SENSYCAL
CONFIANÇA EM MEDIÇÕES

Druck
a Baker Hughes business

PTC200
PTC700
PTC165(i)
PTC255(i)

Premium Temperature Calibrators

Instruction Manual

Druck.com

Introduction

This technical manual contains operating instructions for the PTC Series Premium Temperature Calibrators.

Scope

This technical manual contains a brief description, operation and test procedures for the user of this equipment.

Safety

This equipment is safe when you use the procedures in this manual. Do not use this equipment for other purposes than those specified. This is because the protection given by the equipment can be reduced or canceled.

Use sufficiently approved[1] Technicians and good engineering practice for all procedures in this publication.

Maintenance

Maintenance of the equipment must be done by approved service personnel or the manufacturer's service departments, that both use the manufacturer's procedures.

Software Version

This manual gives the operating instructions for PTC Series temperature calibrators with software version 30.

Technical Advice

For Druck technical advice, use the website address given on the back cover of this manual.

1. An approved technician must have the necessary technical knowledge, documentation, special test equipment and tools to do the necessary work on this equipment.

Marks and Symbols on the Equipment

Symbol	Description
	This equipment meets the requirements of all relevant European safety directives. The equipment carries the CE mark.
	This equipment meets the requirements of all relevant UK Statutory Instruments. The equipment carries the UKCA mark.
	This symbol, on the equipment, indicates that the user should read the user manual.
	This symbol, on the equipment, indicates a warning and that the user should refer to the user manual.
	This symbol warns the user of the danger of electric shock.
	This symbol warns the user of the danger of hot surfaces.
	Druck is an active participant in the UK and EU Waste Electrical and Electronic Equipment (WEEE) take-back initiative (UK SI 2013/3113, EU directive 2012/19/EU). The equipment that you bought has required the extraction and use of natural resources for its production. It may contain hazardous substances that could impact health and the environment. In order to avoid the dissemination of those substances in our environment and to diminish the pressure on the natural resources, we encourage you to use the appropriate take-back systems. Those systems will reuse or recycle most of the materials of your end life equipment in a sound way. The crossed-out wheeled bin symbol invites you to use those systems. If you need more information on the collection, reuse, and recycling systems, please contact your local or regional waste administration. Please visit the link below for take-back instructions and more information about this initiative.  **https://druck.com/weee**

Abbreviations

The following abbreviations are used in this manual; the abbreviations are the same in the singular and plural.

Abbreviation	Description
A	Ampere
ac	Alternating Current
cm	Centimeter
cSt	Centistokes
dc	Direct Current
DUT	Device Under Test
e.g.	For example
FS	Full Scale
GND	Ground
h	Hour
K	Kelvin
lbs	Pounds
LED	Light Emitting Diode
m	Minute
max	Maximum
min	Minimum or minute
mm	Millimeter
n/a	Not Applicable
PC	Personal Computer
PID	Proportional Integral Differential
PV	Primary Variable
SP	Set Point
Ref	Reference
RH	Relative Humidity
SP	Set Point
T_R	Room Temperature
USB	Universal Serial Bus
V	Volts
VA	Volt Ampere
°C	Degrees Celsius
°C/min	Degrees Celsius per minute
°F	Degrees Fahrenheit

Contents

1. Description

The PTC Series calibrators can do tests, calibrate temperature measurement instruments and temperature sensors. It can also measure temperatures. Typical uses include the test and calibration of thermometers, temperature switches/thermostats, resistance thermometers and thermocouples.

The portable instruments are of sufficient size and are strongly built so that they can be used onsite or in a laboratory.

The PTC Series is for industrial, laboratory, and servicing functions in dry environments.

1.1 Model Types

PTC200

PTC700

PTC165(i)

PTC255(i)

Figure 1: Types available

Table 1: Performance of PTC types

Model Type	Temperature Range	Function	Integrated Measuring Instrument
PTC165	-30°C to 165°C (-22°F to 329°F)	Multi-Function	
PTC165i	-30°C to 165°C (-22°F to 329°F)	Multi-Function	✓
PTC200	-50°C to 200°C (-58°F to 392°F)	Dry	
PTC255	T_R to 255°C (T_R to 491°F)	Multi-Function	
PTC255i	T_R to 255°C (T_R to 491°F)	Multi-Function	✓
PTC700	T_R to 700°C (T_R to 1292°F)	Dry	

1.2 How to remove parts from the package

INFORMATION **The temperature calibrators are supplied in special protective packaging. Save the packaging. Use this packaging to protect the instrument if it must be sent to the manufacturer for calibration or repair.**

To prevent damage, carefully remove the instrument from its container.

Do a check of the contents, to make sure that the delivery is complete: refer the delivery note below.

Table 2: Delivery Checklist

Item	PTC200 PTC700	PTC165 PTC255	PTC165i PTC255i
Druck Premium Temperature Calibrator	✓	✓	✓
External reference sensor.	✓	✓	✓
Dry block insert.	✓	✓	✓
Mains cable.	✓	✓	✓
Network (Ethernet) cable.	✓	✓	✓
Test certificate.	✓	✓	✓
Safety manual with directions on how to download the instruction manual.	✓	✓	✓
Protective packaging and transportation protection.	✓	✓	✓
Insert exchange tool.	✓	✓	✓
Work cover with five silicone plugs.		✓	✓
Tub insert.		✓	✓
Terminal connectors (4 × red, 4 × black and 1 × white)			✓
2 × Thermocouple adapters.			✓
2 × Clamp-on ferrites.			✓
2 × Ferrite keys (for opening the clamp-on ferrites)			✓
Optional Protection Case (IOPTC-CASE-1)	✓	✓	✓

1.3 Use of instrument

The PTC type of calibrators must only be used:

- for the test and calibration of applicable temperature measuring instruments,
- for the test and calibration of temperature sensors,
- for the measurement of temperatures.

Do not use the calibrators to apply heat to materials or gases. The calibrators are only for indoor use.

Only use an applicable calibration liquid in the micro baths. The only permitted liquid is silicone oil, see Section 2.3.

Dangerous media (flammable or explosive liquids or gases) must not be used.

The operational safety of the calibrator is only guaranteed for its permitted use. The specified limits must not be broken. See Section 10.

It is your responsibility to select the instrument that is correct for your specified use. You must also connect it correctly, do the tests safely and also make sure all components have the correct maintenance.

2. Safety Instructions

Before you use the calibrator, read through this instruction manual carefully. If the instructions are not obeyed, for example the safety guidelines, this can increase the risks for personnel, the environment, the calibrator and the system to which it is connected.

The calibrator uses state-of-the-art technology. This includes accuracy, operating function and the safe operation of the calibrator.

The operator must have the approval to use the calibrator and understand the applicable safety issues.

Druck can give support for the use of its products by personal training or by the supply of related documentation. The customer must do customer-specific and application-specific tests to make sure that the product is applicable for its planned use.

Approved Personnel:

- The personnel that do the installation, operation and maintenance of the calibrator must have a related qualification. This qualification can be from tests that use personal training or an applicable training manual to supply the necessary knowledge.
- Personnel must know that this instruction manual is available and have access to it at all times.

2.1 General Safety Instructions

- In all work, the applicable national regulations for accident prevention and safety in the workplace must be used. All internal regulations of the operator must also be obeyed, even if these are not given in this instruction manual.
- Make sure that the complete operating instructions are always available at the calibrator installation site.
- The amount of protection must obey the EN 60529 standard. The ambient conditions at the site of use must be in the limits for the given protection rating, see Section 10.1.
- Structural safety must obey the EN 61010-1 standard. The calibrator must be installed such that the requirements for structural safety are obeyed.
- Only use the calibrator if it is in perfect condition. Damaged or faulty calibrators must be given a check without delay and, if necessary, replaced.
- If problems cannot be removed, immediately stop and isolate the calibrator and make sure that it cannot be started accidentally.
- Never leave the calibrator alone when it is in operation or when it is cooling down.
- Do not remove or destroy product labels or other markings on the calibrator, because this will cancel the warranty.

2.2 Special Safety Instructions

- Thermal protection fuse:
  a. The calibrator has a thermal protection fuse that works independently. If there is an over-temperature inside the housing, the thermal fuse breaks its contact: this isolates the power supply to the heating system. The thermal protection fuse cannot be set again and the calibrator becomes unavailable to use.
  b. After the calibrator has cooled, return the calibrator to Druck.
- Risk of injury from dangerous gases:
  a. When liquids are heated, evaporation can make dangerous gases.
- The calibrator must not be used in a possibly explosive atmosphere:

a. Remove all the easily flammable media from near the calibrator.
b. Make sure that the calibrator cannot touch the easily flammable or explosive media.

