

PRESYS®



**Dry Block
Calibrators**
TE-25N / TE-35N / TE-50N

Technical Manual

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1.0 - Introduction



TE-25N / TE-35N / TE-50N

The **TE-25N**, **TE-35N** and **TE-50N** Dry Block Temperature Calibrators produce temperature values on the test block or insert so as to enable the calibration of thermocouples, resistance thermometers, glass thermometers, thermostats, etc.

In combination to producing the temperature values with high accuracy, it also offers the possibility of measuring the signals generated by thermocouples, resistance thermometers, and thermostats that are being measured. This is possible because it incorporates a specific calibrator for these signals including 4 - 20 mA.

Thus, it performs the functions of a thermal bath, a standard thermometer, a calibrator for RTD and TC sensors, and even measures mA.

The TE-25N, TE-35N and the TE-50N models generates temperatures from -25 °C to 155 °C, -35 °C to 155°C and -50°C to 155°C, respectively.

- Presents input for thermocouples, thermoresistances, thermoswitches. Besides generating temperature, it measures the signal from the sensor beign calibrated.
- Makes no use of external standard thermometer.
- Carries out completely automatic calibrations with or without the use of a computer.
- Accuracy to $\pm 0.1^\circ\text{C}$, stability of $\pm 0.02^\circ\text{C}$ and resolution of $\pm 0.01^\circ\text{C}$.
- Communication between computer and ISOPLAN software.
- Portable, compact, provides interchangeable inserts and transportation bag (optional).

It presents a wide variety of programming resources, allowing the performance of automatic calibrations of thermocouples, thermoresistances, thermoswitches. In this case, the sensor is placed in the insert and its electrical terminals are connected to the embedded calibrator. The operator defines the calibration points and the number of repetitions, then the process is started and all the sequence is automatically accomplished.

Another way of performing automatic documented calibrations is by means of the ISOPLAN Calibration Software for PC/WindowsTM, which uses RS-232 or RS-485 serial communication to connect the computer to the dry block. With ISOPLAN software it is possible to register sensors and instruments of a factory, generate work orders, create and print management to the calibration environment.

The **TE-25N**, **TE-35N** and **TE-50N** models has also many other features, such as:

- The electric signal calibrator is independent from the dry block function.
- Internal buzzer beeps when the temperature reaches the desired value.
- Keypad that eases the operation and configuration of the calibrator.
- Graphic display OLED to present big-size digit numbers.
- Thermoelement reading scaled to ITS-90 or IPTS-68.
- Internal regulated 24 Vdc power supply for 2-wire transmitters.
- Internal rechargeable battery and battery charger included in the electric signalcalibrator.
- Independent circuitry for over-temperature protection and safety.
- Insert to choose, strap and test leads included.

1.1 - Technical Specifications

	TE-25N	TE-35N	TE-50N
Operating Range Ambient Temperature: up to 23 °C	-25 °C to 155 °C	-35 °C to 155 °C	-50 °C to 155 °C
Accuracy with Internal Reference	± 0.1 °C	± 0.1 °C	± 0.1 °C
Resolution	0.01 °C		
Stability (after 10 minutes)	0.02 °C		
Axial Uniformity (40mm)	± 0.05° ⁽²⁾	± 0.06° ⁽²⁾	± 0.07° ⁽²⁾
Radial Uniformity Dry Block:	± 0.01 °C ⁽²⁾	± 0.01 °C ⁽²⁾	± 0.02 °C ⁽²⁾
Heating Time: (25 °C to 140°C)	10 min	16 min	11 min
Cooling Time: (25 °C to -25°C)	11 min	16 min	25 min
Electric Power:	200 W	300 W	400 W
Power Supply:	115 Vac or 230 Vac 50/60 Hz ⁽¹⁾ .		
Units / Temperature Scales:	°C or °F/ ITPS-68 or ITS-90 selected by the user		
Well Diameter / Depth:	Ø 25.4 mm (1") x 124 mm		
Weight:	9.0 kg	10.0 kg	12.0kg
Dimensions (HxWxD)	260 x 180 x 305 mm	260x 180x 270 mm	315 x 180x 270 mm
Environmental Operating Conditions:	0 to 50°C/ 0 to 90% UR		

(1) As per Order Code

(2) In full range

Warning: The achievement of -25°C or -35°C or -50°C depends on the temperature and humidity conditions of the laboratory where the calibrations are performed. In general, it can be reached at an ambient temperature of 23 °C and relative humidity less than 60%.

