PRESYS®

Reference Temperature Calibrator

TA-1200PLAB

Technical Manual

EM0356-02

CAUTION!

Remove the transport lock before turning on the TA-1200PLAB. The calibrator operates from 50 to 1200°C, so its minimum operating temperature is capable of melting the material inside the furnace pit, making the equipment permanently unusable.

WARNING!

Avoid electric shock risk on touching the equipment:
- Use only suitable power cable with earth connection;
- Never power the equipment to the mains socket with no earth connection.

WARNING!

High voltage is present inside these equipments. It can cause great damages and injuries.

Do not make any repair service inside the equipment without removing the plug from the supply.

WARNING!

Much electromagnetic noise can cause instability to the equipment.
The equipment is provided with electromagnetic interference filters that protect not only the mains but also the equipment itself against noise. These filters have no function if the unit is not earthed properly.

WARNING!

High temperatures are achieved in these equipments.
Risk of fire and explosion are present in case safety measures are not taken. Sign by means of warnings the hazardous areas at high temperatures.
Do not place the dry-block on inflammable surfaces or even on materials that can be deformed due to high temperatures.
Do not obstruct any air-vent to avoid risk of fire in the equipment.

CAUTION!

The instrument described in this technical manual is intended to be used in a specialized technical area. The user should be responsible by its configuration and the parameter values entered. Factory warns about risks of personal injury or ambient damage as a result of its incorrect use.

CAUTION!

Do not raise the setpoint in steps higher than 500 °C in order to increase heater lifetime.

CAUTION!

Before first use, after transportation and whenever the dry block is not used within a 10-day period, the instrument should be heated to 600 °C for 1 or 2 hours.

CAUTION!

This equipment contains ceramic fiber components. Persons in direct contact with surch materials should take preventive measures when handling them.

WARNING!

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.
Never use the insert of one instrument model in another. This may damage the instrument and cause accidents.

WARNING!

Be careful when handling the ceramic insert.
The ceramic insert consists of three independent pieces joined by a special ceramic glue. When handling it, try to support the parts evenly, especially the unions so that the weight of the insert itself does not force them.

WARNING!

When using the ceramic insert, the use of electrical inputs (both auxiliary input and reference input) can compromise the clock stabilization ate temperatures above 900 ºC due to the electrical conduction of the ceramic when it reaches high temperatures. If the inputs are not being used, the TA-1200PLAB can be used in its entire range (up to 1200 ºC).

Disposal calibrator:

NO HOUSEHOLD WASTE!

The calibrator of the series TA Calibrator consist of various different materials. It must not be disposed of with household waste.

Note: changes can be introduced to the instrument, altering the information contained in this technical manual.

The warranty conditions are available in our sites:
www.presys.com.br/warranty

Table of Contents

1 - Introduction

TA-1200PLAB

The TA-1200PLAB Calibration Furnace is state-of-the-art in the manufacture and performance of high temperature furnaces for calibration of thermocouples.

Its design privileges fundamental technical characteristics in temperature measurement and which are usually the predominant sources of uncertainty in a calibration. Thus it has been designed and tested according to international standards to perfect the following characteristics:

I. Low axial and radial gradients due to the use of differentiated heaters distributed along the thermal well in order to minimize losses at the ends of the insert and to extend the temperature constant region called the measurement zone.
II. High immersion of the sensors to be compared - it has an insert with 250 mm of immersion in the conductive part and about 70 mm in the insulation part, making about 320 mm of total immersion of the sensors, which minimizes heat losses by conduction the rod.
III. High thermal stability or thermal inertia - The 400 mm long insert has a large mass volume and stabilizes any temperature fluctuation due to insertion or removal of the sensor in the insert.

The entire calibrator is enclosed in a thermal shield for operator and laboratory protection from the high temperatures generated. Thus in an eventual blackout of energy the cooling of the furnace happens naturally and surely.

Temperature Advanced Calibrator **TA-1200PLAB** generates temperature in the insert in order to calibrate thermocouples. Besides providing high accuracy temperature values, it also allows the measurement of signals generated by the thermo-element which is being calibrated. This is possible due to an embedded calibrator specific for this type of signal. Thus, they incorporate the functions of dry block, standard thermometer and calibrator for TC.

- TA-1200PLAB calibrator model generates temperatures from 50 ºC (122 ºF) to 1200 ºC (2192 ºF).
- Presents 02 inputs for thermocouples that can follow the parameterization of ITS90 or standard tables.
- Carries out completely automatic calibrations with or without the use of a computer.
- Accuracy to ± 2.5 ºC, stability of 0.01 ºC and resolution of 0.01 ºC.

The calibrator provides an input for an external probe to perform the temperature measurement from a standard sensor (optional) inserted in the same measuring zone of the sensor to be calibrated. The standard sensor calibration curve follows the parameterization of ITS-90.

It presents a wide variety of programming resources, allowing the performance of automatic calibrations. 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 (task), then the process is started and all the sequence is automatically accomplished. After completing the task, a Calibration Report is issued and it can be printed directly in a USB connected printer or can be generated as a PDF document.

TA-1200PLAB has also many other features, such as:

- Built in Web Server, Ethernet communication.
- USB port for software/firmware upgrade.
- The electric signal calibrator is independent from the dry block function.
- Display indication when the temperature reaches the desired value.
- 5.7 inches touch screen display that eases the operation and configuration of the calibrator.
- Thermocouple reading scaled to ITS-90 or IPTS-68.
- Independent circuit for over-temperature protection and safety.
- Insert to choose and test leads included.

1.1 - Technical Specifications

	TA-1200PLAB
Operating Range	50 to 1200 °C (122 to 2192 °F)
Power Supply	230 Vac 50/60Hz
Resolution	0.01 ºC or 0.01 ºF
Display Accuracy	± 2.5 °C
Stability	± 0.1 ºC
Power Consumption	2500 W
Stabilization Time	1 h
Heating Rate	± 6 ºC / min
Cooling Rate	10 h (1100 ºC to 200 ºC)
Calibration Volume	ø 34 mm / 300 mm depth (immersion)
Radial Uniformity	± 0.1 ºC (for metallic insert)
Axial Uniformity (40 mm): **Axial Uniformity (100 mm):**	± 0.20 full range ± 0.35 full range
Dimensions (H,W,D)	Horizontal Model: 600 mm x 470 mm x 450 mm
Weight	43.0 kg
Warranty	1 year

1.1.1 - Input Technical Specifications

Ranges		Resolution	Accuracy	Remarks
millivolt	0 to 70 mV	0.0001 mV	± 0.005 % FS	R_{input} > 10 MΩ
TC-J	-210 to 1200 ºC / -346 to 2192 ºF	0.01 ºC / 0.01 ºF	± 0.10 ºC / ± 0.20 ºF	IEC-60584
TC-B	50 to 250 ºC / 122 to 482 ºF	0.01 ºC / 0.01 ºF	± 1.25 ºC / ± 2.50 ºF	IEC-60584
	250 to 500 ºC / 482 to 932 ºF	0.01 ºC / 0.01 ºF	± 0.75 ºC / ± 1.50 ºF	
	500 to 1200 ºC / 932 to 2192 ºF	0.01 ºC / 0.01 ºF	± 0.50 ºC / ± 1.00 ºF	
	1200 to 1820 ºC / 2192 to 3308 ºF	0.01 ºC / 0.01 ºF	± 0.35 ºC / ± 0.70 ºF	
TC-S	-50 to 300 ºC / -58 to 572 ºF	0.01 ºC / 0.01 ºF	± 0.50 ºC / ± 1.00 ºF	IEC-60584
	300 to 1760 ºC / 572 to 3200 ºF	0.01 ºC / 0.01 ºF	± 0.35 ºC / ± 0.70 ºF	
TC-L	-200 to 900 ºC / -328 to 1652 ºF	0.01 ºC / 0.01 ºF	± 0.10 ºC / ± 0.20 ºF	DIN-43710
TC-C	0 to 1500 ºC / 32 to 2732 ºF	0.01 ºC / 0.01 ºF	± 0.25 ºC / ± 0.50 ºF	W5Re / W26Re
	1500 to 2320 ºC / 2732 to 4208 ºF	0.01 ºC / 0.01 ºF	± 0.35 ºC / ± 0.70 ºF	W5Re / W26Re
TC-Au-Pt	0 to 500 °C/ 32 to 932 °F	ºC / 0.01 ºF	± 0.09 ºC / ± 0.12 ºF	ASTM E1751
	500 to 1000 °C/ 932 to 1832 °F	0.01 ºC / 0.01 ºF	± 0.06 ºC / ± 0.12 ºF	

FS = Full Scale

The thermocouple specifications are valid for standard curve.
Accuracy values are valid within one year and temperature range of 20 to 26 °C. Outside these limits add 0.001 % FS / °C taking 23 °C as the reference temperature. For thermocouples, using the internal cold junction compensation add a cold junction compensation error of ± 0.2 °C or ± 0.4 °F max.