- Operate the calibrator only in the temperature range permissible for the DUT.
- Make sure that the DUT is held securely in the calibrator:
  a. Use only applicable Inserts.
  b. When this is done, also make sure that the structural safety of the calibrator continues.
- Expert mode.
  a. You can select the expert mode for administration and configuration, for the selection of the function, DUT and testing tasks. Knowledge about calibration is necessary, to let settings be made in this mode and how to use the calibrator. Contact Druck for specific training.
  b. If the settings are incorrect, the calibrator can be damaged.

2.3 Calibration Liquid Safety Instructions

Before the use of calibration liquids, fully read all the relevant safety data sheets. Give attention to the information on the physical and chemical properties.

Only use calibration liquids that are applicable to the necessary temperature range, and which are not flammable.

Calibrators are set for specific fluid types. Use only the optional Druck supplied or recommended silicone oil. These oils have temperature limitations that must be obeyed.

Druck recommends the following calibration liquids:

Table 3: Calibration Liquids

Model	Calibration Liquid	Calibration Range	Flashpoint
PTC165(i)	XIAMETER™ PMX-200 Silicone Fluid 10 cSt	-30 °C to 155 °C (-22 °F to 311 °F)	165 °C (149 °F)
PTC255(i)	XIAMETER™ PMX-200 Silicone Fluid 50 cSt	50 °C to 270 °C (122 °F to 518 °F)	280 °C (536 °F)

- Use only the silicone oil recommended in Table 3.
- Before the oil is used, always read the safety data sheet given with the silicone oil. Always make sure there is sufficient ventilation when silicone oil is used, because dangerous substances can be released.
- Make sure silicone oil never touches your eyes.
- Silicone oil is hygroscopic. Use the work cover to seal the micro bath after use. Another method is to remove the Tub Insert from the calibrator and use the transport cover to seal the Tub Insert.

3. Construction and Function

3.1 Construction

1 Dry block
2 Liquid Well
3 Carrying handle
4 Touch screen for operation and measurement value display
5 External reference sensor connection
6 Network connection socket and USB ports
7 ON/OFF switch and IEC Power Supply Connector
8 Integrated Measuring Instrument
9 Exhaust cooling air through side housing grilles
10 Inlet air for housing cooling
11 Inlet air for dry block / micro bath cooling

Figure 2: General View

The calibrator has a strong steel cabinet (2) with integral carrying handle (1). The touch screen display (3) is on the front panel of the unit.

The mains inlet, switch, and fuse holder (4) are on the front of the unit. The external reference sensor connects to (9). USB and network connections are available at (10).

While in operation, cooling air is pulled in from the bottom of the unit (11, 12) and ejected through grilles (6, 8). PTC200 and PTC700 eject air through the top of the unit (6). PTC165(i) and PTC255(i) eject air through side grilles (8).

The rear section of the housing contains the insulated dry block or micro bath (liquid well). Heating elements, together with an integrated temperature sensor, control the temperature of the dry block / micro bath. Some PTC types contain cooling elements: these let the temperature be controlled below room temperature.

3.1.1 Integrated Measurement Instrument

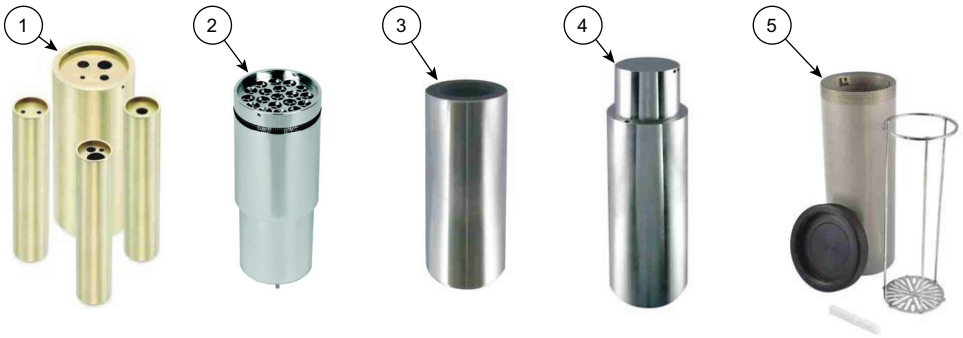
The PTC165i and PTC255i have an integrated measurement instrument.

Figure 3: Integrated Measurement Instrument

Symbol	Description
RTD A / B	Resistance thermometers (2, 3 or 4-wire) Switch test (socket 1 and 2)
TC A / B	Thermocouple input.
+24V out	Transmitter supply.
mA in	Current measurement.
V in	Voltage measurement.
COM	Signal common (ground).
⏚	Functional ground connection.
ext. Ref.	External reference sensor connection.

3.2 Function

The calibrator type and the installed Insert, control what the calibrator can do. Figure 4 gives an overview of the available inserts.



1 Adapter sleeve Insert.
2 Air Shield Insert.
3 Infrared Insert.
4 Surface Insert.
5 Tub Insert.

Figure 4: Insert Overview

Table 4 gives the necessary Insert diameter and material for each calibrator type. Use only Druck supplied Inserts. Druck Inserts have the correct tolerances and materials for the calibrator types.

Table 4: Insert Diameter and Material

Model	Insert Diameter	Insert Material
PTC200	28 mm (1.10″)	Brass
PTC700	29 mm (1.14″)	Aluminum Bronze Alloy
PTC165(i) PTC255(i)	60 mm (2.36″)	Aluminum

Note: Inserts are not interchangeable between calibrator types with different bore sizes.

Table 5 identifies the external reference sensor for each type. It also gives the recommended drill size in the Insert to accept the external reference sensor.

Table 5: External Reference Sensor

Model	External Reference Sensor Part Number	Temperature Range	Drilling Diameter
PTC200 PTC165(i) PTC255(i)	IOPTC-EXSEN-1	-55 °C to 255 °C (-67°F to 491 °F)	3.3 mm to 3.5 mm (0.130″ to 0.138″)
PTC700	IOPTC-EXSEN-2	5 °C to 700 °C (41°F to 1292 °F)	4.8 mm to 5.0 mm (0.189″ to 0.197″)

Note: The external reference sensor is calibrated for use with a specified calibrator. Do not use a different external reference sensor with the calibrator: this will decrease the calibration accuracy.

Table 6 gives the compatibility of insert for each calibrator type. The table also shows when to use the external reference sensor, or the internal reference sensor. Where it is possible to use

the external or internal reference sensor, make sure that the correct function is selected. See Table 7.

Table 6: Insert Compatibility

Insert	Reference Sensor	PTC200	PTC700	PTC165(i)	PTC255(i)
Adapter Sleeve	Internal	✓	✓		
	External	✓			
Air Shield	External		✓	✓	✓
Infrared	Internal			✓	✓
Surface	External			✓	✓
Tub	External			✓	✓

Table 7 gives the function names as they are in the “Select Function” window.

Table 7: Function Names

Insert	Reference Sensor	Function Name
Adapter Sleeve	Internal	dry block + int.reference dry block int.ref.
	External	dry block + ext.reference dry block ext.ref.
Air Shield	External	dry block + ext.reference air shield insert
Infrared	Internal	infrared + int.reference
Surface	External	surface + ext.reference
Tub	External	tub insert + ext.reference silicone oil[a]

a. Refer to Section 2.3 for the correct type of silicone oil to use with the calibrator.

3.2.1 Operation Procedure

INFORMATION **For your safety, manual operation of the calibrator is not possible. This means you cannot make a direct start and select a time to manually stay at the same temperature.**

The test procedure is always started with a testing task, see Section 3.3 on page 9. This makes sure that the calibrator is always started with a defined end of test behavior.

1. Install an applicable Insert into the calibrator, see Section 4.3 on page 11. Make sure that the Insert has a secure fit to make sure optimum heat transfer to the DUT occurs.
2. When all preparations have been completed, start (energize) the calibrator. See Section 1 on page 20.
3. Select the related function in the calibrator software for the Insert. See Table 7 above.

   Note: The Inserts have different characteristics. The calibrator is supplied with a set of pre-defined functions for each insert. These have been found by the factory and are write-protected. They can be used as a basis to create your own custom functions.

4. The calibrator heats or cools the dry block, or calibration liquid, to the set point temperature. When the temperature becomes stable, the DUT can be calibrated.
5. Repeat step 3 for all the necessary calibration set points.

3.3 Test Tasks

INFORMATION **The function and the DUT are independent. During the setup of test tasks (Section 6 on page 23), the related expert mode can be entered. This lets administration and setup be done when the function or DUT is selected.**

Note that changes to existing functions and DUTs always affect all linked test tasks.

Test tasks are containers for defined test conditions. They are helpful for repeat test processes, standard test sequences and to make measurement logs.

All necessary setups for the calibration of a DUT are collected in a test task. The parameters of the test task are saved and linked to the selected function and DUT. See Section 6 on page 23.

The pre-installed and self-defined test tasks together make the primary function of the calibrator. They are a central component of the function and operation of the calibrator.

The focus of this instruction manual is on the use of test tasks during the calibrator operation.

