



Monitemp Plus

Manual

INDEX	2
INTRODUCTION	3
MAIN FEATURES	4
TECHNICAL DATA	5
TYPE TESTS CARRIED OUT	6
DIMENSIONS	7
CONNECTION DIAGRAMS.....	7
CONNECTION DIAGRAMS.....	8
PREVENTIVE MAINTENANCE	9
APPLICATION EXAMPLES	10
INSTALLATION ACCESSORY.....	11
GETTING TO KNOW MONITEMP-PLUS	13
CONFIGURATION MENU FLOWCHART	14
MAIN MENU	14
QUERY FLOWCHART	15
query menu	16
CONFIGURATION FLOWCHART	18
FLOWCHART CONFIGURATION MENU	19
RECOMMENDED SETTINGS	26
SPECIFICATION FOR ORDER.....	27
RECOMMENDED SETTINGS	27
WARRANTY.....	28

INTRODUCTION

The Monitemp Plus **Temperature Monitor** was developed to monitor oil and winding temperature, control ventilation, protect power and distribution transformers (ANSI 49I and ANSI 49).

The **Monitemp Plus** was built obeying strict quality standards and uses state-of-the-art electronic components (SMD), its hardware was designed to withstand severe working conditions, and can be installed directly on the panel of the power transformer, reactor, panels in the yard of power substations, marine platforms and chemical industries. It meets the levels of requirements, supportability and reliability according to IEC, DIN, IEEE and ABNT standards.

As signal input the **Monitemp Plus** allows up to 3 (three) PT-100 temperature sensors (EM 60751 – DIN 43760), also has 2 (two) configurable analog outputs that can be from 0 to 1 mA, 0 to 5 mA, 0 to 10 mA, 0 to 20 mA and 4 to 20 mA, which mirror the oil temperature and the winding temperature, 1 (one) digital output RS-485 (ANSI/TIA/EIA-485-A) with MODBUS RTU and DNP 3.0 (Level 1) protocols chosen by the user, which allows access to all parameters of **MoniTemp Plus** including remote control of the drives in real time, has Setpoints for parameterization of temperatures for Oil Alarm, Winding Alarm, Oil Shutdown, Winding Shutdown, Oil Shutdown, Winding Shutdown, Activation of the 1st and 2nd ventilation group, the signals are made through 8 isolated and potential-free Relays.

The display mode of the **MoniTemp Plus** display is fully configurable, being able to show the highest temperature at the moment, or fix on the display the channel temperature that the operator wants, or else, using the SCAN function, a complete scan is made on all channels continuously. Through the indicative front LEDs and also through the data communication port it is possible to identify which of the channels caused the alarm, the shutdown or the activation of the fans, all functions and parameterizations are easily configured directly on the instrument panel or using the USB port with the UseEasy™ Software that accompanies the equipment or through the RS485 communication port (ANSI/TIA/EIA-485-A) with the MODBUS and DNP3.0 (Level 1) protocols that are native to the equipment.

MAIN FEATURES

- 4-digit display of high luminosity height of 20 mm and decimal place of 13 mm (red);
- Accuracy of 0.25% (FS) and indication of 1 decimal place;
- Simultaneous indication on the display of the 3 monitored temperatures (environment, oil and winding);
- Temperature measuring range from -50 to 250°C;
- Extended operating temperature (-40°C to +85°C);
- Compensated input for PT-100 3-wire sensors (**EM 60751 – DIN 43760**);
- Current input (**TRUE RMS**) from 0 to 10 Amperes with external CT Split Core;
- Universal power supply 48 to 265 VDC/Vac;
- RS485 Digital Output (**ANSI/TIA/EIA-485-A**) with **MODBUS RTU protocol and DNP3.0 (Level 1)** for remote access to all measured parameters and commands;
- Front USB 2.0 for parameterization through UseEasy™ software;
- Access Password Protection for direct parameterization through the display of the **MoniTemp Plus**;
- Auto Baud Rate from 2,400 to 57,600 bps (Automatically Detects the speed of the Communication network);
- Analog outputs configurable via keyboard or **UseEasy™** Software can be from 0 to 1 mA, 0 to 5 mA, 0 to 10 mA, 0 to 20 mA and 4 to 20 mA, for any of the measured channels;
- Drive of up to 2 groups of ventilation or pumps, directly in the front or Remote through the Serial;
- Programmable exercise and ventilation;
- Thermal Image Calculation based on IEC 354-1991, IEEE std C57.91-1995 and NBR 5416-1997;
- Query on the display of the Final Temperature Gradient for the current load (Oil-Winding);
- Query on the transformer charging percentage display;
- Consultation in the display of the load current of the Transformer (KA);
- Consultation of maximum temperature reached by the display (Oil, Winding and environment);
- 01 Relay (NA) with capacity of 6 amps for Oil Alarm (NF on request);
- 01 Relay (NA) with capacity of 6 amps for Winding Alarm (NF on request);
- 01 Relay (NA) with capacity of 6 amps for Oil Shutdown (NF on request), with programmable timing;
- 01 Relay (NA) with capacity of 6 amps for Winding Shutdown (NF on request), with programmable timing;
- 01 Relay (NA) with capacity of 6 amperes for signaling the start of counting the shutdown timing;
- 01 Relay (NA) with capacity of 6 amperes for temperature differential alarm between sensors 1 and 2;
- 01 Relay (NF) with capacity of 6 amps for signaling fault in the monitor (watchdog);
- 01 Relay (NF) with capacity of 6 amps for ventilation or pump drive, with programmable hysteresis and timed interlocking between groups;
- High mechanical strength housing, built entirely in standard aluminum (**DIN IEC 61554**);
- Reduced size 48 x 96 x 96 mm;
- Easy parameterization and use;
- 2 years warranty;

Digital Temperature Monitor – MoniTemp Plus	
Operating Voltage	48 to 265 Vdc/Vac 50/60 Hz
Operating Temperature	-40 to +85°C
Storage Temperature	-50 to +60°C
Consumption	< 15 W
Temperature Measurement Input	PT-100 3-wire (EM 60751 – DIN 43760)
Measuring Range	-50 to 250°C
Analog Outputs 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 Measurement Input Error	0.25% of the end of the scale
Maximum Analog Output Error	0.25% of the end of the scale
Outgoing Contacts	8 Relays – Potential Free
Maximum Switching Power	70 W / 250 VA
Maximum Switching Voltage	250 Vac/Vac
Maximum Driving Current	6.0 A
Serial Communication Port	RS485 (ANSI/TIA/EIA-485-A)
Communication Protocol	MODBUS RTU and DNP 3.0 – Level 1 (Slave)
Auto Baud Rate	2,400 to 57,600 bps
Box (DIN EIC 61544)	48 x 96 x 96 mm – Painted aluminium
Equipment Fixation	Panel door with steel latch stainless
Degree of Protection (NBR IEC 60529)	IP40 (Front), IP 20 (Connectors)
Current Transformer – TC Split Core	
Output Signal	4 to 20 mA
Measuring Range	0 to 10 Aca
Maximum Error of Measurement Inputs	1% of the end of scale
Linearity	1% of the end of scale
Operating Temperature	-40 to +85°C
Storage Temperature	-50 to +60°C