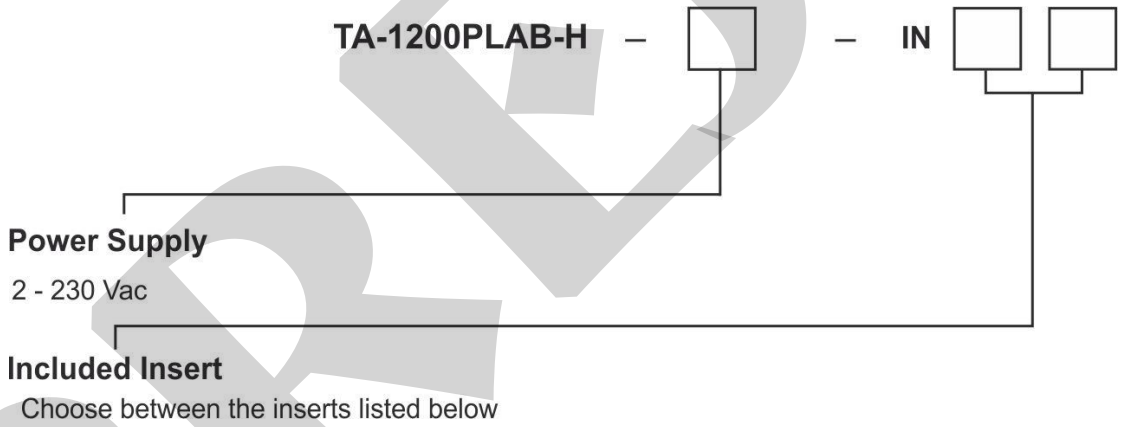
1.1.2 - Special Software Features

- Memory Manager: stores configuration types predefined by the user.

- Data Logger: monitoring of input or output signals, storage and visualization of data in chart or table.

- Help Desk: storage and viewing videos and documents on the calibrator screen.

1.2 - Order Code



Notes:
* Changes can be introduced in the instrument, altering specifications in this manual.

1.3 - Accessories

- Metallic Insert:

Inserts	Holes	ORDER CODE
		TA-1200PLAB-H
IN01	1 x 3/4"	06.04.0075-00
IN02	1 x 1/2"	06.04.0076-00
IN03	1 x 6.0mm and 3 x 1/4"	06.04.0077-00
IN04	3 x 6.0mm and 1 x 1/4"	06.04.0078-00
IN05	4 x 6.0mm	06.04.0079-00
IN06	2 x 6.0mm and 2 x 1/4"	06.04.0080-00
IN07	1 x 6.0mm, 1 x 8.0mm and 1 x 3/8"	06.04.0081-00
IN08	1 x 6.0mm, 1 x 3.0mm and 2 x 1/4"	06.04.0082-00
IN09	Without hole, to be drilled by the client	06.04.0086-00
IN10	Others, under ordering	06.04.0084-00

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

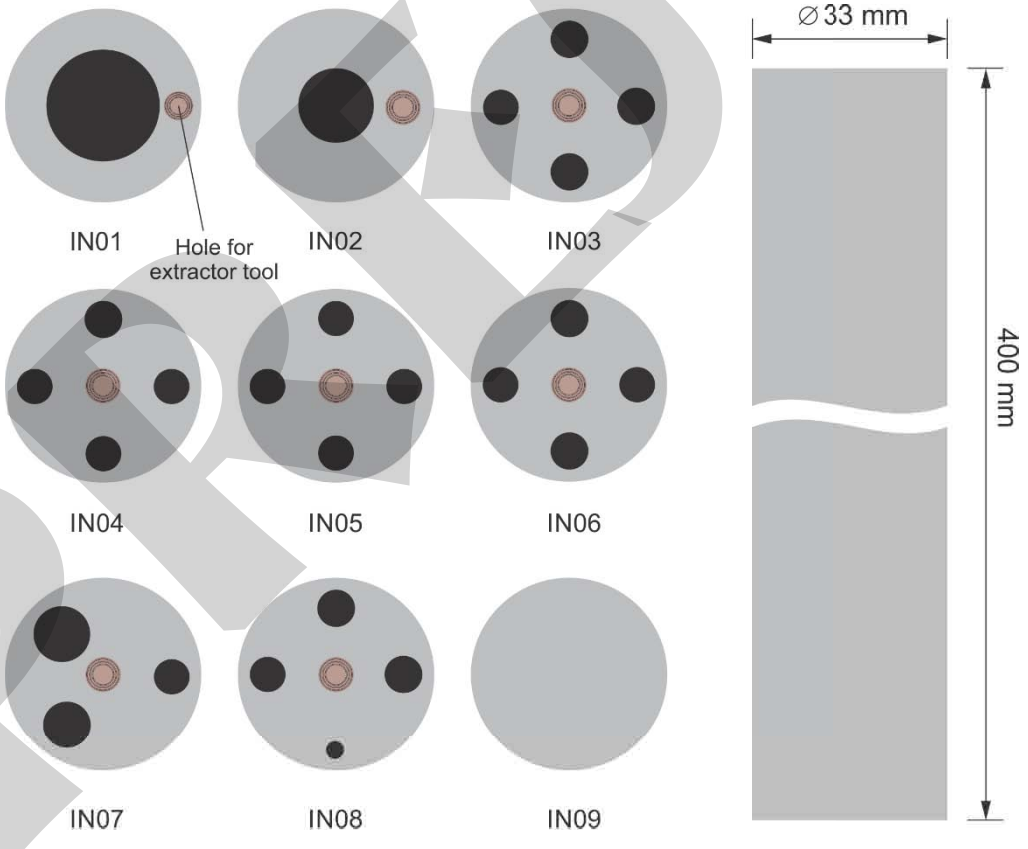


Fig. 01 - Inserts

Ceramic Insert:

Inserts	Holes
IN1C	2x 3.5 mm, 2x 4.0 mm, 2x6.0 mm and 2x 1/4" (Alumina)
IN2C	1x 1/4" and 6x 7.0 mm (Alumina)
IN10	under ordering (Alumina)

1.4 - Initial Usage

Identify if the following parts are present:

- TA-1200PLAB Calibrator;
- Metallic or ceramic insert;
- Bottom insulation of the insert (only one central hole);
- Top insulation of the insert (same holes of the metallic insert);

In the core of the dry block TA-1200PLAB there is a ceramic tube. Therefore, for safety purposes, the insert and the insulators are separated. A support is sent to protect the block. Remove the screws indicated by the arrows and remove the support. Store it and use it whenever you need to transport the dry block.

Finish the mounting using the grounding pin board and the frame with a grid.

1.4.1 - Mounting the Insert in the Calibrator - Vertical Model

To mount the insert inside the Calibrator, proceed as follows:

I) Place the Calibrator in its definitive place and spacing more than 25 cm from nearby walls.

II) Observe in the following figure the type of gap in the lower part of the metallic insert with the type of fitting in the grounding pin inside the furnace well. *Note: The ceramic insert does not have this gap.*

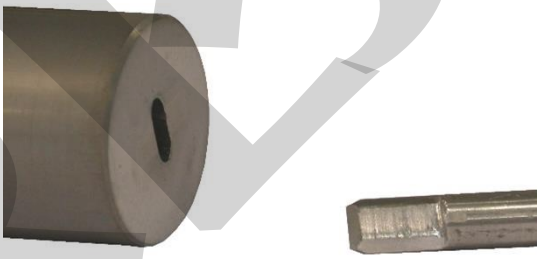


Fig. 02 - Insert Background (Horizontal Model)

I) Screw or fix the extractor to the insert and holding the insert with both hands slowly insert the heavy insert into the very fragile ceramic well. Orient yourself by the mark of a point on the insert to keep this side up.

II) It is essential to ensure an effective grounding if the gap coincides with its fitting on the grounding pin. It is necessary to repeat the movement of the insert back and forth a few times in the well to hear the click noise between the insert and the grounding pin. Unscrew the extractor.

III) Then insert the top insulation in line with the holes in the insert. Use a ceramic rod for it.

IV) Finally, tighten the metal cap by aligning it with the other holes in the top of the calibrator well.

Note that the sensors to be tested must pass through the insulation and deepen inside the metal insert to obtain a correct temperature measurement.

1.5 - Parts Identification

Fig. 03 - Parts Identification

2 - Calibrator Operation

When powered on, the calibrator goes through a self-test routine and shows the last adjustment date. In case of failure, it displays a message to indicate error; if that occurs, the instrument should be sent to the manufacturer for repair.

