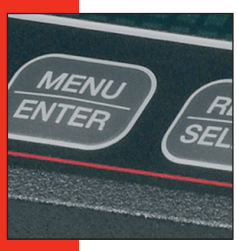
AMETEK®
SENSORS, TEST & CALIBRATION

User Manual
Professional Temperature Calibrator
Jofra PTCt-125/155/350/425/660 A/B/C









User Manual
Professional Temperature Calibrator
JOFRA PTC^{t} -125/155/350/425/660 A/B/C

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1.0 Introduction

This user manual applies to the following instruments:

- **JOFRA PTC^t -125 A - Temperature calibrator**
- **JOFRA PTC^t -125 B - Temperature calibrator with sensor and reference inputs**
- **JOFRA PTC^t -125 C - Temperature calibrator with reference input**
- **JOFRA PTC^t -155 A - Temperature calibrator**
- **JOFRA PTC^t -155 B - Temperature calibrator with sensor and reference inputs**
- **JOFRA PTC^t -155 C - Temperature calibrator with reference input**
- **JOFRA PTC^t -350 A - Temperature calibrator**
- **JOFRA PTC^t -350 B - Temperature calibrator with sensor and reference inputs**
- **JOFRA PTC^t -350 C - Temperature calibrator with reference input**
- **JOFRA PTC^t -425 A - Temperature calibrator**
- **JOFRA PTC^t -425 B - Temperature calibrator with sensor and reference inputs**
- **JOFRA PTC^t -425 C - Temperature calibrator with reference input**
- **JOFRA PTC^t -660 A - Temperature calibrator**
- **JOFRA PTC^t -660 B - Temperature calibrator with sensor and reference inputs**
- **JOFRA PTC^t -660 C - Temperature calibrator with reference input**

These instruments are temperature calibrators designed to calibrate temperature sensors and thermostats.

The PTC^t -instruments are all designed as dry-block calibrators.

Read this manual carefully before using the instrument and ensure that all safety instructions and warnings are observed.

1.1 List of equipment received

When you receive the instrument, the following should be enclosed:

- 1 PTC^t Calibrator
- 1 mains cable
- 1 USB memory stick containing electronic manuals and software package: JOFRACAL, AMETRIM and CON050
- 1 Wifi USB Dongle
- 2 sets of test leads and test clips (2 black and 2 red – B models only)
- 1 heat shield (PTC^t -660 only)
- 1 tool for insertion tube
- 1 USB cable
- 1 Accredited Calibration certificate (International traceable, A-models)
- 2 Accredited Calibration certificates (International traceable, C-models)
- 3 Accredited Calibration certificates (International traceable, B-models)
- 1 set of rubber cones for insulation plugs (PTC^t -125/155 only)

2.0 Safety instructions



Read this manual carefully before using the instrument!

Please follow the instructions and procedures described in this manual. They are designed to allow you to get the most out of your calibrator and avoid any personal injuries and/or damage to the instrument.

The screen menus shown in this manual represent the menus displayed when using a B-model.



Disposal – WEEE Directive

These calibrators contain Electrical and Electronic circuits and must be recycled or disposed of properly (in accordance with the WEEE Directive 2012/19/EU).



Warning

About the use:

- Always supply the calibrator using a power circuit which is separate from essential safety equipment and vital hospital equipment etc., to prevent fatal consequential damages from a potential electrical failure.
- The calibrator **must not** be used for any purposes other than those described in this manual, as it might cause a hazard.
- The calibrator has been designed for **indoor use only** and is not to be used in wet locations.
- The calibrator is **not to be used in hazardous areas**, where vapour or gas leaks, etc. may constitute a danger of explosion.
- The calibrator is **not** designed for operation in altitudes above 2000 meters.
- The calibrator is a CLASS I product and must be connected to a mains outlet with a protective earth connection. Ensure the ground connection of the calibrator is properly connected to the protective earth before switching on the calibrator. Always use a mains power cable with mains plug that connects to the protective earth.
- To ensure the connection to protective earth any extension cord used **must** also have a protective earth conductor.
- Only use a mains power cord with a current rating as specified by the calibrator and which is approved for the voltage and plug configuration in your area.
- Before switching on the calibrator make sure that it is set to the voltage of the mains electricity supply.
- **Always** position the calibrator to enable easy and quick disconnection of the power source (mains inlet socket).
- The calibrator **must** be kept free within an area of 20 cm on all sides and 1 metre above the calibrator due to fire hazard.
- After transport or storage in humid conditions or if the calibrator has not been heated up to minimum 100°C within the last 10 days, the instrument needs to be operated with a well temperature of at least 140°C for 2 hours before it can be assumed to meet all safety requirements of EN61010-1 (PTC^t -350/425/660 only).
- If the calibrator is wet or has been in a wet environment, do not apply power until the moisture has been removed for example by storage at 50°C in a low humidity environment for at least 4 hours.

- **Never** use heat transfer fluids such as silicone, oil, paste, etc. in the dry-block calibrators. These fluids may penetrate the calibrator and cause electrical hazard, damage or create poisonous fumes.
- The calibrator **must** be switched off before any attempt to service the instrument is made. There are no user serviceable parts inside the calibrator.
- When cleaning the well or the insertion tube, **REMEMBER** to wear goggles when using compressed air in the dry-block calibrator and cleaning oil in the liquid bath calibrator.
- Use protection shield when calibrating at high temperatures (PTC^t -660)
- The PTC^t -125 contains R-1270 and R-704 under pressure. The calibrator must **under no conditions** be stored at ambient temperatures above 50°C (122°F) or operated at ambient temperatures above 40°C (104°F). Doing so may cause a hazard.
- Remember to use appropriate protective equipment or get help when carrying the calibrator (for a longer distance) to prevent injuries from dropping the calibrator.

About the front panel:

- For B and C models only, the sockets on the input module must **NEVER** be connected to voltages exceeding 30V with reference to ground.
- Thermostats must not be connected to any other voltage sources during test.

About insertion tubes, insulation plugs, well and sensor:

- **Never** leave hot insertion tubes which have been removed from the calibrator unsupervised – they may constitute a fire hazard or personal injury.

  If you intend to store the calibrator in the optional carrying case after use, you **must** ensure that the instrument has cooled down to a temperature **below 50°C/122°F** before placing it in the carrying case.
- **Never** place a hot insertion tube in the optional carrying case.
- Use only insulation plugs supplied by AMETEK Denmark A/S.

About the fuses:

- The fuse box must not be removed from the power control switch until the mains cable has been disconnected.
- The two main fuses must have the specified current and voltage rating and be of the specified type. The use of makeshift fuses and the short-circuiting of fuse holders are prohibited and may cause a hazard.



Caution – Hot surface

This symbol is visible on the grid plate. 

- **Do not touch** the grid plate, the well or the insertion tube as the calibrator is heating up – they may be very hot and cause burns.
- **Do not touch** the tip of the sensor when it is removed from the insertion tube/well – it may be very hot and cause burns.
- **Do not touch** the handle of the calibrator during use – it may be very hot and cause burns.
- **Over 50°C/122°F**

  If the calibrator has been heated up to temperatures above 50°C/122°F, you must wait until the instrument reaches a temperature **below 50°C/122°F** before you switch it off.
- **Do not** remove the insert from the calibrator before the insert has cooled down to less than 50°C/122°F.



Caution – Cold surface

Below 0°C/32°F (applies only to the PTC^t -125/155 A/B/C models)

- **Do not** touch the well or insertion tube when these are below 0°C/32°F - they might create frostbite.
- If the calibrator has reached a temperature below 0°C/32°F, ice crystals may form on the insertion tube and on the well. This, in turn, may cause the material surfaces to oxidize.

  To prevent this from happening, the insertion tube and the well must be dried. This is done by heating up the calibrator to min. 100°C/212°F until all water left has evaporated.
  Remove the insulation plug while heating up.

  It is very important that humidity in the well and insertion tube is removed to prevent corrosion and frost expansion damages.



Caution…

About the use:

- **Do not** use the instrument if the internal fan is out of order.
- Before cleaning the calibrator, you **must** switch it off, allow it to cool down and remove all cables.
- Always place power cables and cables to attached accessories, such as sensors, in a safe way to reduce the risk of tripping.
- When transporting (carrying) the calibrator, be extra careful not to drop it on other materials, equipment, and body parts.
- Ensure that the allowed temperature range of the external sensors is not exceeded by the calibrator's temperature range. See section 4.6.1 to setup the calibrator's allowed temperature range.
- Acoustic noise emitted from the calibrator may contribute to the existing noise environment. Be aware of the total noise exposure and act accordingly to maintain a safe, healthy, and pleasant working environment.

About the well, insertion tube and sensor:

- The well and the insertion tube **must** be clean and dry before use.
- **Do not** pour any form of liquids into the well. It might damage the well or cause a hazard.
- Scratches and other damage to the insertion tubes should be avoided by storing the insertion tubes carefully when not in use.
- The insertion tube must **never** be forced into the well.

  The well could be damaged as a result, and the insertion tube may get stuck.
- **Before** using new insertion tubes for the calibration, the insertion tubes **must** be heated up to maximum temperature 350°C (662°F) / 425°C (797°F) / 660°C (1220°F) for a period of minimum 30 minutes - (PTC^t -350/660 A/B/C only).
- The insertion tube must **always** be removed from the calibrator after use.
  The humidity in the air may cause corrosion oxidation on the insertion tube inside the instrument. There is a risk that the insertion tube may get stuck if this is allowed to happen.
- If the calibrator is to be transported, the insertion tube **must** be removed from the well to avoid damage to the instrument.

Note…

The product liability **only** applies if the instrument is subject to a manufacturing defect. This liability becomes void if the user fails to follow the instructions set out in this manual or uses unauthorized spare parts.

3.0 Setting up the calibrator

3.1 Before use

The PTC^t -B-models have a precision reference input. To achieve the high precision, a set of sensor coefficients relating to the specific sensor must be present in the PTC^t. Before use of the PTC^t, ensure that the correct coefficients in the PTC^t are equal to those from the sensor's calibration certificate. This is done with the included PC software JOFRACAL. Please read how to do in the chapter "Reference Sensors" in the JOFRACAL user manual.



Warning

- The calibrator **must not** be used for any purposes other than those described in this manual, as it might cause a hazard.
- The calibrator has been designed for **indoor use only** and is not to be used in wet locations.
- The calibrator is **not to be used in hazardous areas**, where vapour or gas leaks, etc. may constitute a danger of explosion.
- The calibrator is **not** designed for operation in altitudes above 2000 meters.
- The calibrator is a CLASS I product and must be connected to a mains outlet with a protective earth connection. Ensure the ground connection of the calibrator is properly connected to the protective earth before switching on the calibrator. Always use a mains power cable with mains plug that connects to the protective earth.
- To ensure the connection to protective earth any extension cord used **must** also have a protective earth conductor.
- Only use a mains power cord with a current rating as specified by the calibrator and which is approved for the voltage and plug configuration in your area.
- Before switching on the calibrator make sure that it is set to the voltage of the mains electricity supply.
- **Always** position the calibrator to enable easy and quick disconnection of the power source (mains inlet socket).
- The calibrator **must** be kept free within an area of 20 cm on all sides and 1 metre above the calibrator due to fire hazard.
- Use protection shield when calibrating at high temperatures (PTC^t -660)
- The PTC^t -125 contains R-1270 and R-704 under pressure. The calibrator must **under no conditions** be stored at ambient temperatures above 50°C (122°F) or operated at ambient temperatures above 40°C (104°F). Doing so may cause a hazard.
- Remember to use appropriate protective equipment or get help when carrying the calibrator (for a longer distance) to prevent injuries from dropping the calibrator.

About the front panel:

- For B and C models only, the sockets on the input module must **NEVER** be connected to voltages exceeding 30V with reference to ground. Thermostats must not be connected to any other voltage sources during test.

Note…

The instrument must **not** be exposed to draughts.

3.1.1 Setting up a dry-block calibrator

Follow the instructions below before using the calibrator:

Warning

Always position the calibrator to enable easy and quick disconnection of the power source (mains inlet socket).

1. Place the calibrator on an even horizontal surface where you intend to use it.

Caution…

- **Do not** use the instrument if the internal fan is out of order.
- The well **must** be clean before use.



2. Ensure a free supply of air to the internal fan located at the bottom of the instrument (pos.②).
   The area around the calibrator should be free of draught, dirt, flammable substances, etc.
3. Check that the fuse size corresponds to the applied voltage on (pos. ③). The fuse is contained in the power control switch (on/off switch). To check; follow the procedure in the PTC^t Reference manual, 131234 section 3.1.1.
4. Check that the earth connection for the instrument is present and attach the cable.
5. Select an insertion tube with the correct bore diameter matching the sensor to be calibrated. Ensure that both the well and the insertion tube are clean. Insert the tube into the well as shown in fig 1.
6. Place the sensor under test and the reference sensors – if available in the insertion tube as shown in fig. 1

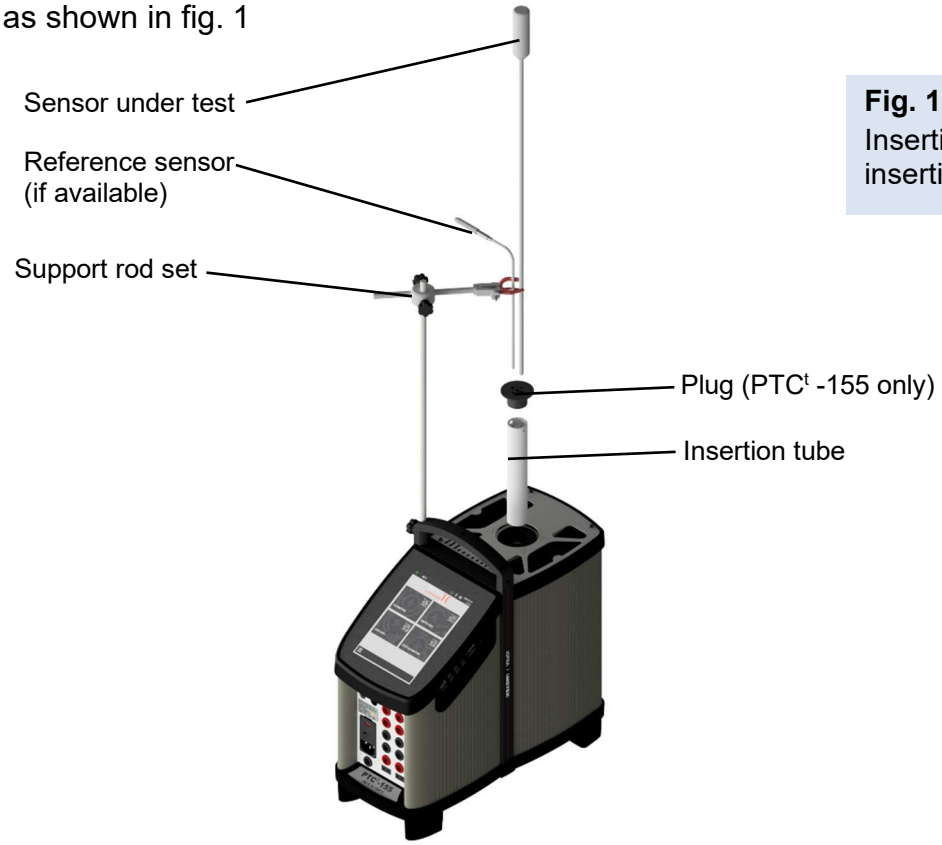


Fig. 1
Inserting sensors and insertion tube

3.2 During use



Caution – Hot surface

This symbol is visible on the grid plate. 

- **Do not touch** the grid plate, the well or the insertion tube while the calibrator is heating up – they may be very hot and cause burns.
- **Do not touch** the tip of the sensor when it is removed from the insertion tube – it may be very hot and cause burns.
- **Do not touch** the handle of the calibrator during use – it may be very hot and cause burns.
- **Do not** remove the insert from the calibrator before the insert has cooled down to less than 50°C/122°F.