1.1.1 - Input Technical Specifications

Input Ranges		Resolution	Accuracy	Remarks
Probe Ext. ¹	0 to 400	0.01 Ω	± 0.005 % FS	
Probe Ext. ¹	-200 to 850 °C / -328 to 1562 °F	0.01 °C / 0.01 °F	± 0.05 °C / ± 0.1 °F	IEC-60751
millivolt	-150 to 150mV	0.001mV	± 0.01% FS	$R_{input} > 10M\Omega$
	150 to 2450mV	0.01mV	± 0.02% FS	auto-ranging
mA	-1 to 24.5mA	0.0001 mA	± 0.02% FS	$R_{input} < 160\Omega$
Resistance	0 to 400	0.01 Ω	± 0.01% FS	excitation current
	400 to 2500 Ω	0.01 Ω	± 0.03% FS	0.9mA auto range
Pt-100	-200 to 850 °C / -328 to 1562 °F	0.01 °C / 0.01 °F	± 0.1 °C / ± 0.2 °F	IEC-60751
Pt-1000	-200 to 400 °C / -328 to 752 °F	0.1 °C / 0.1 °F	± 0.1 °C / ± 0.2 °F	IEC-60751
Cu-10	-200 to 260 °C / -328 to 500 °F	0.1 °C / 0.1 °F	± 2.0 °C / ± 4.0 °F	Minco 16-9
Ni-100	-60 to 250 °C / -76 to 482 °F	0.1 °C / 0.1 °F	± 0.2 °C / ± 0.4 °F	DIN-43760
TC-J	-210 to 1200 °C / -346 to 2192 °F	0.1 °C / 0.1 °F	± 0.2 °C / ± 0.4 °F	IEC-60584
TC-K	-270 to -150 °C / -454 to -238 °F	0.1 °C / 0.1 °F	± 0.5 °C / ± 1.0 °F	IEC-60584
	-150 to 1370 °C / -238 to 2498 °F	0.1 °C / 0.1 °F	± 0.2 °C / ± 0.4 °F	IEC-60584
TC-T	-260 to -200 °C / -436 to -328 °F	0.1 °C / 0.1 °F	± 0.6 °C / ± 1.2 °F	IEC-60584
	-200 to -75 °C / -328 to -103 °F	0.1 °C / 0.1 °F	± 0.4 °C / ± 0.8 °F	IEC-60584
	-75 to 400 °C / -103 to 752 °F	0.1 °C / 0.1 °F	± 0.2 °C / ± 0.4 °F	IEC-60584
TC-E	-270 to -150 °C / -454 to -238 °F	0.1 °C / 0.1 °F	± 0.3 °C / ± 0.6 °F	IEC-60584
	-150 to 1000 °C / -238 to 1832 °F	0.1 °C / 0.1 °F	± 0.1 °C / ± 0.2 °F	IEC-60584
TC-N	-260 to -200 °C / -436 to -328 °F	0.1 °C / 0.1 °F	± 1.0 °C / ± 2.0 °F	IEC-60584
	-200 to -20 °C / -328 to -4 °F	0.1 °C / 0.1 °F	± 0.4 °C / ± 0.8 °F	IEC-60584
	-20 to 1300 °C / -4 to 2372 °F	0.1 °C / 0.1 °F	± 0.2 °C / ± 0.4 °F	IEC-60584
TC-L	-200 to 900 °C / -328 to 1652 °F	0.1 °C / 0.1 °F	± 0.2 °C / ± 0.4 °F	DIN-43710

FS: Full Scale

Note (1): Accuracy refers to external probe input only. The value does not include sensor accuracy or errors due to sensor characterization.

The accuracy values cover a one year period and an ambient temperature range between 20 and 26 °C. Outside this range, add 0.001 %FS / °C, with reference to 23 °C. For thermocouples with internal cold junction compensation, a cold junction compensation error of ± 0.2 °C or ± 0.4 °F must be considered.