The calibrator is supplied with already set functions, test samples and testing tasks. These have been specified in the factory, in which the basic settings of the calibrator have been stored.

These protected test tasks cannot be erased or changed. They function as templates for your own specified test tasks. They can be copied and then changed. This task must not be completed without special training from Druck.

You can make your own test tasks for different DUT or test sequences. These test tasks are directly saved in the calibrator and can be easily started. This makes quick access to repeated test tasks possible.

After the start of the calibrator, the first test task of the selection list is loaded automatically, together with the related parameters.

4. Commissioning and Operation

WARNING **The calibrator can become very hot in operation. If the calibrator is operated without supervision, third-party persons in the vicinity could become injured. It is possible that flammable material could touch the calibrator and cause important injury to personnel and/or damage to property.**

Never leave the calibrator alone when it is in operation or when it is in its cool down period.

Make a commission procedure for the safe operation of the calibrators.

Commissioning includes the installation, electrical connections, preparation for the calibration as well as correct switch ON and OFF of the calibrator.

A visual inspection for damage is also necessary before use.

The necessary steps are given in the following sections.

4.1 Operating Conditions

INFORMATION **The plug of the mains connecting cable serves as a emergency stop device. Make sure that the plug is always easily accessible and to reach. In an emergency, fully pull out the plug to isolate the calibrator from the mains.**

Select a safe installation site in which to commission the calibrator.

Considerations for selecting a safe installation site and calibrator operating location:

- Only suitable for indoor use, do not use outdoors.
- Operate the instrument only in the vertical position on an even surface. The surface must be stable, clean, and dry.
- If the operational conditions are not as given in the above, the structural safety and the specified properties of the calibrator cannot be guaranteed.
- At high testing temperatures, it is recommended to use a sufficiently large, fire-resistant, support surface.
- Make sure sufficient clearance is around the calibrator. On the front side > 1 m, behind and to the sides > 0.5 m. Make sure that there is sufficient head clearance and sufficient clear space above the calibrator.
- Make sure there is sufficient ventilation.
- Do not operate near flammable materials.
- Do not install in a cupboard or other similar type of location.
- The ventilation openings must not be blocked or covered.
- The calibrator must be installed so that it can be de-energized (switched off) quickly.

4.2 Electrical Connection

RISK OF ELECTRIC SHOCK **Calibrators that have been exposed to high humidity for long time periods have an initial higher than normal earth leakage current. Make sure that the calibrator is always connected to a protective earth.**

Always use a known good mains cable with an applicable power plug.

Use only a Druck specified mains cable.

Make sure that the mains outlet is correctly rated and has a protective earth connection.

Before the power is supplied, make sure that the calibrator is properly connected to the protective earth. The protective earth connects to the calibrator through the mains plug.

Before you connect the calibrator, make sure you:

1. Make sure the specified operating mains supply voltage range is correct for the calibrator. See Section 10.
2. Make sure that the mains voltage range is the same as that specified on the rating plate.
3. Only connect the calibrator to a correctly installed and earthed 3-pole socket for mains plugs with earthing contact.
4. Only use extension cables or adapter plugs with a protective earth connection.

4.2.1 Electrical Connection Procedure

1. Put the mains cable into the mains inlet socket of the calibrator.
2. Put the plug of the mains cable in an applicable mains outlet with an earth contact.

4.3 Calibrator Preparation

HOT SURFACE **The calibrator can become very hot when in operation. If you touch hot parts this can burn the skin.**

Never touch the dry block, micro bath, Inserts or the DUT at temperatures above 35 °C (95 °F) or below 10 °C (50 °F).

Let the calibrator become cool (≥ 10 °C and ≤ 35 °C) before you remove the DUT, change the Insert or de-energize (switch off) the calibrator.

INFORMATION **Empty and clean the tub Insert after use. Clean the micro bath tank if oil has spilled into the tank. Failure to clean the tank can cause Inserts to become stuck in the calibrator.**

To prepare to use the micro bath the calibrator must be de-energized (switched off) and cooled to room temperature.

The function of the calibrator is controlled by the installed Insert. The necessary Insert is installed into the opening of the dry block or micro bath. By the use of Inserts, it is easy to switch between dry block, infrared, surface and micro bath functions.

For an view of Insert compatibility, see Section 3.2 on page 7.

4.3.1 Adapter Sleeve Insert

Use adapter sleeves with single or multiple holes for the calibration of straight temperature sensors. For adapter sleeve Insert compatibility, see Section 3.2 on page 7.

1 Brass adapter sleeves for PTC200. Aluminum bronze alloy adapter sleeves for PTC700.
2 Aluminum adapter sleeves for PTC165(i) and PTC255(i).
3 Insert exchange tool.
d Borehole diameter.
h Homogeneous zone. 40 mm (1.6″)

Figure 5: Adapter Sleeve Inserts

For the specified accuracy of the calibrator, the DUT and the adapter sleeve must be matched to each another:

1. The borehole of the adapter sleeve must be no greater than 0.5 mm of the DUT diameter.
2. The measurement element of the DUT must have the same temperature zone of the adapter sleeve. See Figure 5, dimension h.

4.3.1.1 Installation

INFORMATION **Use only Druck adapter sleeves.**
If in doubt, contact Druck.

Use the Insert exchange tool to put the adapter sleeve into the dry block, see Figure 5 item 3.

4.3.1.2 External Reference Sensor

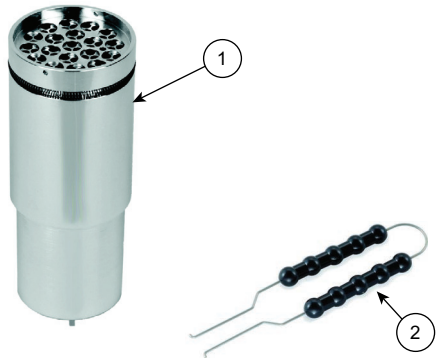
Align the adapter sleeve so that the hole for the external reference sensor is at the 12 o'clock position.

4.3.1.3 Removal and Cleaning

1. Let the calibrator cool before the adapter sleeve is removed.
2. Use the Insert exchange tool to pull the adapter sleeve out of the dry block, see Figure 5 item 3.
3. Clean the adapter sleeve and the dry block. This prevents interference between the two parts caused by unwanted material.

4.3.2 Air Shield Insert

The air shield Insert gives optimum radial and axial temperature distribution. There is a metal spring near the top of the shield to make sure that there is a constant air gap around the shield. For air shield Insert compatibility, see Section 3.2 on page 7.



1 Air shield insert.
2 Insert exchange tool.

Figure 6: Air Shield Insert

4.3.2.1 Installation

Use the Insert exchange tool to put the air shield into the dry block, see Figure 6 item 2. A final push on the air shield is necessary to make the shield be fully in position.

4.3.2.2 External Reference Sensor

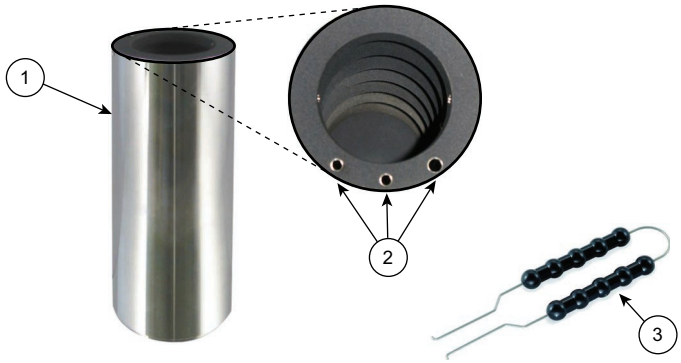
Align the air shield, to put the hole for the external reference sensor at the 12 o'clock position.

4.3.2.3 Removal and Cleaning

1. Let the calibrator become cool before the air shield is removed.
2. Use the Insert exchange tool to pull the air shield out of the dry block, see Figure 6 item 2.
3. Clean the air shield and the dry block.This prevents interference between the two caused by unwanted material.

4.3.3 Infrared Insert

Use the infrared Insert for contact-less measurement infrared thermometers. The infrared Insert has a special surface and surface coating on the inside. Thus, it has an emissivity value of 0.9994 (black body).



1 Infrared insert.
2 External sensor bore holes:
2 × 3.5 mm (0.138″)
1 × 4.5 mm (0.177″)
3 Insert exchange tool.

Figure 7: Infrared Insert

The holes in the border, see Figure 7 item 2, are for external reference sensors. These let accurate temperatures of the inside face of the infrared Insert be measured.

4.3.3.1 Installation

1. Use the Insert exchange tool to put the infrared Insert into the dry block, see Figure 7 item 3.
2. Center the infrared Insert so that there is the same air gap between the infrared insert and the dry block.

4.3.3.2 Removal and Cleaning

1. Let the calibrator become cool and then remove the infrared Insert. Use the Insert exchange tool to pull the infrared Insert out of the dry block, see Figure 7 item 3.
2. Clean the infrared Insert and the dry block. This prevents interference between the two parts caused by unwanted material.