After the self-test is completed, the display shows the main menu:

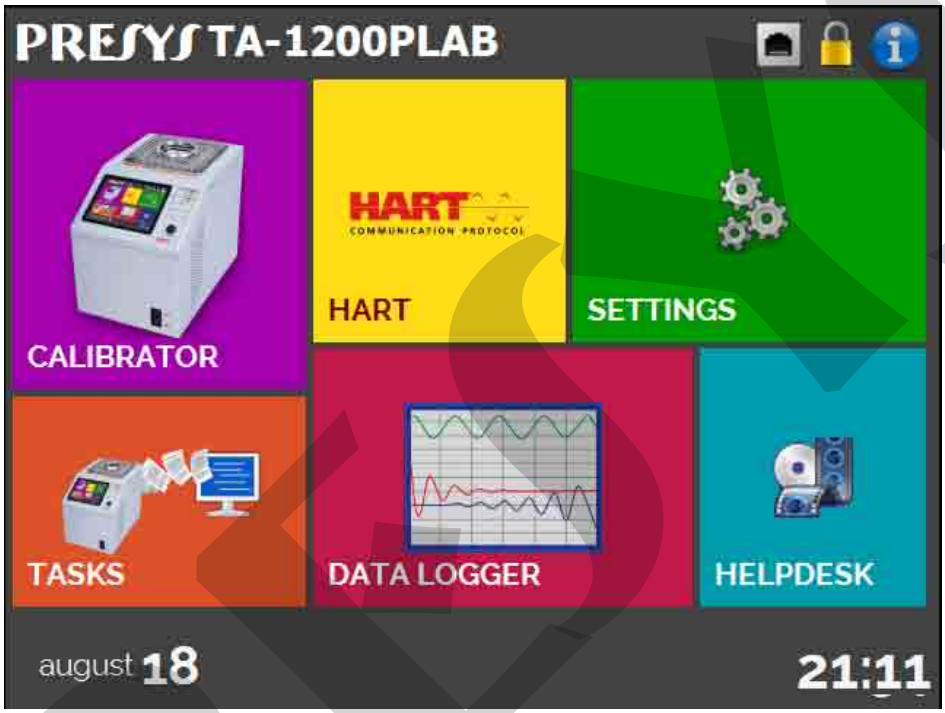


Fig. 04 - Main Menu

The main menu is divided in four functions:

CALIBRATOR - selects the probe and input functions, see section 2.1

HART® - not available for this model.

TASKS - not available for this model.

DATA LOGGER - record measurements, enabling visualization in chart or table, see section 2.2.

HELP DESK - features videos and documents to assist in the use of the calibrator, and can also store files made by the user, see section 2.3.

SETTINGS - general instrument settings, see section 3.

2.1 - Calibrator Menu

To select the probe set point or electrical input functions, from the main menu, press the **CALIBRATOR** button. The following screen is displayed.

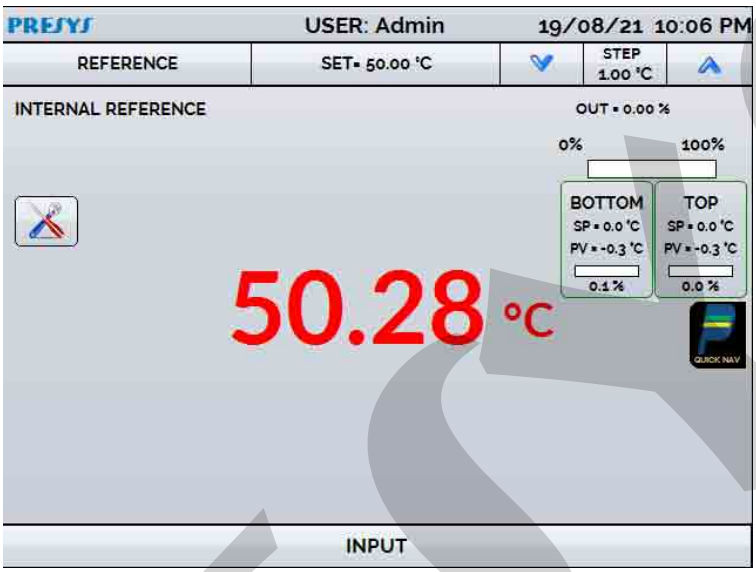


Fig. 05 - Calibrator Function

At the top is shown the probe settings and values.

The centered value shows the block temperature. The **GREEN** color indicates that the temperature is stable, otherwise it is **RED**.

The set point value appears on the top. Touch in the **SET** bar or in the block temperature value to change it. Pressing on the temperature unit it can be changed between °C (Celsius), °F (Fahrenheit) or K (Kelvin).

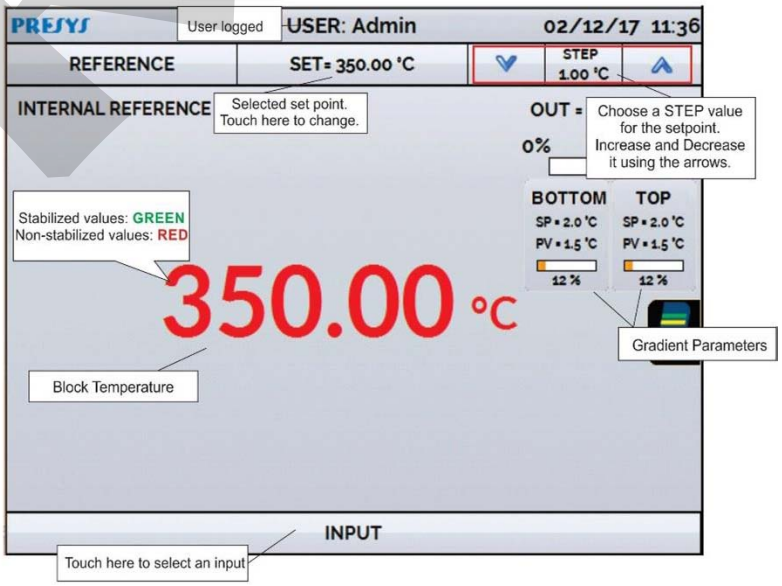


Fig. 06 - Calibrator Mode

In the **STEP** function, a step value can be configured, and the steps can be changed through the up and down arrows.

In the Temperature Generation Configuration  button , it is possible to change the block setpoint rate in ° C / seconds.

In **REFERENCE** menu, you can configure the type of probe reference (see section **2.1.1** Probe Reference). The chosen reference appears just below the REFERENCE button.

At the bottom, an input can be configured. When the input is selected, the screen will split automatically. To select an input, just touch the INPUT bar (see section **2.1.2** INPUT MENU).

The  icon shows a **Quick Navigator**, with the options for Main Menu (**HOME**), **Data-Logger** and **Tasks** (not available for this model). Pressing **MENU**, there are options for the selection of display **Brightness** and **Memory Manager** (see section 2.1.3). Furthermore, it brings information about the auxiliary input configuration and IP address. Press **BACK** to return to Calibrator Mode or **HOME** to go to the Main Menu.

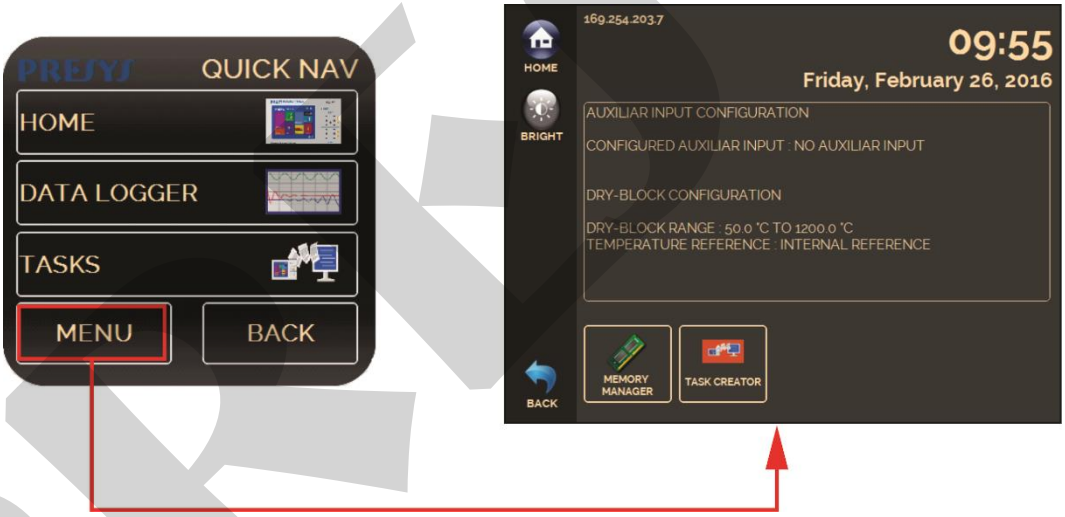


Fig. 07 - Quick Navigator and Secondary Menu

2.1.1 - Probe Reference

There are two different references to the thermal block: **Internal Reference** and **External Reference**.

The **Internal Reference** is a sensor built into the block.

The **External Reference** is an option for more accurate measurements. The reference comes from a Standard Thermocouple Sensor placed inside the insert, among the DUT (devices under test). This Standard Sensor should be a noble metal thermocouple (R, S, B or Au-Pt types). To increase accuracy to the measurements, ITS-90 parameters can be used to correct the thermocouple electromotive force in reference to the IEC-60751 table.

