Electron

Monitemp Plus

MANUAL

INDEX

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 in compliance with 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 in the power transformer panel, reactor, in panels in the yard of power substations, offshore platforms and chemical industries. Meets the levels of demand, supportability and reliability according to IEC, DIN, IEEE and ABNT standards.

With signal input, **Monitemp Plus** allows up to 2 (three) PT-100 temperature sensors (EM 60751 – DIN 43760), 1 input for current measurement for winding and also has 3 (three) 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, that mirror the oil temperature and the winding temperature, 1 (one) RS-485 digital output (ANSI/TIA/EIA-485-A) with MODBUS RTU and DNP 3.0 (Level 1) protocols chosen by the user, which allows access to all **MoniTemp Plus** parameters including remote command of the drives in real time, has Setpoints for temperature parameterization for Oil Alarm, Winding Alarm, Oil Shutoff, Winding Shutoff, Activation of the 1st and 2nd ventilation group, signaling is made through 8 isolated and potential-free Relays.

The display display mode of the **MoniTemp Plus** is fully configurable, being able to show the highest temperature at the moment, or fix the channel temperature of the desired channel on the display, or using the SCAN function, a complete scan of all channels is made continuously. Through the indicative front LED's 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™** Softwarethat comes with 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.

KEY FEATURES

- High-brightness 4-digit display, 20mm height and 13mm decimal place (red);
- Accuracy of 0.25% (FS) and indication of 1 decimal place;
- Simultaneous indication on the display of the 3 monitored temperatures (ambient, oil and winding);
- Temperature measurement range from -50 to 250ºC;
- Extended operating temperature (-40°C to +85°C);
- Compensated input for PT-100 3-wire sensors **(EN 60751 – DIN 43760);**
- Current input **(TRUE RMS)** from 0 to 10 Amps with external Split Core CT;
- Universal power supply 48 to 265 VDC/Vac;
- RS485 Digital Output **(ANSI/TIA/EIA-485-A)** with **MODBUS RTU and DNP3.0 (Level 1)** protocol for remote access to all measured parameters and commands;
- Front USB Type-C for parameterization via **UseEasy™ software**;
- Access Password Protection for direct parameterization via the **MoniTemp Plus**;
- Auto Baud Rate from 2,400 to 57,600 bps (Automatically Detects Communication Network Speed);
- 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;
- Activation of up to 2 groups of ventilation or pumps, directly on the front or Remote through Serial;
- Programmable Exercise and Ventilation;
- Thermal Image Calculation based on IEC 354-1991, IEEE std C57.91-1995 and NBR 5416-1997 standards;
- Consultation on the display of the Final Temperature Gradient for the current load (Oil-Winding);
- Consultation on the transformer loading percentage display;
- Consultation on the display of the load current of the Transformer (KA);
- Consultation of maximum temperature reached by the display (Oil, Winding and environment);
- 01 Relay (NO) with a capacity of 6 amperes for Oil Alarm (NC on request);
- 01 Relay (NA) with a capacity of 6 amperes for Winding Alarm (NC on request);
- 01 Relay (NO) with a capacity of 6 amperes for Oil Shutdown (NC on request), with programmable timing;
- 01 Relay (NO) with a capacity of 6 amperes for Winding Shutdown (NC on request), with programmable timing;
- 01 Relay (NO) with a capacity of 6 amperes for signaling the start of counting the timing of the shutdown;
- 01 Relay (NA) with a capacity of 6 amperes for temperature differential larm between sensors 1 and 2;
- 01 Relay (NF) with a capacity of 6 amperes for signaling fault on the monitor (watchdog);
- 01 Relay (NF) with a capacity of 6 amperes for ventilation or pump activation, with programmable hysteresis and timed interlocking between groups;
- High mechanical strength housing, constructed entirely of standard aluminum **(DIN IEC 61554);**
- Small size 50 x 98 x 83.5 mm;
- Easy parameterization and use;
- 2 years warranty;

TECHNICAL DATA

Digital Temperature Monitor – MoniTemp Plus	
Operating Voltage	48 a 265 Vcc/Vca 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 (EN 60751 – DIN 43760)
Measurement Range	-50 to 250°C
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 Measurement Input Error	0.25% of end-of-scale
Maximum Analog Output Error	0.25% of end-of-scale
Outgoing Contacts	8 Relés – Potencial Books
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)	50x 98 x 83.5 mm – Painted aluminium
Equipment Attachment	Panel Door with Steel Clip stainless
Degree of Protection (NBR IEC 60529)	IP40 (Front), IP 20 (Connectors)
Corrente Transformer – TC Split Core	
Exit Signal	4 to 20 mA
Measurement Range	0 to 10 Aca
Maximum Error of Measurement Inputs	1% of end-of-scale
Linearity	1% of end-of-scale
Operating Temperature	-40 to +85°C
Storage Temperature	-50 to +60°C

Table 1 – Technical Data

TYPE TESTS PERFORMED

- Applied Voltage **(EIC) 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 radiated electromagnetic disturbance **(IEC 61000-4-3):** 80 to 1000 Mhz / 10 V/m;
- Immunity to Fast Electrical Transients **(IEC 60255-22-4)** Alim/Input/Outputs = 4 KV/Common. 2KV;
- Immunity to conducted electromagnetic disturbances **(IEC 61000-4-6**): 0.15 to 80 MHz/10V/m;
- Climate testing **(IEC 60255-21-1)** 3shafts / 0.075 mm – 10 to 58 Hz / 1G from 58 to 150 Hz /8 min/ axis;