4.3.3.3 Application Tips

1. The measurement mark of the infrared thermometer must project itself onto the bottom of the infrared Insert. This is part of the calibration procedure. The measurement mark must be smaller than the inner diameter and must not touch the wall of the infrared Insert.
2. Ice or condensation can occur in the infrared Insert at temperatures of less than 0 °C (32 °F) in high humidity levels. This can change the emissivity of the infrared Insert and decrease the calibration accuracy. The cause of ice or condensation can be decreased by:
   a. Put a cover over the measurement opening of the infrared Insert.
   b. Keep the measurement opening closed for as long as possible.
   c. For the calibration, only open the measurement opening for a short time.

   Note: Ice or condensation can be removed by the use of low heat on the infrared Insert.

4.3.4 Surface Insert

Use the surface Insert to calibrate surface temperature sensors. The surface Insert is hollow. When installed, the top portion of the surface Insert must be above the dry block.

1 Surface Insert.
2 External sensor bore holes:
1 × 3.0 mm (0.118″)
1 × 3.1 mm (0.122″)
1 × 4.5 mm (0.177″)
3 Surface Insert exchange tool.

Figure 8: Surface Insert

The holes in the border, see Figure 8 item 2, are for external reference sensors. These let the correct temperatures of the surface Insert to be measured.

The two threaded boreholes in the border are for the related exchange tool.

4.3.4.1 Installation

1. Use the exchange tool to put the surface Insert into the dry block, see Figure 8 item 3.
2. Center the surface Insert so that there is the same air gap between the surface Insert and the dry block.

4.3.4.2 External Reference Sensor

Align the surface Insert so that the hole for the external reference sensor is at the 12 o’clock position.

4.3.4.3 Removal and Cleaning

1. Let the calibrator become cool and then remove the surface Insert. Use the exchange tool to pull the surface Insert out of the dry block, see Figure 8 item 3.
2. Clean the surface Insert and the dry block. This prevents interference between the two parts caused by unwanted material.

4.3.4.4 Application Tips

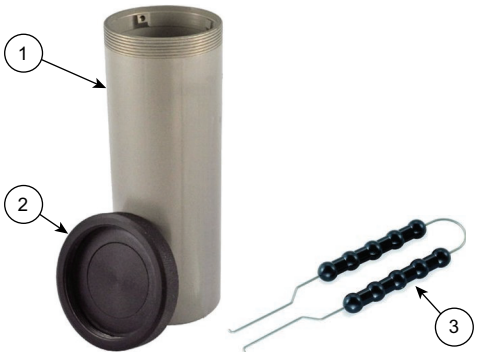
When an external reference sensor is used, put the sensor into the borehole. The measurement element must be under the middle of the calibration surface.

4.3.5 Tub Insert

WARNING **Use safety goggles. Calibration liquid can be ejected when with the tub insert is used. Always use safety goggles when calibration liquids are held.**

INFORMATION **Do not directly fill the PTC with liquid. Always use a tub Insert to contain the calibration liquid.**

The tub Insert is a removable calibration liquid container. It is to be put into and used in the liquid well of the calibrator. It is used for the calibration of sensors that have special shapes or dimensions. The sensor and the calibration liquid must directly touch, to make sure good heat transfer occurs.



1 Tub Insert.
2 Tub Insert transport cover.
3 Insert exchange tool.

Figure 9: Tub Insert

Use the Insert exchange tool to put the tub Insert into the micro bath, see Figure 9 item 3.

The tub insert is supplied with a transport cover to prevent spillage of the calibration liquid while in transportation.

Put the calibration liquid directly into the tub Insert: refer to Section 4.3.5.6 on page 17 for instructions.

4.3.5.1 Work Cover

Figure 10: Work Cover

The work cover is used to:

a. Decrease the evaporation of the calibration liquid.
b. Decrease the cooling of the surface of the calibration liquid.
c. To give stable positioning of the DUT in the tub Insert.

The work cover is screwed on to the micro bath and has five openings for DUT. The openings not used can be closed with the applicable silicone plugs, as shown in Figure 10.

4.3.5.2 Sensor Cage and Magnetic Stirrer

The sensor cage protects the magnetic stirrer: this stops interference between a DUT and the rotation of the magnetic stirrer.

1 Sensor cage
2 Magnetic stirrer
3 Glass spacer

Figure 11: Sensor Cage and Magnetic Stirrer

The magnetic stirrer makes sure that the temperature is the same in all areas of the calibration liquid. Use the user interface on the touch screen to control the speed of the magnetic stirrer.

Make sure the glass spacer is at the bottom of the Tube Insert, then put the magnetic stirrer on the top of the glass plate. The sensor cage must then be put into the Tube Insert.

Note: The magnetic stirrer will have wear while in normal use. The magnetic stirrer has a limited lifetime and must be replaced at regular intervals. See Section 8.1.

4.3.5.3 Magnetic Lifter

The magnetic lifter helps with the removal of the magnetic stirrer from the Tube Insert.

Figure 12: Magnetic Lifter

4.3.5.4 Notes on Calibration Liquid

WARNING Wear safety goggles. Calibration liquid can be ejected when the tub insert is used. Always use safety goggles when calibration liquids are held.

Different calibration liquids give different calibration results because of their special characteristics. Adjustment to the applicable calibration liquid has to be done by the manufacturer.

To get the best possible accuracy from a tub insert, fill it with an applicable calibration liquid. The calibration liquid is put directly into the tub insert.

Note: We recommend using silicone oil as the calibration liquid.

When silicone oil is the calibration liquid:

- Always read the safety data sheet supplied with the silicone oil before use.
- Always make sure of adequate ventilation when silicone oil is used: dangerous substances can be released when the oil is heated.
- Spilled or leaked silicone oil is a slip danger. Always clean up spills.
- Silicone oil is hygroscopic. When the tub Insert is pulled out of the calibrator, use the transport cover to seal the tub Insert.

4.3.5.5 Notes on Cleanliness

INFORMATION **Only use clean calibration liquid.**

The verification and calibration of DUT can cause contamination of the calibration liquid: the rotation of the magnetic stirrer can cause a smeary gel effect on the bottom of the tub Insert. This can effect the calibration accuracy.

It is highly recommended to:

1. Clean the tub Insert.
2. Clean the DUT before calibration.
3. Replace worn magnet stirrers.
4. Replace contaminated calibration liquid.

4.3.5.6 Notes on Calibration Liquid Fill Level

PREVENT FAILURE **Do not go past the maximum fill level. An unwanted release of calibration liquid can cause contamination and damage to the calibrator.**

INFORMATION **When the calibration liquid fill level is not correct, inaccurate calibration can occur. Filling above the maximum fill level can cause a waste of high heat: which prevents compliance with specified tolerances.**

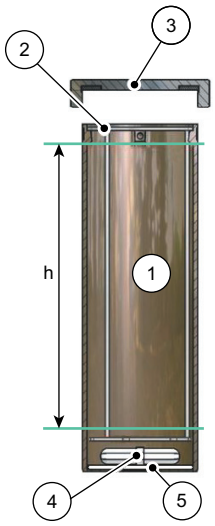
The fill level in the tub Insert will be increased by:

a. Thermal Expansion – Calibration liquids expand differently when their temperature increases. The increase in fill level can be controlled by the calibration liquid in use and the applied temperature.

b. Displacement by Sensors – The volume of the DUT must be included in the decision of the filling amount to be used.

c. Rise due to Stirring – The rotation of the magnetic stirrer makes a whirlpool in the liquid. This raises the fill level at the wall.

The maximum fill levels are shown below:



1 Tub Insert.
2 Sensor cage.
3 Tub Insert transport cover.
4 Magnetic stirrer.
5 Glass spacer

Figure 13: Maximum Fill Level

Parameter	Maximum
Fill Level (h)	136 mm (5.35″)
Fill Volume	~0.32 liters (10.82 fl oz)

Note: The maximum fill level line for the tub Insert is below the sleeve exchange tool fixture.

4.3.5.7 Filling with Calibration Liquid

INFORMATION **Give attention to the maximum calibration liquid fill level, see Section 4.3.5.6.**

When you put in the liquid, leave sufficient room for thermal expansion, displacement by the DUT, and rise of oil level caused by the activity of the stirrer.

Figure 14: Filling with Calibration Liquid

Procedure:

1. Turn the transport cover of the tub Insert until the cover can be removed.
2. Use the sleeve exchange tool to put the tub Insert into the micro bath tank.
3. Put the magnetic stirrer into the tub Insert.

4. Put the sensor cage, together with a DUT, into position: this reduces the volume necessary for the calibration fluid. The DUT can be removed after the liquid is put in. This is necessary if the DUT is too long and will stop the attachment of a Transport cover (page 16).
5. Fill the Tub Insert with calibration liquid.