Table 1 – Technical Data

TYPE TESTS CARRIED OUT

- Applied Voltage (**IEC 60255-5**): 2kV / 60 Hz / 1 min. (Against Earth);
- Voltage Impulse (**IEC 60255-5**): 1.2/50µsec. / 5KV / 3 neg and 3 pos / 5 secs. Interval;
- Electrostatic Discharges (**IEC 6025-22-2**): Air Mode = 8KV / Counted Mode = 6 KV;
- Immunity to irradiated electromagnetic disturbance (**IEC 61000-4-3**): 80 to 1000 Mhz / 10 V/m;
- Immunity to Fast Electrical Transients (**IEC 60255-22-4**) Alim/Entr./ Outputs = 4 KV/Common. 2KV;
- Immunity to conducted electromagnetic disturbances (**IEC 61000-4-6**): 0.15 to 80 MHz/10V/m;
- Climate test (**IEC 60255-21-1**) 3-axis / 0.075 mm – 10 to 58 Hz / 1G from 58 to 150 Hz / 8 min/ axis;

DIMENSIONS

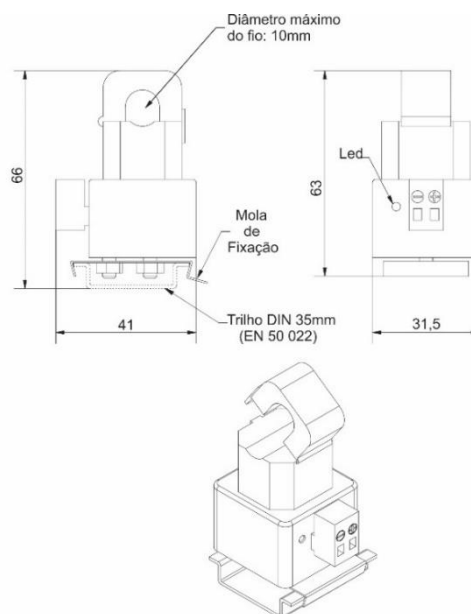
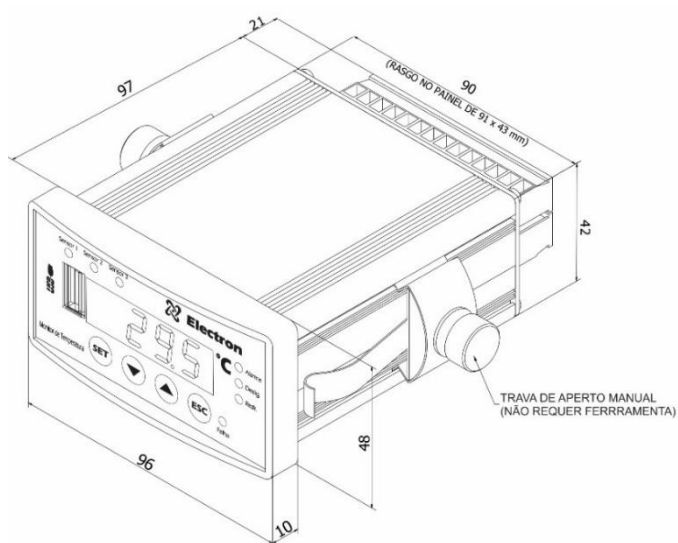


Figure 1 – Monitemp plus dimension

CONNECTION DIAGRAMS

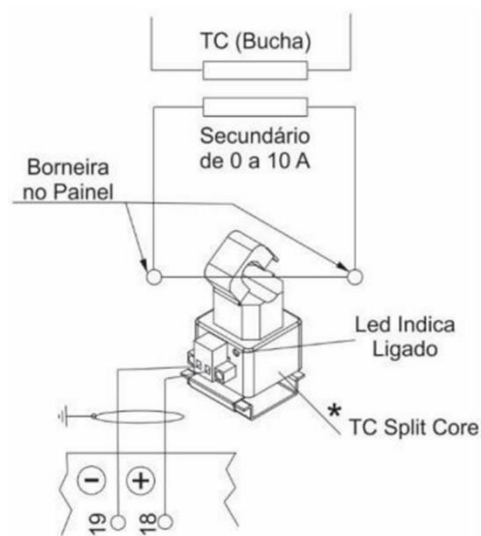
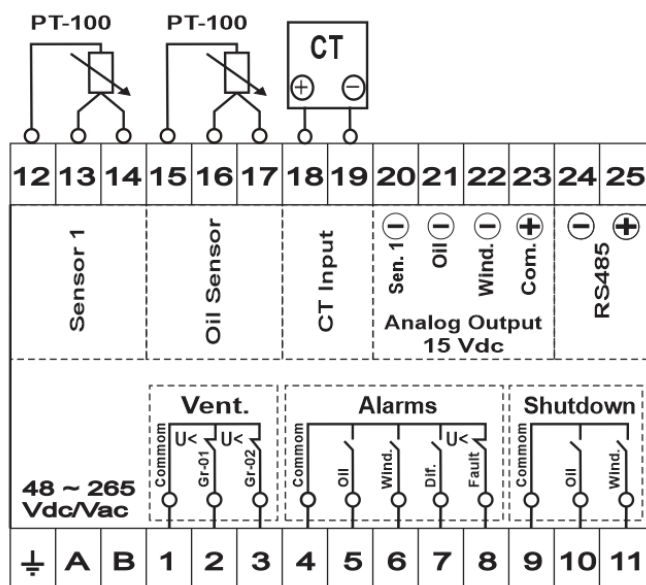


