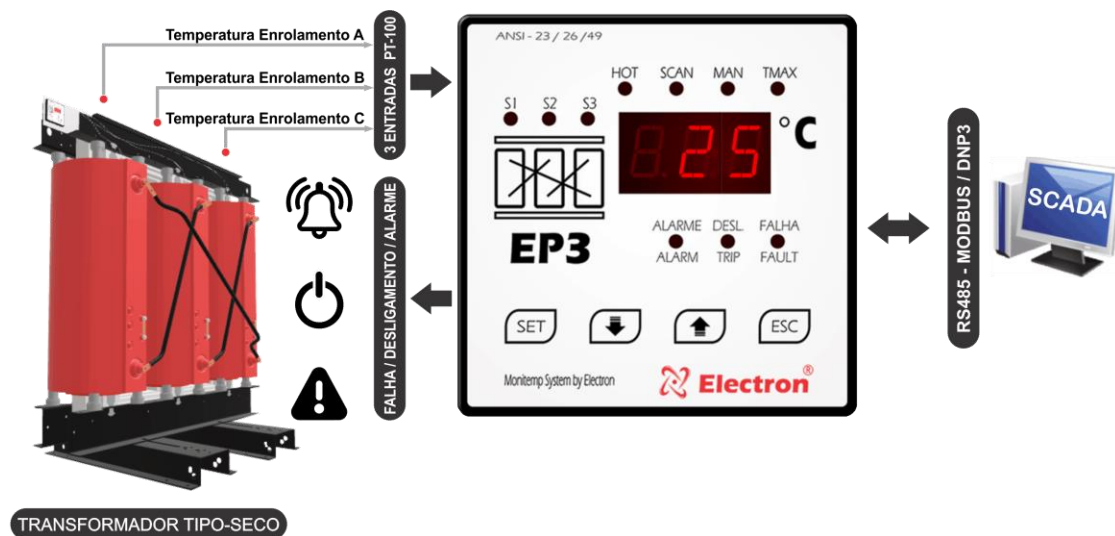


Figure 8 – Illustration of application of EP3.

## EQUIPMENT IN OPERATION



Figure 9 – EP3 installed in a Type-dry Transformer of medium voltage.

**INSTALLATION ACCESSORIES**

Electron do Brasil has a line of accessories that can be purchased together in order to offer a complete solution to meet your application with practicality. We have listed some of the main accessories that can be used for EP3 operation.



**PT-100 STFE temperature sensor:** This sensor can be built with silicone bulb, stainless steel or Teflon. With electrical insulation capacity options of 2 kV, 10 kV or 15 kV. The PT-100 STFE temperature sensor has as a measuring 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 dry-type transformer windings due to its high accuracy and quality of materials, the PT-100 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 sensor terminal.

Link to Electron's PT100 STFE temperature sensor page:  
<https://electron.com.br/site/produtos/rtd-pt100-2/>



**PT-100 STE temperature sensor:** This sensor is built stainless steel bulb AISI-304 injected aluminum head (IP 65) and adjustable bucim with BSP 3/4" and 1/2" threads or can be manufactured according to design. Its measuring 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 inclement weather and electrical disturbances for temperature monitoring of transformers and machines that require high measurement accuracy in environments subjected to electrical noise and weathering. The PT-100 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 sensor terminal.

Link to Electron's PT100 STFE temperature sensor page:  
<https://electron.com.br/site/produtos/rtd-pt100/>



**Double door panel for outdoor/outdoor use:** Box for external use with double door for mounting instruments, accessories and passage of control wires and power of the power transformer. The external door contains glass display with UV protection for viewing the quantities measured by the temperature monitor and the panel contains special paint that is weather resistant and its degree of protection is IP 55, as NBR IEC 60529:2017.

Link to the page of the double port panel for external use – IP 55:  
<https://electron.com.br/site/produtos/painel-para-uso-externo-ip55/>



**Reference card for PT-100 signal:** This accessory was developed to perform the verification of the temperature value displayed by equipment with input of RTD PT-100 sensors of 3 wires. 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).

Link to the Reference Card page for PT-100 sign:  
<https://electron.com.br/site/produtos/>

**SPECIFICATION FOR ORDER****EP3 Thermal Protection Relay.**Product Code: **PA0048.**

Click on the link below to request a quote directly through our website:

<https://electron.com.br/site/produtos/ep3/>

EP3 – Temperature Monitor for Dry Traffic - 3 PT100 Sensors - Electron - Digital Technology

**SUPPORT AND CONTACT**

For other questions, suggestions, questions or for any other matter related to this or other products manufactured by Electron do Brasil, please contact us through the following contacts:

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