1.2 - Order Code

TE-25N / TE-35N / TE-50N - - IN

Power Supply

- 1 - 115 Vac
- 2 - 230 Vac

Included Insert

Choose from those listed above

1.3 - Acessories

- **Inserts:**

Description	Holes	Order Code
IN01	1 x 3/4"	06.04.0011-00
IN02	1 x 1/2"	06.04.0012-00
IN03	1 x 6,0 mm and 3 x 1/4"	06.04.0013-00
IN04	3 x 6,0 mm and 1 x 1/4"	06.04.0014-00
IN05	4 x 6,0 mm	06.04.0015-00
IN06	2 x 6,0 mm e 2 x 1/4"	06.04.0016-00
IN07	1 x 6,0 mm, 1 x 8,0 mm and 1 x 3/8"	06.04.0017-00
IN08	1 x 6,0 mm, 1 x 3,0 mm and 2 x 1/4"	06.04.0018-00
IN09	Without hole, to be drilled by the client	06.04.0019-00
IN10	Others, by request	06.04.0020-00
IN1P	1 x 3,0 mm, 1 x 6,0 mm, 1 x 8,0 mm e 1 x 1/4"	06.04.0121-00
IN1A	1 x 1/8", 1 x 3/16", 2 x 1/4" e 1 x 3/8"	06.04.0122-00
IN1E	1 x 4,0 mm, 1 x 6,0 mm, 1 x 8,0 mm, 1 x 10,0 mm e 1 x 1/4"	06.04.0123-00

Note: When asked, the calibration certificate will be provided for the first insert ordered.

- **Temperature sensors:**

Description	Order Code
Probe 1/5 DIN Straight (mini-DIN conector)	04.06.0001 - 21
Probe 1/5 DIN Angular 90° (mini-DIN conector)	04.06.0007 - 21

- **Communication Interfaces**

Description	Order Code
RS-232 - DB-9F Conector (COM1)	06.02.0002 - 00
RS-232 - DB-25F Conector (COM2)	06.02.0004 - 00
RS-485	06.02.0006 - 00

- **Soft Carrying Case.** Order Code: 06.01.0006-00 (T-25N/T-35N) and 06.01.1016-10 (T-50N).

- **ISOPLAN Calibration Software.**

- **Calibration Certificate.**

Included Items:

- Strap;
- Insert (selectable);
- Insert extractor tool;
- Test leads;
- Power cord;
- Manual and calibration certificate.

2.0 - Calibrator Operation

The calibrator keeps the block temperature controlled and allows the reading of a thermo-element connected to its terminals. It is possible to verify the thermocouple, thermoresistances, temperature transmitters etc. together with the block temperature value and temperature set point.

The calibrator has 3 operating modes:

- *Manual Mode* to select the block temperature straight from the keypad.
- *Programmable Mode*: 6 different programs with 11 temperature set point values. The block temperature is selected among the programmed values by the keys \uparrow and \downarrow . The *Programmable Mode with Timer* scans automatically the temperature set points.
- *Automatic Mode* to calibrate thermo-elements. The thermo-elements calibration is performed in an automatic way by the calibrator: the schedule and the calibration results, besides the thermo-element readings are stored in the calibrator memory.

When powered on (**ON/OFF** key), the calibrator goes through a self-test routine and shows the last calibration date and the value of the battery voltage. The battery voltage is constantly monitored and the low battery warning is provided. After the self-test is completed, the display shows the starting menu. The initial set point is 25.00 °C:

\Rightarrow	IN	EXEC	
	CONF	CAL	COM

Através das teclas \uparrow , \downarrow , \leftarrow e \Rightarrow , escolha as opções do menu e tecle **ENTER**.

By means of keys \uparrow , \downarrow , \leftarrow and \Rightarrow , choose the menu options and press **ENTER**.

IN: selection of the calibrator signal input. Choose among mV, Ohms, thermocouples, thermoresistances, mA, switch or none. More details in item 2.1 - *Menu IN*.

EXEC: The calibrator enters the manual or programmable operating mode.

CONF: Accesses the calibrator configuration options. More details in item 2.2 - *Menu CONF*.

CAL: This option accesses the TE-25N/TE-35N/TE-50N calibrator adjustment functions, protected by password. More details in section 6 - *Calibration*.

COM: Accesses the automatic calibration parameters. It is possible to perform a calibration without a computer or using it (via the ISOPLAN software). More details in item 2.5 - *Automatic Operating Mode*.

2.1 - Menu IN

⇒ mV	OHM	TC	
RTD	mA	SW	NO

mV, mA, SW: selects milivolt, milliampere or switch input, respectively.

OHM: selects ohms input. Following, choose from the menu the wiring 2, 3 or 4 wire.

⇒ 2-WIRE	3-WIRE
4-WIRE	

TC: selects thermocouple input. Choose among the **J, K, T, E, N** and **L** types. In the next menu, the internal or manual cold junction compensation is chosen.

⇒ INTERNAL
MANUAL

If the internal compensation is selected, the cold junction temperature value is displayed by the calibrator. If the **MANUAL** option is selected, the cold junction must be supplied by the operator. After confirming the value, by pressing **ENTER**, the calibrator goes back to the operating mode.

