Electron

POSITION INDICATOR TAP-IPTE

MANUAL

INDEX

INTRODUCTION

The IPTE TAP Position Indicator is intended for the Remote TAP Position Indication of Transformers using On-Load Changers with Potentiometric Crown.

The IPTE has an input that allows the receipt of the signal from a Potentiometric Crown, being compatible with both resistive signals and current signals from 4 to 20mA. In this way, it is possible to indicate the current PAT position on the instrument display in simple numerical form (1...51) or (-24...0...24), programmable. In addition, the equipment offers a universal analog output that can be configured for 0 to 1V, 0 to 5V, 0 to 10V, 0 to 20mA or 4 to 20mA (or other as requested), and also a digital output (RS485) with Modbus RTU and DNP3 (L1) protocol, allowing remote access to all configuration parameters, plus commands to raise and lower TAP, change the status of Automatic/Manual and Remote/Local.

The IPTE also has a signal reading failure indication feature, activated if the TAP change takes more than 10 seconds or if there are failures in the reading of the Potentiometric Crown, such as cable breakage, resistor burnout, among other problems.

Its robust structure is built in aluminum, following DIN standards for panel fixing, with dimensions 98x50x82.5mm

IPTE was developed following strict quality standards and designed to withstand severe working conditions, and can be installed in power substation yards, maritime platforms and chemical industries. Meets the requirements for ensurability and reliability according to IEC, DIN, IEEE and ABNT standards.

KEY FEATURES

- High-brightness 4-digit display, 20mm height and 13mm decimal place (red);
- Measurement range from 0 to 50 Positions (0 to 5000 Ohms) maximum pitch of 100 Ohms;
- Signal input from the Potentiometric Crown (mA and Resistive);
- Universal power supply 48 to 265 Vdc/Vac;
- RS-485 Digital Output **(ANSI/TIA/EIA-485-A)** with Modbus RTU and DNP 3 (Level 1) protocol for remote access to all measured parameters;
- Analog output from 0 to 1 mA, 0 to 5 mA, 0 to 10 mA, 0 to 20 mA and 4 to 20 mA configurable directly on the front;
- Front USB Type-C for parameterization via UseEasy™ software;
- Stores in memory the maximum and minimum TAP reached in the period;
- Contact for Failure Indication (Watchdog);
- High mechanical resistance case, built entirely in aluminum;
- IP20 degree of protection **(NBR IEC 60529);**
- Auto Baud Rate from 2400 to 57,600 bps (Automatically Detects Communication Network Speed);
- High mechanical strength housing, built entirely in DIN IEC **61554 standard aluminum;**
- Reduced size 98x50x82.5mm;
- Easy parameterization and use;
- 2 years warranty;

TECHNICAL DATA

DIGITAL TAP POSITION INDICATOR – IPTE	
Operating Voltage	48 a 265 Vcc/Vca 50/60 Hz
Operating Temperature	-40 to +85°C
Consumption	< 15 W
Tap Measurement Input	Resistive Crown from 0 to 5000 Ohms 0 to 20 mA or 4 to 20 mA transducer
Measurement Range	-50 to 50 TAP's – Programmable (50 pos.)
Analog Output and Maximum Load Options	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
Maximum Analog Output Error	0.25% of end-of-scale
Outgoing Contacts	8 – Free of Potential
Maximum Switching Power	70 W / 250 VA
Maximum Switching Voltage	250 Vdc/Vac
Maximum Driving Current	6.0 A
Serial Communication Port	RS-485 **(ANSI/TIA/EIA-485-A)**
Communication Protocol	Modbus RTU e DNP 3.0 (Slavic)
Auto Baud Rate	2400 to 57600 bps
Box (DIN EIC 61544)	48 x 96 x 140 mm – Aluminium
Equipment Attachment	Flush Panel Mounting
Degree of Protection (NBR IEC 60529)	IP 20