DIMENSIONS

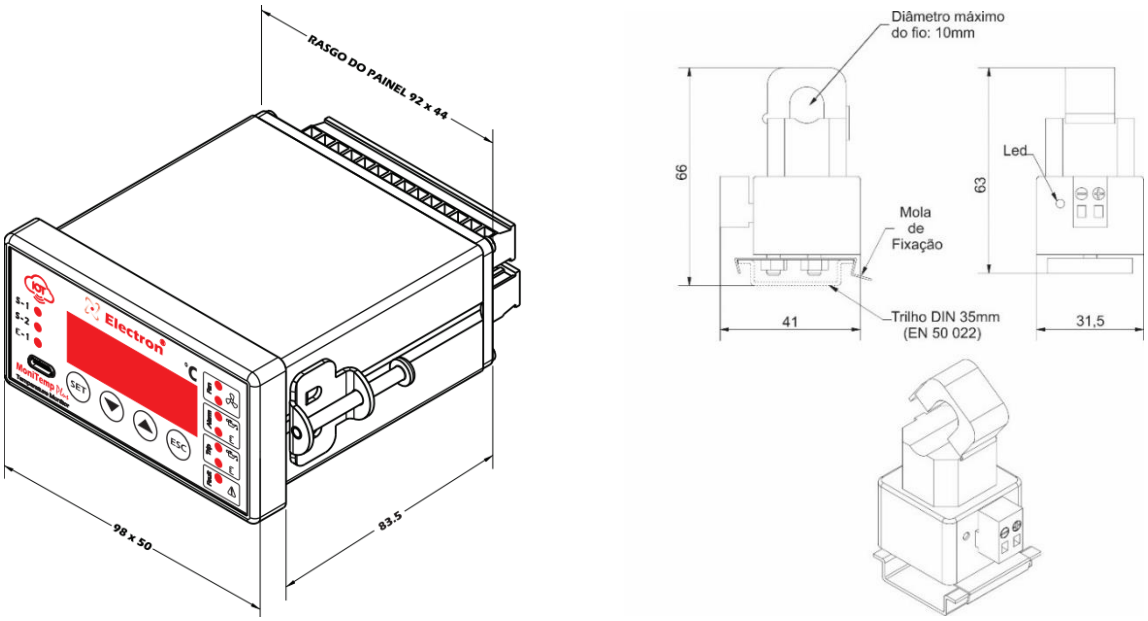


Figure 1 – Monitemp plus dimension

CONNECTION DIAGRAMS

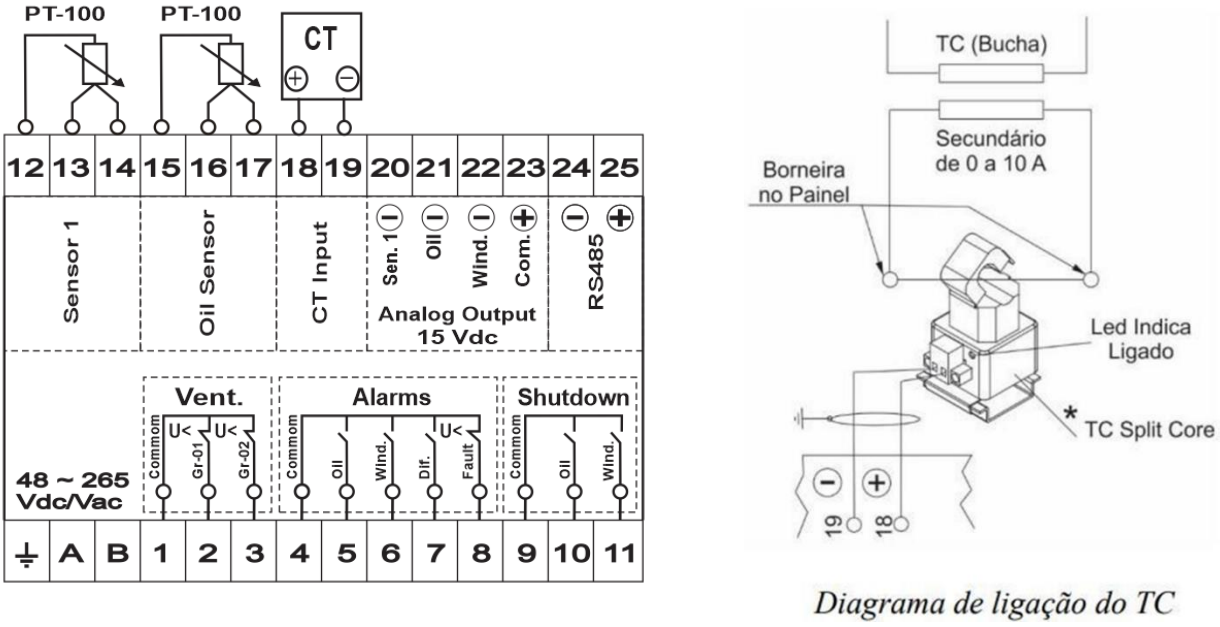


Figure 2 – Monitemp plus diagram

OPERATION CHART

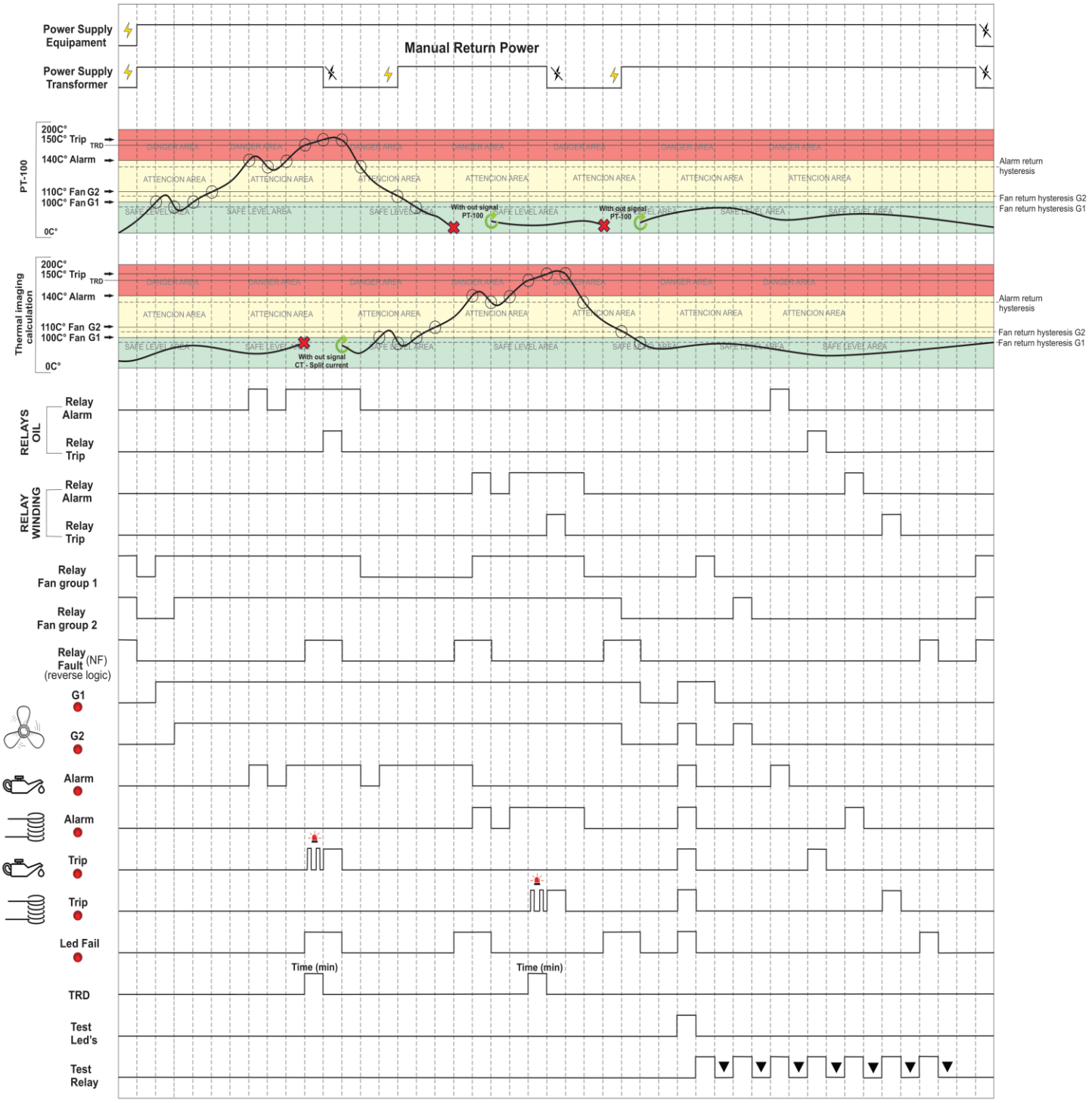


Table 2 – Operating chart

PREVENTIVE MAINTENANCE

PREVENTIVE AND CORRECTIVE MAINTENANCE							
Items to be checked preventively			Verification Frequency				Corrective action
SHARE	Verification Elements	ACTIVITIES	Every Month	Every 3 Months	Every 6 Months	Every 1 Year	When Needed
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 3 – Preventive maintenance

APPLICATION EXAMPLES

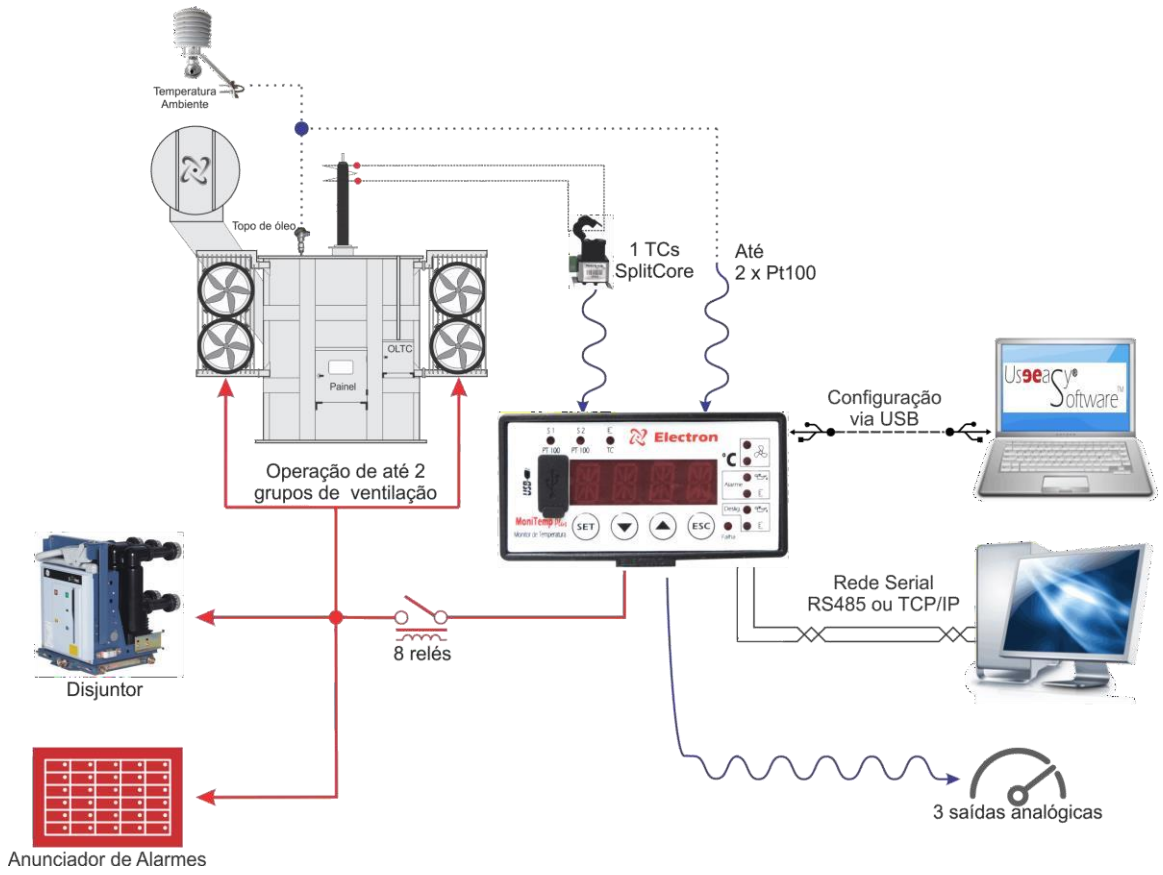


Figure 3 – Application example

INSTALLATION ACCESSORY

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

PT-100 STFE Temperature Sensor: This sensor can be constructed with silicone, stainless steel, or Teflon bulb. With electrical insulation capacity options of 2 kV, 10 kV or 15 kV. The PT-100 STFE temperature sensor has as its measurement principle to evaluate the variation of electrical resistance with temperature using the temperature coefficient of pure platinum (0.385 Ohm/K), according to IEC 751 (DIN 43760). Ideal for temperature monitoring of windings of dry-type transformers due to its high precision and quality of materials, the 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 terminal of the sensor.