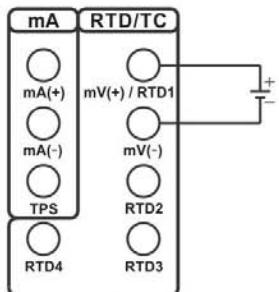
RTD: Selects the type of thermoresistance used. Choose from **PT100, NI100, CU10** and **PT1000** types. Choose also if the wiring is 2, 3 or 4-wire.

NO: Disables reading of external signal.

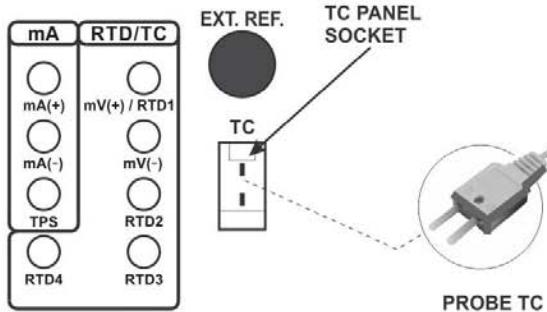
Selecting one of the options above, the calibrator goes straight to the manual operating mode, with no need to select the **EXEC** option.

2.1.1 - Input Connectons Diagrams

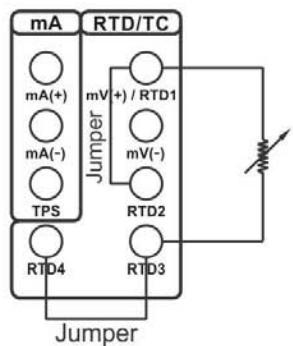
Millivolts



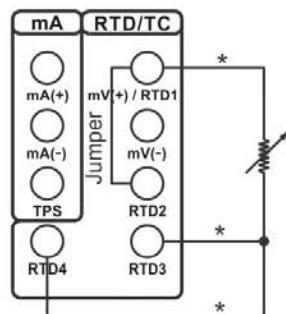
Thermocouple (TC)



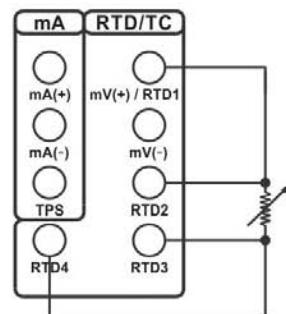
Ohm / RTD (2-wire)



Ohm / RTD (3-wire)

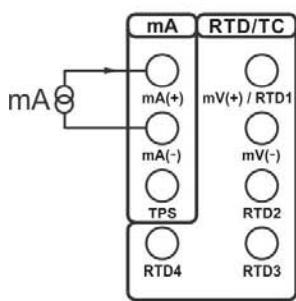


Ohm / RTD (4-wire)

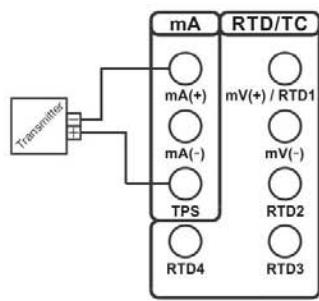


(*) use same gauge
and length wires

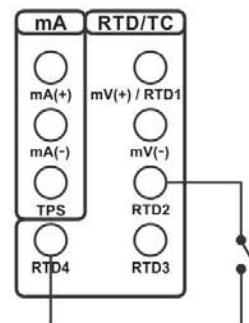
mA



mA with power supply



Switch (SW)



2.2 - Menu CONF

⇒ CF SC	PRG BT	MEM DT	DSP BZ
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CF: Selects the temperature unit between °C or °F. The ITS-90 or IPTS-68 temperature scales are selected for both the thermo-element and for the internal block reference readings purpose.

⇒ °C-90 °C-68	°F-90 °F-68
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DSP: This option sets the OLED display contrast.

BT: Shows the battery or the battery charger voltage value if the dry block is turned off or on, respectively.

Battery Level	Estado da bateria	Display
4.0 a 7.0V	normal	-----
< 4.0V	low	LOW BATTERY

DT: Updates the date and time of the calibrator. Thus, when the calibrator performs a calibration in the automatic mode via ISOPLAN-5, all data are registered together with date and time of occurrence. Every time the calibrator is powered off, the internal clock does not continue to be updated. However, the ISOPLAN-5 software can automatically update the calibrator date and time with the computer internal clock. Otherwise, use keys \uparrow and \downarrow to change the field that blinks and the keys \Rightarrow and \Leftarrow to go to another field. The key **ENTER** confirms the last selection.

BZ: Menu that configures the piezoelectric buzzer.

⇒ NO	YES	ENDCAL
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NO: Disables the buzzer.