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

TYPE TEST PERFORMED

- Applied Voltage (IEC 60255-5): 2kV / 60Hz / 1 min. (against land);
- Immunity and Electrical Transients (IEC 60255-22-1): 2.5kV / 1.1MHz / 2 sec. / 400 outbreaks/sec;
- 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-ground/neutral-ground 2KV, 5 per polar (±);
- Immunity to conducted Electromagnetic disturbances (IEC 61000-4-6): 0.15 to 80 MHz / 10V/m;
- Climate Ensaio (IEC 60068-21-14):- 40ºC + 80ºC / 72 hours;
- Vibration Resistance (IEC 60255-21-1): 3-axis / 10 to 150Hz / 2G / 160min/axis;
- Vibration Response (IEC 60255-21-1): 3-axis / 0.075mm-10 at 58 Hz / 1G from 58 to 150 Hz / 8min/axis;

DIMENSIONS

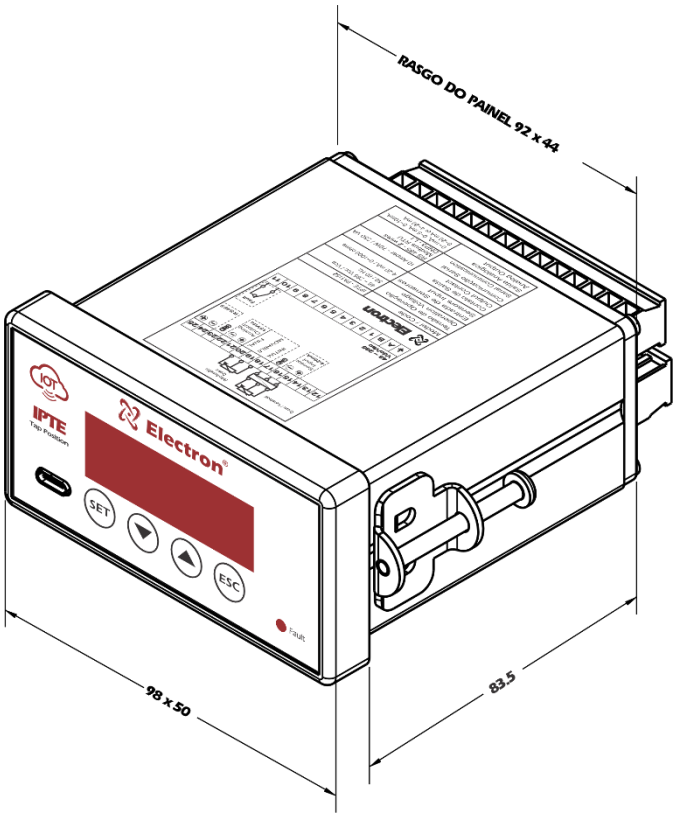


Figure 1 – Dimensions

CONNECTION DIAGRAM

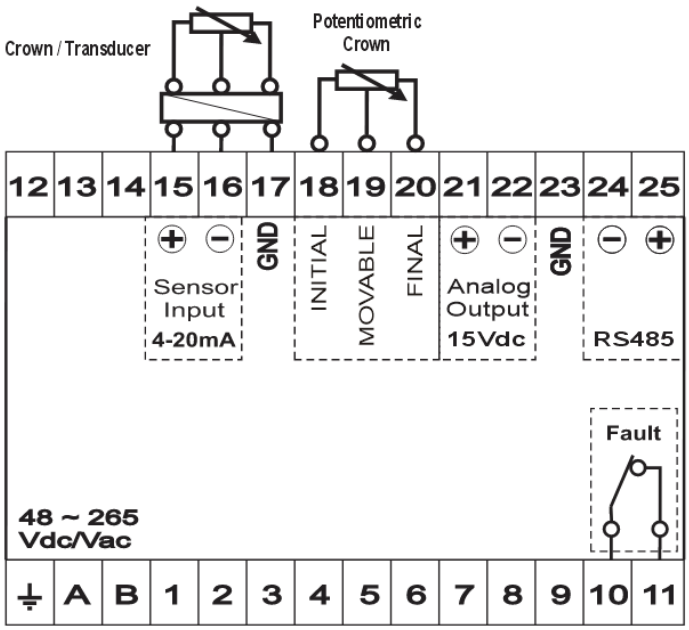


Figure 2 – Connection diagram

APPLICATION EXAMPLES

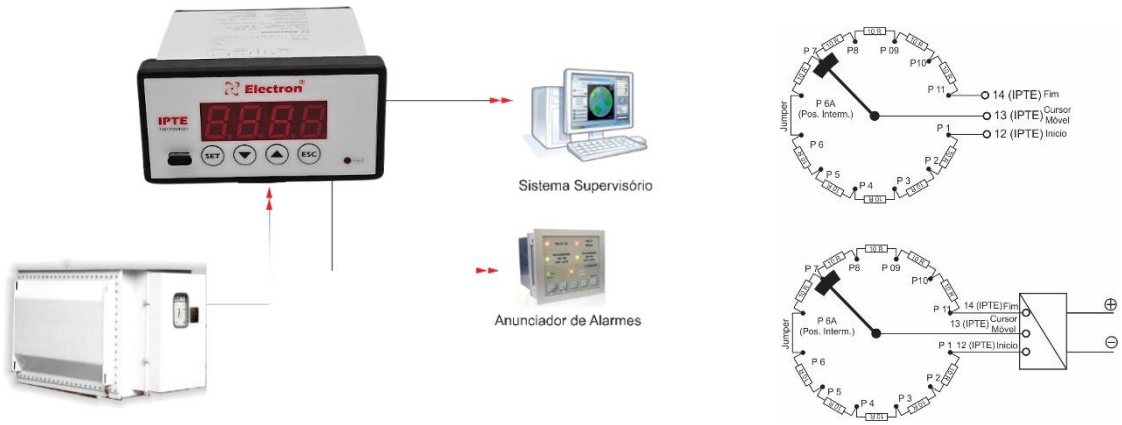