Diagrama de ligação do TC

Figure 2 – Monitemp plus Diagram

CONNECTION DIAGRAMS

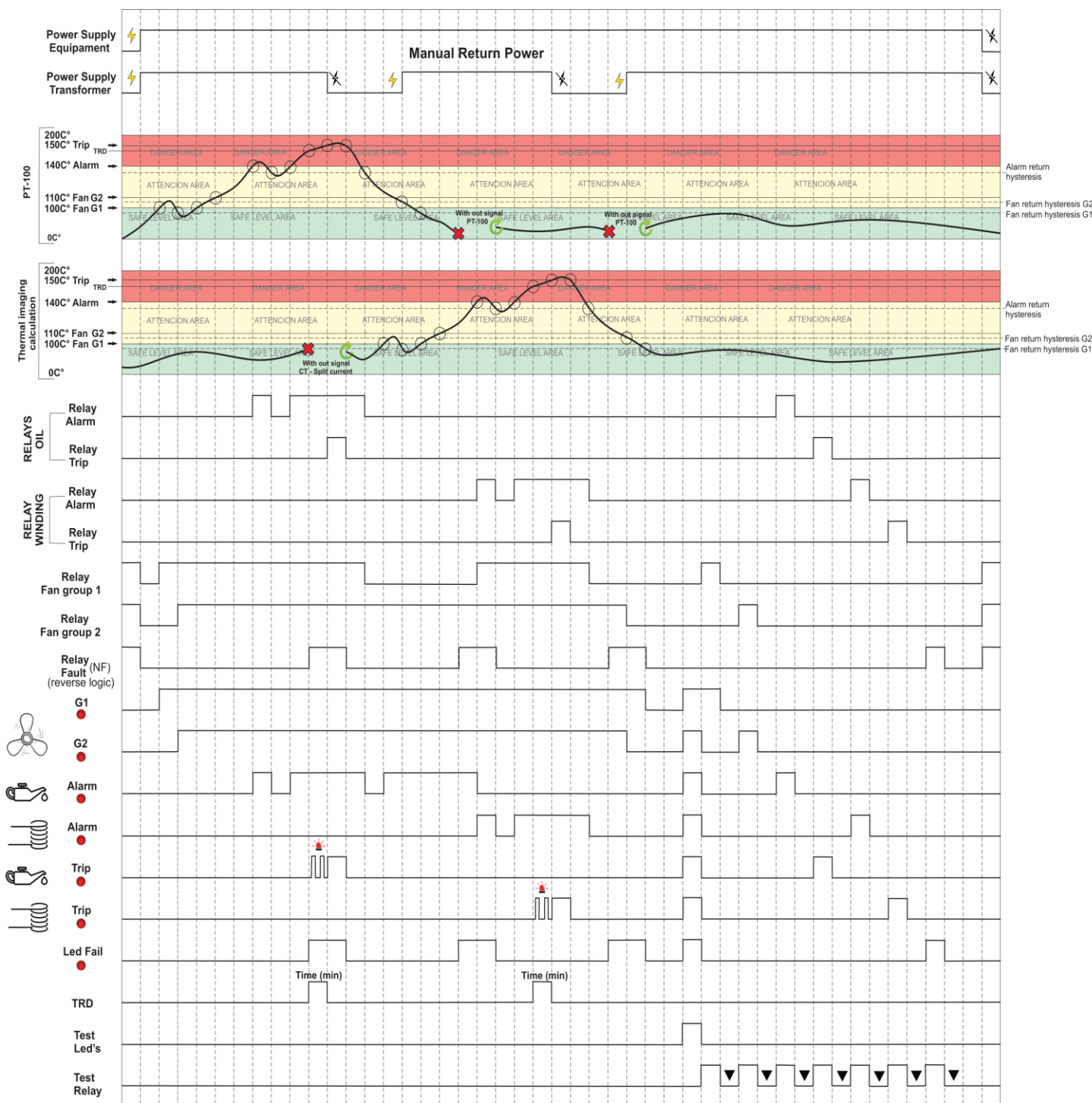


Table 2 – Chart of operation

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					
 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 circuit and burning of equipment and sensors.							
	3 - After 10 years of use it is recommended to replace the equipment.							

Table 3 – Preventive maintenance

APPLICATION EXAMPLES

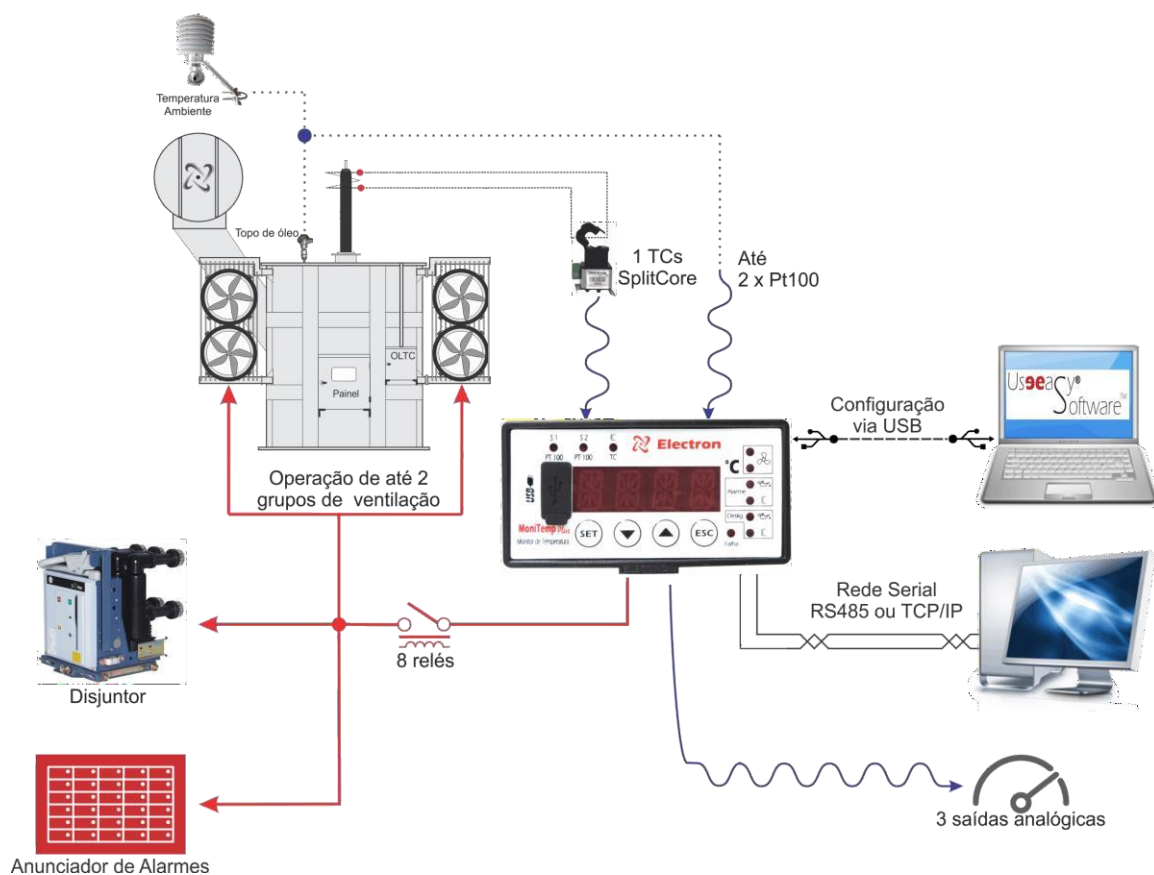


Figure 3 – Application example

INSTALLATION ACCESSORY

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 operation of Monitemp plus.



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 protection against UV rays 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.