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

PT-100 STE Temperature Sensor: This sensor is constructed of AISI-304 stainless steel bulb, injected aluminum pumphead (IP 65) and adjustable gland with 3/4" and 1/2" BSP threads, or can be manufactured according to design. Its measurement principle is to evaluate the variation of electrical resistance with temperature using the temperature coefficient of pure platinum (0.385 Ohm/K), according to IEC 751 (DIN 43760). Ideal for installations subject to weather and electrical disturbances for temperature monitoring of transformers and machines that require high measurement accuracy in environments subjected to electrical noise and weather. The PT-100 3-wire sensor is widely used in the market, as the possibility of measurement error is greatly reduced due to the compensation principle of the third terminal of the sensor.

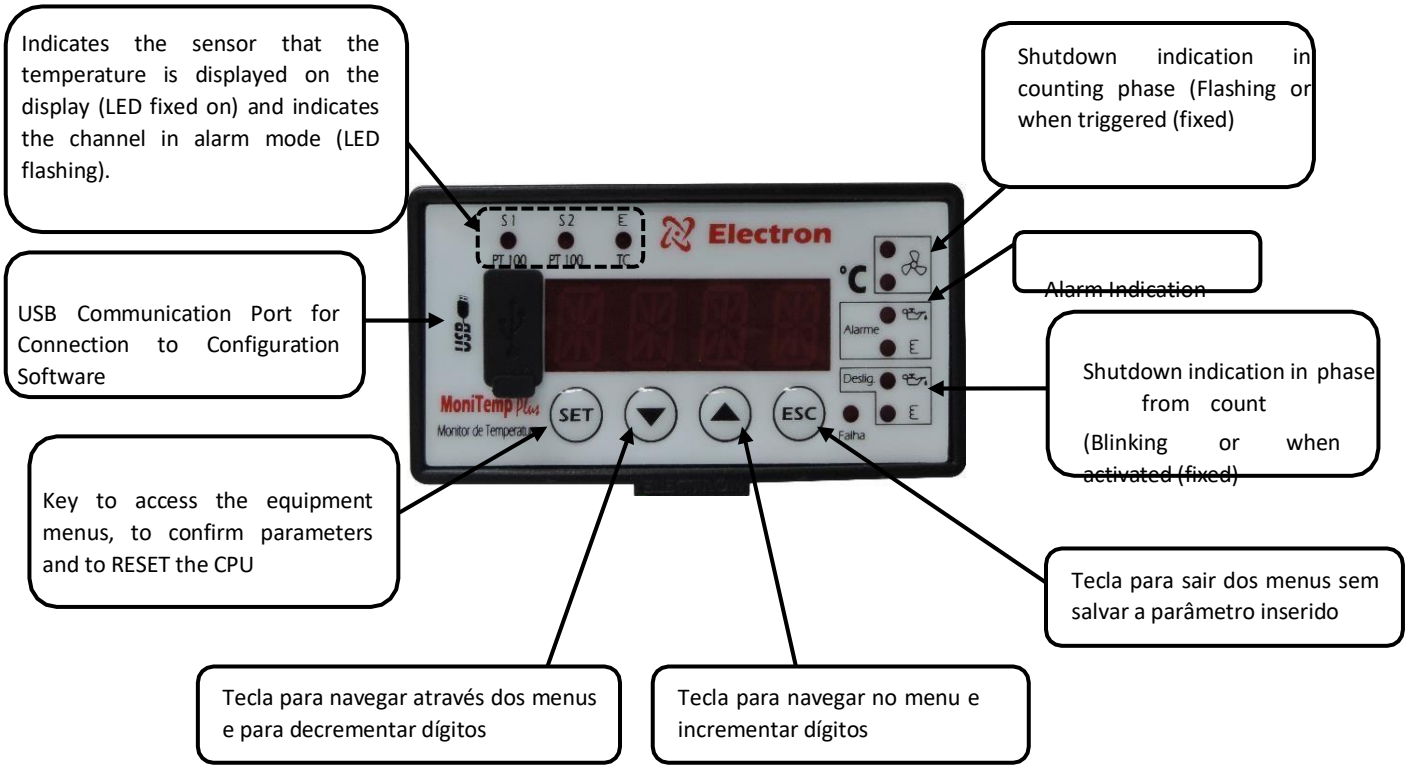
Electron PT100 STFE Temperature Sensor Page Link:
https://electron.com.br/site/produtos/rtd-pt100/

Double door panel for outdoor/outdoor use: Box for outdoor use with double port for mounting instruments, accessories and passing control wires and power of the power transformer. The external door contains a glass viewer with UV protection for viewing the quantities measured by the temperature monitor and the panel contains special paint that is resistant against weather and its degree of protection is IP 55.

Dual Port Panel for Outdoor Use – IP 55 Page Link:
https://electron.com.br/site/produtos/painel-para-uso-externo-ip55/

PT-100 signal reference card: This accessory was developed to verify the temperature value displayed by equipment with PT-100 3-wire RTD sensor input. It consists of precision resistors that send an equivalent fixed and constant resistance signal for selection between 3 different ranges, 0 °C (100 Ohms), 26 °C (110.9 Ohms) and 200 °C (175.86 Ohms).