Figure 3 – Application Example

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			
	Sensors	Integrity / Positioning / Fastening			X		Replacement, repositioning and/or fixing of sensors
	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		
	Sensor Input	Gauge sensor 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				
ATENÇÃO	**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

GETTING TO KNOW IPTE

High brightness Alphanumeric LED display.

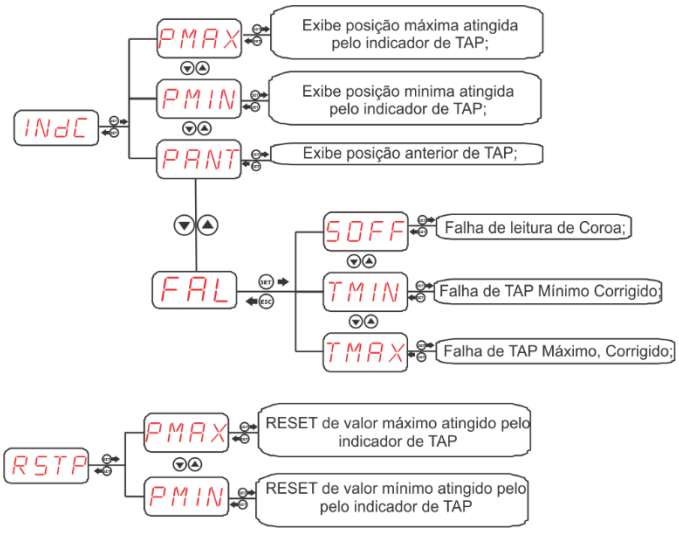
Key to navigate through the query, configuration, parameter confirmation and RESET menus.

QUERY MENU

To access this menu, press the **SAT** key. Using the decrement key and/or increment select the **INDC** option, then press the **SAT** key, then use the increment key or the decrement key to navigate the menu, to consult the desired parameter press the **SET** key, to return press the **ESC key**.