YES: The buzzer beeps when the block reaches the set point and stabilizes.

ENDCAL: The buzzer beeps only at the end of a calibration in the automatic operating mode.

PRG: Menu that programs the calibrator.

⇒ DEC_IN SET POINT	DEC_PRB
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DEC_IN: Selects the number of decimals of the thermo-element reading. The default value depends on the input signal.

⇒ DEFAULT
0 1 2 3 4

DEC_PRB: Selects the number of decimals of the block temperature and the set point value. The default number is 2.

0	1	⇒ 2
---	---	-----

SP: Enables the calibrator *Programmable Operating Mode*, and allows the configuration of programmed values. The selected program is indicated by the selection arrow. Choose one of the **6** temperature programs or **NO** to disable this *Programmable Mode*.

Select any of the 6 programs and confirm with the key **ENTER**. Following, it is shown the menu of temperature set point configuration.

⇒ 10%	20%	25%
VARIABLE		

Change the configuration to steps (STEPS) of **10%**, **20%**, **25%**, **VARIABLE** or press **C/CE** to maintain the configuration already stored in memory. The temperature range of the program must be configured through the values in **SET POINT HIGH** and **SET POINT LOW** in case of **10%**, **20%** or **25%** fixed steps of the range. The option **VARIABLE** allows the user to define from 2 to 11 values of temperature set point, not necessarily in ascending order.

To verify the step values of a program, select the **VARIABLE** option and confirm the values shown in the display with the key **ENTER**. The **10%**, **20%** and **25%** options change the number of steps automatically and recalculate the values according to **SET POINT HIGH** and **SET POINT LOW**.

SC: This function scales the input reading. The scaling is very useful in temperature transmitter calibration, for instance, because it displays the current temperature and the transmitter reading (mA) in the same unit. Thus, the error can be verified directly in °C or °F. Select the option **SC** and press **ENTER**. If no input is selected in **IN**, the calibrator will show the **SELECT INPUT FIRST** message. In this case, go to menu **IN** and select the input signal type.

The function **SC** will show **IN** or **NO**. Confirm **IN** to configure the scaling or **NO** to disable the **SC** function, with the key **ENTER**.

The scaling is performed via the **INPUT HIGH** and **INPUT LOW** parameters, corresponding to the maximum and minimum values of the calibrator signal input, in the For example, temperature transmitter with 0 to 100 °C input and 4 to 20 mA output. The scaling with one decimal would be:

INPUT HIGH: 20.0000 mA
INPUT LOW: 4.0000 mA
SCALE DEC (0-4): 1
SCALE HIGH: 100.0 #
SCALE LOW: 0.0 #

MEM: The TE-25N/TE-35N/TE-50N calibrator allows many special programs and functions that can be of frequent use. In situations like this, it would be useful to store the current configuration in memory in order to save time. Up to 8 configurations can be stored in memory.

Selecting the option **MEM**, it is possible to store the current configuration (**WRITE**), restore a previous stored configuration (**RECALL**) or erase the 8 configurations from memory (**CLEAR ALL**).

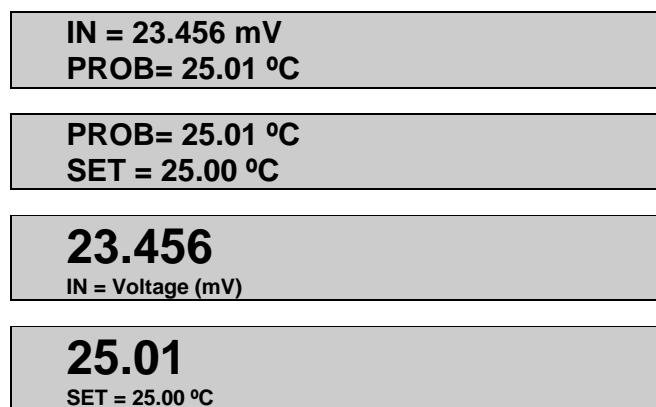
⇒ WRITE	RECALL
CLEARALL	

Selecting the option **WRITE** or **RECALL** will present a new menu with numbers 1 to 8, representing each one of the memory positions. Choose one of the positions and press **ENTER**. The writing operation (**WRITE**) can be made in an already used memory position. The calibrator asks for the overwriting confirmation with the message **OVERWRITE MEMORY?**. The **CLEAR ALL** operation shows a confirming message **ARE YOU SURE?**. In both cases, press **ENTER** to confirm the operation or **C/CE** to cancel.