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



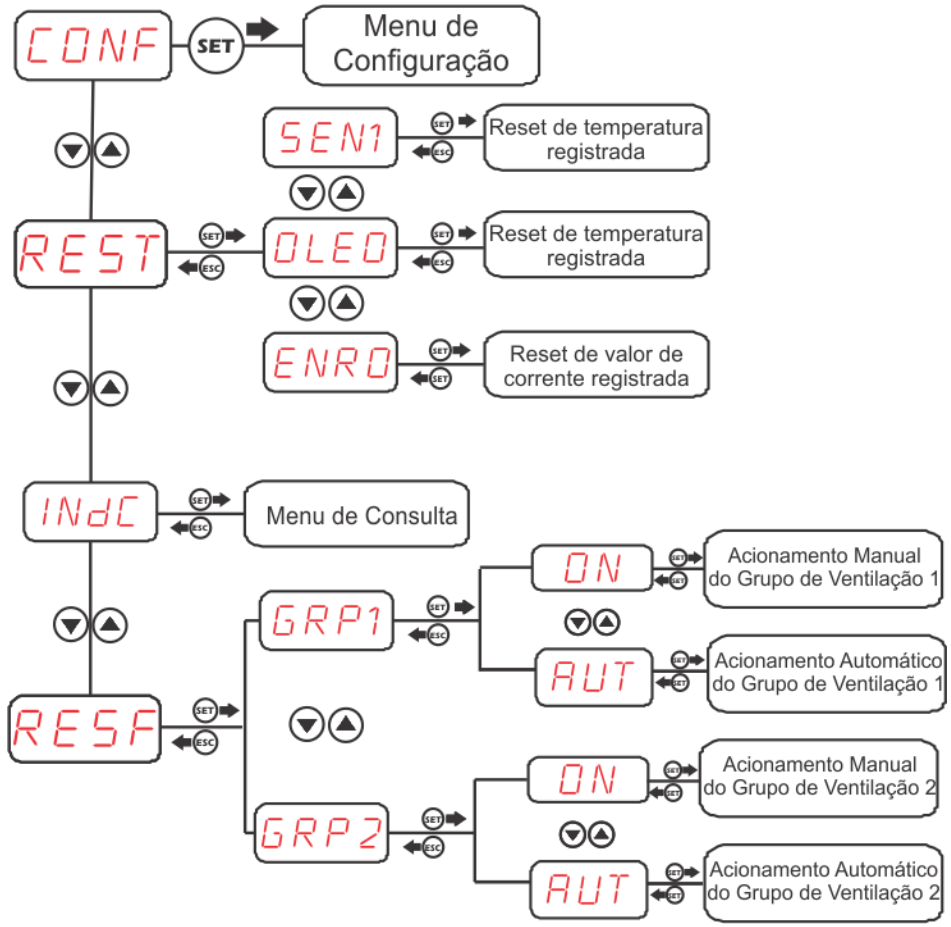
The **MoniTemp Plus** is an instrument developed to monitor the temperature of Oil Transformers, having in its configuration inputs for PT-100 sensors and current signal from the TC Split Core that measures the transformer load current.

Through mathematical calculations extracted from the NBR 516-1997 and IEC 354-1991 standards and implemented in its powerful microcontroller, the MoniTemp Plus traces the thermal image curve of the transformer winding, it is enough to obtain the oil temperature that is measured in the instrument itself through the PT-100 sensors and the current that circulates through the winding (through the auxiliary CT'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 monitoring the oil temperature and winding online, 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 rated capacity of the transformer, load curve, temperature gradient, etc.

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

CONFIGURATION MENU FLOWCHART

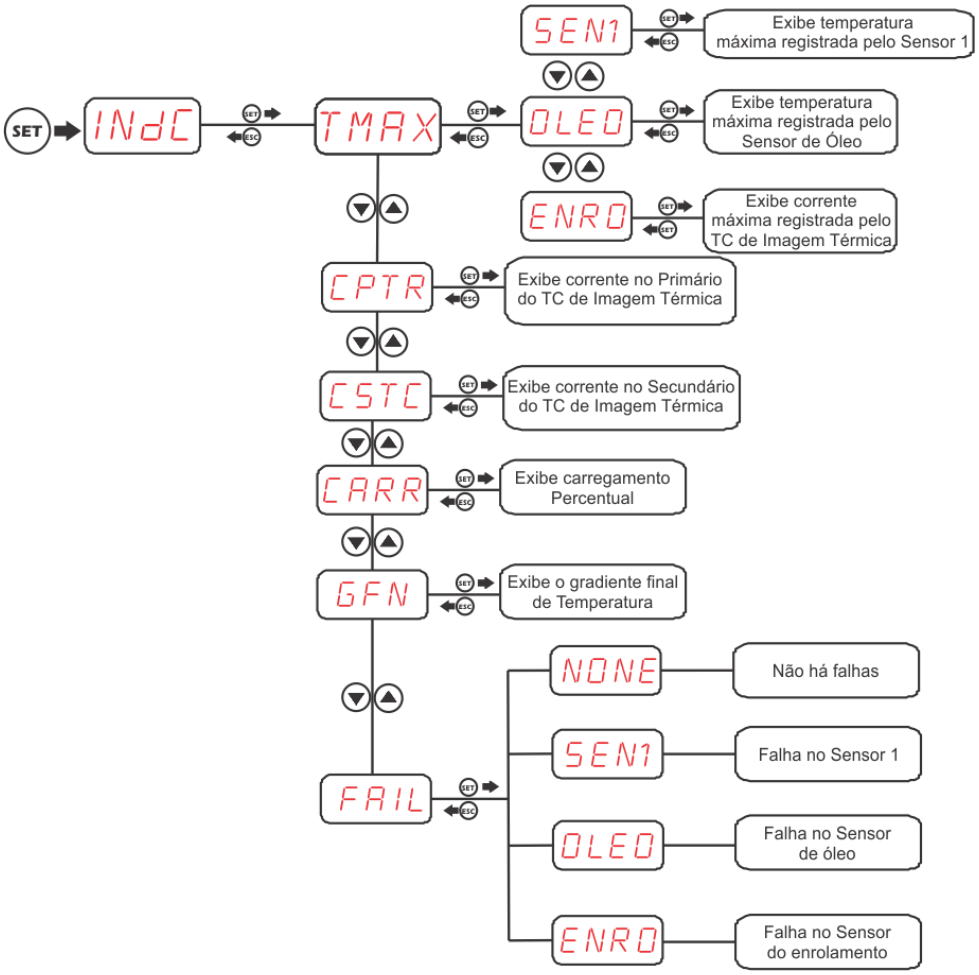


MENU PRINCIPLE

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 the 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 next topics.