MENU	PARAMETER		DESCRIPTION
INdC	**PMAX**		Screen for querying the Maximum Position Reached by the PAT Indicator. To return to the root menu, press the **ESC key.**
	PMIN		Screen for consultation of the Minimum Position Reached by the PAT Indicator. To return to the root menu, press the **ESC key.**
	PANT		Screen to consult the Previous Position of TAP. To return to the root menu, press the **ESC key**.
	FAL	Screen to check the failure(s) that occurred in the indicator.	
		SOFF	Failure to read the Crown;
		TMIN	Minimum TAP failure fixed;
		TMAX	Maximum TAP failure reached;
RSTP	Menu to delete the High or Low Position record and start a new period. When the maximum and/or minimum values are cleared, the current record automatically becomes the stored value. To return to the root menu, press the **ESC key**.		
	PMAX		RESET of the maximum value reached by the TAP indicator by pressing the SET button ;
	PMIN		RESET the minimum value reached by the TAP indicator by pressing the SET button ;

QUERY MENU FLOWCHART



CONFIGURATION MENU

By pressing the **SET** key in the **CONF option,** a four-digit number will appear on the display, which is the reminder of the password that is configured on the equipment and immediately afterwards 0000 will appear. Use the increment and/or decrement key to enter the password, to confirm the chosen number and move to the next square press the **SAT** key, to return to the previous number press the **ESC** key. Confirming the four digits, if the password is correct, you will enter the configuration menu, displaying the acronym **MCPO on** the display. Otherwise, it will go back on display **0000**.

NOTE. The factory password is **0000** and the reminder number is 1807, if the user changes this password in the **PASS** menu and forgets it, just send the reminder number to ELECTRON and the product password will be reset.

MENU	PARAMETER	VARIABLE	DESCRIPTION
MCPO	→ Menu to configure the Range of positions for indications; **Note:** After setting the Start and End position, IPTE automatically recognizes the total number of switch positions and the analog output varies in this range.		
	INIC	**-50.0** to **50.0**	Use the increment/decrement key to set the initial value of the position, then press the SET button **;**
	FINL	**-50.0** to **50.0**	Use the increment/decrement key to set the initial value of the position, then press the SET button **;**
CPAR	Menu to configure the pitch of the Potentiometric Crown or Transmission Module (MTCS).		
	---	**4.7** to **100** Ohms	Select the step and confirm press **SET**;
Mode	→ Menu to choose the mode of indicating the position of TAP on the IPTE Display. Select the option for the position display mode and press the **SAT key**.		
	A	---	In this mode, the indicator will display the positions in numerical mode;
	ALPHA	---	In this mode the indicator will display the TAP positions above the neutral value are indicated as R, positions below will be indicated as L.
	→ Menu for choosing the mode of indicating the position of TAP on the IPTE display. Select the Crown Reading Boot Mode option and confirm by pressing the **SAT key**.		