The configuration of the thermocouple calibration coefficients (C0, C1, C2 e C3 corrects the electromotive force (E) given by the linearization table of the thermocouple by the IEC-60751 standard. After correction, the electromotive force of the thermocouple follows this formula:

$E' = E + C0 + C1.t + C2.t^2 + C3.t^3$, where t is the temperature in °C and E' and E the electromotive force in mV.

When using External reference, the probe indication is displayed on the screen and the control is made by the internal probe.

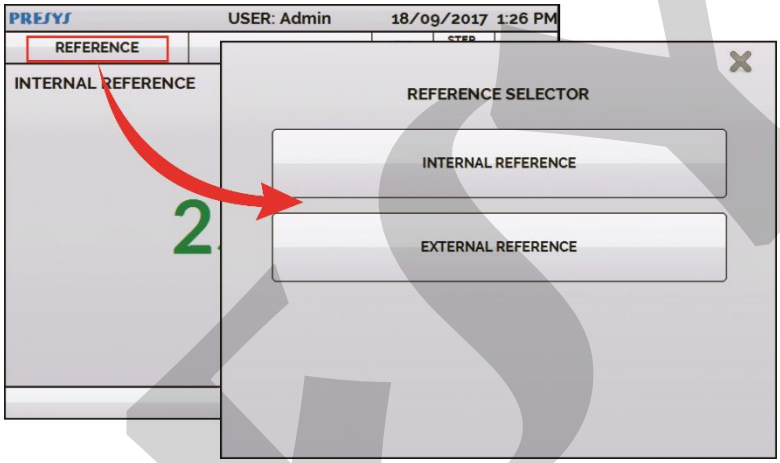


Fig. 08 - Choosing the Type of Temperature Reference

To select the Reference between Internal and External, touch the **REFERENCE** bar. Select a reference between the registered sensors. To add a new sensor, select **MANAGER** and **ADD.** When selecting External Reference, the ITS-90 parameters must be set. If the sensor does not have parameters, use the value "zero" for all the coefficients.

ID: Sensor Identification
TYPE: Thermocouple type (R, S, B)
Scale: Reference table for the thermocouple
MIN and **MAX**: Operating range for the thermocouple
CJC: Type of Cold Junction Compensation. If MANUAL is chosen, inform the temperature.
C0, **C1**, **C2** and **C3**: Thermocouple coefficients.

The coefficient values can be found in the Reference Sensor Certificate.

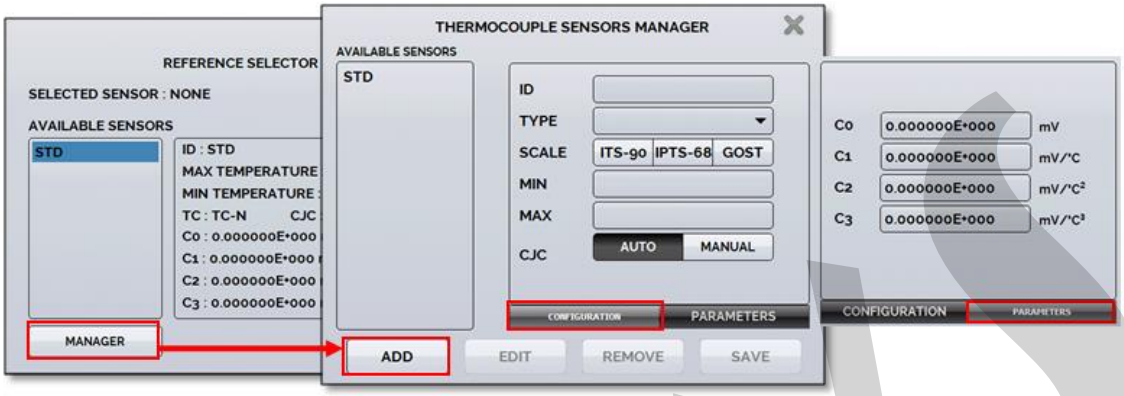


Fig. 09 - Adding a new Reference Sensor

After filling the blanks, click on **SAVE** button and confirm. The new sensor is now available to be chosen in the list. To edit data from a sensor, select it and press **MANAGER** button. To remove a sensor, select it and press **REMOVE.**

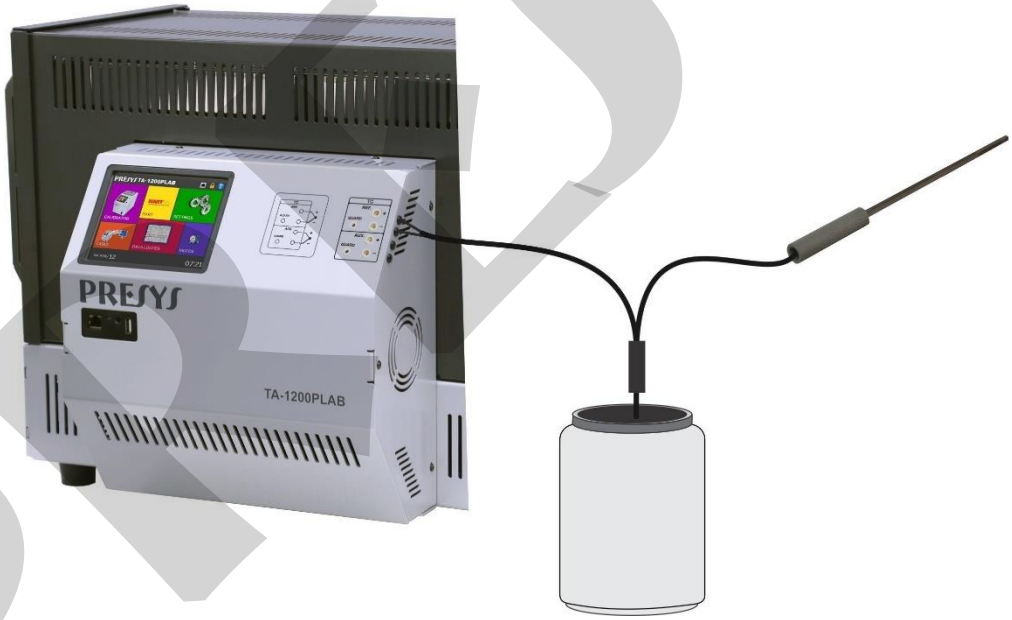


Fig. 10 - Connecting the Standard Sensor for the External Reference

Note: the values corresponding to controlled temperatures appear in **GREEN** / **RED**. Values that show only the sensor indication appear in **BLACK**.

2.1.2 - Input Settings

The INPUT menu has the following options:

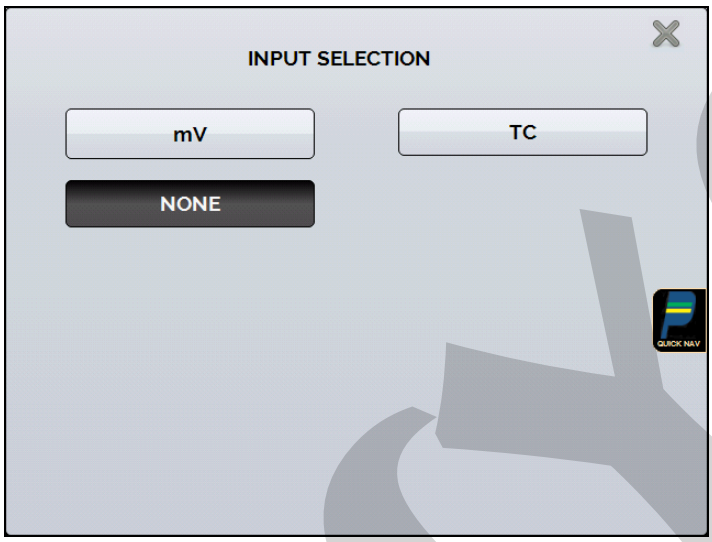


Fig. 11 - Input Menu Options

For **TC** (thermocouple), you must select the thermocouple type and the type of cold junction compensation (CJC): **Internal** or **Manual**. In **Internal** option, the compensation is done internally; In **Manual** you must provide the value of the temperature of the cold junction to the calibrator.