Caution – Cold surface

Below 0°C/32°F (applies only to the PTC^t -125/155 A/B/C models)

- If the calibrator has reached a temperature below 0°C/32°F, ice crystals may form on the insertion tube and on the well. This, in turn, may cause the material surfaces to oxidize.

  To prevent this from happening, the insertion tube and the well must be dried. This is done by heating up the calibrator to min. 100°C/212°F until all water left has evaporated.
  Remove the insulation plug while heating up.

  It is very important that humidity in the well and insertion tube is removed to prevent corrosion and frost expansion damages.
- **Do not touch** the well or insertion tube when these are below 0°C/32°F – they might create frostbite.

3.3 External reference sensor

The following JOFRA STS Reference sensors can be used with the varies models:

PTC^t -125: STS-150 A 912
PTC^t -155: STS-150 A 915
PTC^t -350: STS-150 A 935
PTC^t -425: STS-150 A 966
PTC^t -660: STS-150 A 966

Use the configuration software CON050 supplied with PTC^t to program and to update calibration information in intelligent sensors.
For instructions read the software manual for CON050 installed on the USB key.

3.4 Symbol description

3.4.1 Status bar

STATUS indicator WARNING/ERROR symbols



The green symbol indicates that the calibrator is in a proper functional working process.



The yellow symbol indicates a warning.



The red symbol indicates an error. When the error symbol is displayed the calibration results cannot be saved.

See section 7.0 in the Reference manual 131234 for details concerning warnings and errors.

True temperature



Shows the temperature of the internal reference sensor



The freeze symbol indicates that the temperature is below 10°C/50°F.



The heat symbol indicates that the temperature has exceeded 40°C/104°F.



Do not touch the sensor or remove the insertion tube from the well - they might create frostbite / they might be very hot and cause burns.

Remote Hosts



Indicates a remote connection is active

USB indicator



Indicates an USB memory stick is connected.

Wifi indicator



Indicates active Wifi connection.

Ethernet indicator



Indicates active Ethernet connection.

Screenshot function



When pressing the Screenshot symbol you can create screenshots. Can be used throughout the operation when a USB memory stick is connected. Screenshots are saved in png-format.

Real time clock and date display



Shows the present time and date

3.4.2 Navigation bar

 Open Menu	 Next step	 Open folder/ Open file
 Go back	 Delete	 Save results on USB drive
 Start operation	 Save results	 Next page/screen
 Stop operation	 Save as	 Enter manual readings
 Pause operation	 Test results	
 Previous step	 External Reference	

3.4.3 Screen Configuration



Graph.
Shows/hides temperature graph.



Information fields.
When activated the information fields are not visible



Chanel 1 information field.
When activated the Chanel 1 information field is not visible



Chanel 2 information field.
When activated the Chanel 2 information field is not visible

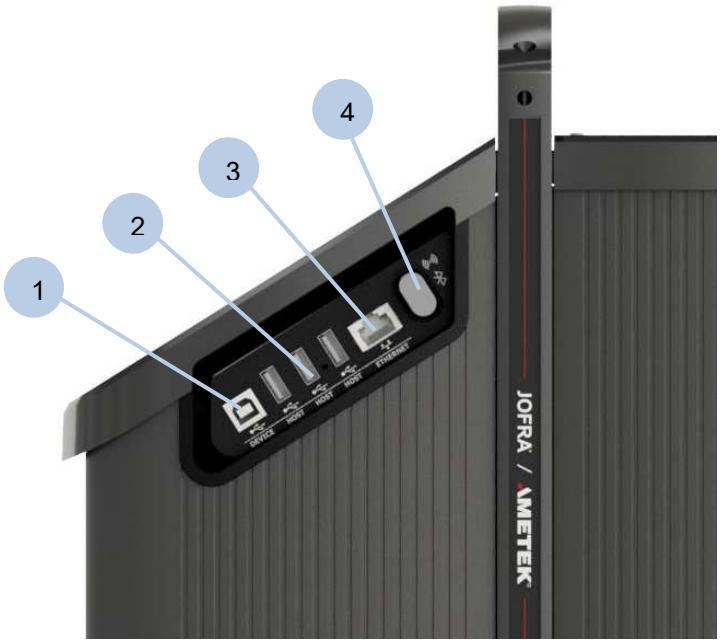
3.5 Calibration screen display

The screen gives an overview of the calibrator status and reads out the most relevant readings.



Pos.	Description
1	**Status bar**: Is always visible and informs you of the current status
2	**Screen Configuration**: The screen layout can be configurated when activated. When activated the symbols appear blue and when deactivated the symbols appear black. See section 3.4.3 for description.
3	**TRUE temperature reading**: Displays the current reading of the internal reference sensor / external reference sensor with stability indicator displaying the status of the TRUE Temperature stability and information about the selected TRUE reference sensor. If the SET follows TRUE function is activated the symbol will be displayed in this field.
4	**Channel 1 / Channel 2**: Displays the temperature measured by the SUT (Sensor Under Test) connected to CH1/CH2 with stability indicator displaying the status of the Sensor Under Test and TRUE sensor stability and information about the CH1/CH2 (type of selected sensor, measured value and stability setting).
5	**SET Temperature**: Displays the numeric value of the current SET target temperature selected.
6	**(Option) Graph indicator**: Displays the temperature or stability of TRUE, CH1 and CH2. See section 4.3.5 in the Reference manual 131234.
7	**Navigation bar**: The relevant options that can be selected at the present point are displayed in the Navigation bar. See section 3.4.2 for description. Access to the menu can be activated throughout the entire calibration. The menu can be switched on and off in all stages of operating the calibrator.

3.6 Input/Output Connections



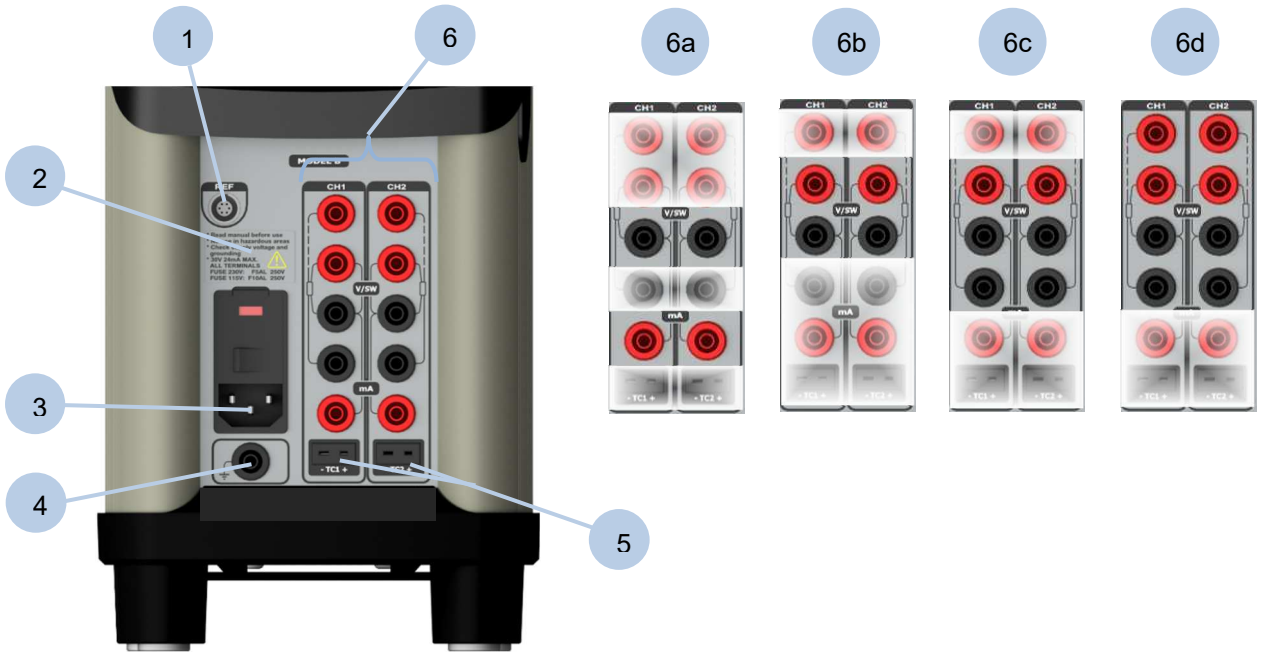
Pos.	Description
1	**Device**: USB 2.0 Device Port, 1 x USB B
2	**Host**: USB 2.0 Host Port, 3 x USB A
3	**Ethernet**: Ethernet port 10/100/1000 base-T, RJ45
4	**Wifi slot**: Connection for optional Wifi module

3.7 Input sections (B and C models only)

Warning

The input terminals must **NEVER** be connected to voltages exceeding 30V with reference to ground.

This image shows the PTC^t – B-model.



Pos.	Description
1	Input for external reference sensor (B and C models)
2	Label indicating fuse value (all models)
3	Power control switch with cable connection and on/off switch. It also contains the main fuse (all models)
4	Connection to chassis (earth/ground) (B-model)
5	TC connection for thermocouples (B-model)
6	Chanel 1 and Chanel 2 - Connection for Sensor Under Test (B-model) **Note** that this connection is for voltage free switches
6a	mA input
6b	Input for Voltage, Switch and RTD sensor (2 wire)
6c	Input for RTD sensor (3-wire)
6d	Input for RTD sensor (4 wire)

One of the inputs either pos. **5**, **6 a, b, c or d** can be selected displaying the “SENSOR” temperature in the Setup and pos. **1** can be displayed as “TRUE” temperature.

Note…

Only the sensor type, which is to be tested, should be connected to the input panel.

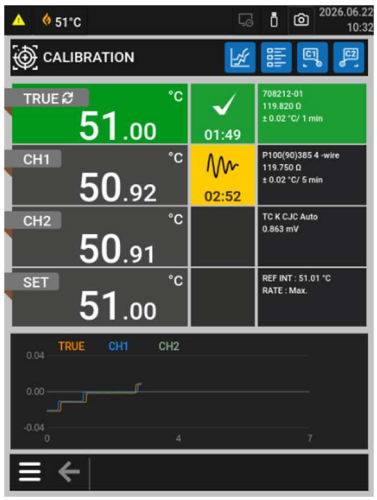
3.8 Stability of temperature values

The stability of the TRUE and SENSOR temperatures is indicated by the following messages:

-  "No check for stability": If Convert to Temperature or Use Stability Criteria is disabled in Sensor Setup, there will be no check for stability.
-  "Not stable": Indicates that the measured temperature is not yet within the specified stability criteria.
- 

Indicates "Time to stable": The temperature changes are within the specified stability criteria (see section 10.0 in the Reference manual 131234) and states a time (in minutes and seconds) when the stable situation can be achieved.
- 

Indicates that the “stable” situation is achieved and states the time (in hours, minutes and seconds) for how long the “stable” situation has been achieved.



- If External reference is selected as TRUE, the stability criteria will refer to this. The criteria can be changed, however, if the temperature stability criteria is set wider or the stability time is set shorter, the calibrator may not reach the SET temperature.
- If “Use stability criteria” is set to “Yes” for the SENSOR, the automatic calibration function will continue to next temperature step only when both TRUE and SENSOR indicate stability.

4.0 Operating the Calibrator

Warning **Caution…**

Please inspect the Safety Instructions in section 2.0 before using the instrument.

You can carry out, monitor and analyze your calibrations operating directly on the instrument or through a web browser interface from anywhere in your facility or remotely.

All the operational functions can be easily accessed through the Menu screen.

All editable fields are accessed by pressing the actual field 

When operating – no matter where you are – the “Open Menu” key and the “Back” key will always be available to you.

At some points, when operating the calibrator, some choices are not relevant and will therefore be shaded.

4.1 Starting the calibrator

Switch on the calibrator using the power control switch (pos. 3, page. 16). A start up screen is displayed and then replaced with the Welcome menu screen:



Select the function of your choice by pressing the image of the function on the screen.
For example, for calibration press the function “Calibration”.

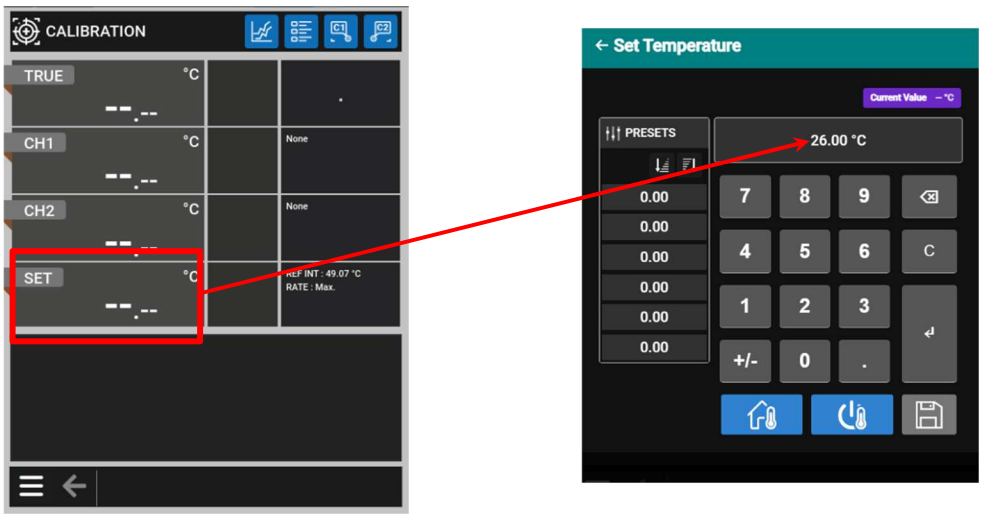
Once activated the Welcome Screen will not be displayed again, and all operational options are selected using the Menu Screen.

4.2 CALIBRATION

This function enables you to perform manual calibrations of different temperature sensors.

4.2.1 Setting the temperature

1. Press the SET field on the Calibration screen and a Set Temperature function is displayed.



2. Use the numeric keys to enter a new value or choose one of the preset values from the PRESETS list. Press ↵ to accept the value and the calibrator returns to the CALIBRATION screen.

3. Press  to start the Prepare for Storage function. When started, the calibrator will continue to the storage temperature defined in the Temperature Setup menu and switch off temperature control. If Dehumidify has been enabled, the calibrator will heat to 105°C/221°F before going to the storage temperature.

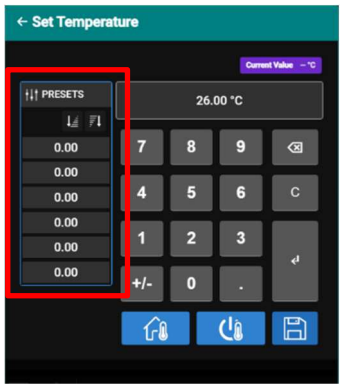
4. Press  to switch off the temperature controller. The temperature controller will remain off until a new SET-temperature is entered, or Auto Step/Switch Test/Auto Calibration is started.

   Through this Calibration screen, a new set point value can be entered at any stage of the operation **except when one of the automatic functions are active.**

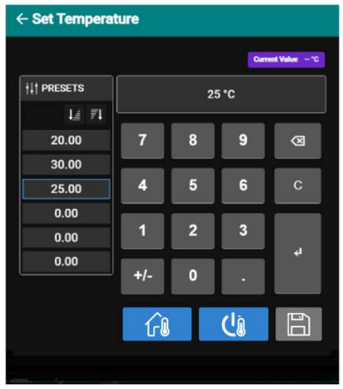
4.2.1.1 Saving the temperature as a Preset temperature

The temperature can be saved as a Preset temperature making it available through a PRESETS list for your later choice.

1. Use the numeric keys to enter a new value.
2. Press the “Save” key . The key and the box around the PRESETS list will turn blue making the PRESETS list editable for storage of the new temperature.