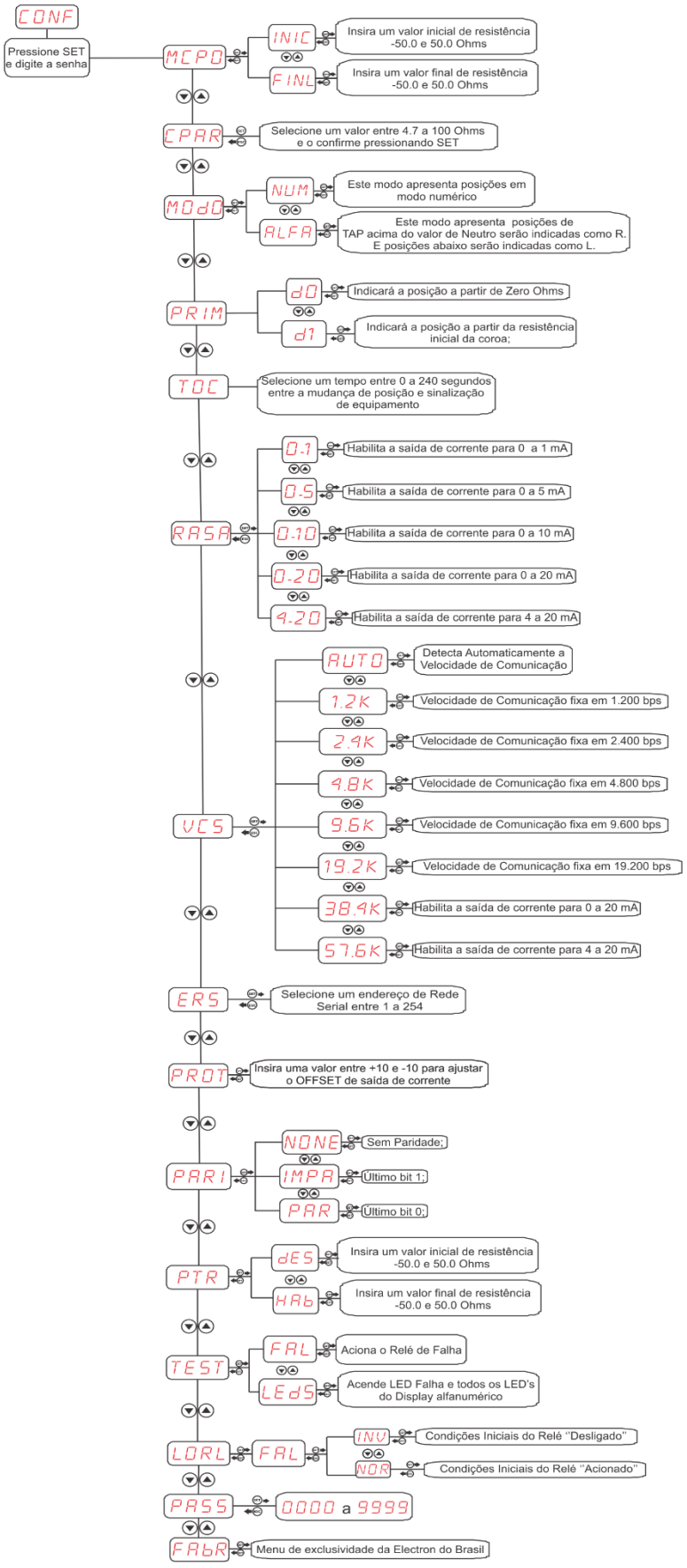
PRIM	d0	---	It will indicate the position from Zero Ohms;
	d1	---	It will indicate the position from the initial resistance of the crown;
OCD	→ Menu to set the switching time. Set the desired time, and confirm by pressing the **SAT key**.		
	---	0 to 240 seconds	Select the time between the change of position and the signaling of equipment;
SHALLOW	→ Current output selection menu (Terminals 21 and 22). Set the desired communication speed and confirm by pressing the **SAT key**.		
	0-1	---	Enables current output to 0 to 1 mA;
	0-5	---	Enables current output to 0 to 5 mA;
	0-10 years	---	Enables current output to 0 to 10 mA;
	0-20 Room	---	Enables current output to 0 to 20 mA;
	4-20 months	---	Enables current output to 4 to 20 mA;