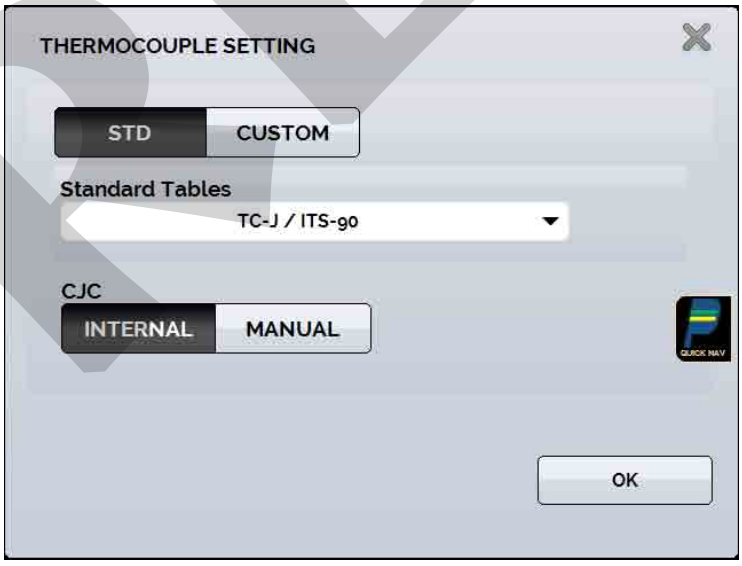


Fig. 12 - TC Menu Options

2.1.2. - Input Connections Diagrams

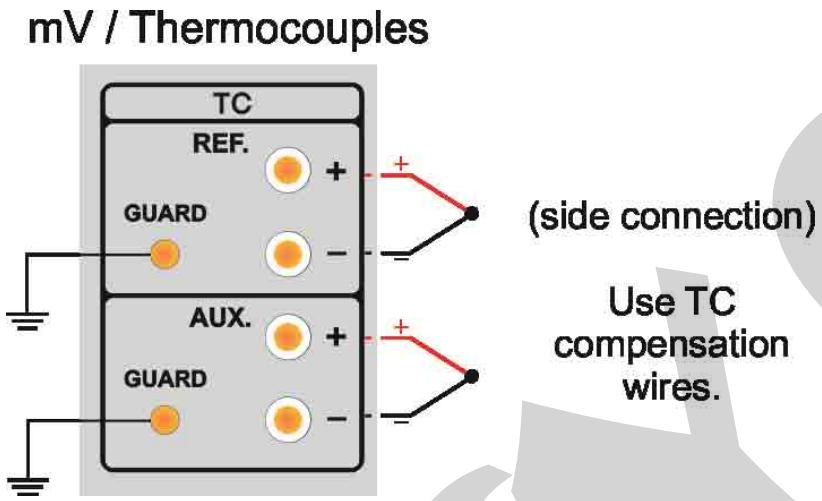


Fig. 13 - Input Connections

2.1.3 - Saving Current Configuration (Memory Manager)

The TA Series calibrators admit several special functions that may become of frequent use. In these situations, it is useful to store such settings in the instrument in order to save time.

After setting the desired calibration mode (input type or special function), press the icon → **MENU**, and the button **MEMORY MANAGER**. On the option **CREATE NEW** can be given a name for this configuration and a description. Press the **SAVE** button.

The operation that was being performed by the TA Calibrator shall be stored in memory identified by the name given to it. To use it again, even after the calibrator is turned off and on, select the name of the desired setting and press the **LOAD** button. The **SAVE AS DEFAULT** button sets the current configuration as the default configuration of the calibrator. Thus, every time the calibrator is turned on, this will be the initial configuration of the calibrator.

2.2 - Data-Logger

The TA Series Calibrators allow you to record a series of measurements over time to display data in chart or table format.

Select **CALIBRATOR** from the main menu and select the desired configuration for Probe and Input.

Press the icon and select **DATA LOGGER.**
The calibrator automatically starts the measurements and displays each measured point on the chart.

For measurements to be saved, you must press the **REC** button (see **Figure 22**). With this option selected, all points (measurement and time) are saved in an internal file in TA Calibrator, which can be used to generate a table or chart.

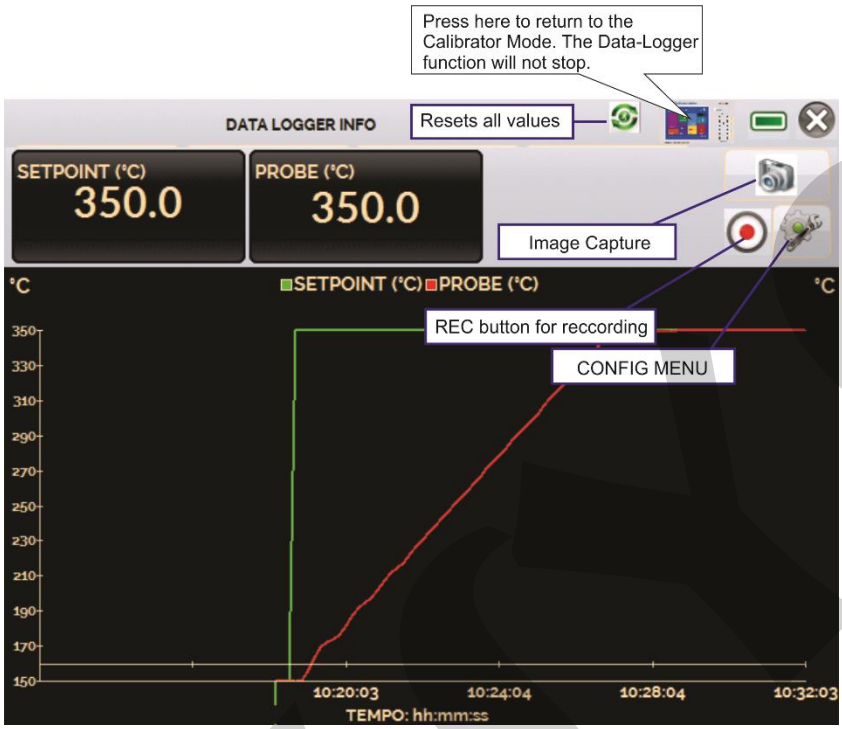


Fig. 14 - Data Logger

In configuration menu (icon  , you can edit the background color of the chart, color and line thickness, sampling rate (in seconds) and set the x (time) and y (measurements) axis of the chart.

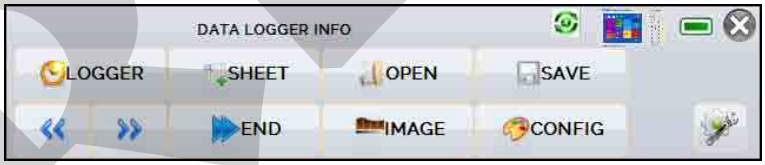


Fig. 15 - Data-Logger Configuration Menu

Recording can also be programmed to start at a certain date and time in the **LOGGER** option. Just set the start time and end time of recording. During the defined range, the measured points are saved in an internal file in TA Calibrator.

To view a saved file press the **OPEN** button, select the desired file, and press **LOAD**. The file name contains the date and time of the measurements.

The **SHEET** button allows the visualization of data in table format, with the date and time of the measurement and the measured values.

If the user wants to export the current data to a .csv file that can be opened in spreadsheet softwares, press the **SAVE** button and indicate the name and where it will be saved. The button  saves the current screen image as a .png file. All saved screens can be viewed in the **IMAGE** menu. These files are saved in the internal SD card of the calibrator. To access the files saved on the TA Calibrator, connect the USB cable to the computer (type A USB) and to the TA Calibrator (Type-B USB, see **Figure 5**).

2.3 - Help Desk

The calibrator allows viewing of videos and documents. The videos can be viewed while a calibration is performed and are intended to assist in the use of the calibrator. The documents can be calibration procedures or instructions that can be stored and viewed on the calibrator itself.

From the main menu, when selecting **HELP DESK** and the **VIDEOS** tab, a list of video categories will appear. Select the desired category and video. Press the FULL SCREEN option to view the video in full screen, or WINDOW for reduced screen. Selecting the window option, it is possible to watch the video while using the calibrator functions.
To insert new videos in the calibrator, connect the USB cable to the computer (USB Type A) and to the Calibrator (USB Type-B, see figure 05). Open the VIDEOS folder. Copy the video to some subfolder (category) in the VIDEOS folder. If you prefer to create a new category, just create a new folder within VIDEOS with the name of the desired category and copy the file to this folder.

To insert documents, such as procedures or instructions, the files must be converted into PDF files and must be saved inside the HELP folder on the SD card; Create a folder with the same name as the document and insert it into this folder.

3 - SETTINGS

The SETTINGS menu has 4 divisions (tabs at the bottom): **DATE AND TIME**, **NETWORK**, **SERVICES** and **SYSTEM**.

3.1 - Date and Time

The date, time and time zone for the calibrator can be set in the date and time bar. You can also set the decimal separator for .CSV files between commas and periods.

3.2 - Network

In the **NETWORK** tab it is possible to configure the IP address of the calibrator for communication with the computer and the Wi-fi (wireless) network. The IP address can be configured dynamically (**DHCP**) or it can have a fixed address (Disable the **DHCP** option and change the desired addresses).

Communication via Wi-fi is carried out via USB/WIFI adapter (optional item). In the **NETWORK** tab it is possible to configure the device name (name that calibrator will be displayed on the network). By selecting **CONFIGURE WIRELESS NETWORK** (WIFI) the user can view the available networks and configure which network he wants to connect to.