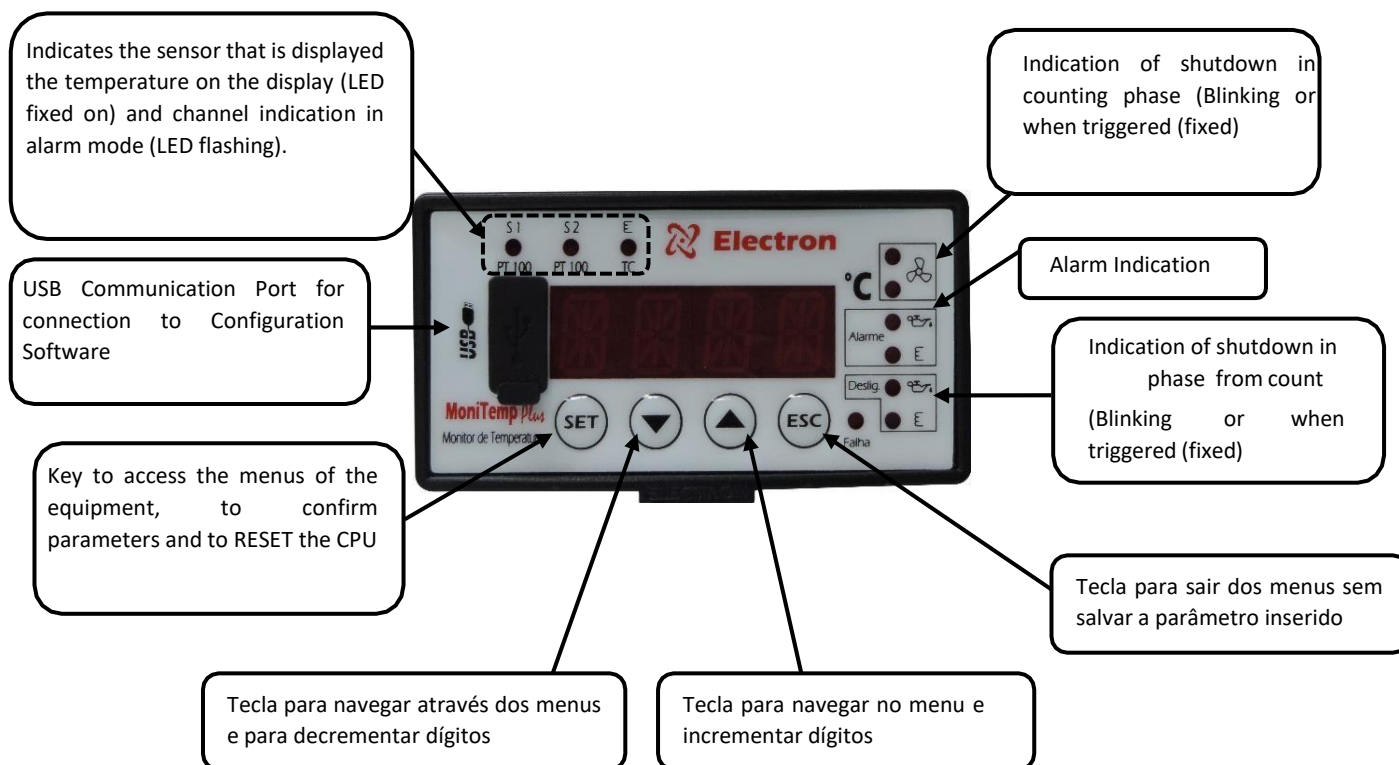
Link to the page of the double port panel for external use – IP 55:
<https://electron.com.br/site/produtos/painel-para-uso-externo-ip55/>



Monitor de Temperatura Digital – MoniTemp Plus ANSI – 49 / 49I

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/>



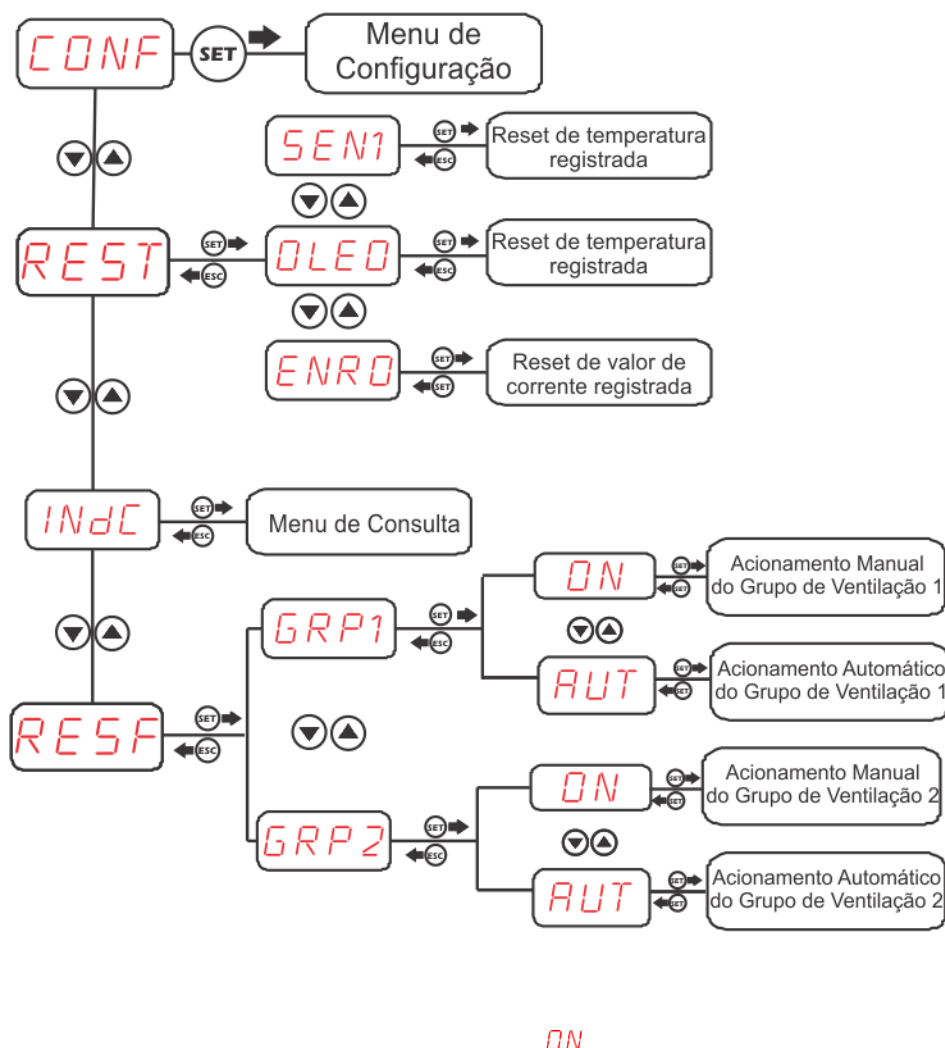
The **MoniTemp Plus** is an instrument developed to monitor the temperature of Oil Transformers, having in its configuration inputs for PT-100 sensors and current signal from the TC Split Core that measures the load current of the transformer.

Through mathematical calculations extracted from the standards NBR 516-1997 and IEC 354-1991 and implementer in its powerful microcontroller the MoniTemp Plus traces the thermal image curve of the transformer winding, it is enough only to obtain the temperature of the oil that is measured in the instrument itself through the PT-100 sensors and the current that circulates through the winding (through the auxiliary TC's) that is also measured by the MoniTemp through the TC Split Core that accompanies the instrument, With this information and the parameters configured by the user, the transformer temperatures are monitored.

In addition to online monitoring of oil temperature and winding, information can also be consulted and used to feed a supervisory and diagnostic system, for example with only 1 instrument we can obtain the oil temperature, winding temperature and ambient temperature, Final Gradient, current circulating through the winding and percentage loading, based on the nominal capacity of the transformer, charge curve, temperature gradient, etc.

All functions and parameterizations can be done directly on the front keyboard of MoniTemp or through the remote software, we have divided the menus into three blocks, Configuration, Indications, Cooling.