   Note: The liquid must not go above the maximum fill level and there must be sufficient reserve space for an additional rise in the level.
6. Turn the Work cover into position.
7. Insert the DUT through the Work cover into the Tub Insert (page 15).

4.3.6 Integrated Measuring Instrument

This section relates to the PTC165i and PTC255i with the integrated measuring instrument.

4.3.6.1 Connect the DUT (Thermocouple)

1. Connect the cable ends to the terminal connectors, or thermocouple adapter, to the applicable inputs.
2. Connect the cable screen to the earthing socket if necessary.

4.3.6.2 Connect the DUT (mA or V)

Connect the temperature sensor to the integrated measuring instrument as follows:

- Current signal:
  1. 3-wire DUT with voltage supply from calibrator:
     a. Voltage supply for test specimen: socket “+24 V out”.
     b. Signal: “mA in”.
     c. GND: GND
  2. 2-wire DUT with voltage supply from calibrator:
     a. Voltage supply for test specimen: socket “+24 V out”.
     b. Signal: “mA in”.
  3. 2-wire DUT with voltage supply from calibrator:
     a. Signal: “mA in”.
     b. GND: GND
- Voltage signal:
  1. 3-wire DUT with voltage supply from calibrator:
     a. Voltage supply for test specimen: socket “+24 V out”

        Note: The DUT must be applicable for a supply voltage of 24 V.
     b. Signal: “V in”.
     c. GND: GND
  2. 2-wire DUT with voltage supply from calibrator: Not possible.
  3. 2-wire DUT with voltage supply from calibrator:
     a. Signal: “V in”.
     b. GND: GND

4.3.7 Measurement Interference Suppression

Electromagnetic interference can change a measurement value if a DUT cable has no cable screen. Use a clamp-on ferrite to cancel this effect. Insert the DUT cable into the clamp-on ferrite. It is recommended to wind the DUT cable with more than one turn around the clamp-on ferrite.

For optimum results, make sure the ferrite's damping properties are compatible with the interference frequency.

4.3.7.1 Attachment of the Clamp-on Ferrite

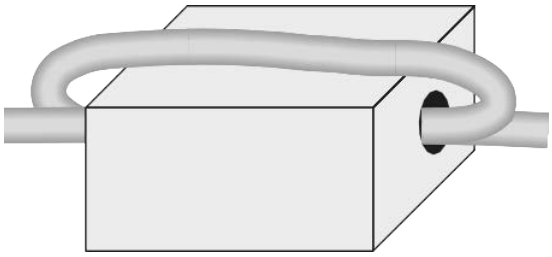


Figure 15: DUT Cable with Clamp-on Ferrite

1. Open the clamp-on ferrite.
2. Put the DUT cable into the clamp-on ferrite.

   Note: Attach the clamp-on ferrite as near as possible to the calibrator's measurement connectors.
3. Wind the DUT cable with more than one turn around the clamp-on ferrite, see Figure 15.
4. Close the clamp-on ferrite.

4.3.7.2 Remove the Clamp-on Ferrite

1. Open the clamp-on ferrite with the supplied ferrite key.

4.4 Switch ON, Cool Down and Switch OFF

For reasons of safety, when the switch ON of the calibrator occurs, the fan will operate at the maximum speed. When the internal reference sensor has measured a safe temperature, the fan speed is adjusted to the correct speed.

4.4.1 Switch ON (Energize)

WARNING Safely connect the calibrator to a protective earth, because there is a danger to life from electric shock. Before the power is supplied (energized), make sure that the earth connection of the calibrator is correctly connected to the protective earth.

WARNING After transport, storage or long periods of non-use, moisture can seep into the heating elements (magnesium oxide).

To dry the heating elements, the calibrator must be slowly warmed up. To dry the heating elements, set the calibrator to 120 °C (248 °C) for at least 15 minutes. Be aware that In this period, the calibrator will not have the necessary electrical insulation for protection class I.

INFORMATION Do not expose the calibrator to high levels of humidity for a long time. Excessive condensation can occur on the calibrator if a cold unit is brought into a considerably warmer place.

Before switching on the calibrator, allow it to acclimatise for at least 2 hours at room temperature.

1. Turn on the mains switch.
2. The fan of the calibrator starts and the display shows the Druck logo.
3. The type designation and the current software version are shown.
4. The main window is shown and the calibrator is available for use.

5. The first entry in the selection list, with its parameters, is shown as the test task.

4.4.2 How to cool down the Calibrator

HOT SURFACE The calibrator can become very hot when in operation. To touch hot parts can cause serious injuries.

Never touch the dry block, micro bath, Inserts or the DUT at temperatures above 35 °C (95 °F) or below 10 °C (50 °F).

Let the calibrator cool before you remove the DUT, change the insert or switch off (de-energize) the calibrator.

INFORMATION In the event of mains failure, or if the mains switch is turned off, or if the mains plug is removed due to an emergency stop, the built-in fan stops and does not provide cooling. Sufficient thermal decoupling occurs automatically between the micro bath / dry block and the housing.

To prevent injuries or material damage, it is necessary to cool down the calibrator.

Use the shutdown icon to cool the calibrator to a safe temperature. See “Behavior at the End of the Test Task” on page 28.

4.4.3 Switch OFF (de-energize) procedure

INFORMATION Only switch off the calibrator when the dry block / micro bath is at room temperature.

When switch off is done at high temperatures, the calibrator and/or the DUT can be damaged.

1. Tap the ✖ icon until the Home screen is shown.
2. Tap the ⏻ icon to shutdown (de-energize) the calibrator.
3. The calibrator regulates the temperature to a safe value. The message “Please wait – device is being brought to a safe temperature” is shown.
4. When the safe temperature has been reached, the message “You can now switch off the device” is shown.
5. Use the mains switch to switch OFF the calibrator.
6. Disconnect the calibrator from mains power if no more tests are necessary.
7. Remove the power cable from the wall outlet.
8. Clean the calibrator after use, see Section 8.3 on page 38.

5. User Interface

5.1 Home Screen

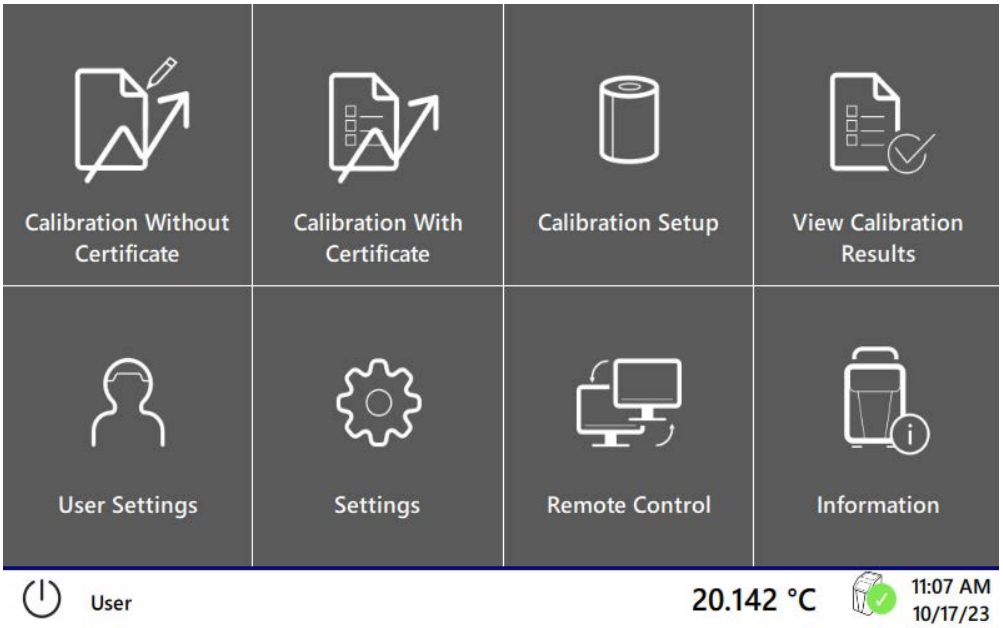


Figure 16: Home Screen

icon	Title	Description
	Calibration Without Certificate	Do a quick calibration. Only select the calibration function and enter a test point. No certificate is made.
	Calibration With Certificate	Do a calibration with a previously specified test task. After the calibration, a test certificate is automatically made: this can be exported.
	Calibration Setup	Lets management be done of test tasks, devices under test and calibration functions.
	View Calibration Results	Lets the results of calibrations be looked at by the use of a certificates. The certificate can be exported as a PDF or XLSX Excel file, as a raw data file to a USB flash drive or through the WebApp.
	User Settings	Use this function to set the name, language, temperature unit, sound output and decimal places. The name of the User will be on the test certificate.
	Settings	Use this function to set the date, DUT averaging time and IP address of the calibrator. The following can also be done: import or export a backup file, switch OPC mode ON or OFF, and choose between the standard or customized template for the certificates.
	Remote Control	Use this function to Start or Stop remote access. Use this function to operate the calibrator remotely, These communication protocols are available for use: OPC UA, serial communication and HTTP
	Information	Use this function to look at information about the calibrator.