2.3 - Manual Operating Mode

The display shows the selected temperature

There are 4 ways in which the information are shown, covering the calibrator input value (**IN**), the block temperature (**PROB**) and the temperature set point (**SET**). The key \Leftrightarrow interchanges the display presentation way:



The block temperature set point is selected directly by the keypad, even if the message **SET** is not being displayed. The numeric keypad enables the **SET** selection in any of the display presentation ways, to change the set point.

The set point value is increased by key \uparrow and decreased by key \downarrow . While the keys are kept pressed, the set point continues to be increased or decreased.

The key \Rightarrow does not have function in the manual operating mode of the TE-25N/TE-35N/TE-50N calibrator.

2.4 - Programmable Operating Mode

Pre-configured programs can be load from the calibrator memory, enabling the programmable operating mode. The temperature programmed values of the block are used directly, with no need to enter the set point.

The display shows **STEPn** beside the block temperature set point value in the programmable mode. The number of the program is indicated by **n**. Using the keys \uparrow and \downarrow , the programmed values of temperature set point are changed. The numeric keypad continues available for manual selection of the block temperature in the same way of the manual operating mode.

The automatic scan over the programmed temperatures is implemented by defining the stabilization time of the thermoelement in the block.

The key \Rightarrow enables the automatic scan over the points. When pressed, the message **STEPn** gives place to **0s** and the calibrator waits for the stabilization time configured from 1 to 9 minutes, by the keys **1** to **9**. The automatic scan is disabled by pressing key \Rightarrow again.

The countdown of the stabilization time is only started when the block temperature reaches the programmed temperature and stabilizes withing a range of approximately ± 0.05 °C. At this time the buzzer beeps, in case it is configured to **YES**.

2.5 - Automatic Operating Mode

The thermoelement calibration is perfomed in an automatic way bay the calibrator. The configuration, as well as the calibration verification is carried out by the calibration itself. Also it is possible to use the ISOPLAN software and its work orders, like a CAC – Computer Aided Calibration.

The independent automatic calibration, without the use of ISOPLAN is planned in the option **TAGMAN** from the menu **COM**.

TAG	EXEC	VERIF
ADDRESS	⇒ TAGMAN	

Before you start programming, configure first the signal that will be read by the calibrator in the menu **IN**. To calibrate glass thermometers, for example, there is no eletric sinal to be read. In this case, option **IN** from the menu must be configured to **NO** and the calibrator will ask to enter the value indicated by the thermometer, at the end os the stabilization time os each calibration point.

The data for an automatic calibration concern:

- **TAG**: the thermo-element tag identification.
- **SP**: the block temperature reference values for the calibration (calibration points).
- **TOL**: the maximum tolerance for the thermo-element operation.
- **STB**: the stabilization time, in seconds, so that the thermo-element temperature indicates correctly. This timer starts just after the block reaches and stabilizes at the set point temperature.
- **STR**: the calibration strategy of the programmed reference values. The availablestrategies are: \uparrow (UP), \downarrow (DOWN), $\uparrow\downarrow$ (UP - DOWN), $\downarrow\uparrow$ (DOWN - UP), $\uparrow\downarrow\uparrow$ (UP - DOWN - UP) and $\downarrow\uparrow\downarrow$ (DOWN - UP - DOWN).
- **RP**: the strategy number of repetitions.
- **RGI**: the thermo-element indication range.
- **RGO**: the operating temperature range that corresponds to the indication range

The automatic calibration begins when the option **EXEC** from the menu **COM** is selected. All the operations are automatizally performed by the calibrator. The keypad dows not work until the end of the calibration.

At the end of the stabilization time, the calibrator stores the thermoelement reading in memory and goes to the next point, in case some input signal has been previosly configured in the menu **IN** and connected to the calibrator terminals.

The **CALIBRATION END** message appears on the display at the end of the automatic calibration. Press **ENTER** to confirm. The results can be verified in option **VERIF** from the menu **COM**.

The first message in option **VERIF** informs the calibration result, with the number of points that have succeeded. Following, press **ENTER** to verify each one of the readings

performed by the calibrator. The keys \Rightarrow and \Leftarrow interchange 2 screens: one that displays the block and thermo-element temperature value and the other displays a message indicating the calibration point number and its state (**OK** or **FAIL**), besides the error value in %.

The option **TAG** from menu **COM** can present a list of up to 4 tags that have been downloaded or uploaded with the ISOPLAN-5 software. The key **ENTER** selects the tag to be calibrated from the tag list. The automatic calibration starts by the option **EXEC** from menu **COM** and the calibration data can be verified in option **VERIF**. To calibrate automatically not using ISOPLAN-5, there is a reserved place for one manual tag. The selection of the manual tag is performed by confirming the option **TAGMAN** with the key **ENTER**.