CONFIGURATION MENU FLOWCHART



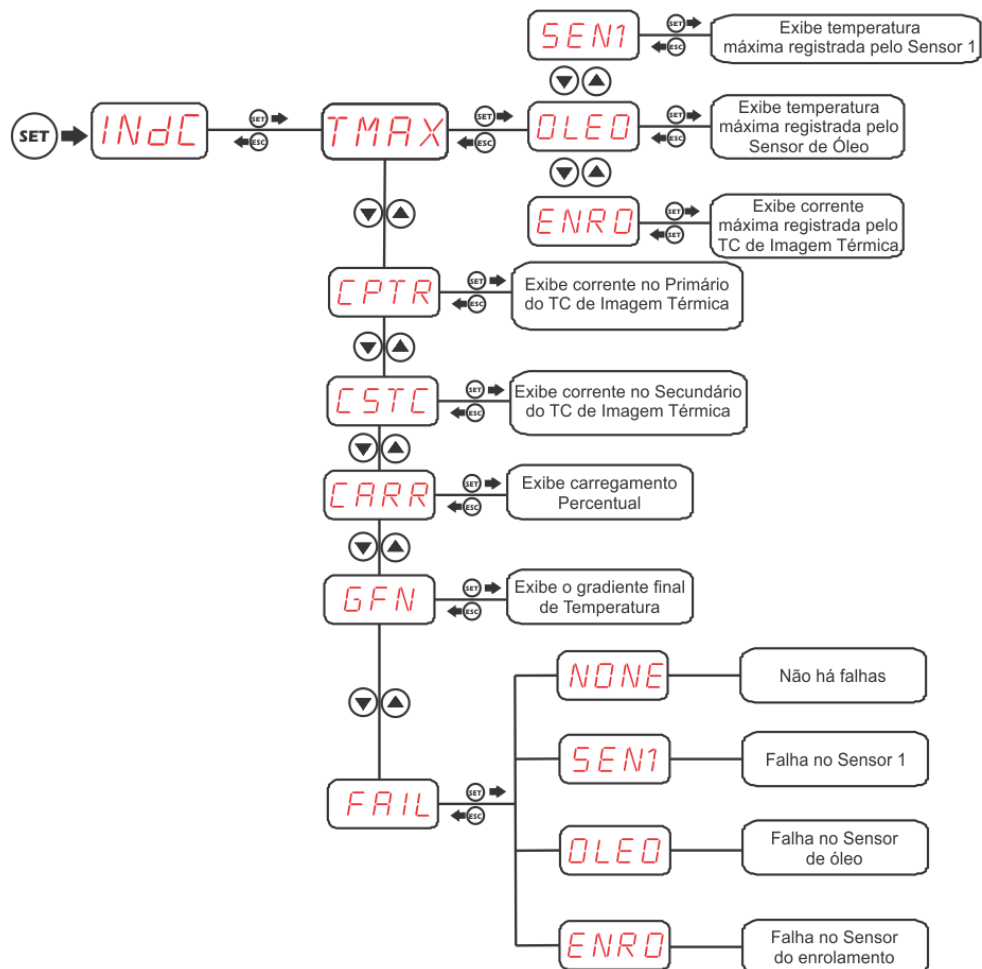
ON

MAIN MENU

Press the SET key once and the acronym CONF(Configuration), then use the navigation, increment and decrement keys, to navigate through the main menus to access desired option press the SET key, to return to the previous menu, press the ESC Key. In this topic, only the RESF(Cooling) and REST(RESET) menus will be detailed. The CONF (Configuration) and INdC (Indicators) menus will be covered in the following topics.

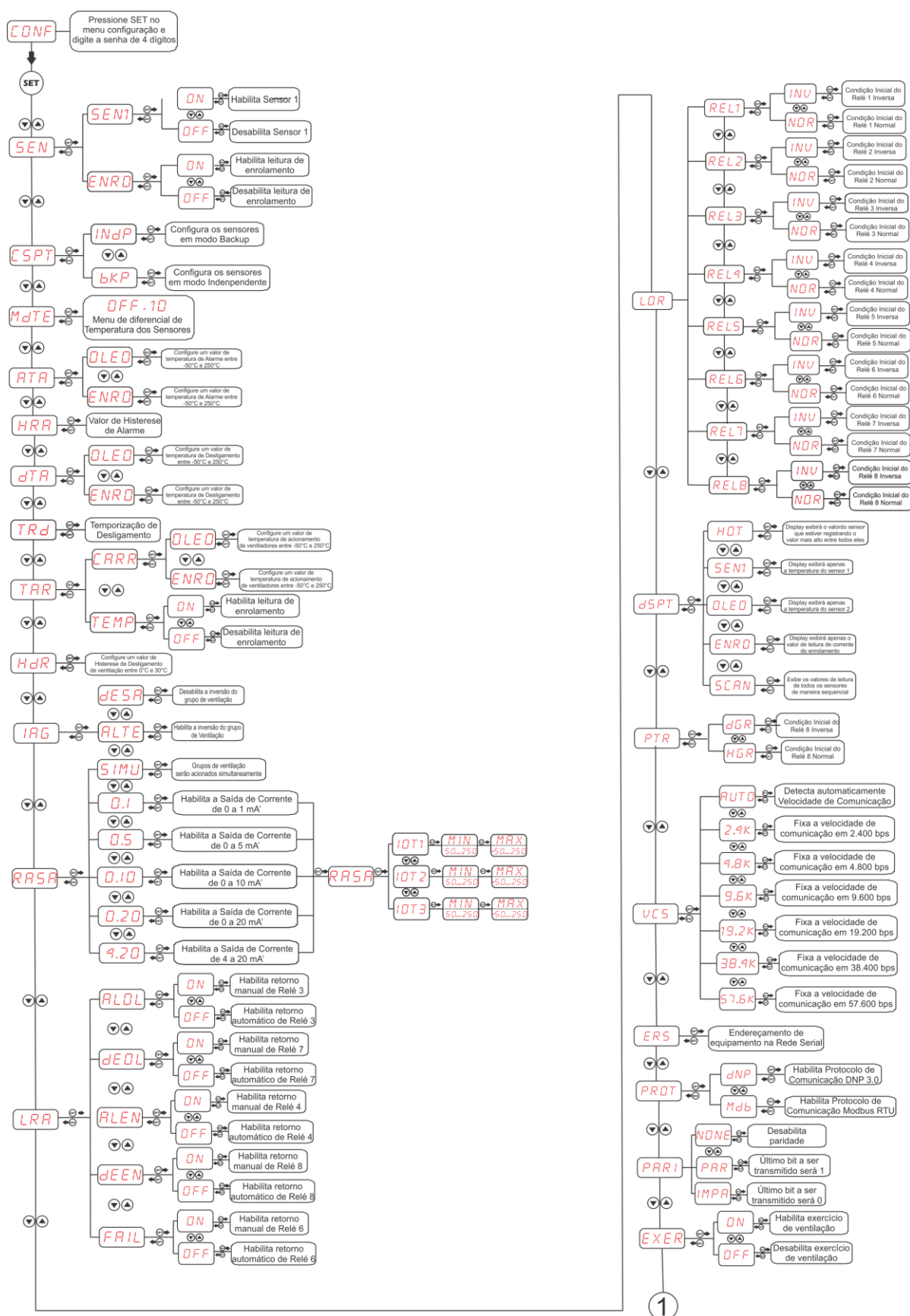
Menu	Parameters	Variable	Descripti on
REST	SEN1		The Maximum Value Register by Sensor 1 will be Reset by pressing the SET key;
	OIL		The maximum value recorded by the Oil Sensor will be Reset by pressing the SET key;
	ENRO		The maximum value recorded by the Winding will be Reset by pressing the SET key;
RESF	GPR1	ON	Manual Activation of Ventilation Group 1;
		AUT	Automatic Activation of Ventilation Group 1;
	GPR2	ON	Manual Activation of Ventilation Group 2;
		AUT	Automatic Activation of Ventilation Group 2;