CONFIGURATION MENU

MENU	PARAMETER	VARIABLE	DESCRIPTION
VCS	→ Menu, adjust the Serial Communication Speed. Press **SET** and set the desired communication speed.		
	AUTO	---	Automatically Detects Communication Speed;
	1.2K	---	Fixed Communication Speed at 1,200 bps;
	2.4K	---	Fixed Communication Speed at 2,400 bps;
	4.8K	---	Fixed Communication Speed at 4,800 bps;
	9.6K	---	Communication speed fixed at 9,600 bps;
	LIFE 19.2K	---	Communication speed fixed at 19,200 bps;
	LIFE 38.4K	---	Communication speed fixed at 38,400 bps;
	LIFE 57.6K	---	Communication speed fixed at 57,600 bps;
ERS	→ Menu to adjust the Network Address. Set the Serial Network address using the increment key or the decrement key and confirm by pressing the SET key **.**		
	---	1 to 254	Each device connected to the RS 485 network (terminals 24 and 25) must have a different address from the others, so that the computer can identify it;
PROT	→ Communication Protocol selection menu. Configure the desired option and confirm by pressing the **SAT key**.		
	dNP	---	Configures the DNP 3.0 Serial Communication protocol;
	MdB	---	Configures the Modbus RTU Communication protocol;
PARI	→ Parity selection menu. Configure the desired option and confirm by pressing the **SAT key**.		
	NONE	---	No parity;
	IMPA	---	Last bit of message to be transmitted will be 1;
	PAIR	---	Last bit of message to be transmitted will be 0;
	→ Parameter write protection menu by RS485. Select the Crown Reading Boot Mode option and confirm by pressing the **SAT key**.		

PTR	**des**	---	Disables write protection;
	Hab	---	Enables write protection;
TEST	→ Menu to test the Relay drives and LED lighting. Select the Relay Logic option and confirm by pressing the **SAT key**.		
	FAL	---	Activates the Fault Relay after pressing the SET button **;**
	Leds		Activates all LED's on the Display after pressing the SET key **;**
LORL	→ Selection menu to choose Relay Logic. **NOTE:** ***The factory password for IPTE is 0000. In case of loss or forgetfulness of the password, contact Electron do Brasil and inform the password reminder number;***		
	FAL	**INV**	Initial Conditions of the "Off" Relay;
		NOR	Initial Conditions of the "Triggered" Relay;

SETUP MENU FLOWCHART



CONFIGURATION MENU

PASS	---	**0000** to **9999**	To change the numbers use the increment and/or decrement keys, to confirm the chosen digit and move on to the next one, press the **SAT** key, to return to the previous digit press the **ESC key;**
FABR	---	---	Exclusive menu Electron do Brasil. To exit the Menu, press the SET key.

DEFECT SOLUTION

Display	Cause	Solution
SOFF	Reliable signal from the sensor does not reach the IPTE	Check and replace if the sensor cable is not shielded.
		Check the grounding of the sensor cable.
		Check and eliminate possible bad contact.

The IPTE automatically returns to reading mode when normalized, to reset the IPTE press the **SET key** for approximately 5 seconds, until the word REST appears on the display, then release and the equipment will restart.

The IPTE has a fault contact (relay 4), it will act in case of **SOOF** or if there is a power drop.

PREVENTIVE MAINTENANCE

PREVENTIVE AND CORRECTIVE MAINTENANCE							
Items to be checked preemptively			Frequency of Verification				Corrective action
SHARE	Verification Elements	ACTIVITIES	Every Month	Every 3 Months	Every 6 Months	Every 1 Year	When Needed
VERIFICATION	Fastening clip and snap to the rail	Fixing to the panel door or panel bottom		X			Retightening, Fitting, changing terminals or changing screws
	Terminal blocks and connector comb	Attachment and attachment to the equipment		X			
		Tightening the screws in fixing the conductors		X			
	Sensors	Integrity / Positioning / Fixation			X		Replacement, Repositioning and/or Attachment of Sensors
	Sensor Well in Oil Transformers	Oil level in the well			X		Filling with oil to the indicated level
TESTS & MEASUREMENTS	Digital Relays and Outputs	Individual drive test			X		Refer to technical assistance from Electron do Brasil
	Led's and Displays	Test Lead Led's and Display Segments			X		
	Navigation buttons	Navigation test of navigation buttons			X		
	Sensor Input	Benchmarking sensor inputs using a standard				X	
	Input voltage Supply equipment	Measure Power Input Voltage			X		Override voltage input values according to equipment model
	RS-485 communication outputs	Communication and command testing in the supervisory system			X		Refer to technical assistance from Electron do Brasil
	Milliampere Current Signal Inputs	Measuring, comparing, and gauging input signal in passive and/or active mode			X		
	Signal outputs of milliampere current	Measuring, comparing, and gauging input signal in passive and/or active mode			X		
CLEANING	Terminal blocks and connector comb and junction box	Debris, Impurities and Moisture	X				Cleaning with a dry cloth, compressed air and vacuum cleaner
	Aluminum Equipment Enclosure		X				
	Front Display of the equipment		X				
ATENÇÃO	**1 - Keeping the equipment within the ideal working temperature (50°C to 60°C) prolongs the useful life and avoids corrective maintenance.** **2 - The accumulation of dust and impurities in the installations can cause short circuits and burnout of equipment and sensors.** **3 - After 10 years of use, it is recommended to replace the equipment.**						