Connecting the calibrator to the network it is possible to view and print Reports / Certificates of the tasks through the computer. Press the indicated network icon to access the configured IP address after connected to the network. When connected to the wireless network, the icon will be the Wi-fi network

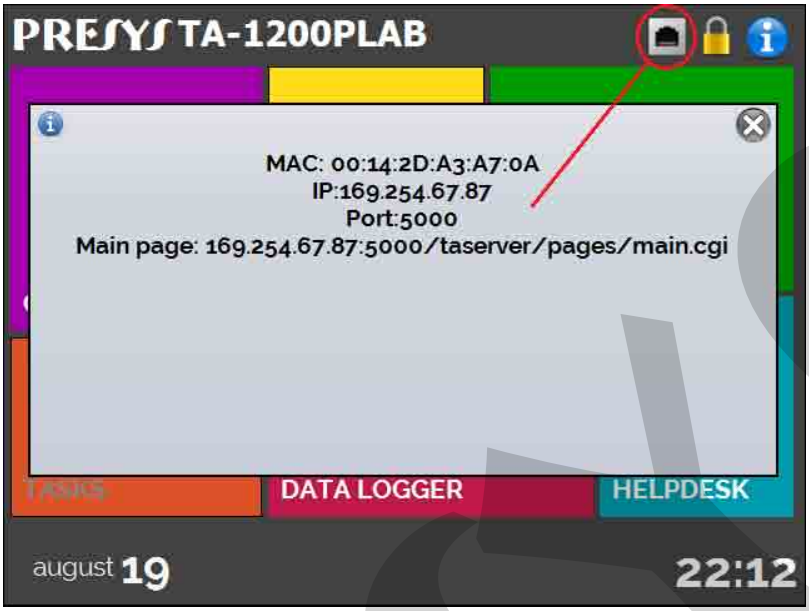


Fig. 16 - IP Address

3.3 - Services

In the **SERVICES** bar, the user can configure the communication types of the calibrator, among other settings. The options are

• **REMOTE ACCESS** - Access options via WEBSERVER (Remote Server) and via VNC (Virtual Network Computing)

• **SERIAL COMMUNICATION** - Serial communication settings

• **FILE SHARING AND USB HOST CONTROL** - Options for allowing / denying access to file sharing and setting passwords

• **SERVER ADDRESS** - Setting the Remote Server address

• **STARTUP MODE** - The user selects whether he prefers the calibrator to start in calibrator mode or on the main screen.

3.3.1 - Built-in Web Server

Connect the network cable into the Ethernet port of **TA Calibrator** on the side (see **Fig. 5**).

To access the built-in webserver open the web browser on your computer and enter the following address.

<***calibrator_IP_address>:5000/taserver/pages/main.cgi***

User: *admin*

Password: *xvmaster*

To verify the IP address press the button indicated below.

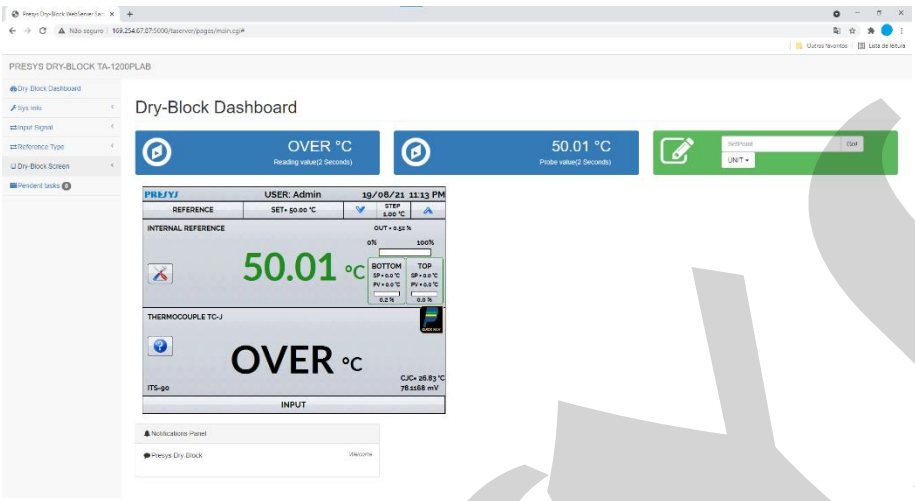


Fig. 17 - TA Calibrator Web Server

In the Web Server, you can monitor the calibrator screen, change the setpoint and see the auxiliary input readings.

3.3.2 - Remote Access - VNC

Virtual Network Computing (or VNC only) is a graphical desktop sharing system that uses the Remote Frame Buffer protocol (RFB) to remotely control another computer or device. When activating this option, the calibrator screen can be accessed directly on the computer.

To access via VNC, it is necessary to download and install a VNC viewer program, some of which are available for free on the internet. Connect the calibrator to the network via Ethernet or Wifi cable. Set the IP address indicated on the network icon in the VNC viewer (Figure 24) and connect. When prompted, use the password "adm". This password can be changed later on the NETWORK → FILE SHARING tab of the calibrator.

3.3.3 - Command List SCPI

To control the calibrator using the SCPI commands, connect a serial cable to the USB HOST port on the Calibrator TA (see Figure 5 - Parts identification). Connect the cable to the computer's serial port. In the **Settings** → **Services** → **Serial Comm** menu, activate the RUN key to ON.

Communication Parameters:

Parity: none
Data bits: 8
Baud rate: configurable in the menu Configuration → Services → Serial Comm
Stop Bits: configurable in the Configuration → Services → Serial Comm menu

***IDN?**

Description: Instrument Identification
Parameters: ---
Response: Manufacturer, ID, Serial Number, Software Version

***CLS**

Description: Cleans error list.
Parameters: ---
Response: ---

CALibration:DATE:LAST?
Description: Shows last calibration date
Parameters: ---
Response: <AAAA>,<MM>,<DD> e.g.: 2018,05,30
CALibration:DATE:NEXT?
Description: Shows nect calibration date
Parameters: ---
Response: <AAAA>,<MM>,<DD> e.g.: 2019,05,30

SOURce:READ?
Description: Shows controlled temperature
Parameters: ---
Response: 52.13

SOURce:MEAS?
Description: Reads the temperature of the internal and external probe. If the external probe is not configured, it will show the value 0 (zero).
Parameters: ---
Response: 52.13,53.14

SYSTem:ERRor?
Description: Shows last error code
Parameters: ---
Response: Error code:
Command does not exist = "0x001";
Error deleting error list = "0x002";
Error reading the calibrator information = "0x003";
Error reading the last calibration date = "0x004";
Error reading the next calibration date = "0x005";
Error changing the setpoint = "0x006";
Error reading the setpoint = "0x007";
Error reading control temperature = "0x008";
Error reading the value of the probes = "0x009";

Error when configuring and reading auxiliary input = "0x00A";
Error when trying to set auxiliary input = "0x00B";
Error reading configured auxiliary input = "0x00C";
Error trying to activate control = "0x00D";
Error trying to disable control = "0x00E";
Error when trying to go to local mode = "0x00F";
Error when trying to go to remote mode = "0x010";
Error trying to read the error list = "0x011";

MEASure:<InputType>?
Description: Defines the entry and reads the value at once
Parameters: Input Type: None -> NONE
Current -> CURRent
mV -> VOLTage
Switch -> SWitch
TC -> TC <TCType> <scale> <CJCType> <CJCValue>
TCType -> all types of the manual in TC-J format, e.g.
scale -> ITS-90 or IPTS-68
CJCType -> MANUAL or INTERNAL
CJCValue -> If MANUAL, send the compensation value.

READ?
Description: Reads the value of the configured auxiliary input (for this command you must send a CONF command initially). This command returns unit
Parameters: ---
Response: 1.005 mV

SOURce:SetPOint <SP>
Description: Changes setpoint
Parameters: <SP> -> Reference value, without temperature unit, ex. 50.00
Response: ---

SOURce:SetPOint?
Description: Reads the setpoint
Parameters:
Response: Response: <SP> e.g. 50.00

SOURce:OUTPut OFF
Description: Control off
Parameters: ---
Response: ---

SOURce:OUTPut ON
Description: Control on

Parameters: ---
Response: ---

SYSTem:LOCal
Description: Go to local mode
Parameters: ---
Response: ---

SYSTem:REMote
Description: IGo to remote mode
Parameters: ---
Response: ---

3.4 - System

In the **SYSTEM** tab you can configure the calibrator volume, adjust the touchscreen, calibrator identification, language, printer and security options.

- **Touch Screen Options**: To adjust the screen, press TOUCH SCREEN OPTIONS. Press the center of the + signs on the screen (use of the touch screen pen is recommended). After calibration, press the screen again at any point to confirm.

- **Language configuration**: Select the desired language and confirm with OK. The system must be restarted to save the new configuration.

- **Screen Brightness Adjustment**: Select the desired screen brightness and confirm with OK. The options are: 25%, 50%, 75% and 100%.

- **Calibrator identification**: In this option it is possible to identify the calibrator, choosing a TAG, company name and location.

- **Sound Options**: Press + or - to set a value for the audio volume.

- **Security Options**: Initially, the instrument does not have a password. This setting can be changed in SECURITY OPTIONS.