6. Calibration

WARNING Warm up before the first calibration. Let the calibrator warm up for minimum of one hour before the first calibration. For example: make the calibrator operate until the first test point is met.

IMPORTANT Before the calibration, check that the inside of the block and the surface of the calibration insert are dry. Any ice or condensation that is present can be safely removed by heating to above 100 °C.

6.1 Calibration Setup

When a test certificate is not necessary after calibration, please continue with “Calibration Without Certificate” (page 31).

For a calibration with certificate, first add the devices under test (temperature sensors) and a test task. A test task contains the test points, one or more devices under test and the calibration function used.

Use this procedure to do the Calibration Setup (this is necessary for both types of calibration):

- On the Home screen, tap the Calibration Setup icon (page 22).
  The test task can be set and the devices under test and calibration functions.

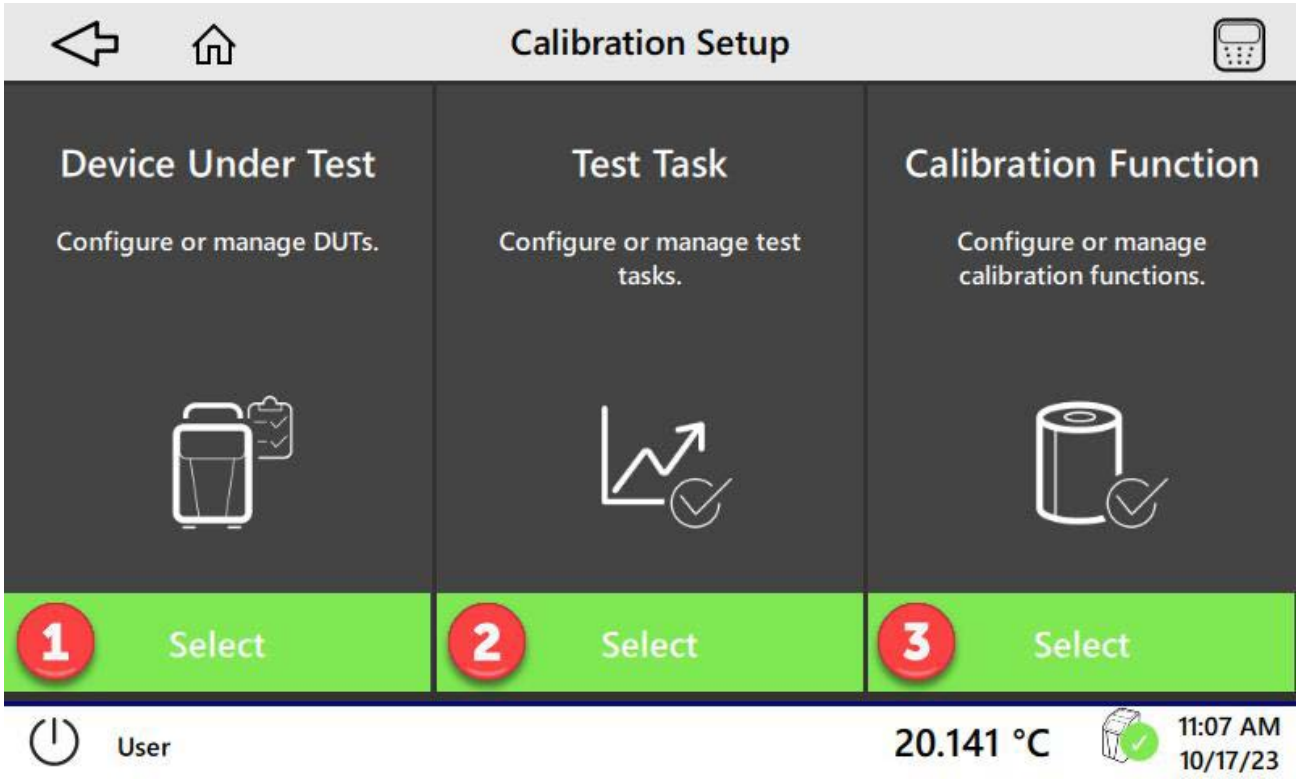


Figure 17: Calibration Setup

6.1.1 Set the Devices Under Test

- Tap (1) in the “Calibration Setup” window for the “Device Under Test” column.

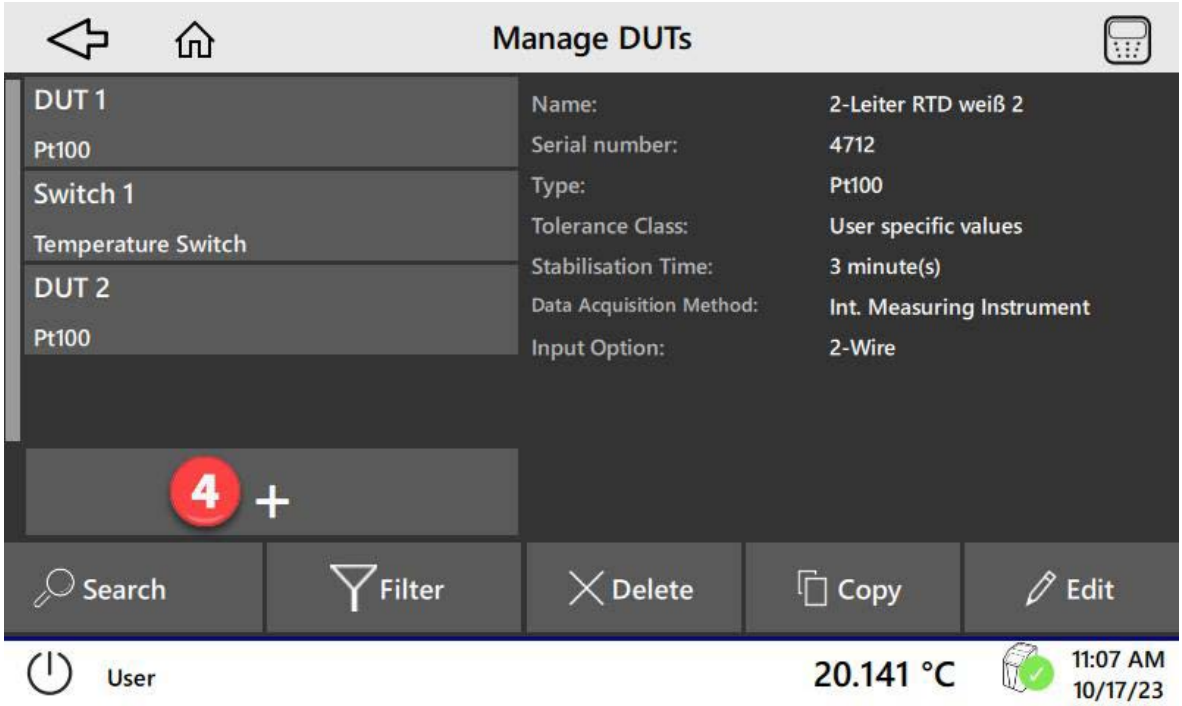
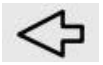


Figure 18: Manage DUTs

- In the “Manage DUTs” window, tap “+” (4) to add a device under test.
- Enter the necessary data into the fields. Use the “Previous”  and “Next” icons to move through the windows.