Menu	Parameters	Variable	Descripti on
REST	SEN1		The maximum value recorded by Sensor 1 will be Reset by pressing the SET key;
	OIL		The maximum value recorded by the Oil Sensor will be Reset when pressing the SET key;
	ENRO		The maximum value registered by the Winding will be Reset when 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;

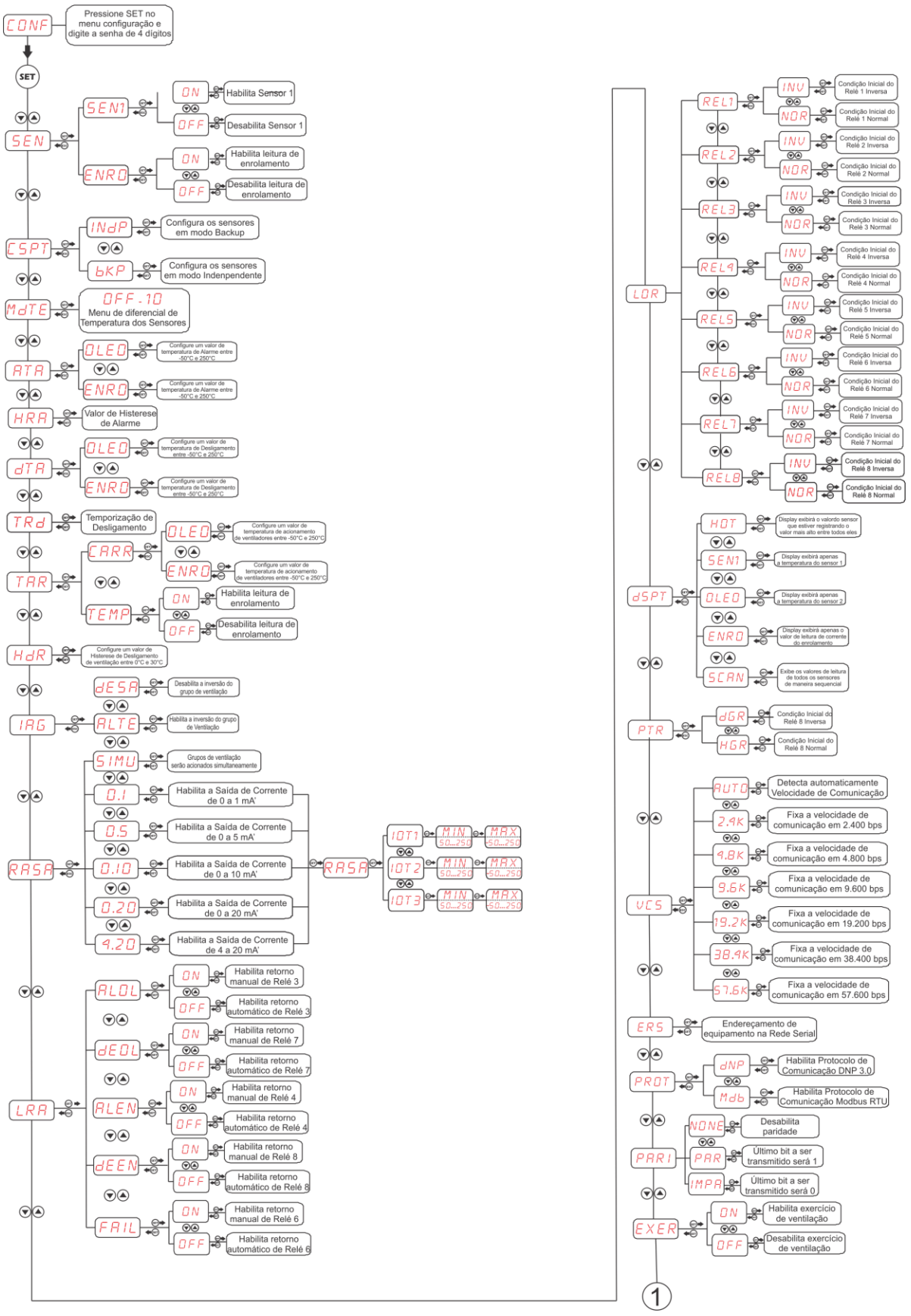
QUERY FLOWCHART



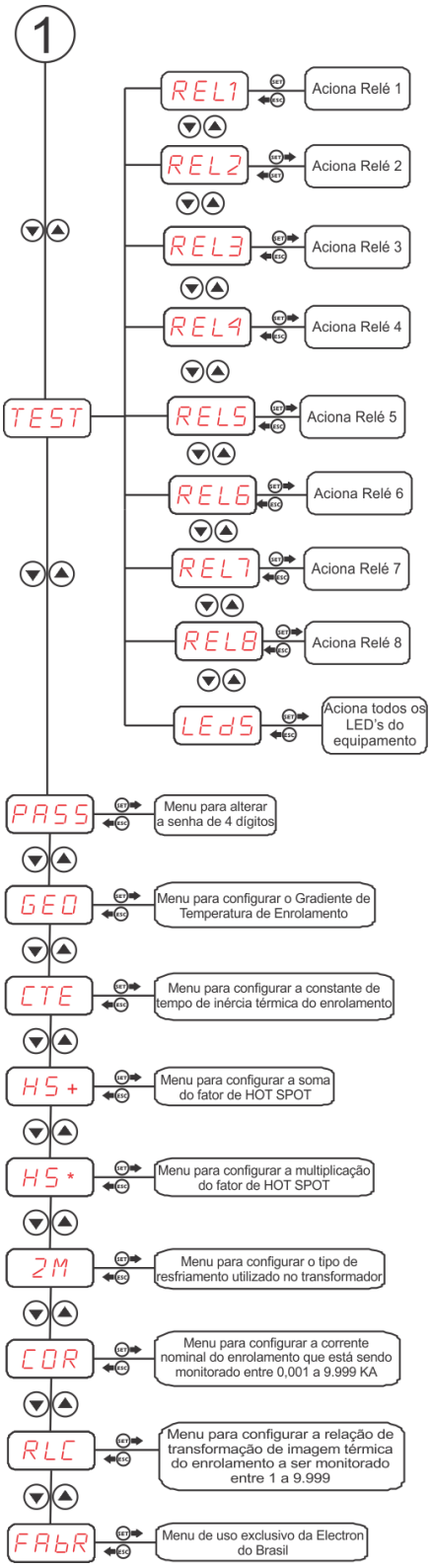
INQUIRY MENU

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 CT;
	CPTR		Displays the value of electric current on the primary of the Thermal Imaging CT; Screen for checking the current value calculated through the parameter RLC, which is going through the primary of the Thermal imaging CT of the winding. To check the calculated winding current value, press the SET button .
	CSTC		Displays the value of electric current on 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 Thermal imaging CT of the winding. To check the actual winding current value, press the SET button.
	CARR		Displays Transformer percentage load; Query screen of the percentage load of the Transformer based on the rated current of the transformer that is configured through the COR parameter. To check the percentage load of the Winding, press the SET key.
	GFN		Displays the final gradient of Temperature; Value of the difference of oil temperature and winding temperature for current load and after Thermal stabilization. To see the final gradient of the winding1, press the SET key.
	FAIL	NONE	There is no indication of any failure;
		SEN1	Sensor 1 fault indication;
		OIL	Indication of failure in the Oil sensor;
		ENRO	Indication of read failure in the Winding.