3. Press one of the fields in the list to store your new temperature. The  "Save" key will turn grey.
You can choose any field in the PRESETS list also the ones with already predefined temperatures. The existing predefined temperature will be replaced by the new temperature, and this is now saved for future use.



It is not possible to delete the temperatures from the PRESETS list.
You can only define up to 6 Preset temperatures.

The temperatures can be sorted on the PRESETS list placing either the lowest temperature or the highest temperature at the top of the list.

Press  for Low ➔ High.

Press  for High ➔ Low.

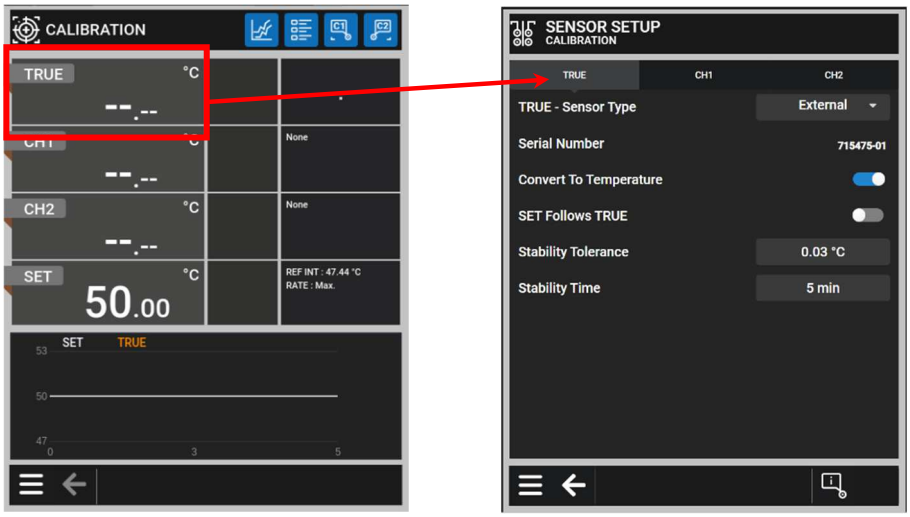
4. Press  to accept the value and the calibrator returns to the CALIBRATION screen.

4.2.2 Setting the TRUE parameters

Internal reference source.
The calibrator has a set of internal stability criteria it shall meet before stability is indicated. Additional stability time may be set beyond the internal stability criteria.

External reference source
The TRUE value on the Calibration screen will be read from the Intelligent Reference Sensor connected to the REF. INPUT on the front panel (see section 3.7, pos. 1, page 16). The calibrator automatically reads the calibration data and serial number of the Sensor.

1. Press TRUE to access the SENSOR SETUP menu. The sensor setup can also be edited immediately before running the Auto Step or the Switch Test.



2. Choose your sensor type – External or Internal – from the dropdown list.
3. **Internal** : Set the additional stability time by touching the "0 min" field and type the requested stability time using the numeric keys.

   Stability time is set (in minutes) using integers from 1 – 99.

   External : Slide the "Convert To Temperature" button to the right making the stability fields visible.

   - When activated the readout of the external reference is set as a temperature.
   - When not activated the readout of the external reference is set in Ω values.

4. The SET Follows TRUE function enables you to reach the TRUE temperature measured by the External reference sensor. Activate the function by sliding the button to the right.

Note...

that when the function is active, the calibrator will control the temperature to the TRUE temperature. This means that it could take longer time before the calibrator indicates stability.

The SET follows TRUE function is indicated with the symbol at the TRUE reading on the Calibration screen. TRUE

Note...

SET follows TRUE is only available when the External reference sensor is displayed in temperature units.

5. Set the stability tolerance and the stability time using the numeric keys.

   Stability tolerance can be set down to ±0.001°. The tolerance should be set low enough to utilize the good temperature stability of the calibrator – however a low value also gives a longer time to be stable.

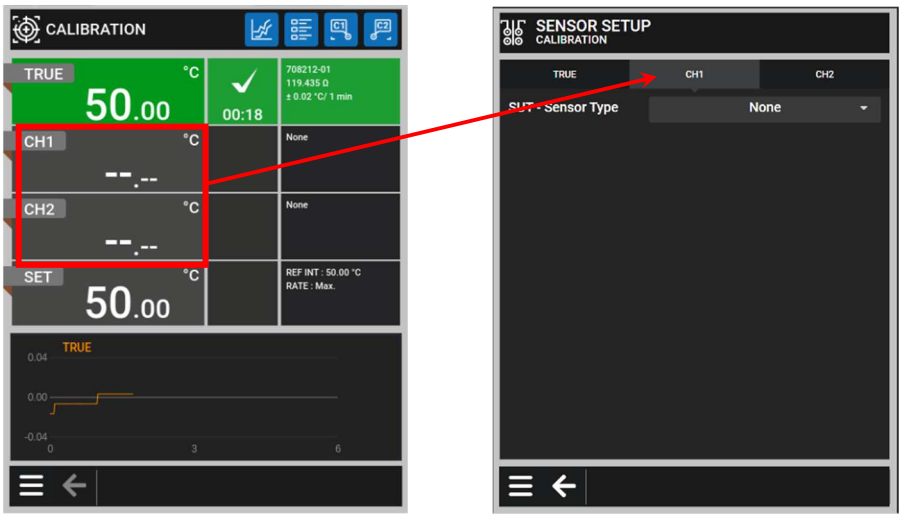
   Stability time is set (in minutes) using integers from 1 – 99.

   When the TRUE temperature has reached the specified Stability tolerance during the specified Stability time, then the stability indicator on the Calibration screen will turn green.

6. Press  “Information” in the Navigation bar to get access to a Reference Information screen showing the calibration data of the Intelligent Reference sensor.

4.2.3 Setting the CH1 and CH2 (Channel 1 and 2) parameters

1. Press CH1 or CH2 either on the CALIBRATION screen or in the SENSOR SETUP menu.



2. **SUT - Sensor type:**
   Choose between :
   - Thermocouple Sensors (μV)
   - Voltage Sensors (V)
   - Current Sensors (mA)
   - RTD Sensors (resistance temp. detector (Ω))
   - None (no sensor connected)
3. Select a sensor.

   The selected sensor and its list of parameters are now displayed. The various settings can be edited as described in the following :

4. **Convert to temperature:**
   (using thermocouple, voltage, current and RTD)
   - When activated – the inputs are converted to temperatures.
   - When not activated – no conversion is made.
     When the function is not activated the type of model is the only other parameter which can be altered.

5. **Model:**
   (using thermocouple and RTD)

   Toggle between the models; K, N, R, S, T, U, B, L, E and J (thermocouple) or P10(90)385, P100(90)385, P100(90)392, P1000(90)385, P200(90)385, P50(90)385, P500(90)385, Pt-100 MILL, P100(90)391, P50(90)391, YSI-400, H120(90)672, M100(90)428, M50(90)428-06, M100(90)428 and M50(90)428 (RTD).

6. **Cold junction compensation:**
(using thermocouple)

- "Auto" – when the automatic mode is selected, the calibrator measures the temperature in the TC connector and uses this for the cold junction compensation of the thermocouple.
- "Manual" – to define a manual temperature for cold junction compensation. Can be used when an external cold junction temperature can be established.

7. **Cold junction temperature:**
(using thermocouple)

When "Manual" Cold junction compensation has been selected, the temperature for cold junction can be set using the NUMERIC keys.

8. **Voltage (V) and temperature (T) span:**
(using voltage)

The minimum and the maximum of the voltage and the corresponding temperature span can be set here.

Use the NUMERIC keys to set the value of the voltage and/or the temperature.

9. **Current (I) and temperature (T) span:**
(using current)

The minimum and the maximum of the current and the corresponding temperature span can be set here.

Use the NUMERIC keys to set the value of the current and/or the temperature.

10. **Number of wires:**
(using RTD)

The number of wires used for the sensor under test can be selected here.

Choose between 2, 3 or 4 wires.

11. **Use stability criteria:**
(using thermocouple, voltage, current and RTD)

Beside the stability check on the Reference sensor, it is also possible to ensure that the Sensor Under Test (SUT Sensor) is stable before the temperature is indicated as stable.

- When activated – Stability will be checked on both Reference sensor (TRUE) temperature and Sensor Under Test (SUT Sensor) temperature.
- When not activated – Stability will be checked on Reference sensor (TRUE) temperature only.

12. **Stability tolerance:**
(using thermocouple, voltage, current and RTD)

Enter the Stability tolerance (temperature) by pressing the NUMERIC keys.

The Stability tolerance can be set down to ±0.001° however the expected performance of the Sensor Under Test should be considered before setting the tolerance.

13. Stability time:

(using thermocouple, voltage, current and RTD)

Set the Stability time by pressing the NUMERIC keys. Stability time can be set from 1 – 99 minutes.

When the SENSOR temperature has reached the specified Stability tolerance during the specified Stability time, then the stability indicator on the Calibration screen will turn green.

4.3 AUTO CALIBRATION

Note…
This Calibration function is for B models only.

This function enables you to perform automatic calibrations of different temperature sensors. The calibration procedure is semi-automatic, using parameters and settings, which are defined in workorders. These workorders are created and edited using the "JOFRACAL" PC program. Multiple calibrations can be performed using the same workorder settings.

1. Access the AUTO CALIBRATION menu from the Menu screen.



A Workorder List is displayed.

2. Choose a workorder and run the selected workorder by pressing “Start” . A new calibration is started.

   You can also choose to activate:

   - (View) – shows the setting of the workorder.
   - (Results) - shows the previous calibration results from this workorder.
   - (Delete) - deletes the workorder setting and the results.

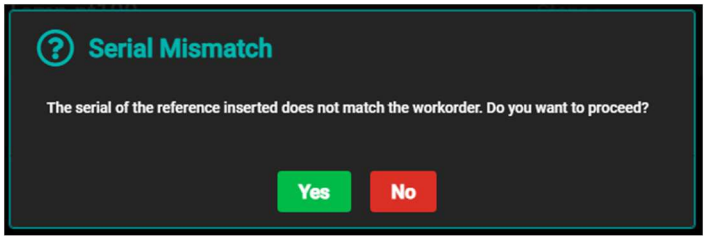
   For operating the Results menu see section 4.3.3.
   For operating the View menu see section 4.3.4.
   For operating the Delete function see section 4.3.5.

Note…
Calibration information is available in several places throughout the calibration menus. The content of this information is described in section 4.3.4.

4.3.1 Running a calibration

1. To run the calibration, press  “Start” .

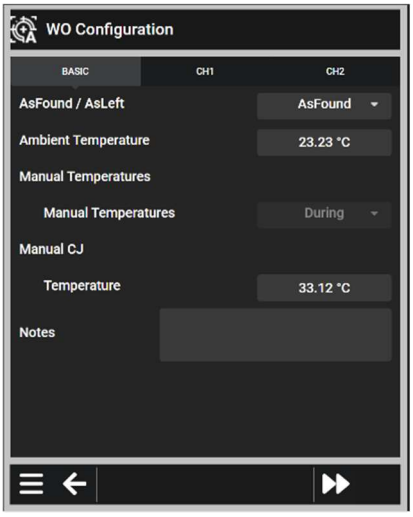
   If the serial number of the reference sensor used for calibration does not match the one specified in the workorder the following message is displayed :



   If you proceed, the connected reference sensor will be documented along with the results.

   If you do not wish this message to appear, the correct reference sensor must be specified when the workorder is edited using the “JOFRACAL” PC program.

2. Press Yes and the Work Order Configuration setup menu is displayed.



   Before the actual calibration begins several BASIC, CH1 and CH2 parameters are available for editing:

   BASIC:

   - **As Found/As Left** - choose between calibration As Found or As Left
   - **Ambient Temperature** - set/edit the Ambient Temperature.
   - **Manual Temperatures** – choose between Manual Temperatures After and During calibration
   - **Manual CJ (Cold Junction)** - The temperature for Cold Junction can be set manually using the NUMERIC keys.

   CH1/CH2:

   - **ID** – identification of the SUT sensor connected under test.
   - **Serial No** - the serial number of the sensor can be edited.
   - **LOC 1 – LOC 3** - use the NUMERIC keys to type in your choice of wording necessary to explain where your sensors are located in your facility.

Note…

If the sensor under test is a thermocouple sensor and the manual compensation mode is selected in work orders, a cold junction temperature must be defined.

Note…

The BACK key cancels a selection/edit and returns to the previous menu.

3. Press “Next page” to proceed with the operation.

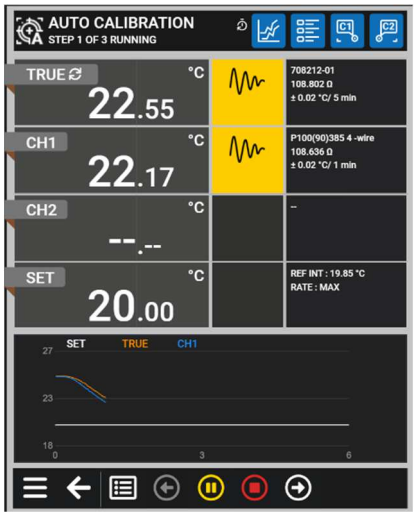


A Connection Guide is displayed, giving a graphical display of the setup and sensor connections.

4. Start the calibration by pressing “Start”.

5. The Calibration Running step 1 of 2 is started and the temperature is heading towards step 1.

   The following screen is displayed :



6. When the temperature has reached the stable criteria, the calibration data will be stored, and the temperature goes towards the next set temperature.

Note…

The calibration can be stopped at any time by pressing “Stop”, but this will erase the calibration results.

During calibration several other functions are available:

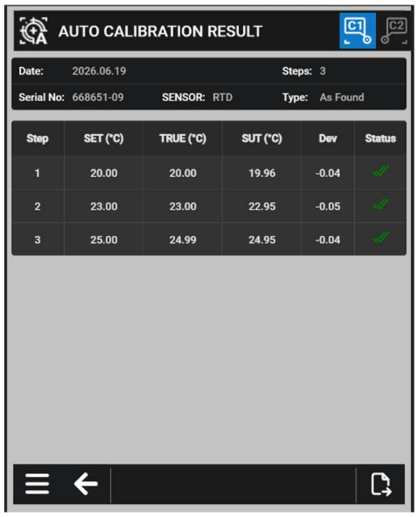
- (Results) - To view the calibration results (no editing is possible).
- (Pause) - To pause the calibration.
- (Prev) - Force the calibration to jump a step backwards to the previous calibration screen regardless of the calibration stability.
- (Next) - Force the calibration to jump a step forward to the next calibration screen regardless of the calibration stability. This will leave the current step without saving calibration results

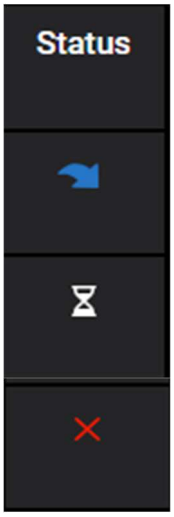
7. When the calibration has completed a green check ✓ is shown on the screen and the Calibration Result follows quickly hereafter.
8. Press “Results” to access the AUTO CALIBRATION RESULT screen.

   If the calibration has been forced to jump a step forward a blue arrow will be displayed in the Status column.

   If the calibration is still in progress an hourglass will be displayed in the Status column.

   If the calibration is out of tolerance a read cross will be displayed in the Status column.





Indicates that the result for CH1 is displayed.

9. Press to display the result for CH2.
10. Press “Save” to store the results in the calibrator

    or

11. press “Delete” and press “Yes” to delete the calibration results or “No” to return to the AUTO CALIBRATION RESULT screen.