The option **ADDRESS** selects the communication address of the TE-25N/TE-35N/TE-50N calibrator. The communication protocol used is ModBus - RTU, with no parity and baud rate of 9600. The calibrator communication with the computer can use RS-232 or RS- 485, for network option, according to the communication interface used. In order to communicate with the ISOPLAN software, configure **ADDRESS** to 1.

3.0 - Recommendations as regards Accuracy of Measurements

PRESYS dry block temperature calibrators are instruments of high accuracy level, requiring the observation of all the procedures described in this section, in order to achieve the necessary conditions to get the accuracy levels during the calibrations.

- Special attention should be paid in relation to the insert cleanliness. When necessary, it should always be washed with water and soap, well rinsed and dried. Oil, grease, solid particles can hinder the heat transference to the insert and even jam the insert inside the block.
- The sensor to be calibrated must fit snugly into the appropriate well. In case the sensor is loose, the measurement accuracy meaning can be completely senseless. The meaning of clearance between the sensor and the respective well should be understood in a subjective way and the common sense is very important. Thus, the sensor should enter the insert well (both completely clean) in such a way to stay snugly enough so that it can not move or swing inside but it should not enter by force to get jammed.
- In the specific case of generating negative temperature with the TE-25N/TE-35N/TE-50N model, the calibrations should be performed in a descending temperature order. This procedure is useful because in negative temperatures ice is formed in the insert surface and between the insert and the thermoelement being calibrated. This humidity change the thermal contact and cause error in the calibration. After finishing the use of the insert below 0 °C, increase the set point to a positive temperature value, withdraw the insert from the block and the sensor, dry completely all these parts before continuing the calibration. This procedure guarantees an accuracy next to ± 0.1 °C. In case you can accept higher values of accuracy, like ± 0.2 °C or more, these cares can be left apart.

3.1 - Getting a Better Accuracy from the Dry Block

The temperature control is based in the temperature measurement of an internal sensor placed in the block.

This control sensor is adjusted in a factory by means of another sensor with high accuracy (probe) connected to a superthermometer, as described in item 6.2 – Probe Calibration. So, at factory, the accuracy of the superthermometer is transferred to the dry block calibrator. The transference will be well performed only when there is a perfect temperature equilibrium between the internal control sensor and the superthermometer probe. Therefore, it should not have any clearance between the insert and the block or between the probe and the insert. Both the internal sensor and the probe should also be at the same depth.

The user will get the best accuracy from the dry block, provided in this technical manual, in case one succeeds in reproducing the same conditions as the factory adjustment, that is, the same insert used in factory, no clearance, same depth, etc.

Summing up, the important thing to get the best accuracy from the dry block is to reproduce the process used by the factory to adjust the dry block itself.

In this case, the dry block is only used as a heat generator, not as a standard temperature calibrator. The user can use the fact that the dry block stability value is much lower than its accuracy value. So, placing the superthermometer sensor and the thermo-element under calibration in a two-hole-insert, it is possible to compare both temperature measurements.

3.2 - Recommendations to Other types of Insert

When the user uses a different type of insert, other than the one used to adjust the dry block, for example the cup like insert fulfilled with tiny steel balls, the accuracy from the manual is no longer valid, since the thermal contact is different in relation to that insert.

However, another control sensor adjustment can be performed to the new insert. Do that using an external probe with high accuracy, placed in the new insert and follow the steps described in item 6.2 - *Probe Calibration*.

This new readjustment of the calibrator indication overwrites the factory calibration and it remains even after turning off the dry block.

Should you want the factory calibration back again, activate the option **RESTORE** from menu calibration / probe.

4.0 - Safety Instructions

- If the calibrator is turned on, do not leave the room without an identification or warning about the high temperature hazard.
- Before turning the calibrator off, return the block temperature to values close to the ambient temperature.
- Never remove the insert from the dry block or the thermo-elements from the insert, while they are in temperatures far from the ambient. Wait until they reach the ambient temperature so that the heterogeneous cooling of the parts do not jam each other.

5.0 - Calibrator Warning Messages

Warning	Meaning	Procedure
RAM ERROR READ MANUAL	Problem in RAM memory	Turn the calibrator off and on. If the error persists, send the instrument to the factory
EEPROM ERROR READ MANUAL	Problem in EEPROM memory	Same as the previous item
LOW BATTERY	Level of battery voltage is low	Check the TE-25N/TE-35N/TE-50N calibrator power supply
UNDER / OVER	Input signal out of specifications or scaling range	See item 1.1.1 on Input Specifications
????.??°C	Input sensor is open	Check input connections and sensor

6.0 - Calibration (Adjustment)



ATTENTION: The password required for the adjustment procedures (entry/exit) is available on the White label located on the back of the instrument.