Table 2 – Preventive maintenance

IMPORTANT RECOMMENDATIONS

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

1. All sensors as well as equipment must be grounded, do not use the same ground point for power supply and for the sensor so that there is no potential difference.

2. Correctly grounded sensors and power prevent malfunctions or damage in cases of disturbances, surges, and inductions in the equipment.

3. Use 120 Ohm resistors at the 2 ends of the transmission line (beginning and end) in the communication network (RS-485) in order to generate the potential difference necessary for the correct functioning of the communication network.

4. Do not use the IPTE directly in the SOL, whenever it is installed in the field it is important to have a panel with smoked 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 TERM

The TAP Digital Electron Position Indicator 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/breach a seal with damage caused by persons not authorized by Electron and in disagreement with the instructions that are part of the technical description.

WARRANTY TERM

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 team;

The damage is caused by a fall or impact;

Infiltration of water or any other liquid;

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

Use of the Warranty

To take advantage of this guarantee, the customer must send the product to Electron along with a copy of the purchase invoice, properly packaged, so that no damage occurs during transport. For an emergency service, it is recommended to send as much information as possible regarding the detected defect. It will be analysed and subjected to full 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.

SPECIFICATION FOR ORDER

Equipment: TAP Position Indicator - IPTE
Product Code:

Click on the link below to request a quote directly through our website:
https://electron.com.br/site/produtos/ipte/

SUPPORT & CONTACT

For further doubts, 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:

→ Address: Avenida Brasil n. 2436, Bairro Lagoa, Itupeva–SP - 13.296-122

→ Phone: (11) 4496-3627

→ Mobile: +55 (11) 94133-7472 (Sales) / +55 (11) 93745-6828 (Technical Support)

→ Website: www.electron.com.br

→ e-mail: vendas@electron.com.br (For commercial dealings)

→ E-mail: tecnico@electron.com.br (For questions, information and technical/application queries)

DECLARATION OF CONFORMITY

Available for Downloads on the Website:

http://electron.com.br/wp/wp-content/uploads/2014/09/CARTA-DE-CONFORMIDADE-PORTUGUÊS.pdf

REVISION CONTROL

Revision No. 1.1 July 2011.
- Format Change.

Revision No. 1.2 August 2011.
- Added ANSI code. - Changed power consumption from <5W to <15W

Revision No. 1.3 August 2015.
- General Overhaul.

Revision No. 2.0 October 2019.
- Added "**TOC**" Menu – TAP position signaling time;
- Added "**PTR**" Menu – Parameter Write Protection by RS485;
- Changed the indication in **the RASA** menu – D0 to 0-1, D1 to 0-5, D2 to 0-10, D3 to 0-20 and D4 to 4-20;
- Changed the indication in the BaudRate menu – V1 for 1.2k, V2 for 2.4k, V3 for 4.8k, V4 for 9.6k, V5 for 19.2k, V6 for 3.8k and V1 for 5.7k;
- Changed the indication in the menu **TEST** – REL1 to FAL;
- Changed the indication in the LORL **–** REL1 menu to FAL;

Revision No. 2.1 November 2019.
- Spell Check,

Revision No. 2.2 – General Review 19/06/2021

Revision No. 2.3 – General Revision 19/06/2023

Revision No. 3.0 – Input Resistive and current, images/dimension.