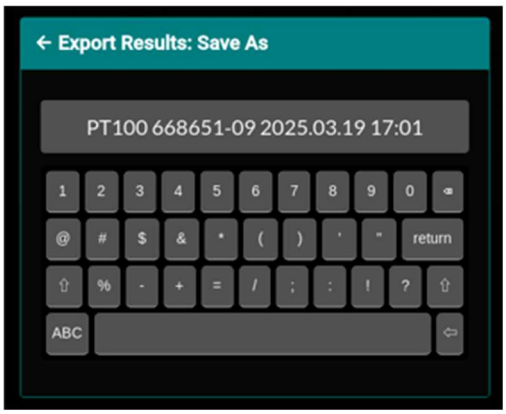
    A full Auto Calibration Result List can be viewed using the instructions in section 4.3.3

4.3.2 Saving calibration results

It is possible to export Auto Calibration results in csv-format to a USB-memory stick.

It is possible to use the export function immediately after the Auto Calibration is completed and the result is saved if the result has not been deleted from the calibrator memory.

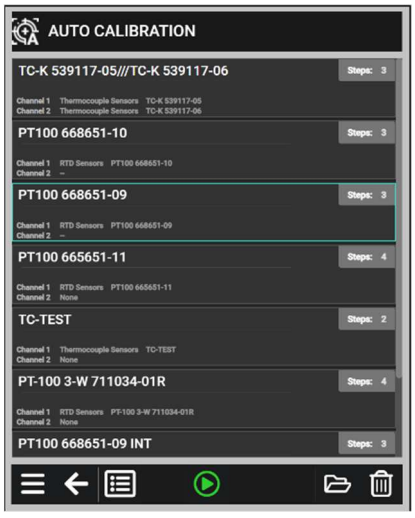
1. To export immediately after the Auto Calibration is completed, press  .
2. Insert a USB memory stick and press .
3. It is now possible to enter the filename.



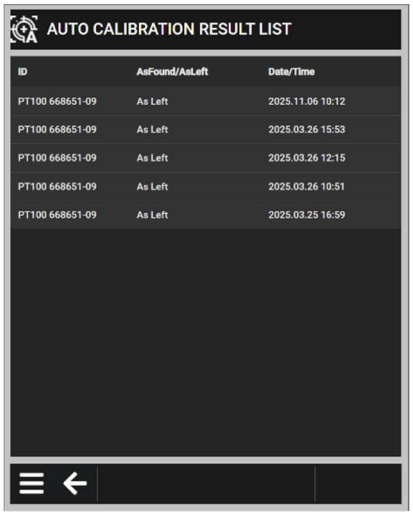
To export the result later, see Section 4.3.3 - Viewing calibration results.

4.3.3 Viewing calibration results

1. Select one of the Auto Calibrations available.

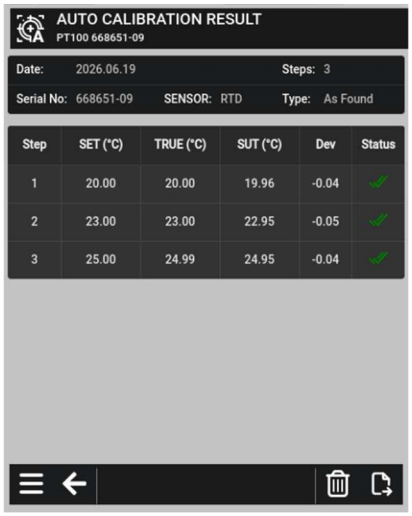


2. Access the AUTO CALIBRATION RESULT LIST by pressing  “Results” on the AUTO CALIBRATION screen.



A full Auto Calibration Result List is displayed.

3. Select a workorder to be displayed showing the calibration details for the specific workorder.



The calibration results can be uploaded with the “JOFRACAL” PC program. This enables you to print out the results on a certificate.

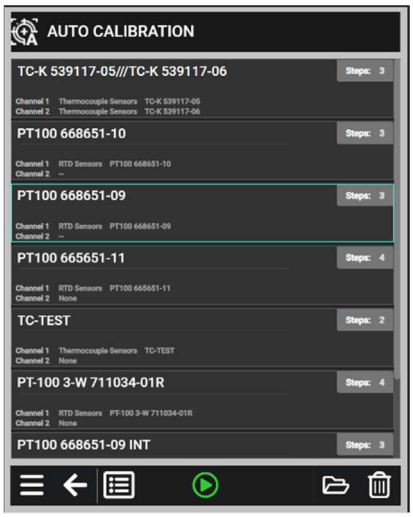
4. Press  “Export” if you wish to save the results on a USB drive.

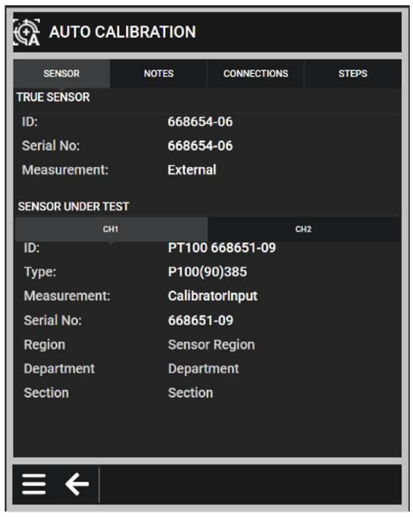
5. Press  “Back” to exit the AUTO CALIBRATION RESULT LIST and return to the AUTO CALIBRATION screen. Press  “Back” again to return to the CALIBRATION screen.

4.3.4 Displaying calibration information

Calibration information is defined within the workorders created on the PC using "JOFRACAL".

1. Choose a workorder from the AUTO CALIBRATION menu and press “Open ” to access the workorder info menu.

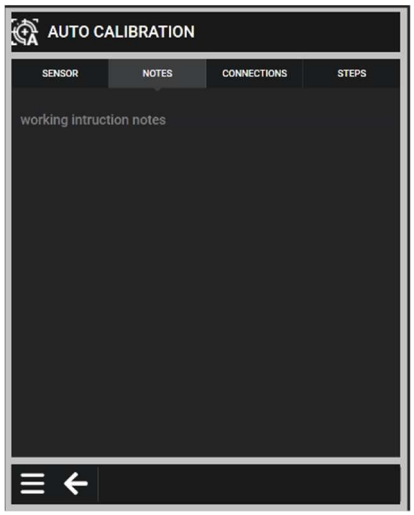




An AUTO CALIBRATION screen showing the workorder sensor setup is displayed.

This screen gives you an overview of the workorder sensor setup including a summary of Notes, Scenario and Steps. Each of these can be displayed in detail.

2. Press “NOTES” to access the NOTES function.



A list of working instruction notes is displayed.

The notes are information entered via the PC program, when the workorder is created.

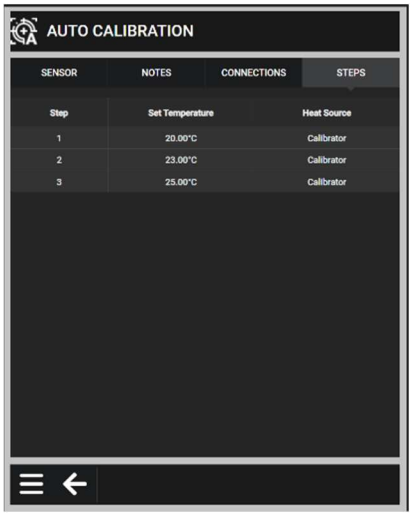
3. Press “CONNECTIONS” to access the CONNECTION GUIDE function.



A workorder connection is displayed.

The calibration set up is shown in a graphic format, and the active sensor input is marked. The parameters for this setup are defined in the work order created using the PC program.

4. Press “STEPS” to access the STEPS function.



A list of Temperature Steps is displayed.

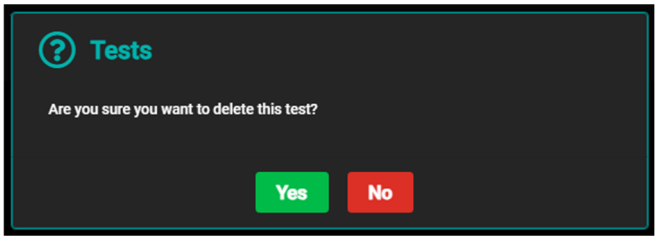
This function shows the pre-defined temperature steps for the calibration.

5. Press  “Back” to exit the STEPS function and return to the AUTO CALIBRATION screen.

4.3.5 Deleting workorders

It is possible to delete a workorder using the Delete function from the AUTO CALIBRATION screen.

1. Press  “Delete” to delete the test.



2. Press “Yes” if you want to delete your workorders and “No” if you want to exit the Delete function without deleting anything.



Warning

If you choose to delete a workorder, the whole workorder including the calibration results will be deleted.

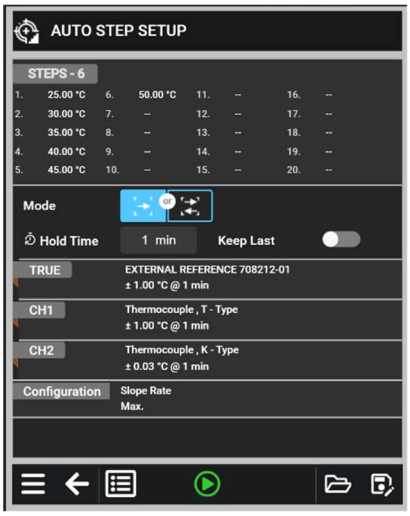
3. Press  “Back” or  “Menu” to exit the AUTO CALIBRATION function.

4.4 AUTO STEP SETUP

Auto step is used to step automatically between a range of different calibration temperatures. This is useful when calibrating sensors in places that are difficult to reach and sensors where the output is displayed in a different location.

4.4.1 Running an Auto Step Calibration

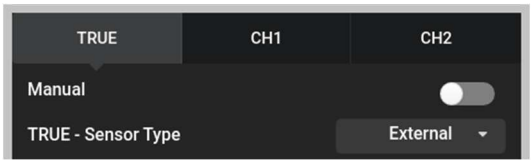
1. Access the AUTO STEP SETUP menu from the Menu screen.



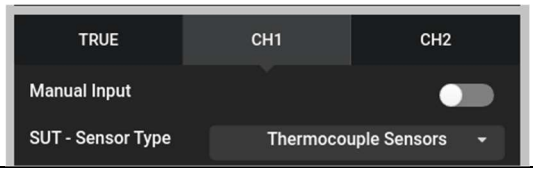
The AUTO STEP SETUP menu is displayed.

2. Access the AUTO STEP SETUP parameters to edit:

- **No of steps** - the number of temperature steps per direction (T_1➔T_x) can be set using integers from 1 – 20. When a Two-way mode is selected, the same number of steps are used for the second direction (T_x➔T_1).
- **Mode** - toggle between “One-way”  and “Two-way”  .
- **HOLD time** - defines the time (in minutes) the temperature is maintained (after it is stable) for each step.
- **Keep Last** – if activated the calibrator will maintain the temperatures last step. If disabled, the calibrator will proceed to Storage Temperature when the Auto Step is completed.
- **TRUE** - the TRUE setup menu is displayed. In this menu you have the opportunity to check and if necessary, change the settings as described in section 4.2.2 – Setting the TRUE parameters. When running Auto Step, Manual input of TRUE temperature can be selected.



- **CH 1/CH2** - the CH1/CH2 setup menu is displayed. In this menu you have the opportunity to check and if necessary, change the settings as described in section 4.2.3 – Setting the CH1 and CH2 (Channel 1 and 2) parameters. When running Auto Step, Manual input of temperature can be selected for CH1 and CH2.

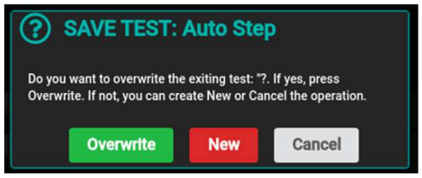


- **Configuration** - access the TEMPERATURE SETUP menu to edit the TEMPERATURE parameters and/or configurate the Silent Mode, the Max Speed and the Slope Rate.
- **Manual Temperatures** – If TRUE, CH1 or CH2 is set to Manual, it can be selected to enter results for each step during the calibration “During” or results for all steps when the calibration is completed “After”.





3. If you wish to save the Auto Step Setup, press the “Save as” key in the Navigation bar. If the Auto Step Setup is modified from previously saved setup, you will have the option to overwrite or create new.



4. Press “Open” to view/open saved Auto Step Setup’s.

5. When the parameters have been set press to start the AUTO STEP Calibration, and a CONNECTION screen is displayed showing the active sensor input marked.



6. Press to start the actual Auto Step calibration.



An AUTO STEP RUNNING step screen is displayed.

7. While the step test is in progress, the TRUE, CH1, CH2 and Configuration Setups are available for Read Only.

   In the Navigation Bar the following functions are available. Press :

    to review the AUTO STEP RESULT (no editing is possible).

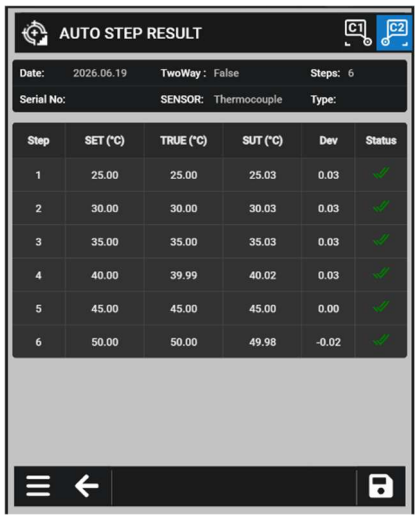
    to stop the Auto Step test.

    to pause the test. The test will not continue to next running step.

    to force the test to jump a step backwards to the previous running step regardless of the step's stability.

    to force the test to jump a step forward to the next running step regardless of the step's stability.

   When the Auto Step test is complete the results are displayed.



 Indicates that the result for CH1 is displayed.

8. Press  to display the result for CH2.

9. Press  "Save" to save the results storing them in the calibrator's memory.

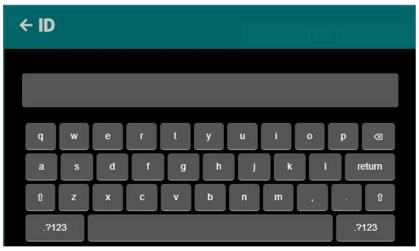
A SAVE: AUTO STEP RESULT setup menu is displayed.



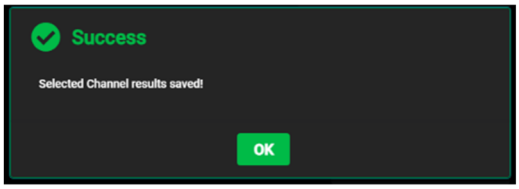
The following parameters are available for editing:

- **ID** – identification of the SUT sensor connected under test.
- **Serial No** - the serial number of the sensor can be edited.
- **LOC 1 – LOC 3** - use the NUMERIC keys to type in your choice of wording necessary to explain where your sensors are located in your facility.
- **Operator** – identification of the person operating the instrument.
- **Ambient Temperature** - set/edit the Ambient Temperature.
- **As Found/As Left** - choose between calibration As Found or As Left.

10. Press the grey fields in the setup and use the numeric keys to enter a value of your own choice.



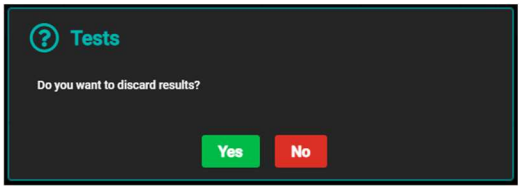
11. Press  "Save" and a check-box is displayed confirming that the results are saved.



12. When pressing "OK" you return to the AUTO STEP RESULT screen.

For external saving, connect a USB drive to the calibrator and press  "Export" to save the results on the USB drive.

13. Press  "Delete" to delete the results from the screen.



The calibrator then returns to the AUTO STEP SETUP menu.