Warning: Enter the following options only after understanding them completely. Otherwise, it may be necessary to return the instrument to the factory for recalibration!

Select **CAL** option from the menu and press the **ENTER** key. You should then enter the password (**PASSWORD**) to access the calibration menu.

The password functions as a protection to calibration ranges. After the password is entered, the menu displays the options:

⇒ IN	OUT	DATE
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You should then enter the password access the calibration menu. ormed and once it has been filled in, it will be displayed everytime the calibrator is turned on.

Options for **IN** calibration are:

⇒ mV	mA	OHM	CJC
PROBE			

6.1 - Input Calibration

Select the corresponding mnemonic and apply the signals presented in the tables below.

When calibrating inputs, the display shows on the 2nd line the value measured by the calibrator and on the 1st line the same value is expressed as a percentage.

Note that the applied signals just need to be close to the values shown in the table.

Once the signal has been applied, store the values of the 1st and the 2nd calibration points, by pressing keys 1 (1st point) and 2 (2nd point).

mV Input	1 st point	2 nd point
G4	0,000 mV	70,000 mV
G3	0,000 mV	120,000 mV
G2	0,000 mV	600,000 mV
G1	600,000 mV	2400,000 mV

mA Input	1 st point	2 nd point
Single range	0,0000 mA	20,0000 mA

Input calibration for Ω is performed in two steps:

a) Application of mV signal:

For the calibration below, leave terminals RTD3 (+) and RTD4 (+) short-circuited.

mV Signal	Terminals	1 st point	2 nd point
V OHM3	RTD3(+) e mV(-)	90,000 mV	120,000 mV
V OHM4	RTD4(+) e mV(-)	90,000 mV	120,000 mV

b) Application of standard resistors:

Connect a decade box or standard resistors on terminals RTD1, RTD2, RTD3 and RTD4 (4-wire connection).

Resistors	1 st point	2 nd point
OHM3	20.000 Ω	50.000 Ω
OHM2	100.000 Ω	500.000 Ω
OHM1	500.000 Ω	2200.000 Ω

The cold junction calibration (CJC) is performed measuring the mV(-) terminal temperature. Store only the 1st point.

Cold Junction	1 st point
CJC	32,03 °C

7.0 - Instructions for Hardware Maintenance

There are no parts or components in the temperature calibrator that can be repaired by the user. Only the 6Amp fuse, placed within the socket on the rear can be replaced by the user.

The fuse may blow due to a voltage spike in the mains or a calibrator component fault. Replace the fuse once. If a second fuse blows again, it is because the fault is not that simple. Send the calibrator to the factory for repair.

Take care when using the cup-like insert and the tiny balls of steel. Handle the balls or the sensors only when they are at ambient temperature. Operate the dry block calibrator in a proper location to prevent it from falling down or even to prevent the balls at high temperature from being spilled outside causing body burn or other damages or injuries.

8.0 - Tiny Steel Balls (Optional), Recommendations of Use

As an optional, the dry block calibrators offers a plastic container with tiny steel balls and a cup-like insert. This item are exclusive accessories of PRESYS dry block calibrators, which is proper for being filled with the tiny balls.

With both the cup-like insert and the tiny balls, it is possible to calibrate temperature sensors with irregular shape or whose dimensions do not match the available insert holes. One should place the sensor to be calibrated in the insert and fulfill the remaining volume with the tiny balls.

It is important to note that accuracy gets worse in this kind of procedure because the dry block is calibrated in factory using an insert with an appropriate well that fits the standard sensor snugly. Thus, the accuracy specifications presented in this manual are not valid any more. Anyway, consider an increase of up to five times the accuracy values.

To use the tiny balls and continue achieving accurate measurements it is necessary to read from an external reference sensor tied together with the sensor to be calibrated both plunged in the tiny balls. In order to join the sensors, one can use rigid copper wire. Wind them with several turns starting from the tip of the sensors. For a reference thermometer it is suggested **PRESYS** Super Thermometer ST-501.

Safety Instructions:

Every care must be taken when using the mug insert and steel balls. Only place or remove the balls or sensors when at room temperature. Operate the bath in an appropriate place where it is not possible for the bath to fall or tip over so that the spheres at high temperature can fall out and cause burns or other damage.

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