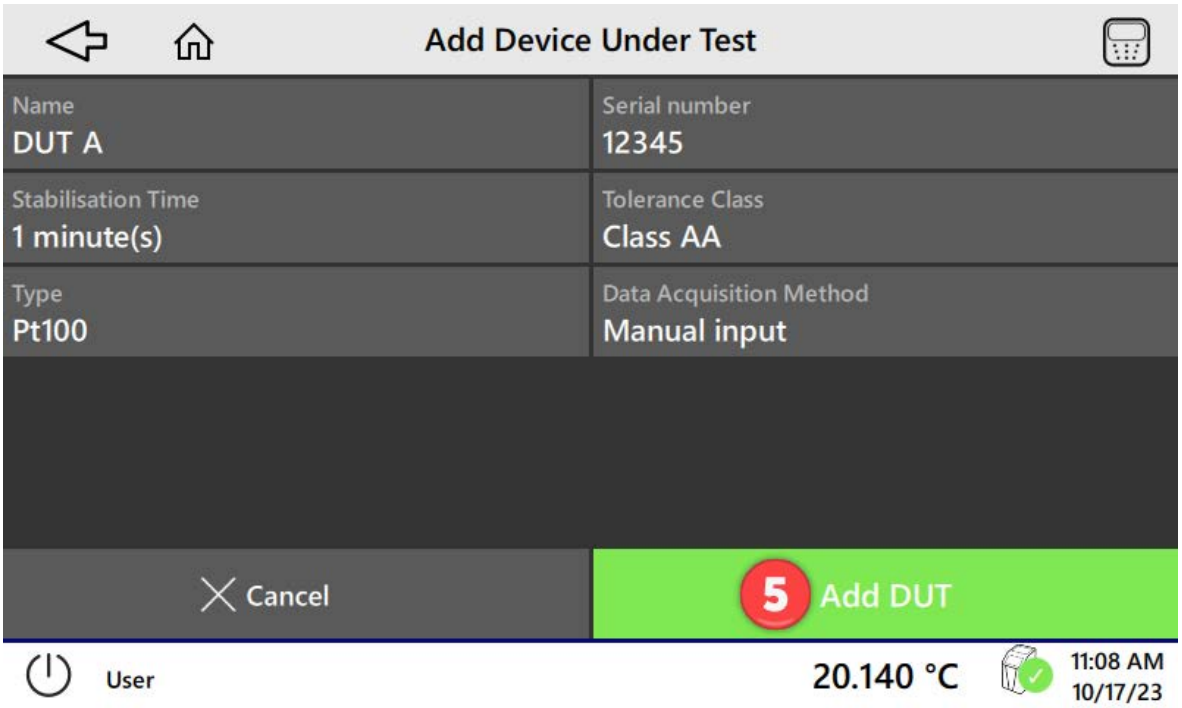


Figure 19: Add Device Under Test

- Push the “Add DUT” (5) button to accept all the data and continue.

6.1.2 Add Test Task

- In the “Calibration Setup” screen, tap the Test Task “Select” button (2).

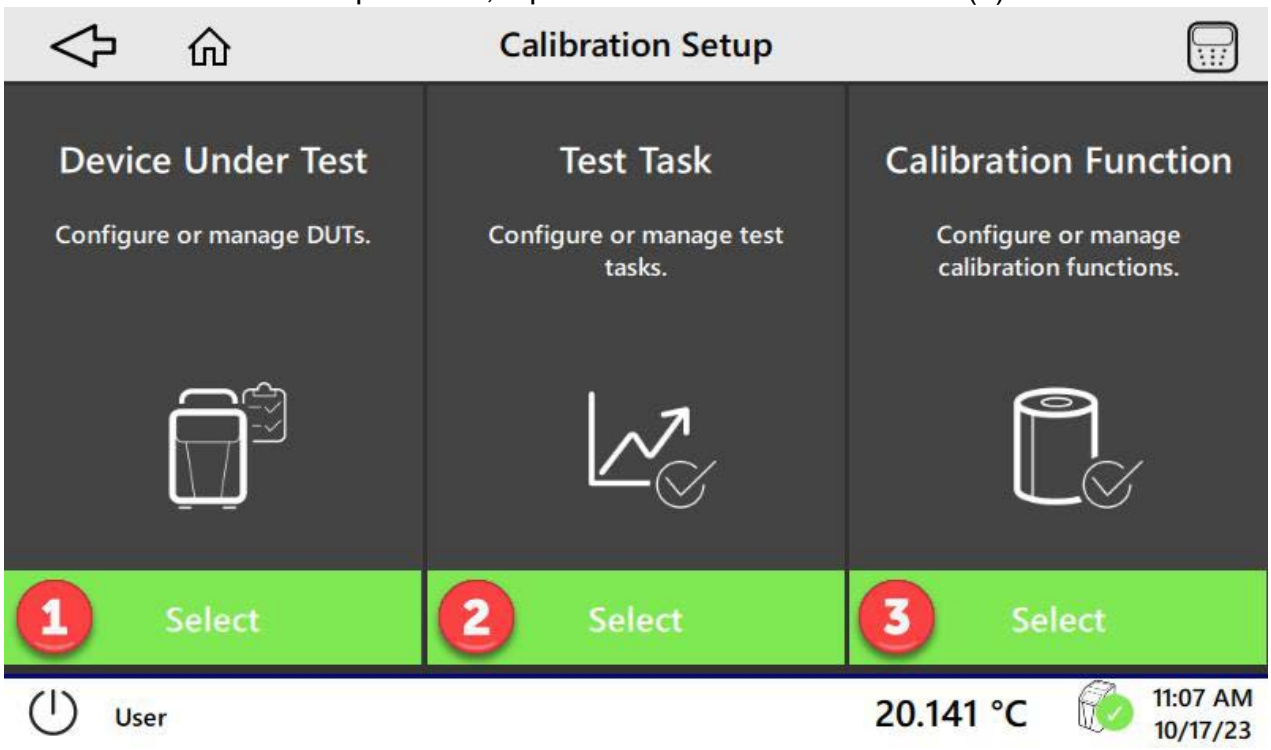


Figure 20: Calibration Setup - Test Task

- Tap “+” to add a task. Enter the necessary data into the fields. Use the “Previous” and “Next” buttons to move through the wizard application.

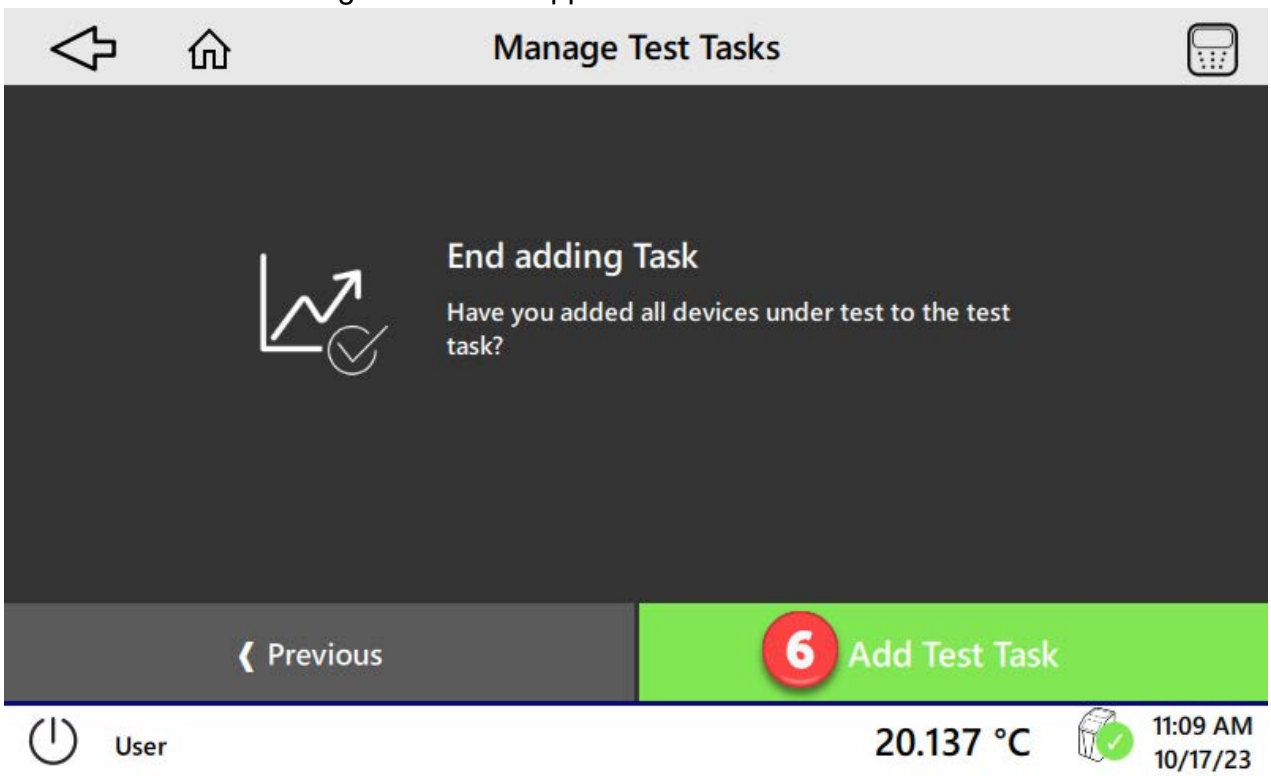


Figure 21: Manage Test Tasks

- Tap the “Add Test Task” button (6). If more changes to the test task are not necessary, please continue with “Calibration with Certificate” (page 32).

6.1.3 Edit Test Task

- In the “Calibration Setup” window (see page 25), tap the “Select” button (2) in the Test Task column.
- In the “Manage Test Tasks” window, tap the new test task and then tap the Edit icon.
- In the “Edit” mode the following can be changed: task name, number of test points and devices under test added to the test task, and the selection of the calibration function.