Note…

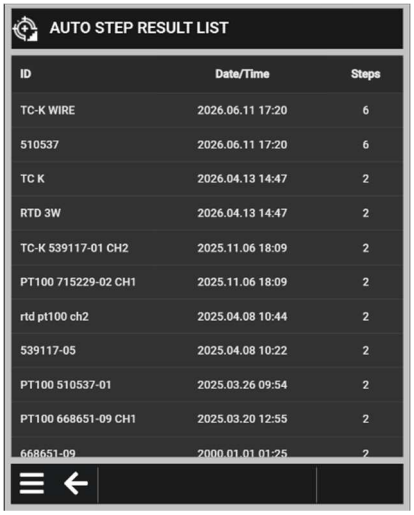
The BACK key returns you to previous the menu. The BACK key can be used throughout the process.

4.4.2 AUTO STEP test results

At the end of an Auto Step test the results are displayed and stored in the calibrators memory. The measured TRUE and SENSOR temperatures for each step are displayed.

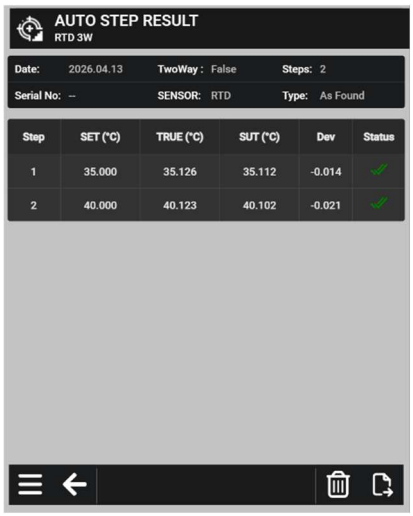
To view stored AUTO STEP test results

1. Access the AUTO STEP RESULT LIST by pressing "Results" in the Navigation Bar on the AUTO STEP SETUP screen.



The AUTO STEP RESULT LIST is displayed.

2. Select an Auto Step Result to be displayed by pressing on the line of the job.



3. Press "Back" twice to return to the AUTO STEP SETUP menu.

The memory can hold 50 Auto Step Results.

4.5 SWITCH TEST SETUP

Note…

This SWITCH TEST function is for B models only.

Switch Test automatically locates the switch temperatures of a thermostat.

Three parameters are required:

- Start temperature (T_1)
- End temperature (T_2)
- Rate of change in temperature (slope rate).

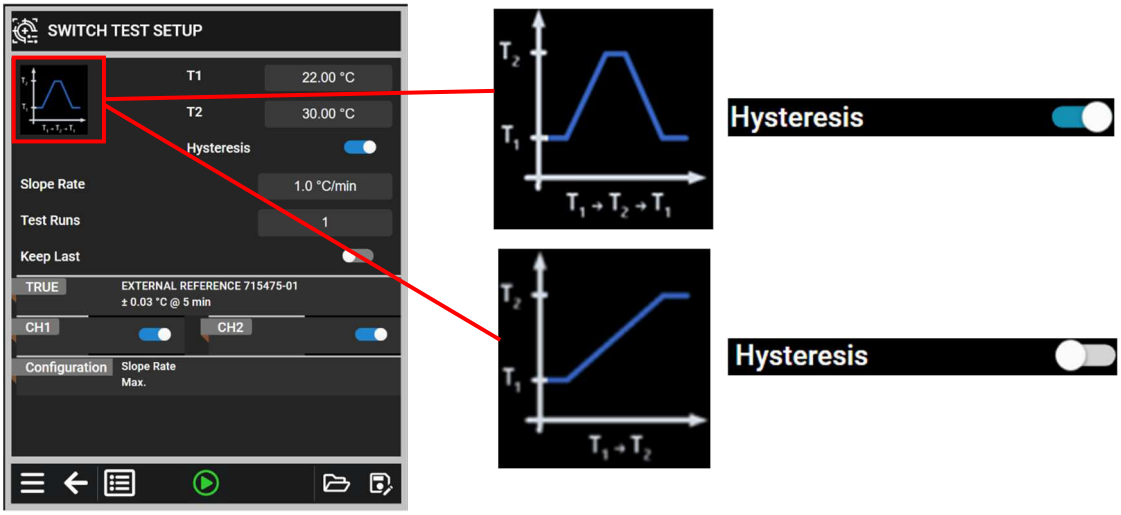
Hysteresis of a thermostat can also be determined here. Where the hysteresis determines the tolerance between the upper switch temperature and the lower switch temperature of the thermostat.

4.5.1 Running a Switch Test

Note…

Temperature range is limited by Min. SET Temp. and Max. SET Temp. settings are editable in the TEMPERATURE SETUP menu (see section 4.6) and by the temperature range of the external reference sensor, if connected.

Access the SWITCH TEST SETUP menu from the Menu screen.



1. A SWITCH TEST SETUP menu is displayed.

   The small graph illustrates the current T_1, T_2 and hysteresis selections. Note that T_1 can be greater than T_2.

2. Access the setup fields to edit the parameters:
   - **T1** - first set temperature
   - **T2** - second set temperature
   - **Hysteresis** - to determine hysteresis, slide the Hysteresis button to the right activating the Hysteresis parameter. When activated a two-way-temperature measurement is set and when not activated a one-way-temperature measurement is set.

- **Slope rate** – sets the slope rate used between T1 and T2. The permitted range is 0.1 - 9.9°C/min. / 0.2 - 17.8°F/min.
- **Test Runs** – can be set from 1 to 5 making it possible to run the test more than once.
- **Keep Last** – if activated the calibrator will maintain the temperatures last step. If disabled, the calibrator will proceed to Storage Temperature when the Switch Test is completed.
- **TRUE** - the TRUE setup menu is displayed. In this menu you have the opportunity to check and if necessary, change the settings as described in section 4.2.2 – Setting the TRUE parameters.
- **CH 1/CH2** - the CH1/CH2 can be enabled or disabled by sliding the buttons to the right activating the CH1/CH2. When activated the CH1/CH2 are enabled. When not activated the CH1/CH2 are disabled.
- **Configuration** - access the TEMPERATURE SETUP menu section 4.6 to edit the TEMPERATURE parameters.

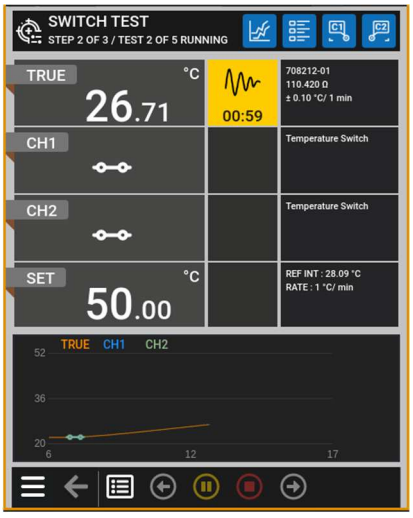
Note...

the slope rate should be set so that the thermostat sensor can follow the temperature in the calibrator's well.

3. When the parameters have been set press to start the Switch Test and a CONNECTION screen is displayed showing the active sensor input marked.



4. Press to start the actual Switch Test.



A SWITCH TEST RUNNING step screen is displayed.

5. While the Step Test is in progress, the TRUE, CH1, CH2 and Configuration Setups are available for Read Only.

   In the Navigation Bar the following functions are available. Press :

    to review the SWITCH TEST STEP RESULT (no editing is possible).

    to stop the Switch Test.

    to pause the test. The test will not continue to next running step.

    to force the test to jump a step backwards to the previous running step ‘regardless of the step’s stability.

    to force the test to jump a step forward to the next running step regardless of the step’s stability.

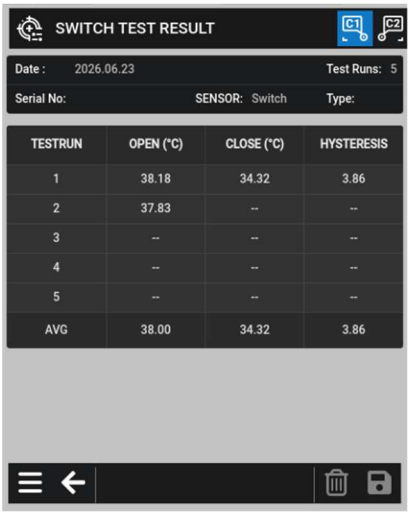
4.5.2 Showing Switch Test Results

Two types of Switch Test Results are available:

- Results during a switch test.
- Results of a finished switch test.

Results during a switch test

1. Access the SWITCH TEST RESULT list by pressing  “Result ” from the SWITCH TEST Navigation bar.

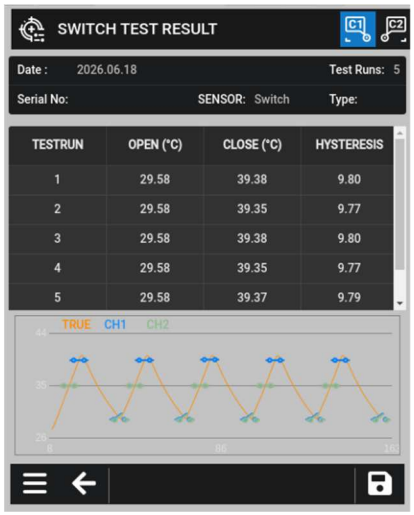


2. This shows the results that are currently available. These results change as the test progresses.

   Press  “Back” to return to the switch test.

Finished Switch Test Results

At the end of a switch test the results are displayed. These show the temperature when the thermostat has closed and the temperature when it has opened – whichever comes first. The difference between these 2 temperatures is calculated as the hysteresis.



1. Press  “Save” to save the results storing them in the calibrator’s memory.

Note...

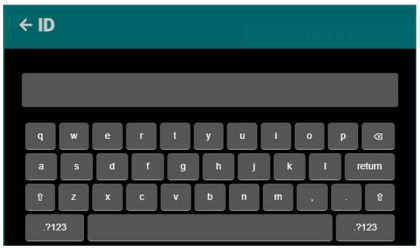
A hysteresis result is only measured when hysteresis is set to “Yes”.

A SAVE: SWITCH TEST RESULT setup menu is displayed.

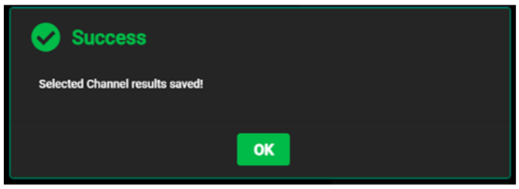


2. The following parameters are available for editing:
   - **ID** – identification of the SUT sensor connected under test.
   - **Serial No** - the serial number of the sensor can be edited.
   - **LOC 1 – LOC 3** - use the keys to type in your choice of wording necessary to explain where your sensors are located in your facility.
   - **Operator** – identification of the person operating the instrument.
   - **Ambient Temperature** - set/edit the Ambient Temperature.
   - **As Found/As Left** - choose between calibration As Found or As Left.

3. Press the grey fields in the setup and use the numeric keys to enter a value of your own choice.



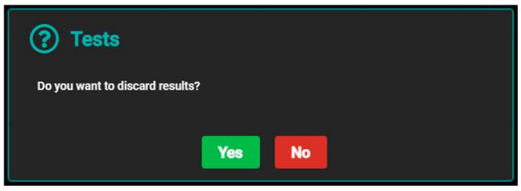
4. Press “Save” and a check-box is displayed confirming that the results are saved.



5. When pressing “OK” you return to the SWITCH TEST RESULT screen.

   For external saving, connect a USB drive to the calibrator and press “Export” to save the results on the USB drive.

6. Press “Delete” to delete the results from the screen.



The calibrator then returns to the SWITCH TEST SETUP menu.

Note…

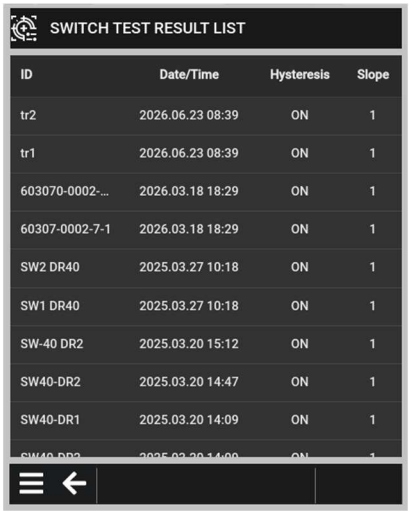
The BACK key returns you to previous the menu. The BACK key can be used throughout the process.

If no change in the switch position is registered during the test, the test will stop and show the Switch Test Result screen.

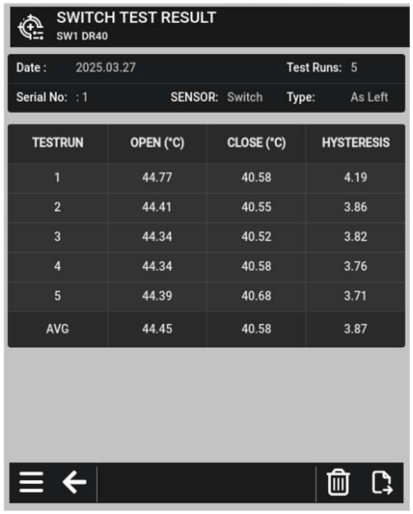
7. Delete the result by pressing “Delete” or save the result by pressing “Save”.

To view stored Switch Test Results

1. Access the Switch Test Result List by pressing “Result” from the Switch Test Setup menu.



2. Select a test result to be displayed.

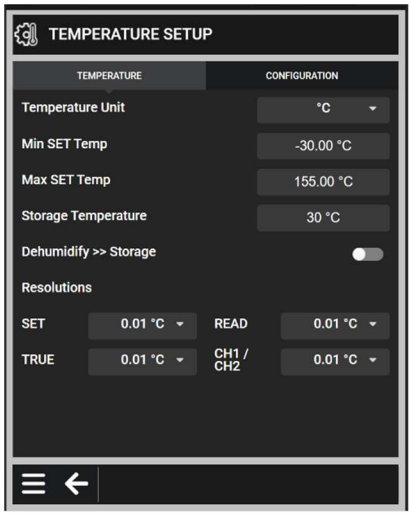


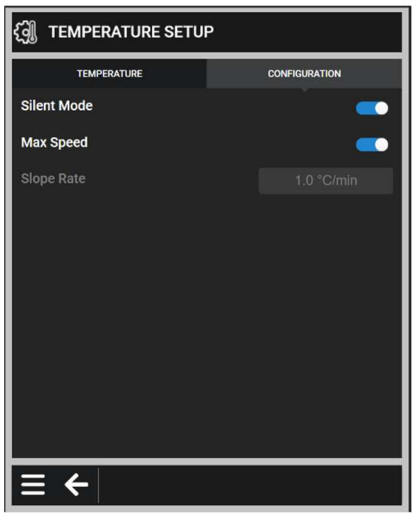
3. Press  twice to return to the Switch Test Setup menu.

   The memory can hold 50 SwitchTest Results.

4.6 TEMPERATURE CONFIGURATION menu

1. Access the TEMPERATURE CONFIGURATION menu from the Menu screen.





A TEMPERATURE SETUP menu is displayed.

The TEMPERATURE SETUP can also be accessed when working with AUTO STEP and SWITCH TEST.

You can choose between TEMPERATURE parameters and CONFIGURATION parameters.

4.6.1 Setting the Temperature parameters

1. **Temperature unit:**

   Choose between:

   - °C (Celsius)
   - °F (Fahrenheit)
   - K (Kelvin)

2. **Min SET Temp / Max SET Temp:**

   Use the NUMERIC keys to set the Min/Max SET temperature in Celsius, Fahrenheit or Kelvin.

3. **Storage Temperature:**

   Use the NUMERIC keys to set the Storage Temperature in Celsius, Fahrenheit or Kelvin.

4. **Dehumidify >> Storage:**

   Slide the button to the right to activate the Dehumidify >> Storage function.