CONFIGURATION FLOWCHART



FLOWCHART SETUP 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 set to 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	Enable input a from Sensor 1;
		OFF	Disables input a from Sensor 1;
	OIL	ON	Enables Sensor 2 input a;
		OFF	Disables Sensor 2 input a;
	ENRO	ON	Enables Sensor 3 input a;
		OFF	Disables Sensor 3 input a;
CSPT	→ Selection menu for 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		Sensor 1 reads the ambient or switch temperature and sensor 2 reads the Transformer Oil temperature: • Disabled the option to turn off sensor 2 (Oil Sensor); • If a failure occurs in Sensor 2, it will only indicate in the thermal image calculation that it is based on Sensor 2, it will only indicate SOFF on sensor 1 and the Fault Relay will act; • If sensor 2 fails, the thermal image calculation will be interrupted, the Fault Relay and also the forced ventilation indicating SOFF on Sensor 2; • Enable config option
	BKP		In this parameterization, the average of the oil temperature reading between Sensor 1 and Sensor 2 will be performed. • Enables the option to turn off the Oil sensor (Sensor 2); • If any of the sensors fails, the thermal image calculation will be performed by the other sensor and the display will display the acronym SOFF and the fault relay (watchdog) will be activated; • If any fault occurs in the Oil Sensor (Sensor 2) Sensor 1 will assume the adjuster parameters for the Oil Sensor (Sensor 2);
MdTE		OFF - 10.0	Differential temperature menu of Sensor 1 and Sensor 2 (Oil). - If the Temperature difference between Sensor 1 and Sensor 2 is greater than the one parameterized in this menu, the Relay 5 "Diff. Temp" (terminals 4 and 7);
MINUTES	→ Menu to configure the trigger temperature of the Alarms, when the corresponding Sensor reaches the configured temperature the Relays will be activated and the Alarms LED will also be activated;		
	OIL	-50.0 to 250.0	Oil sensor activated Relay 3 (Terminals 4 and 5);
	ENRO	-50.0 to 250.0	Oil sensor activated Relay 4 (Terminals 4 and 6);

Menu	Parameters	Variable		Description
HRA	→ Menu to configure the trigger temperature of the Alarms, when the corresponding sensor reaches the set temperature the respective relays are activated and the red LED on the front of the equipment lights up indicating the Alarm active; EXAMPLE: If the ATA menu value is set to 90°C and the HRA menu is set to 1°C, the Alarm Relay will only be deactivated when the temperature reaches 88.9°, i.e. 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 was parameterized in the TRd menu starts, the red "off" LED of the corresponding sensor will be flashing during the time count and the instrument display will be showing a countdown in minutes, and at the end of the count, the red LED "off" of the corresponding sensor will be fixed on the front. In case the counting time is zero, the relay will be triggered instantly after the temperature reaches the set value; Select the desired Temperature for each sensor and confirm it by pressing the SET key;			
	OIL	-50.0 to 250.0		Oil sensor activated Relay 7 (Terminals 9 and 10);
	ENRO	-50.0 to 250.0		Oil sensor activated 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	→ the Menu to configure the Fan Activation Temperature, when reaching the value programmed in the TAR parameter by its respective sensor, the Relay (terminals 01 and 02) for the input of the 1st Group and Relay 2 (Terminal 01 and 03) for the activation of the 2nd Group, the red LED "ventilation" will light up on the front of the equipment indicating the active Fan Group. Note 1: This command has timed interlocking, the 2nd group will only trigger 15 secs. After the activation of the 1st Group if the sensor reaches the activation temperature of the 2 Groups; Note 2: When there is only 1 Ventilation Group in the Transformer, the user must parameterize the same activation 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 to 250.0	Select the Vent Drive Temperature and confirm it by pressing SET;
	ENRO	GR02	-50.0 to 250.0	Select the Vent Drive Temperature and confirm it by pressing SET;
Hdr	→ Menu to set the ventilation shutdown hysteresis, temperature difference between turning on and off the chiller. Example: If the TAR is programmed at 65°C and the HdR programmed at 5°C, the chiller will only be turned off when the temperature reaches 59.9°C i.e. at 5°C;			
		0 to 30		Select the desired temperature differential and confirm by pressing the SET key;

Menu	Parameters	Variable	Description
AGI	→ Menu to enable Automatic Flipping of ventilation groups. Select the desired option and confirm it by pressing the SET key.		
	of ESA		Disable the reversing of the ventilation group;
	HIGH		Enable the inversion of the ventilation group, that is, at each match of the groups an inversion is made, making the group that had previously started first become 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		Configures the current output to 0 to 20 mA;
	4.20		Configures the current output to 4 to 20 mA;
LRA	→ Menu to choose how the Alarms/Shutdown and failure will return after their 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 operator's intervention, 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 automatically return after the temperature normalizes or fails. Select the Alarms, Shutdowns, and Fault returns option and confirm them by pressing SET.		
	ALOL	ON	Enables Manual Return Relay Alarm 3 (Oil);
		OFF	Enables Automatic Return Alarm Relay 3 (Oil);
	dEOL	ON	Enables Manual Return Relay Shutdown 7 (Oil);
		OFF	Enables Automatic Return Relay Shutdown 7 (Oil);
	ALEN	ON	Enables Manual Return Relay Alarm 4 (Winding);
		OFF	Enables 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 Fault Relay Return;
		OFF	Enables Automatic Fault Relay Return;