QUERY FLOWCHART

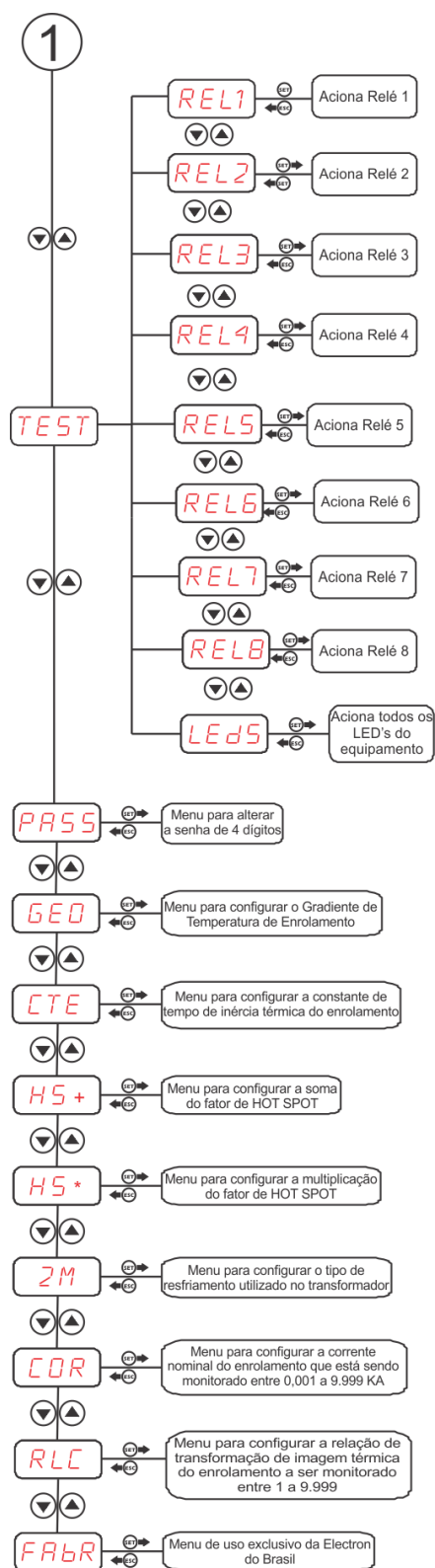


QUERY MENU

Menu	Parameters	Variable	Description
INdC	TMAX	SEN1	Displays maximum value recorded by Sensor 1;
		OIL	Displays the maximum value;
		ENRO	Displays the maximum value recorded by the Thermal Imaging TC;
	CPTR		Displays the value of electric current in the primary of the Thermal Imaging CT; Screen for checking the current value calculated through the parameter RLC, which is undergoing the primary of the Thermal Imaging CT of the winding. To query the calculated current value of the winding press the SET key.
	CSTC		Displays the value of electric current in the secondary of the Thermal Imaging CT; Current in the Secondary of the Thermal Imaging CT (measured by Splitcore). Screen for checking the actual current value that is passing through the secondary of the Winding Thermal Imaging TC. To see the value of the actual winding current press the SET key.
	CARR		Displays percentage load of the Transformer; Query screen of the percentage load of the Transformer based on the nominal current of the transformer that is configured through the COR parameter. To see the percentage load of the Winding press the SET key.
	GFN		Displays the final Temperature gradient; Value of the difference of the oil temperature and the winding temperature for the current load and after Thermal stabilization. To query for the final gradient of winding1, press the SET key.
	FAIL	NONE	There is no indication of any flaws;
		SEN1	Indication of failure in Sensor 1;
		OIL	Indication of failure in the Oil sensor;
		ENRO	Indication of read failure in Winding.



FLOWCHART CONFIGURATION MENU



Menu	Parameters	Variable	Description
SEN	→ Menu to enable and/or disable the input of the sensors, 1 (one), Oil and Winding. NOTE: The option to disable Sensor 2 (oil) will only be available if the CSPT menu is configured in BKP, otherwise this option will not appear. Select the ON or OFF option from the menu and confirm by pressing the SET key		
	SEN1	ON	Enables input from Sensor 1;
		OFF	Disables input a from Sensor 1;
	OIL	ON	Enables input from Sensor 2;
		OFF	Disables input a from Sensor 2;
	ENRO	ON	Enables input from Sensor 3;
		OFF	Disables input a from Sensor 3;
CSPT	→ Selection menu of the reading mode of the PT-100 Sensors. Select a parameter and confirm it by pressing the SET key. NOTE: Only one of the options can be enabled.		
	INdP		<p>Sensor 1 reads the ambient temperature or the switch and sensor 2 reads the temperature of the Transformer Oil:</p> <ul style="list-style-type: none"> • Disabled the option to turn off sensor 2 (Oil Sensor); • If there is a failure in Sensor 2, it will only indicate in the thermal image calculation that it is based on Sensor 2, it will only indicate SOFF in Sensor 1 and the Fault Relay will act; • If failure occurs in sensor 2 the thermal image calculation will be interrupted, the Fault Relay and also the forced ventilation indicating SOFF in Sensor 2; • Enables the config option
	BKP		<p>In this parameterization will be performed the average of the oil temperature reading between Sensor 1 and Sensor 2.</p> <ul style="list-style-type: none"> • Enables the option to turn off the Oil sensor (Sensor 2); • If there is a failure in any of the sensors, the thermal image calculation will be carried out by the other sensor and the display will display the acronym SOFF and the failure relay (watchdog) will be triggered; • If there is any failure in the Oil Sesnor (Sensor 2) Sensor 1 will assume the adjuster parameters for the Oil Sensor (Sensor 2);
MdTE		OFF - 10.0	<p>Temperature differential menu of Sensor 1 and Sensor 2 (Oil).</p> <p>- If the Temperature difference between Sensor 1 and Sensor 2 is greater than that parameterized in this menu, the Relay 5 "Dif. Temp" (posts 4 and 7);</p>
MINUTES	→ Menu to configure the activation temperature of the Alarms, when the corresponding Sensor reaches the configured temperature the Relays will be triggered and the Alarm LED will also be triggered;		
	OIL	-50.0 to 250.0	Oil sensor triggered Relay 3 (Terminals 4 and 5);
	ENRO	-50.0 to 250.0	Oil sensor triggered Relay 4 (Terminals 4 and 6);