   - When activated the Prepare for Storage function will heat to 105°C/221°F before proceeding to storage temperature.
   - When not activated the Prepare for Storage will go directly to storage temperature.

4.6.2 Setting the Temperature Resolutions

1. Choose between:
   - SET
   - READ
   - TRUE
   - CH1/CH2

2. Choose between the resolutions:
   - 1
   - 0.1
   - 0.01

4.6.3 Setting the Configuration parameters (noise, speed)

1. **Silent Mode:**

   Slide the button to the right to activate the Silent Mode.

   - When activated the fan operates in a silent mode reducing the noise. Using this option the cooling process is working at a reduced speed.
   - When not activated the fan operates in a fast mode giving the best performance of cooling.

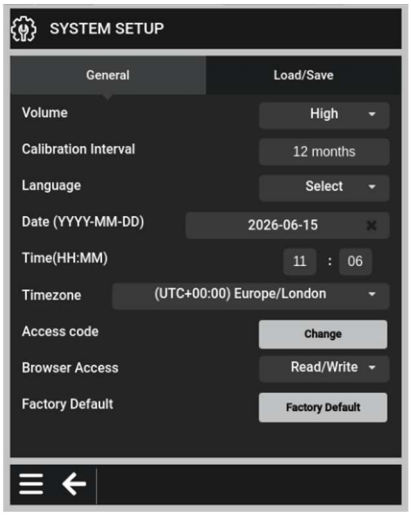
2. **Max Speed:**

   Slide the button to the right to activate the Max Speed.

   - When activated the calibrator will heat/cool at fastest speed and Slope Rate will be in Read Only mode.
   - When not activated the calibrator will heat/cool with the rate defined by Slope Rate. Slope Rate can be edited using the NUMERIC keys.

4.7 SYSTEM SETUP menu

1. Access the SYSTEM SETUP menu from the Menu screen.



A SYSTEM SETUP menu is displayed.

4.7.1 Setting the Volume, Calibration Interval and Language parameters

1. **Volume:**

   The volume of the sound can be adjusted choosing between:

   - Off
   - Low
   - Medium
   - High

2. **Calibration Interval:**

   Set the required recalibration interval for the calibrator using the NUMERIC keys. Choose a value between 1 month and 999 months.

   When the recalibration interval is exceeded, a warning will be displayed at Power on and the warning symbol will appear on the screen.

Note...

The recalibration interval is not used for the external reference sensor. The interval for these sensors is stored in the intelligent sensor.

3. **Selecting a language:**

   Select the required language from the list of installed languages (depends on region).

   When selected the calibrator will restart with the selected language.

4.7.2 Setting the Date, Time and Time zone parameters

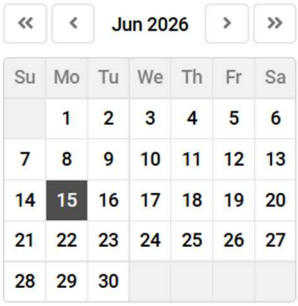
Date:

The calibrator is set up with a default date (present date).

1. Change the date by pressing the Date field on the screen 

and a calendar appears.

2. Choose a date from the calendar. When selected the date will appear in the date field.





3. When restarting the calibrator, the present date will be the default date.
The date can be deleted by pressing the ✖ in the date field.

Time:

The calibrator is set up with a default time (present time).

4. Change the time by pressing the Hour and Minute fields on the screen 

Use the NUMERIC keys to type in the new time.

Time zone:

5. Select the relevant time zone from a list of various zones by pressing the Time zone field 

When restarting the calibrator, the selected time zone will be the default time zone.

When connected to the network through ethernet or Wi-Fi, date and time will be synchronized.

4.7.3 Setting the Access Code

1. The following features can be protected by an access code:
   - Resetting the calibrator to Factory default settings
   - Setting the Min/Max SET Temperature
   - Setting calibration interval
   - Editing the Access Code while it is enabled

2. To set an access code, press the Change field on the screen 

3. Use the NUMERIC keys to type in a value from 0000 to 9999. Use all 4 digits.
Typing 000 disables the Access Code function.
When the access code is accepted a green check  will be visible for a few seconds allowing you to continue.

Note...

If you choose to let your access code consist of only 1, 2 or 3 digits you must enter the access code with 0 followed by the chosen value to get the requested 4 digits.

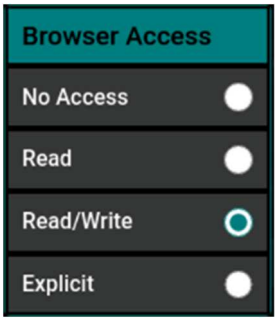
The access code can be deleted allowing you to change the Min/Max SET temperature without having to enter the access code.

1. Use the NUMERIC keys to type in your access code.
2. Delete the access code. No new value is typed.
3. Accept the new empty setting.
   It is now possible to access the editor without using the access code.

4.7.4 Setting the Browser Access

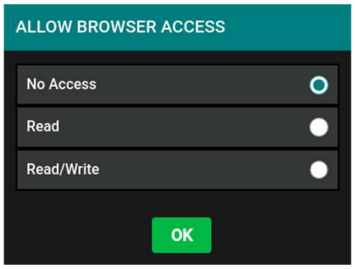
The Browser Access can only be used operating directly from the calibrator and is controlling remote access to the calibrator. It is not possible to access this function when working remote.

1. Access the Browser Access by pressing the setting field on the screen.



   A Browser Access list is displayed.

2. Choose between :
   - **No Access** – Remote operation is not allowed.
   - **Read** – Remote read only access is allowed.
   - **Read/Write** – Remote operation is allowed. The remote host can access parameters and change them.
   - **Explicit** – Access privileges can be granted to remote hosts by the user of the calibrator whilst operating the calibrator. See section 4.8.6 for Remote Access Privileges



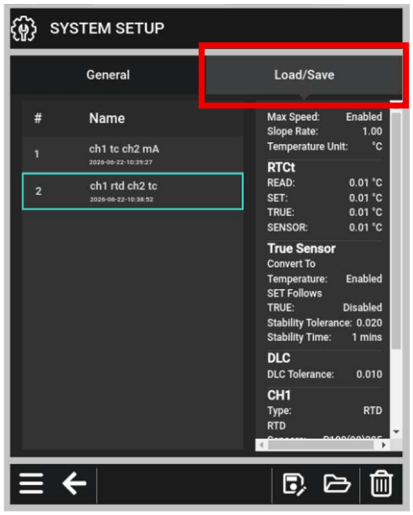
4.7.5 Setting the Factory Default

Selecting the “Factory Default” will change the active setup to the initial settings.

4.7.6 Load/Save settings

Calibrator configuration can be saved and restored from the SYSTEM SETUP menu.

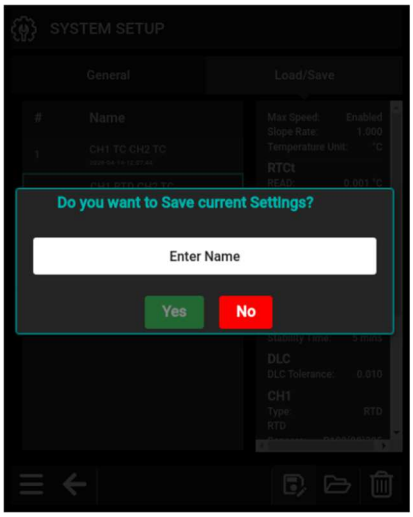
1. Select “Load/Save” on the screen.
   The Load/Save tab lists all previously stored calibrator configurations. If no calibrator configurations have been stored, the list is empty.

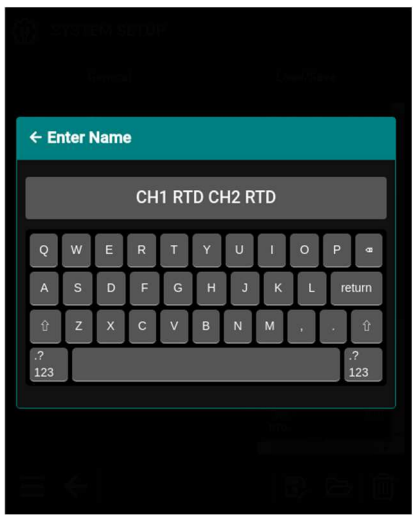


Save Settings

1. To save the current calibrator settings, press  “Save as”.
   A confirmation popup requests a name to store the settings under.

2. Press the text box and use the on-screen keyboard to enter the name followed by pressing ‘return’.

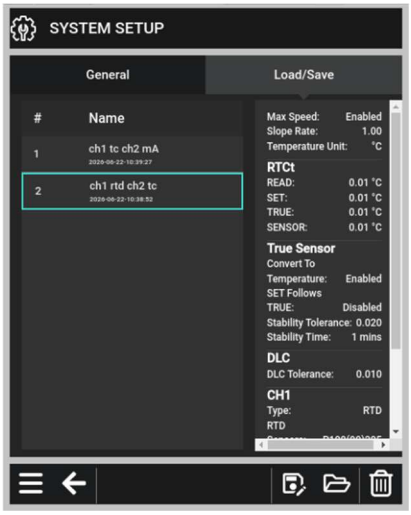




3. Press Yes to store the calibrator configuration, or No to cancel.
   The stored configuration will be displayed in the list.

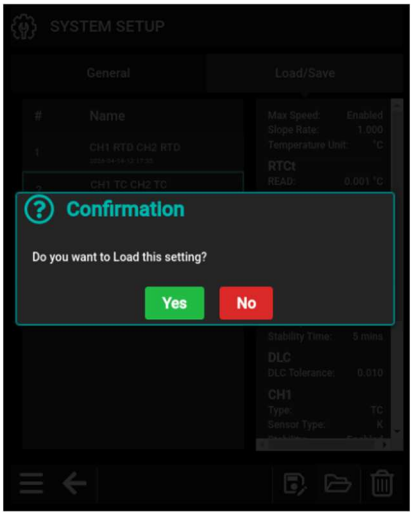
Load Settings

1. To load a previously stored calibrator configuration, select the relevant line in the list. The configuration details will be displayed to the right of the list.



Scroll down to read all details.

2. Press  “Open folder/Open file” and a confirmation popup is displayed



3. Press Yes to load the selected configuration, or No to cancel.

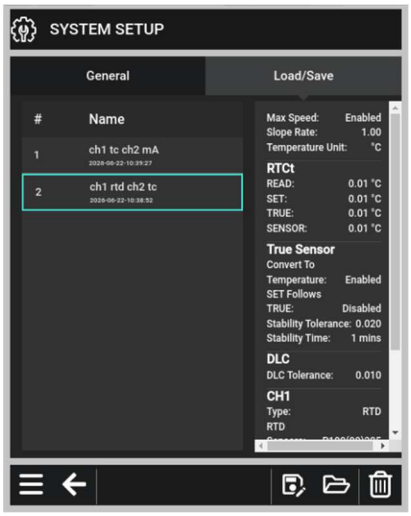


Note…

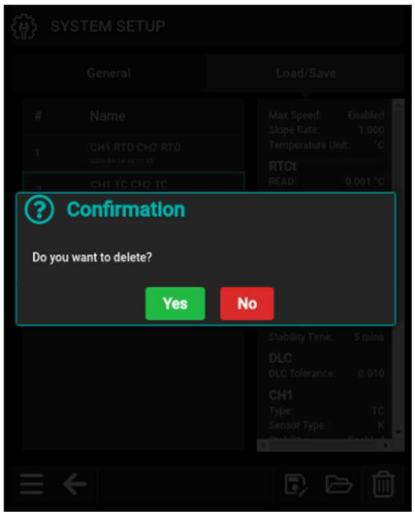
Loading a previously stored calibrator configuration overwrites the current calibrator configuration and cannot be undone! Store current configuration before loading previously stored configuration if needed.

Delete stored Settings

1. To delete a previously stored calibrator configuration, select the relevant line in the list. The configuration details will be displayed to the right of the list.



2. Press  “Delete” and a confirmation popup is displayed



3. Press **Yes** to delete the selected configuration, or **No** to cancel.

Note...
Deleting stored calibrator configurations cannot be undone.

4.8 COMMUNICATION SETUP

1. Access the COMMUNICATION SETUP menu from the Menu screen.



The COMMUNICATION SETUP menu is displayed.

4.8.1 Setting LAN

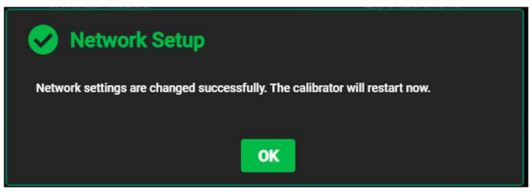
The LAN and WLAN are set up in DHCP (Dynamic Host Configuration Protocol) mode as default.

1. Slide the DHCP button to the left to get editable access to the LAN parameters:
   - **IP Address**
   - **Subnet Mask**
   - **Default Gateway**
   - **MAC Address**
2. You can configure the LAN-settings manually using the NUMERIC keys

   When editing the IP Address, the Subnet Mask and the Default Gateway you need to type in 4 sets of digits with a full stop between them using digits from 0 to 255.



3. When the DHCP button is in active mode, the IP address will be updated when leaving the COMMUNICATION SETUP menu.
4. Press Save "Save" when the parameters have been edited and the calibrator will restart.



4.8.2 Setting WLAN (Optional)

In addition to current IP address and subnet mask of the wireless network interface, the corresponding MAC (hardware) address is displayed.



1. With the DHCP button active the network DHCP server will decide a vacant IP address and default subnet mask for the calibrator's wireless network interface. When the DHCP button is inactive the user will be able to choose an:
   - **IP Address**
   - **Subnet Mask**
   - **Default Gateway**
   - **MAC Address**
2. When connected to a wireless network, the status bar on the top of the screen will display a symbol indicating the connection status .

4.8.3 Subnet Mask

The subnet mask defines the range of IP addresses that can communicate with each other as a sub-network. Typical values are "255.255.255.0" and "255.255.0.0". In most cases, match the subnet mask of another device on the network, or let the DHCP server apply it.

Example:
The calibrator has IP address 192.168.8.10 and subnet mask 255.255.255.0. Only devices with IP addresses in the 192.168.8.xxx range (xxx value from 0 to 254) can communicate with the calibrator.

Example:
The calibrator has IP address 172.10.20.30 with subnet mask 255.255.0.0. Devices with IP addresses in the range 172.10.xxx.yyy (xxx and yyy values each from 0 to 254) can access the calibrator.

4.8.4 Using Wifi Connections (Optional)

The PTCt calibrator can communicate over Wifi 802.11ac/abgn (2.4 GHz / 5 GHz ISM bands) using an external Wifi certified USB Dongle as wireless network interface.

It is possible to connect to a Wifi network shared by a smartphone for direct access to the calibrator.

It is possible to connect to a Wifi network and a wired ethernet network at the same time. Only the IP address range specified for the particular network interface can be used for accessing the calibrator user interface. Network interfaces are not bridged.

Note...

Local approvals
A wide set of radio approvals for the USB dongle exists. Before using the dongle, confirm that the approvals cover the geographic area in which usage is intended. Using outside areas covered by the approvals may conflict with local laws and is at the user's own risk.

1. Attach the dongle in the dedicated, recessed USB connector marked with wireless symbols.

   Notice the orientation of the Wifi dongle and USB A connector. The dongle can be mounted in the connector even during storage or transport of the calibrator.

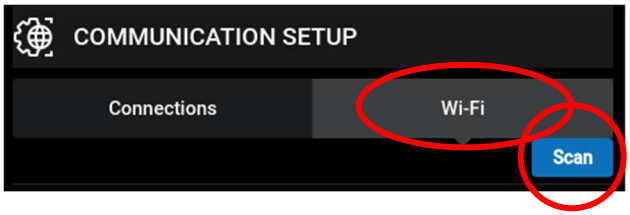


Caution...