Menu	Parameters	Variable	Description
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	Relay 3 Reverse Initial Condition;
		INV	Initial condition of Relay 3 Normal;
	REL4	NOR	Relay 4 Reverse Initial Condition;
		INV	Initial condition of Relay 4 Normal;
	REL5	NOR	Initial condition of Relay 5 Inverse;
		INV	Initial condition of Relay 5 Normal;
	REL6	NOR	Relay 6 Reverse Initial Condition;
		INV	Initial condition of Relay 6 Normal;
	REL7	NOR	Initial condition of Relay 7 Inverse;
		INV	Initial condition of Relay 7 Normal;
	REL8	NOR	Relay 8 Reverse Initial Condition;
		INV	Initial condition of Relay 8 Normal;
dSPT	→ Menu to choose the display mode of the quantities on the display; Select the desired option and press SET		
	HOT		The Display will display the value of the sensor that is registering the highest value.
	SEN1		Display will only display the temperature of Sensor 1;
	OIL		Display will display the temperature of Sensor 2 only;
	ENRO		Display will only display the current reading value of the winding;
	SCAN		Displays the reading values of all sensors in a sequential manner;
PTR	→ Menu to enable or disable recording protection of equipment parameters		
	dGR		Disables write protection;
	dGR		Enables write-protect
You guys	→ 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 serial communication speed at 2,400 bps;
	4.8K		Sets serial communication speed at 4,800 bps;
	9.6K		Sets serial communication speed at 9,600 bps;
	19.2K		Sets serial communication speed at 19,200 bps;
	38.4K		Sets the serial communication speed at 38,400 bps;
	57.6K		Sets 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 (terminal 24 and 25) must have a single address different from the others, so that the supervisor can identify it. NOTE: The 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 resume communication. See page XX		
		1 to 254	Set up the desired address and confirm it by pressing the SET key
PROT	→ Menu for choosing the type of Network Communication Protocol. Select the Communication Protocol and confirm it by pressing SET		
	dNP		DNP 3.0 Communication Protocol (Level 1);
	MDB		MODBUS RTU Communication Protocol;
PARI	→ Menu for choosing 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	→ Daily ventilation exercise programming menu; After 1 minute of the ON programming confirmation, the Ventilation Exercise will be triggered for the first time and will remain activated for 5 minutes (Flashing Ventilation LED). This cycle will be repeated at every 24-hour interval from the first activation. NOTE: If the equipment is de-energized or RESET, the above cycle will be repeated and the count will start again for the next cycle of Ventilation Exercise. Select the desired option and confirm by pressing the SET key.		
	ON		Daily exercise Enabled;
	OFF		Daily exercise disabled;
TEST	→ ATTENTION, when using this menu, it will activate the relay outputs and light up all the LED's of the monitor so that the operator can make sure that they work, however, if the Monitemp Plus is in operation and the Shutdown Relays are connected to the system protection, the Relay will be activated and it will result in the shutdown of the Transformer;		
	RL1		Activates Relay 1 "GR1" after pressing the SET key;
	RL2		Activates the Relay 2 "GR2" after pressing the SET key;
	RL3		Activates Relay 3 "Oil Alarm" after pressing the SET key;
	RL4		Activates Relay 4 "Winding Alarm" after pressing the SET key;
	RL5		Activates the Relay 5 "Temperature Differential" after pressing the SET key;
	RL6		Activates Relay 6 "Failure" after pressing the SET key;
	RL7		Activates Relay 7 "Oil TRIP" after pressing the SET key;
	RL8		Activates Relay 8 "TRIP of Winding" after pressing the SET key;
	Leds		Activates all the LED's of the MoniTemp Plus;

Menu	Parameters	Variable	Description
PASS	→ Menu to change the four-digit passcode. This password will be used to access the equipment configuration menu. 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 NOTE: The factory password of MoniTemp Plus is 0000. In case of loss or forgetfulness of the password, contact Electron do Brasil and inform the password reminder number.		
		0000 to 9999	Enter the desired 4-digit passcode and confirm it by pressing the SET key.
GEO	→ Menu to configure the Temperature Gradient in the Winding. The difference between the oil top temperature and the average winding temperature, after thermal stabilization under rated load conditions. NOTE: Value obtained in the warm-up test or by calculation. Set the gradient value to Desired and press the SET key.		
		0 to 30	Select the Temperature Gradient value in the Winding, 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 standard. 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 500	Set the value of the time constant and 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 standard. 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 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 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 to configures the rated electrical current value of the Transformer Winding being monitored. EXAMPLE: Winding Current with nominal load. 0.95((KA) .		

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

Menu	Parameters	Variable	Descriptio n
RLC	→ Menu to configure the transformation ratio of the Thermal Imaging CT 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 CT ratio and confirm it by pressing SET.
FAbR			Menu of Exclusivity Electron. For 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 Acionamento do Ventilador - TAR	65ºC 1ºGrupo 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 REST acronym. Release the Monitor will reboot, without losing the previously configured parameters.

Display	**Cause**	**Solutio n**
OFF	There is no reliable signal from the Sensor to the MoniTemp	Check and replace if the Sensor cable is not armored.
		Check the 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: 1

RECOMMENDED SETTINGS

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

1. All sensors as well as equipment must be grounded.
2. Properly grounded sensors and power prevent malfunctions 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 (start and end) in order to generate the potential difference necessary for the correct operation of the communication network.
4. Only use with the 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 on the SUN, 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

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

Disclaimer of Warranty

The warranty does not cover transportation expenses for technical assistance, freight and insurance for shipment of a product with evidence of defect or malfunction. The following events are also not covered: Natural wear and tear of parts due to continuous and frequent use, damage to the outside caused by falls or improper packaging; attempt to repair/break a seal with damage caused by persons not authorized by Electron and in disagreement with the instructions that are part of the technical description.

Loss of Warranty

The product will automatically lose its warranty when:

- The instructions for use and assembly contained in this manual and the installation procedures contained in the NBR 5410 Standard are not observed;
- Subjected to conditions outside the limits specified in the respective technical descriptions.
- Tampered with or repaired by a person other than Electron's technical staff;
- The damage is caused by a drop 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 enjoy this warranty, the customer must send the product to Electron along with a copy of the purchase invoice properly packaged so that there is no damage in transport. For emergency care, it is recommended to send as much information as possible regarding the defect detected. The equipment will be analyzed and subjected to complete functional tests.

The analysis of the product and its eventual maintenance will only be carried out by the technical team of Electron do Brasil at its headquarters.