Menu	Parameters	Variable	Description
HRA	→ Menu to configure the activation temperature of the Alarms, when the corresponding sensor reaches the adjusted temperature the respective relays are triggered and the red LED on the front of the equipment lights up indicating the active Alarm; EXAMPLE: If the value of the ATA menu is programmed at 90°C and the HRA menu programmed with 1°C, the Alarm Relay will only be triggered when the temperature reaches 88.9°, that is, with 1°C below the ATA parameter, this value is valid for the 2 Alarms, Oil Sensor and Winding.		
		0 to 10	Select the desired Temperature Hysteresis and confirm it by pressing the SET key.
dTA	→ Menu to configure the activation temperature of the Shutdown relays, when the sensor reaches the set temperature the time count that has been parameterized in the TRd menu is initiated, the red LED "shutdown" of the corresponding sensor will be flashing during the time count and the instrument display will be presenting a countdown in minutes, and at the end of the count the red LED "shutdown" of the corresponding sensor will be fixed on the front. If the counting time is zero, the relay will be triggered instantly after the temperature reaches the adjusted value; Select the desired Temperature for each sensor and confirm it by pressing the SET key;		
	OIL	-50.0 to 250.0	Oil sensor triggered Relay 7 (Terminals 9 and 10);
	ENRO	-50.0 to 250.0	Oil sensor triggered Relay 11 (Terminals 9 and 11);
TRd	→ Menu to configure the Shutdown Time, when the temperature of the dTA parameter is reached the count will start. If the parameterized value is zero, the corresponding sensor shutdown relay will be triggered immediately.		
		0 - 20	Select the desired shutdown time and confirm by pressing the SET key.
.TAR	→ Menu to configure the Temperature of activation of the fans, when reaching the value programmed in the TAR parameter by its respective sensor is triggered the Relay (terminals 01 and 02) for input of the 1st Group and the Relay 2 (Post 01 and 03) for activation of the 2nd Group, will light the red LED "ventilation" on the front of the equipment indicating the active Fan Group. Note 1: This command has inter-lock timed, the 2nd group will only trigger 15 secs. After the activation of the 1st Group if the sensor reaches the drive temperature of the 2 Groups; Note 2: When there is only 1 Ventilation Group in the Transformer the user must parameterize the same drive values in the 2 Groups, use the IAG Menu in D2 and jump the contacts 02 and 03 of the monitor		
	OIL	GR01	-50.0 a 250.0 Select the Ventilation drive temperature and confirm it by pressing SET;
	ENRO	GR02	-50.0 a 250.0 Select the Ventilation drive temperature and confirm it by pressing SET;
Hdr	→ Menu to configure the hysteresis of ventilation shutdown, temperature difference between turning the cooler on and off. Example: If the TAR is programmed at 65°C and the HdR programmed with 5°C, the cooler will only be turned off when the temperature reaches 59.9°C i.e. with 5°C;		
		0 to 30	Select the desired temperature differential and confirm by pressing the SET key;

Menu	Parameters	Variable	Description
IAG	→ Menu to enable Automatic Reversal of ventilation groups. Select the option you want, and then confirm it by pressing the SET key.		
	dESA		Disable the inversion of the ventilation group;
	ALTE		Enable the inversion of the ventilation group, that is, at each departure of the groups an inversion is made, making the group from which it had previously departed in the first sense the 2nd Group;
	SIMU		Simultaneous activation of the 2 ventilation groups;
SHALLOW	→ Menu to choose the value of the current outputs (Analog Outputs);		
	0.1		Sets the current output to 0 to 1 mA;
	0.5		Sets the current output to 0 to 5 mA;
	0.10		Sets the current output to 0 to 10 mA;
	0.20		Sets the current output to 0 to 20 mA;
	4.20		Sets the current output to 4 to 20 mA;
LRA	→ Menu to choose how the Alarms/Shutdown will return and fail after its activation (ANSI-86 function), if the ON variable means the RESET is configured as Manual, that is, the contacts of the respective Relays will only return to the normal state after the intervention of the operator, where it will be necessary to restart the equipment manually according to the instructions on page XX, if the choice is OFF the Relays will return automatically after temperature normalization or failure. Select the Alarms, Shutdowns, and Failure returns option and confirm them by pressing SET.		
	UNDERNEATH	ON	Enables Manual Return Alarm Relay 3 (Oil);
		OFF	Enables the Automatic Return Alarm Relay 3 (Oil);
	dEOL	ON	Enables Manual Return Shutdown of Relay 7 (Oil);
		OFF	Enables the Automatic Return Shutdown of Relay 7 (Oil);
	ALEN	ON	Enables Manual Return Relay Alarm 4 (Winding);
		OFF	Enables the Automatic Return Alarm Relay 4 (Winding);
	dEEN	ON	Enables Manual Return Relay Shutdown 8 (Winding);
		OFF	Enables Automatic Return Relay Shutdown 8 (Winding);
	FAIL	ON	Enables Manual Failure Relay Return;
		OFF	Enables Automatic Failure Relay Return;

Menu	Parameters	Variable	Descriptio n
LOR	→ Menu to determine the initial condition of the equipment relays; Configure the conditions of the Relays and confirm it by pressing SET		
	REL1	NOR	Initial condition of Relay 1 Inverse;
		INV	Initial condition of Relay 1 Normal;
	REL2	NOR	Initial condition of Relay 2 Inverse;
		INV	Initial condition of Relay 2 Normal;
	REL3	NOR	Initial condition of Relay 3 Inverse;
		INV	Initial condition of Relay 3 Normal;
	REL4	NOR	Initial condition of Relay 4 Inverse;
		INV	Initial condition of Relay 4 Normal;
	REL5	NOR	Initial condition of Relay 5 Inverse;
		INV	Initial condition of Relay 5 Normal;
	REL6	NOR	Initial condition of Relay 6 Inverse;
		INV	Initial condition of Relay 6 Normal;
	REL7	NOR	Initial condition of Relay 7 Inverse;
		INV	Initial condition of Relay 7 Normal;
	REL8	NOR	Initial condition of the Relay 8 Inverse;
		INV	Initial condition of Relay 8 Normal;
dSPT	→ Menu to choose the mode of display of the quantities on the display; Select the option that you want, and then press SET		
	HOT		The Display will display the value of the sensor that is recording the highest value.
	SEN1		Display will display only the temperature of Sensor 1;
	OIL		Display will display the temperature of Sensor 2 only;
	ENRO		Display will display only the current reading value of the winding;
	SCAN		Displays the reading values of all sensors sequentially;
PTR	→ Menu to enable or disable equipment parameter recording protection		
	dGR		Disables write protection;
	dGR		Enables write protection;
VCS	→ Network Serial Communication Speed selection menu or for automatic detection of Serial Communication Speed;		
	AUTO		Automatically detects the Serial Communication Speed of the network;
	2.4K		Sets the serial communication speed at 2,400 bps;
	4.8K		Sets the serial communication speed at 4,800 bps;
	9.6K		Sets serial communication speed at 9,600 bps;
	19.2K		Sets the serial communication speed at 19,200 bps;
	38.4K		Sets serial communication speed at 38,400 bps;
	57.6K		Sets the serial communication speed at 57,600 bps;