When mounting the USB dongle in any of the USB ports marked "HOST", the dongle will extend beyond the calibrator side, leading to a risk of mechanical stress to the dongle and/or the USB connector when storing or transporting the calibrator. Only use the designated, recessed USB connector for the USB dongle.

2. Access the Communication Setup from the Menu screen and select Wifi Connections.

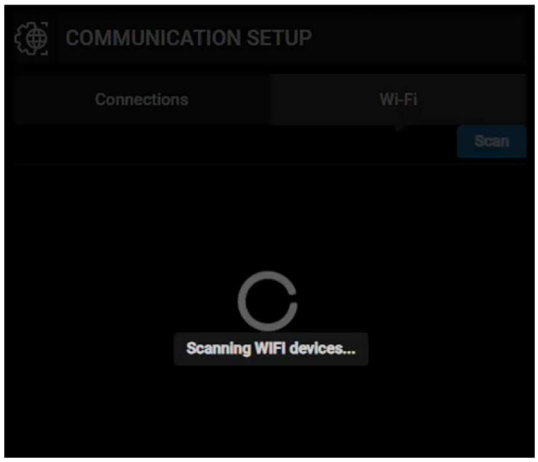
3. If no Wifi network SSIDs are listed, press Scan to list available Wifi network SSIDs.

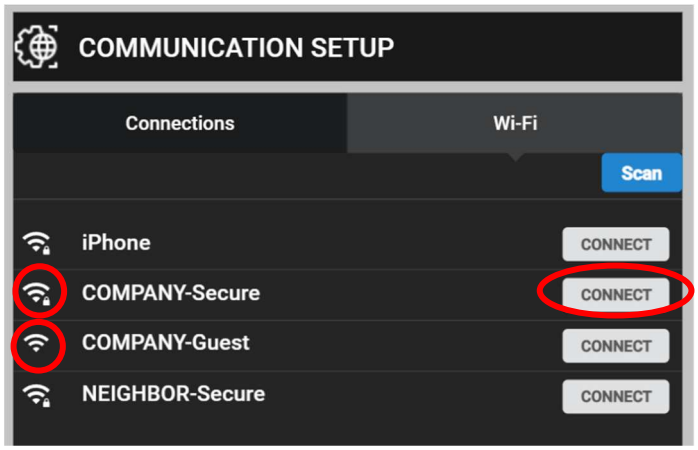


Note...

If no SSIDs are listed, first check the correct connection of the USB dongle and wait a moment for the calibrator to recognize it. If problems persist, restart the calibrator. Also ensure that at least one Wifi network is available, having adequate signal strength for the dongle to discover and communicate with the network access point.

The available Wifi networks are scanned and the discovered SSIDs are listed.





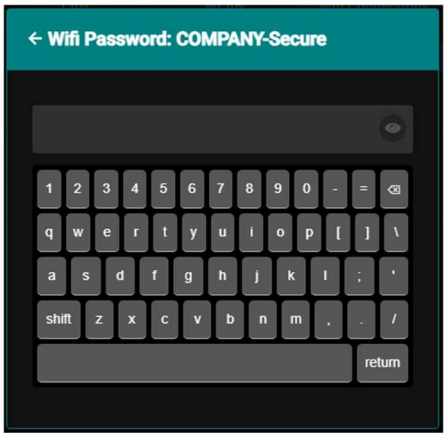
Each SSID is accompanied by a symbol, indicating the security level of the network.

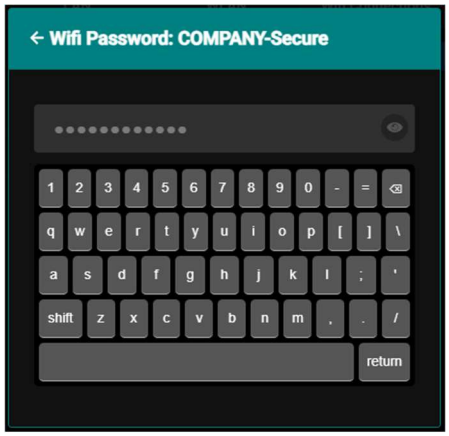
Networks protected by a password are displayed with a lock symbol .

Networks without password protection are displayed without a lock

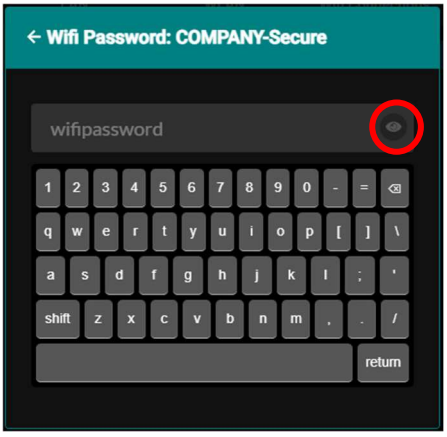
4. For the desired wireless network, press CONNECT. If the network is not password protected, the calibrator immediately connects to the network.

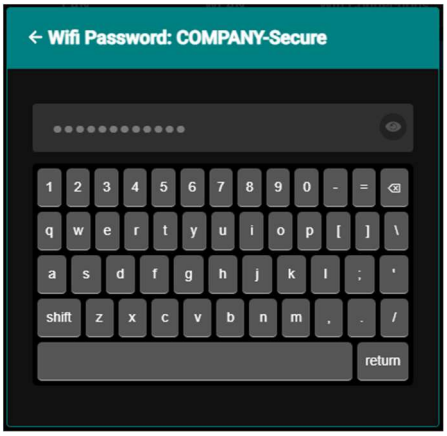
5. If the network is protected by password, a dialog appears, requesting the password. Use the NUMERIC keys to enter the password for the network. Entered characters are displayed in the password input field as dots.



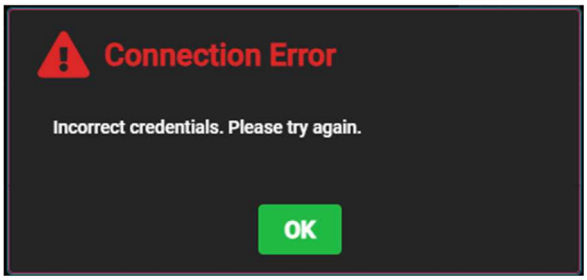


6. Press and hold the eye symbol to momentarily display the password as clean text. When released, the password characters are displayed as dots again.





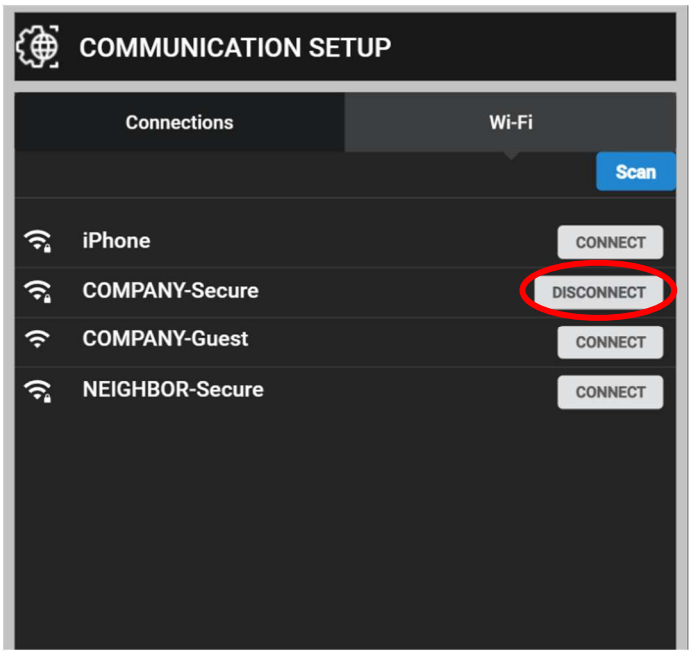
7. If the entered password is incorrect connection fails, and an error message is displayed.



8. When connection to a wireless network is established, the network address settings can be set up on the WLAN tab of the Communication Setup page. See section 4.8.2.

4.8.4.1 Disconnecting from Wifi network (Optional)

1. When connection to a wireless network is established, connection can be terminated by pressing DISCONNECT in the Wifi Connections tab of the COMMUNICATION SETUP page.



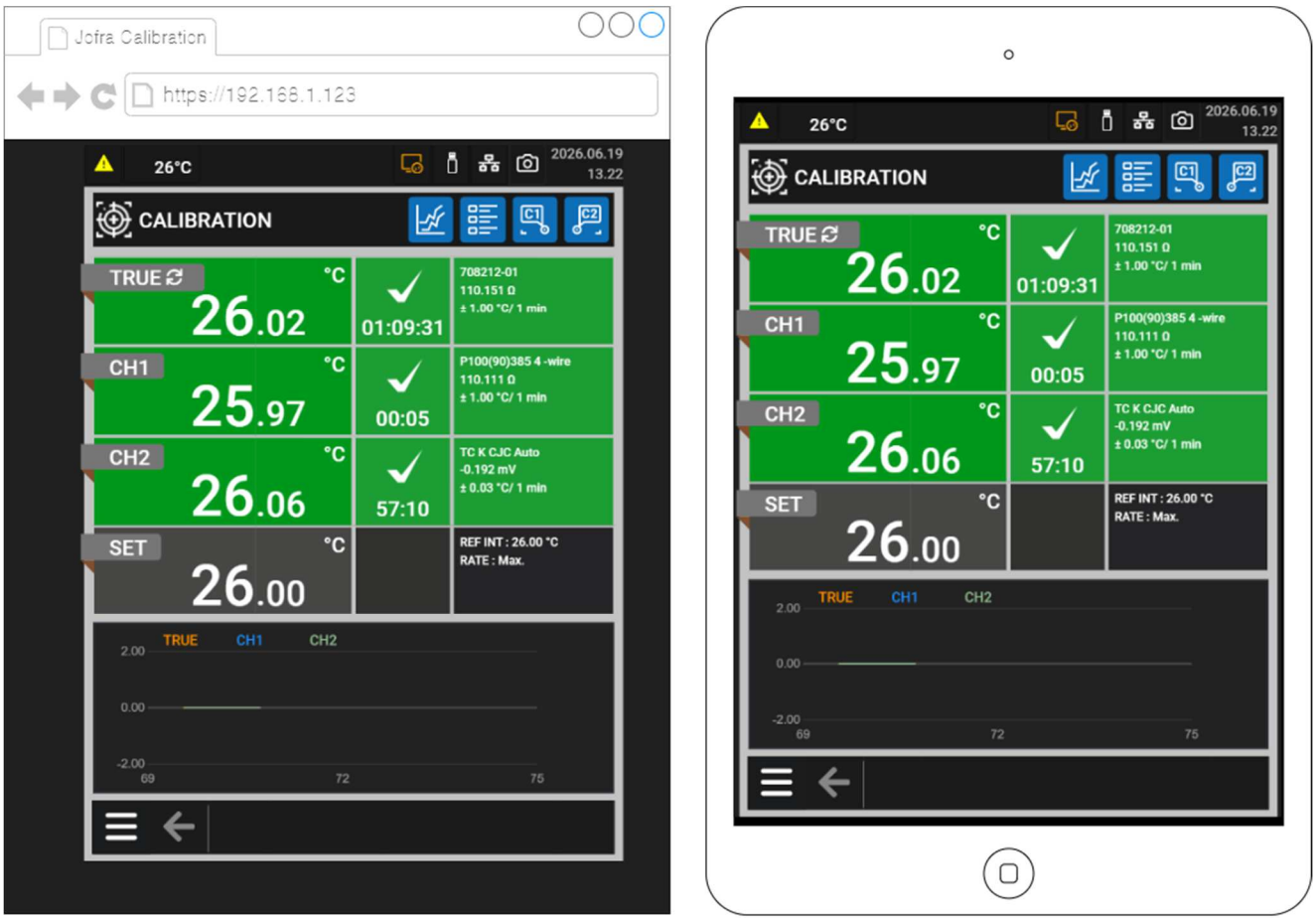
4.8.5 Remote Access (Optional)

The remote user interface can be used to supervision readings and calibration progress, or manually control set temperature, run automated calibration procedures from a connected device. All system settings, temperature setup and sensor input configurations can be viewed, and if privileges are granted, edited.

When connection to a network is established and configured, the calibrator user interface can be remotely accessed from a web browser using the calibrator's IP address or a host name that resolves to the IP address.

The address syntax to access the remote web user interface is: http://IP-address.

The remote web browser user interface will display the Calibration window as default. Any active warnings and errors will be displayed on the remote interface upon logging on.



Use the computer's mouse or the device's touchscreen to press on active elements and buttons in the user interface.

When a remote device has Read/write privileges, the local user interface on the calibrator has limited functionality. System settings, temperature setup, and sensor configurations are disabled. Control can be regained by revoking Remote Access Privileges, as described in section 4.8.6 below.

The remote user interface is supported by all modern browsers (Edge, Firefox, Chrome, Safari, etc.), which has JavaScript enabled. The user interface has a native resolution of 640(h) x 480(w) pixels, which is the recommended minimum window size. Web browsers with larger viewport will scale/zoom the displayed calibrator screen accordingly.

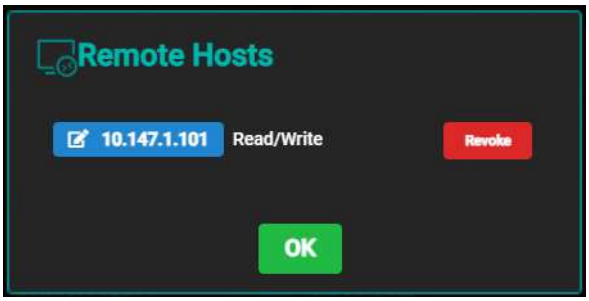
4.8.6 Remote Access Privileges (Optional)

Upon connection from a remote web browser, the local user interface displays a notification stating, “Remote host connected”.

A list of currently connected Remote Hosts can be displayed by pressing the screen symbol in the status bar on the top of the screen.

A popup appears, listing the IP address and current privileges for the connected hosts.

Privileges can be revoked by pressing Revoke, essentially limiting the access to read-only for that particular host.



See section 4.7.4 for details on how to set up default privileges for remote hosts.

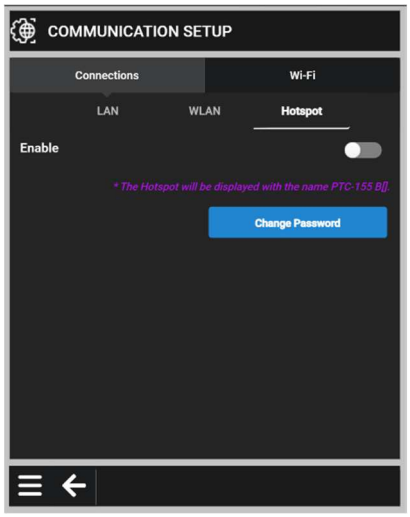
4.8.7 Remote communication

See PTCt Remote Communication manual.

4.8.8 Hotspot (Optional)

The PTCt calibrator can create a local, isolated Wi-Fi Hotspot, to which Wi-Fi enabled client devices such as smartphones, tablets or computers can connect directly.

In the Connections tab of the Communications Setup window, the Hotspot can be enabled. It creates a Wi-Fi network with an SSID related to the calibrator model.



Hotspot SSID naming: “Calibrator Model[Serial Number]”. Example: A PTCt-350 B with serial number 123456-12345 will generate a Hotspot SSID called “PTCt-350B[123456-12345]”.

Default Hotspot password: The default password for the Hotspot is the calibrator model type. Example: A PTCt-350 B has default Hotspot password “PTCt-350 B”. To increase security, change the password for an active Hotspot to a strong and unique one.

Once enabled, the Hotspot can be accessed by any compatible client device using Wi-Fi. The calibrator’s Hotspot IP address is displayed in the Connections tab of the Communications Setup window. Also, the number of devices currently connected to the hotspot is displayed in this tab.