To create a new user, press the key icon and then the users icon. Fill in the blanks and press **CREATE**. It is possible to add a signature to be used in issuing the **TASKS** reports and certificates.

Pay attention to the functions that each user level has access in the table below:

User Level	Function				
	Calibrator	Tasks	Hart®	Data-Logger	Settings
Operator	✓	✓	×	×	×
Tec	✓	✓	✓	✓	×
Admin	✓	✓	✓	✓	✓

To lock the system, press the padlock  icon on system menu. The next time the TA Calibrator is turned on, it will request login and password. To unlock the system, login as an Admin Level user and press the padlock icon on system menu again.

***NOTE:* Never delete all admin level users when using password access!**

• **Printer Conf.**: Configure the printer language (PCL3 / PCL5e / PCL3G etc.).
• **Adjust Cal.:** Adjustment level protected by password. See section 6.0 Calibration (Adjustment) for more information.

4 - 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.
- Never transport the dry block with the metallic insert inside it, as the metallic insert can hit the ceramic tube damaging it permanently.

5 - Recommendations as regards Accuracy of Measurements 

PRESYS Temperature Advanced 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 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 cannot move or swing inside but it should not enter by force to get jammed.

6 - Calibration (Adjustment) 

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 the **ADJUST/CAL** option from the **SETTINGS** > **SYSTEM** menu. You should then enter the password **9875** to access the calibration menu.

The password functions as a protection to calibration ranges. After the password is entered, the menu displays the options **GENERAL**, **INPUTS** and **PROBE**.

Options for **INPUTS** are **mV** and **thermocouple**.

6.1 - Input Calibration

The following procedure applies to input for reference and auxiliary. Inputs must be adjusted separately

Select the corresponding mnemonic and apply the signals presented in the tables below. 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 calibration points 1 and 2. Press **SAVE** to save the typed values

mV Input	1st point	2nd point
Single range	0.0000 mV	50.0000 mV

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

Cold Junction	Point 1
CJC	32.03 ºC (measured value)

6.2 - Probe Calibration

To readjust the internal Probe it is necessary to compare the value indicated by the calibrator (Probe) and the temperature value from a standard probe placed in the dry block insert. The temperature of the standard probe should have high accuracy.

The option to adjust the internal sensor has seven points of adjustment. These points are recorded via points 1 to 7.

Before starting the calibration (adjustment), record in these points the respective initial storing values, according to the table below:

Calibration Point	Initial value to record (°C)	Standard indication	New value to record	New indication of the Standard
Point 1: 150 °C	150.0	149.96	150.0	150.01
Point 2: 350 °C	350.0	349.93	349.9	349.99
Point 3: 600 °C	600.0	598.03	598.0	600.02
Point 4: 750 °C	750.0	745.32	745.3	749.99
Point 5: 850 °C	850.0	843.13	843.1	850.03
Point 6: 1000 °C	1000.0	990.45	990.4	999.97
Point 7: 1100 °C	1100.0	1087.11	1087.1	1100.05

Select the calibration point and then press **CHANGE TEMPERATURE**. Wait for the complete stabilization of the point. On the field **Adjusted Point**, write the value presented in the standard thermometer and confirm in the SAVE button. Go to the next point and continue the adjustment until the last point.

6.3 - PID Control Parameters 

The TA-1200PLAB temperature calibrator has a PID control algorithm to calculate the block control output.

The dry block stability and response time features are related to the PID parameters, explained below:

The K parameter (proportional gain) amplifies the error signal between the setpoint and the block temperature to establish the output signal. When this parameter is very high, the output reaction is very quick, however this can take the system into oscillation. Decreasing this parameter, the dry block would not be able to react quickly enough to external variations, giving the impression of a sudden out of control.

The I parameter (integral gain) is responsible for the integral action and it is the most important part in the setpoint control. While an error persists between the setpoint and the block temperature, the integral action will actuate on the output signal until the error is brought to zero.

The D parameter (derivative gain) is responsible for the derivative action that provides a quick response at the control output resulting from any rapt variation in the

block temperature. It is used to eliminate oscillations. However, it can cause oscillations in the presence of much noise.

All temperature calibrators are tuned in factory and the parameters are close to the optimum ones. In case one wants to improve a specific feature of the calibrator (stabilization time or response time, for instance), make sure the alteration is made reasonably.

The changes can be made entering the menu **SYSTEM → GENERAL → PID CONFIG**. This menu is protected by password (**9875**).

6.4 - Axial Homogeneity Adjustment

Attention! Performing this procedure may change the accuracy of the calibrator. When changing the insert it may be necessary to readjust the axial homogeneity of the TA-1200PLAB

Following this procedure, the user will be able to obtain gradients of the order of ± 0.35 °C for the range of 150 to 1200 °C within the length of the calibrator measurement zone. The measurement zone of this equipment is 10 cm from the bottom of the insert outwards.

The TA-1200PLAB calibrator has three independent controls acting on three heating zones to guarantee any desired temperature profile on your isothermal block. All measuring and differential thermocouples used in the instrument are of noble metals to ensure the best temporal stability.

Homogeneity Test

The homogeneity test must be done with two standards of noble metal thermocouples inserted in the same horizontal hole as the insert. For this test, one thermocouple remains in the bottom of the well and the other is removed every 2 cm until it reaches 10 cm. See the figure below:

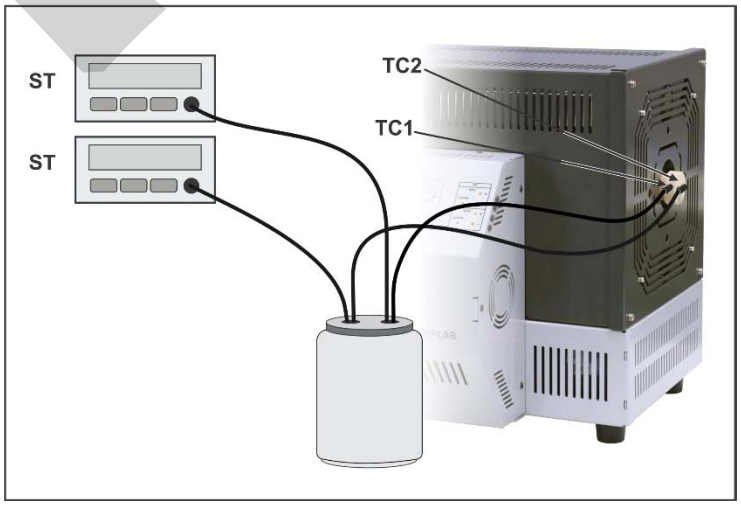


Fig. 18 - Equipment Connections

Choose the test set points. As default, the tested temperatures in factory are: 300, 600, 900 and 1100 °C. If necessary, you can prioritize other points or ranges for gradient adjustment.

a) Let the two standard thermocouples touching the bottom of the well. Set the test temperature and wait until it stabilizes (at least one hour).
b) Record the temperature of the two standards;
c) Remove the TC2 sensor for 2 cm, leaving the TC1 in the same position until the end of the test. Wait at least 3 minutes and record the temperature of both standards.
d) Repeat the step c) until TC2 reaches the distance of 10 cm from the bottom of the well.
e) Return TC2 to the bottom of the well. You can set the next test temperature or proceed with the axial gradient adjustment.

If the Axial gradient is higher than desired, change the BOTTOM or TOP setpoints until the gradient is minimized. Remember to write down the previous setpoint and use this value as the basis for changing the gradient.

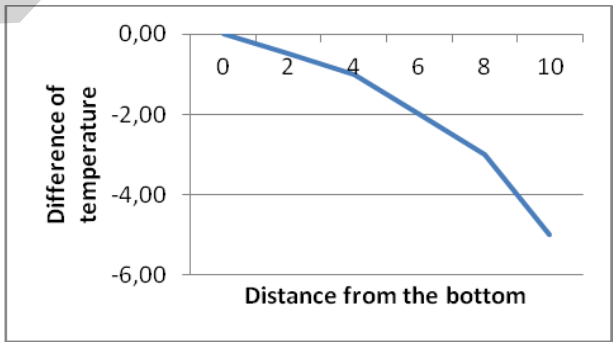
Always leave a time of at least one hour to observe the effect on the gradient of the furnace after changing the setpoints of the BOTTOM and TOP slaves.

Results Examples

In the following example, values above the desired for the gradient were found:

Example 1:

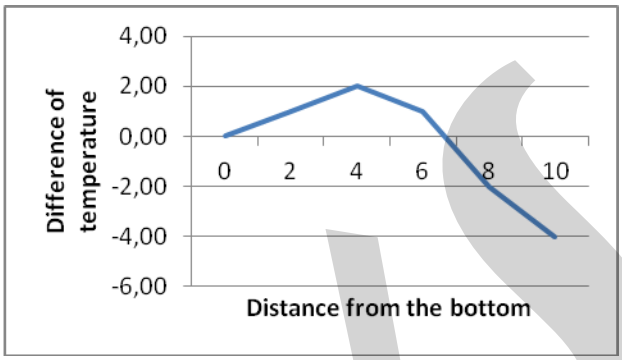
Dist (cm)	TC1 (°C)	TC2 (°C)	Δt (°C)
0	600,00	600,00	0,00
2	600,00	599,50	-0,50
4	600,00	599,00	-1,00
6	600,00	598,00	-2,00
8	600,00	597,00	-3,00
10	600,00	595,00	-5,00



It is possible to observe in the example that as the sensor moves away from the bottom and approaches the top, there is a drop in temperature. In this case, increasing the value of the TOP setpoint it is possible to gradually reduce this temperature difference.