Menu	Parameters	Variable	Description
ERS	→ the Menu to configure the Serial Network Address, each equipment connected to the RS 485 network (post 24 and 25) must have a single address different from the others, so that the supervisor can identify it. NOTE: MoniTemp has Auto Baud Rate from 2,400 to 57,600 bps (speed auto-detection). If there is a sudden and extreme change in the communication speed of the equipment, it may lose its reference and it is necessary to restart the monitor to return communication. See page XX		
		1 to 254	Configure the desired address and confirm it by pressing the SET key
PROT	→ Menu to choose the type of Network Communication Protocol. Select the Communication Protocol and confirm it by pressing SET		
	dNP		Communication Protocol DNP 3.0 (Level 1);
	Mdb		MODBUS RTU Communication Protocol;
PARI	→ Menu to choose the parity, that is, the last bit to be transmitted in the message to verify the integrity of the data;		
	NONE		No parity;
	ODD		Last bit of the message to be transmitted will be 1;
	PAIR		Last bit of the message to be transmitted will be 0;
EXER	→ Schedule menu of the daily ventilation exercise; After 1 minute of the confirmation of the ON schedule the Ventilation Exercise will be activated for the first time and will remain activated for 5 minutes (Flashing Ventilation LED). This cycle will be repeated every 24 hours from the first trigger. NOTE: If the equipment is de-energized or RESETado the above cycle will be repeated and will start again the count for the next cycle of Ventilation Exercise. Select the option you want, and then confirm by pressing the SET key.		
	ON		Qualified Daily Exercise;
	OFF		Daily exercise disabled;
TEST	→ ATTENTION, when using this menu, it will trigger the outputs of the relays and light all the LED's of the monitor so that the operator makes sure of their operation, however, if the MoniTemp Plus is in operation and the Shutdown Relays are connected in the protection of the system, there will be the activation of the Relay and will result in the shutdown of the Transformer;		
	RL1		Triggers Relay 1 "GR1" after pressing the SET key;
	RL2		Triggers Relay 2 "GR2" after pressing the SET key;
	RL3		Triggers Relay 3 "Oil Alarm" after pressing the SET key;
	RL4		Triggers Relay 4 "Winding Alarm" after pressing the SET key;
	RL5		Triggers Relay 5 "Temperature Differential" after pressing the SET key;
	RL6		Triggers Relay 6 "Failure" after pressing the SET key;
	RL7		Triggers the Relay 7 "Oil TRIP" after pressing the SET key;
	RL8		Triggers the Relay 8 "Winding TRIP" after pressing the SET key;
	Leds		Triggers all LED's of MoniTemp Plus;

Menu	Parameters	Variable	Description
PASS	→ Menu to change the four-digit password. This password will be used to access the configuration menu of the equipment. To change the numbers use the increment or decrement key, to confirm the chosen digit and move to the next one, press the SET key, to return to the previous digit press the ESC key OBS: The factory password of MoniTemp Plus is 0000. In case of loss or forgetting of the password, contact Electron do Brasil and inform the password reminder number.		
		0000 to 9999	Enter the desired 4-digit password and confirm it by pressing the SET key.
GEO	→ Menu to configure the Temperature Gradient in the Winding. Difference between the temperature of the oil top and the average winding temperature, after thermal stabilization under nominal load conditions. NOTE: Value obtained in the heating test or by calculation. Set the Desired gradient value, and then press the SET key.		
		0 to 30	Select the Winding Temperature Gradient value, and then press SET.
CTE	→ Menu to configure the HOT-SPOT factor, added to the GEO Menu according to NBR 5416-1997 and IEEE std. C57.91-1995, is the temperature of the hottest point of the winding. If the IEC standard is used to calculate the hottest point, this parameter must be set to Zero.		
		0 a 500	Set the value of the time constant, and then press the SET key.
HS+	→ Menu to configure the HOT-SPOT factor, added to the GEO Menu according to NBR 5416-1997 and IEEE std. C57.91-1995, is the temperature of the hottest point of the winding. If the IEC standard is used to calculate the hottest point, this parameter must be set to Zero.		
		0 to 20	Set the HOT-SPOT (Sum) value and confirm it by pressing SET
HS*	→ Menu to configure the Hot-spot factor; multiplied by the GEO according to IEC 354-1991 is the temperature of the hottest point of the winding. If the ABNT standard is used to calculate the hottest point, this parameter must be set to 1.0.		
		1.0 to 1.5 %	Set the value of the HOT-SPOT (Multiplication) factor and confirm it by pressing the SET key.
2M	→ Menu to configure the type of cooling used in the transformer: 1.6 – Natural Oil and Forced Oil; 2.0 – Directed Oil;		
		1.0 to 2.0	Configure the type of cooling used in the refrigerator and confirm it by pressing SET.
COLOUR	→ Menu for configures the nominal electrical current value of the Transformer Winding being monitored. EXAMPLE: Winding Current with rated load. 0.95((KA) .		

COLOUR		0.001 to 9.999	Select the nominal electric current value and confirm it by pressing SET .
--------	--	----------------	-----------------------------------------------------------------------------------

Menu	Parameters	Variable	Description
RLC	→ Menu to configure the transformation relationship of the Thermal Image TC of the winding to be monitored. EXAMPLE: Thermal Imaging CT 950 / 5 A = CT ratio 190;		
		1 to 9,999	Set the value of the Thermal Imaging TC relationship and confirm it by pressing SET.
FAbR			Electron Exclusivity Menu. To this menu, press the SET key.

RECOMMENDED SETTINGS

	ABNT		IEC		ANSI	
	55,0° C	65,0° C	55,0° C	65,0° C	55,0° C	65,0° C
Hot Spot - HS+ (ABNT)	10	15	0			
Hot Spot - HS* (IEC)	1,0		1,3			
Expoente 2M	1,6 (ON* e OF**) / 2,0 (OD***)					
Constante de Tempo do Enrolamento, CTE.	300 segs.					
Temperatura de Aacionamento do Ventilador - TAR	65°C 1º Grupo e 75°C 2º Grupo					
Alarme de Temperatura do óleo - ATA-SEN2	85°C (ON*) / 75°C (OF**)					
Alarme de Temp. dos Enrolamentos- ATA-SEN3	105°C					
Desligamento por Temp. do óleo - DTA-SEN2	110°C					
Desligamento por Temp. dos Enrolamentos - DTA-SEN3	120°C					
Tempo de Retardo de Desligamento – TRD	2 min.					
Histerese de Desligamento Resfriador –HDR	5°C					

*ON=óleo Natural

**OF= óleo Forçado

***OD=óleo Dirigido

The Sensor automatically returns to reading mode when normalized, to RESET the MoniTemp Plus hold down the **SET** key until the display displays the acronym **REST**. Release the Monitor will reboot, without losing the previously configured parameters.

Display	Cause	Solution
SOFF	There is no reliable signal from the Sensor to the MoniTemp	Check and replace if the Sensor cable is not armored.
		Check grounding of the Sensor cable.
		Check and eliminate possible bad contact.
		Replacing the temperature sensor if it is damaged.

SPECIFICATION FOR ORDER

	PRODUTO	QUANTIDADE
	MoniTemp Plus – Monitor de Temperatura de Óleo e Enrolamentos	Quantidade: <input type="text" value="1"/>

RECOMMENDED SETTINGS

Before putting into operation the equipment check the following recommendations:

1. All sensors as well as equipment must be grounded.
2. Properly grounded sensors and power supply prevent malfunction or damage in cases of disturbances, surges, and inductions in the equipment.
3. Use in the communication network (Rs485) resistors of 120 Ohms at the 2 ends of the transmission line (beginning and end) in order to generate potential difference necessary for the correct functioning of the communication network.
4. Only use with MoniTemp Plus the original accessories that come with the equipment (TC Split core), as they have been rigorously tested together to ensure maximum efficiency and performance in the operation of the set.
5. Do not use the Monitor directly in the SOL, whenever it is installed in the field it is important that it has 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

The MoniTemp Plus Electron has a warranty period of two years from the date of sale consigned on the invoice, with coverage for any manufacturing defects that make it inappropriate or unsuitable for the applications it is intended.

Disclaimer of Warranty

The warranty does not cover transportation expenses for technical assistance, freight and insurance for shipment of product with evidence of defect or malfunction. The following events are also not covered: Natural wear of parts by continuous and frequent use, damage to the outside caused by falls or improper packaging; attempted repair / violation of 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 Standard NBR 5410 are not observed;
- Subjected to conditions outside the limits specified in the respective technical descriptions.
- Breached 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 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 duly packed 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 operating 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.