When Hotspot connection is established, use the device’s web browser and enter the calibrator’s Hotspot IP address or scan the displayed QR code shortcut to access the calibrator user interface.

To prevent unintentional external connections to the Hotspot, disable it when not used.

4.8.8.1 Connect to calibrator using Hotspot

1. Enter the Communication Setup window and select the Hotspot tab.

2. Press the toggle switch button next to “Enable” to enable the Hotspot. The toggle switch has blue background when enabled.



3. On the client device, scan available Wi-Fi networks and select the calibrator’s Hotspot – or use the device’s camera to scan the QR code displayed in the Communication Setup window on the calibrator screen to connect to the Hotspot automatically.

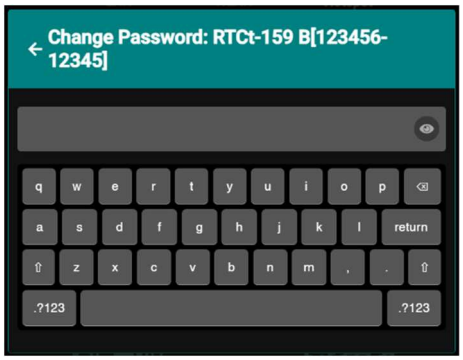
4. Open the client's web browser and enter the calibrator's Hotspot IP address in the address bar – or use the device's camera to scan the QR code displayed in the Communication Setup window on the calibrator screen to navigate to the calibrator's Hotspot IP address automatically.

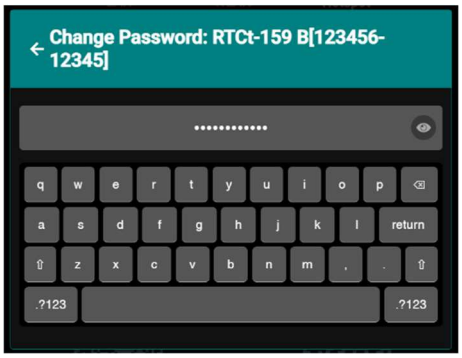


4.8.8.2 Change password

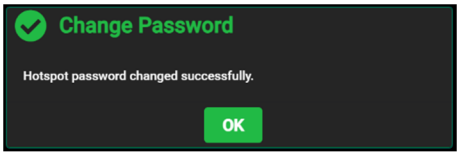
1. On the Hotspot tab of the Communication Setup window, press the Change Password button.

2. Enter a strong password using the on-screen keyboard. During typing, characters are displayed as dots in the password field. Press the eye symbol to momentarily display the typed password characters as plain text.





3. On Press "return". The Hotspot password will be updated, confirmed by a popup dialog.



4.8.8.3 Disconnect from Hotspot

1. On the Hotspot tab of the Communications Setup window, press the toggle switch button next to "Enable" to disable the Hotspot. The toggle switch has grey background when disabled. Hotspot details such as IP address and number of connected devices are hidden.

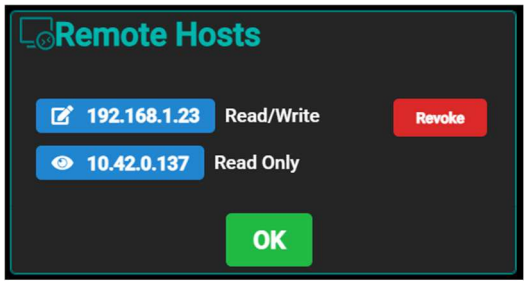
4.8.8.4 Multi-client behavior

It is possible to simultaneously access the calibrator from multiple client devices, across different calibrator network interfaces.

Depending on the Browser Access setting in the System Setup, the first client is granted read or read/write access. Clients, connecting hereafter, are granted read access.

1. To view a list of the currently connected client devices, press the Screen-icon  in the top status bar.

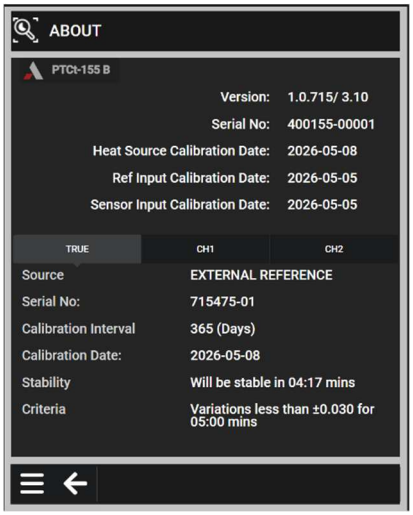
2. Write access for a particular client device can be revoked by pressing Revoke-button Revoke next to the IP address of that client device.



4.9 ABOUT / STATUS

1. Information about the calibrator and the status can be viewed using the ABOUT / STATUS function.

   Access the ABOUT / STATUS function from the Menu screen.



   An ABOUT / STATUS summary about the calibrator type, the software version installed, the serial number and the date when it was last calibrated is displayed.

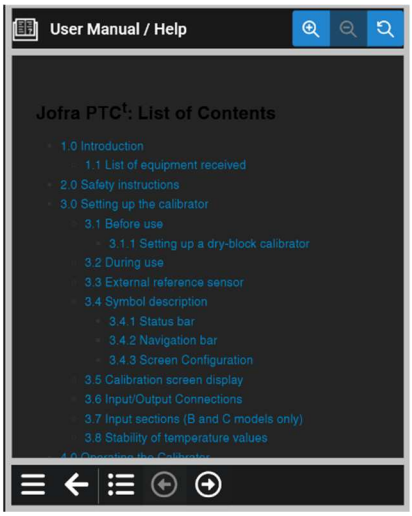
2. Press either the TRUE, CH1 or CH2 field to get access to an ABOUT / STATUS summary of the sensors setting and stability information.

Note...

The list will be cleared, when the calibrator is switched off.

4.10 USER MANUAL / HELP

1. Access the USER MANUAL / HELP function from the Menu screen.



2. Press one of the sections to enter the requested text.

   Choose between:

   - enlarging the text
   - reducing the text
   - returning to default text size

3. When browsing through the sections you can return to the previous pages by pressing and proceed to the next page, having already been displayed by pressing .

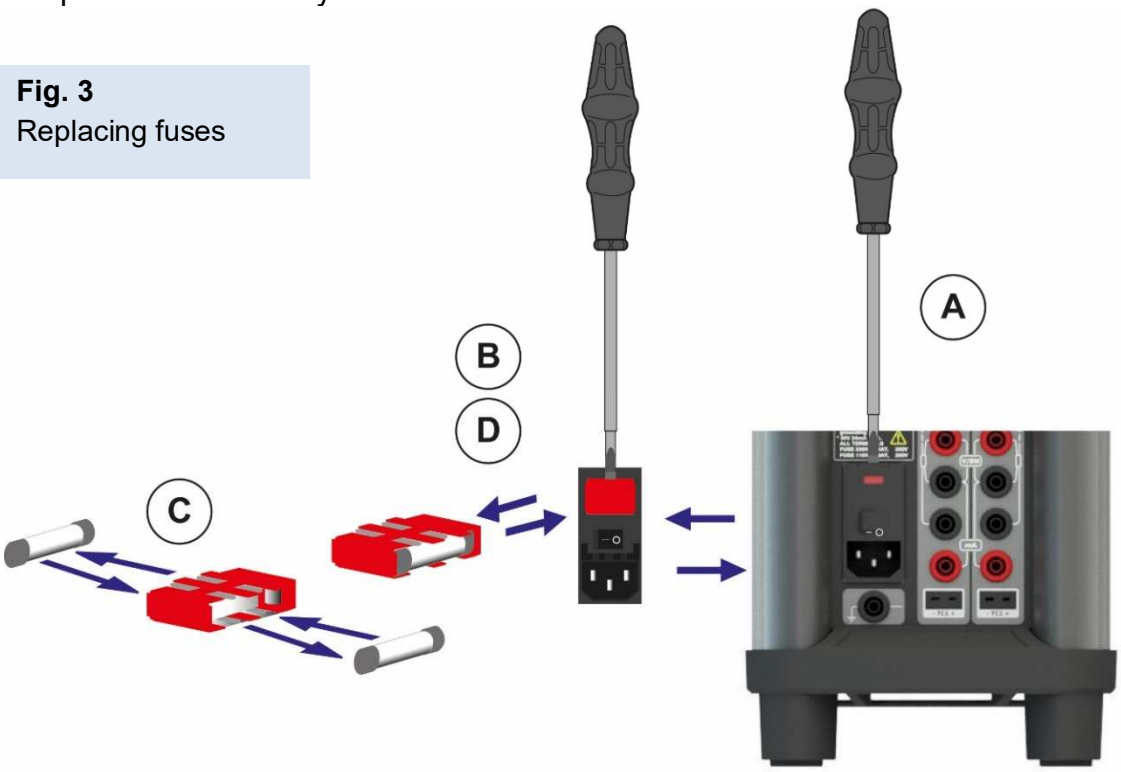
4. Press to return to the List of Contents.

5.0 Setting the mains voltage and replacing the main fuses

Warning

- The calibrator **must** be switched off before any attempt to service the instrument is made. There are no user serviceable parts inside the calibrator.
- The fuse box **must not** be removed from the power control switch until the mains cable has been disconnected.
- The two main fuses must have the specified current and voltage rating and be of the specified type. The use of makeshift fuses and the short-circuiting of fuse holders are prohibited and may cause a hazard.

Fig. 3
Replacing fuses



A. Locate the main fuses in the fuse box in the power control switch and check the voltage of the power control switch (on/off switch (230V/115V)). If the voltage of the power control switch differs from the line voltage, you must adjust the voltage of the power control switch.

B. Open the lid of the fuse box using a screwdriver and remove the fuse box.

C. Replace the fuses. The fuses must be identical and should correspond to the line voltage.

- PTC^t-125: 115V/230V, F4A = 131195
- PTC^t-155: 115V/230V, T6A = 130972
- PTC^t-350/425/660 115V, F10A = 131181 / 230V, F5A = 131180

If the fuses blow immediately after you have replaced them, the calibrator should be returned to the manufacturer for service.

D. Slide the fuse box into place with the correct voltage turning upwards.

6.0 After use

6.1 Storing and transporting the calibrators



Caution…

The following guidelines should always be observed when storing and transporting the calibrators. This will ensure that the instruments and the sensors remain in good working order.



*N*arning

- The calibrator **must** be switched off before any attempt to service the instrument is made. There are no user serviceable parts inside the calibrator.
- Remember to use appropriate protective equipment or get help when carrying the calibrator (for a longer distance) to prevent injuries from dropping the calibrator.

The following routine must be observed **before the insertion tube is** removed and the instrument switched off:



Over 50°C/122°F

If the calibrator has been heated up to temperatures above 50°C/122°F, you must wait until the instrument reaches a temperature **below 50°C/122°F** before you switch it off.



Below 0°C/32°F

(applies only to the PTC^{t}-125/155 A/B/C models)

- **Do not** touch the well or insertion tube when these are below 0°C/32°F - they might create frostbite.
- If the calibrator has reached a temperature below 0°C/32°F, ice crystals may form on the insertion tube and on the well. This, in turn, may cause the material surfaces to oxidize.
  To prevent this from happening, the insertion tube and the well must be dried. This is done by heating up the calibrator to min. 100°C/212°F until all water left has evaporated.
  Remove the insulation plug while heating up.
  It is very important that humidity in the well and insertion tube is removed to prevent corrosion and frost expansion damages.

1. Switch off the calibrator using the power control switch.

   Note that the calibration procedure may be interrupted at any time using the power control switch. Switching off the calibrator during the calibration process will not damage either the instrument or the sensor.

2. Remove the insertion tube from the calibrator using the tool for insertion tube supplied with the instrument as shown in fig. 4.

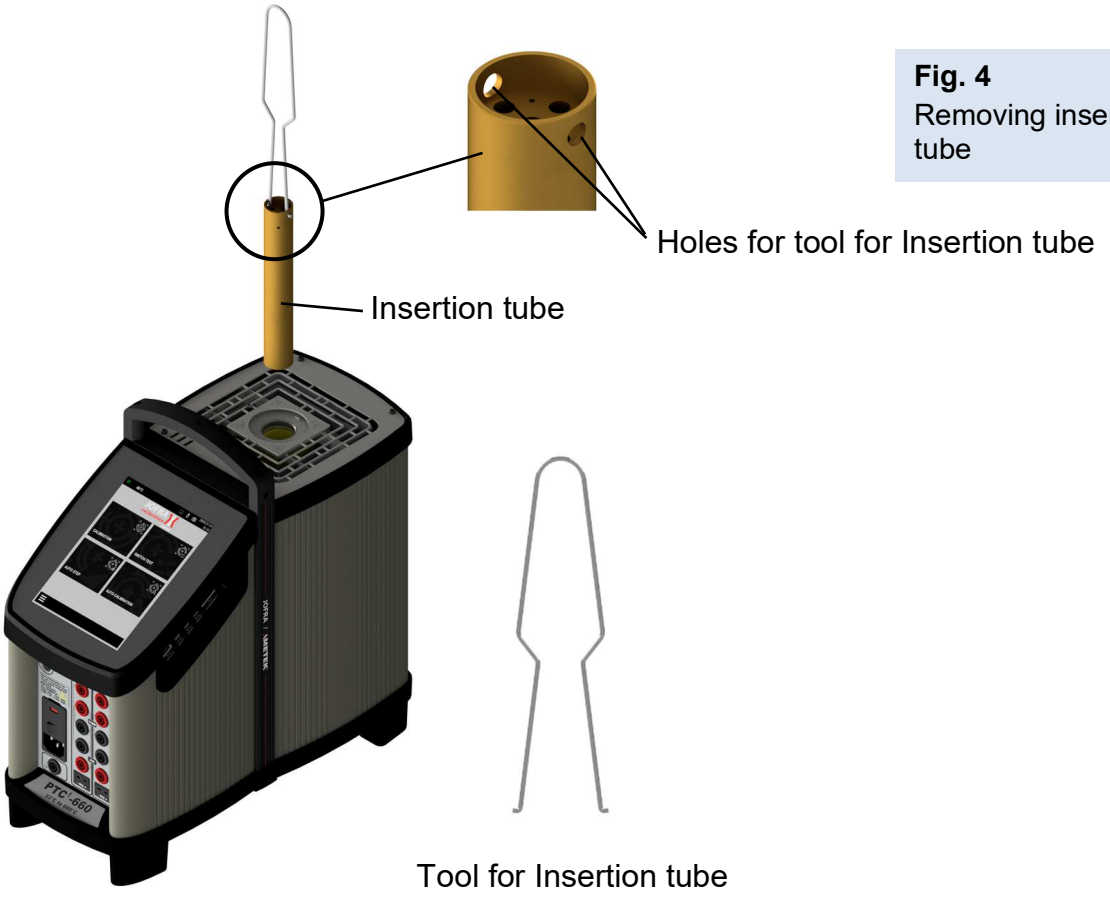


Fig. 4
Removing insertion tube



Caution – Hot surface

Do not remove the insert from the calibrator before the insert has cooled down to less than 50°C/122°F.



Caution…

- The insertion tube must **always** be removed from the calibrator after use.
  The humidity in the air may cause corrosion oxidation on the insertion tube inside the instrument. There is a risk that the insertion tube may get stuck if this is allowed to happen.
- The insertion tube **must** be removed to avoid damage to the instrument if the calibrator is to be transported long distances.



Warning (all models)

- **Never** leave hot insertion tubes that have been removed from the calibrator unsupervised – they may constitute a fire hazard or personal injury.

  If you intend to store the calibrator in the optional protection carrying case after use, you **must** ensure that the instrument has cooled to a temperature **below 50°C/122°F** before placing it in the carrying case.
- **Never** place a hot insertion tube in the optional carrying case.
- **Do not** touch the well or insertion tube when these are deep frozen – they might create frostbite.

6.2 Contact information

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