Example 2:

Dist (cm)	TC1 (°C)	TC2 (°C)	Δt (°C)
0	600,00	600,00	0,00
2	600,00	601,00	1,00
4	600,00	602,00	2,00
6	600,00	601,00	1,00
8	600,00	598,00	-2,00
10	600,00	596,00	-4,00



It is possible to observe in the example that as the sensor moves away from the bottom and approaches the top, there is a rise and then a drop in temperature. In this case, increasing the value of the TOP and BOTTOM set points it is possible to gradually reduce this temperature difference.

To adjust the values, go to the TA-1200PLAB main menu and enter in **SETTINGS** menu. Enter the tab **SYSTEM** and select **ADJUSTMENT/CAL.**

The following sections are protected by password (**9875**). Entering the adjustment option, select the option **GRADIENT** and then the **ADJUST** button.

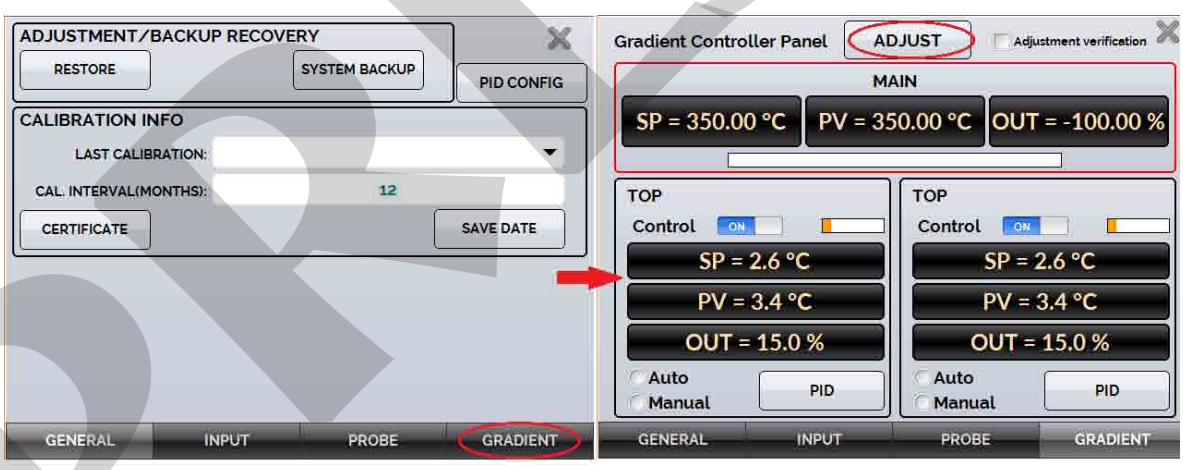


Fig. 19 - Gradient adjustment

To add a point click on ADD button.

To edit a value, click on the point row and edit the values. Note that the new value must be added to the value previously recorded. Click on **SAVE** button to save the changes.

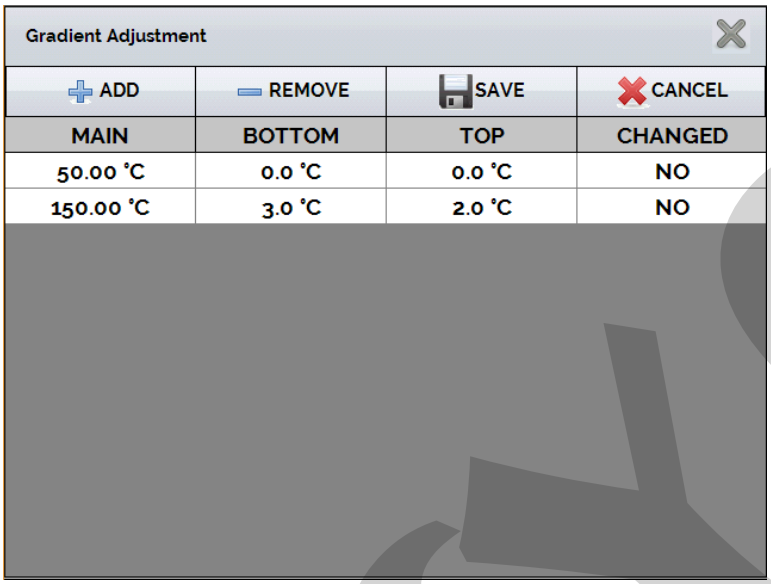
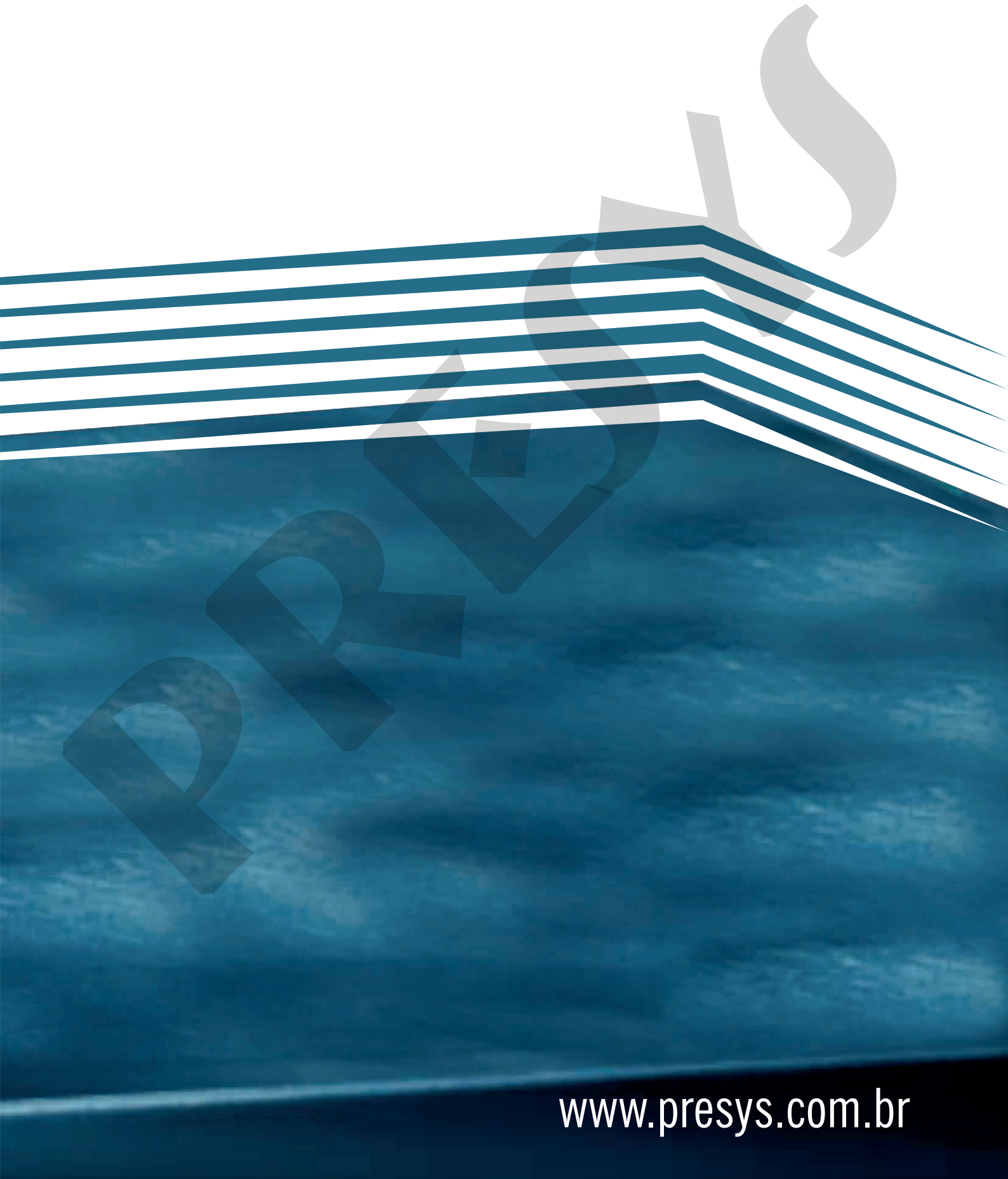


Fig. 20 - Gradient adjustment

Note that because the differential thermocouples BOTTOM and TOP are far from the test thermocouples inserted in the insert, the ratio of setpoint changes to the error produced in the gradient is not one-to-one, but must be searched by repetitive execution of this procedure until reach the desired gradient.



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