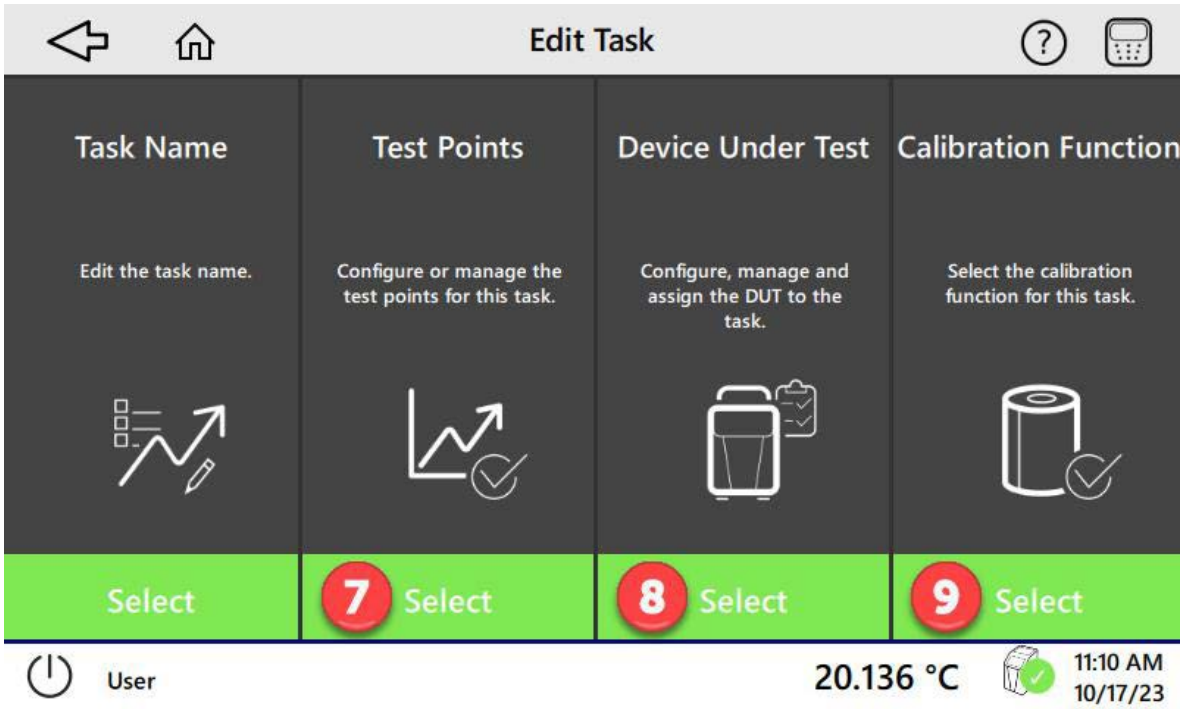


Figure 22: Edit Task

6.1.3.1 Add Test Points

In the “Edit (Test) Task” window (see page 26), tap the “Select” button (7) in the Test Points column.

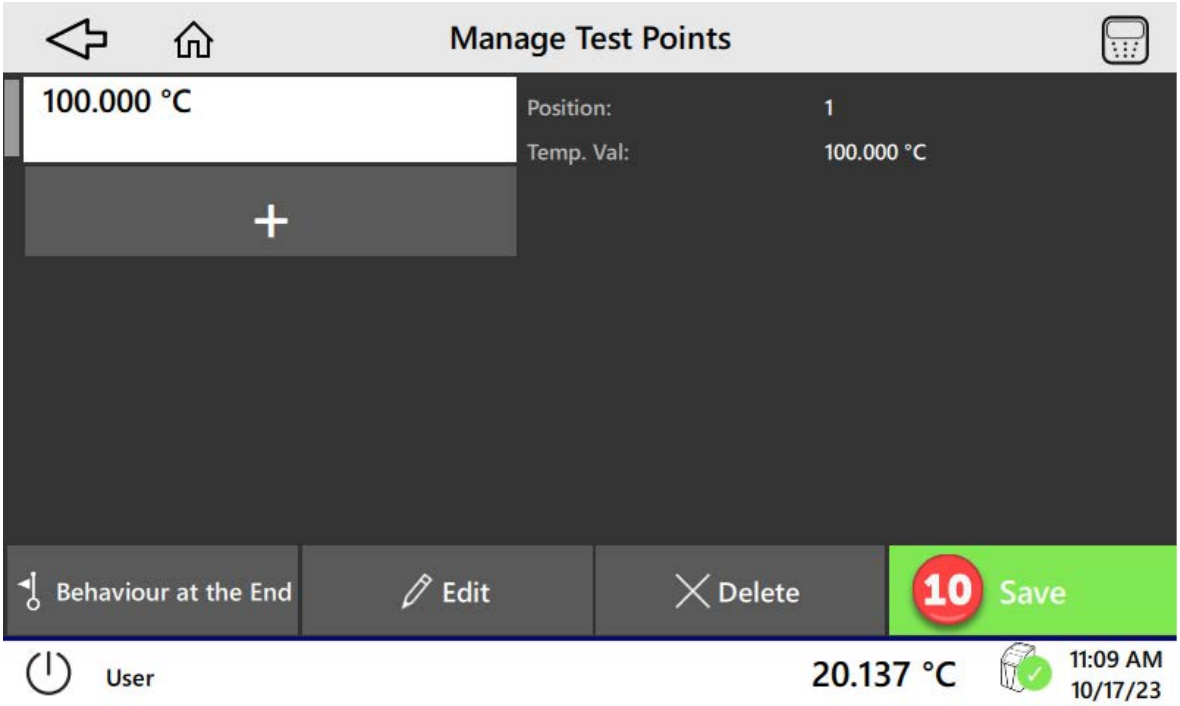


Figure 23: Manage Test Points - First

The test points of the test task can be edited.

Add Test Points Manually

- In the “Manage Test Points” window, Tap “+” to add a test point.
- Accept the new test point: tap the “Save” button (10) to accept the changes.

6.1.3.2 Behavior at the End of the Test Task

- In the “Manage Test Points” window, tap the “ Behavior at the End” button (refer to Section 6.1.3.1 on page 27).

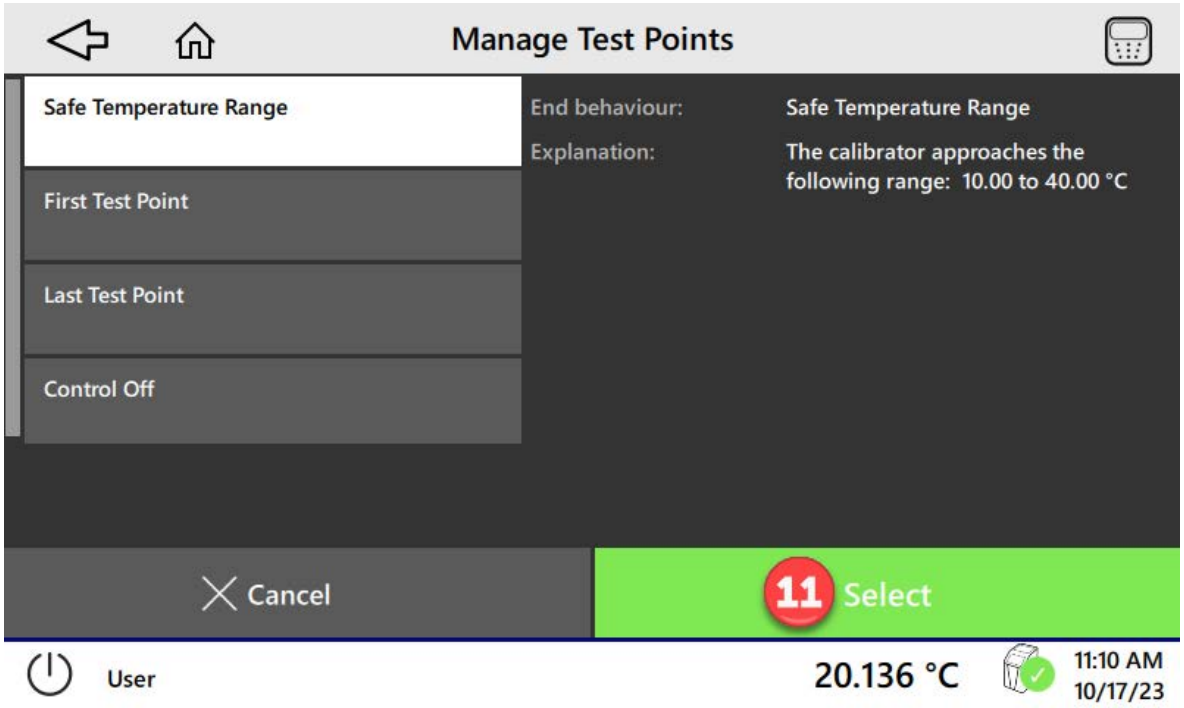


Figure 24: Manage Test Points - Second

- Select one of the options:
- Accept your selection: tap the “Select” button (11).
- Accept your changes: tap the “Save” button (10).

6.1.3.3 Add Device Under Test to Task

- In the “Edit Test Task” window, tap Select “Device under Test” (8) (refer to page 26).

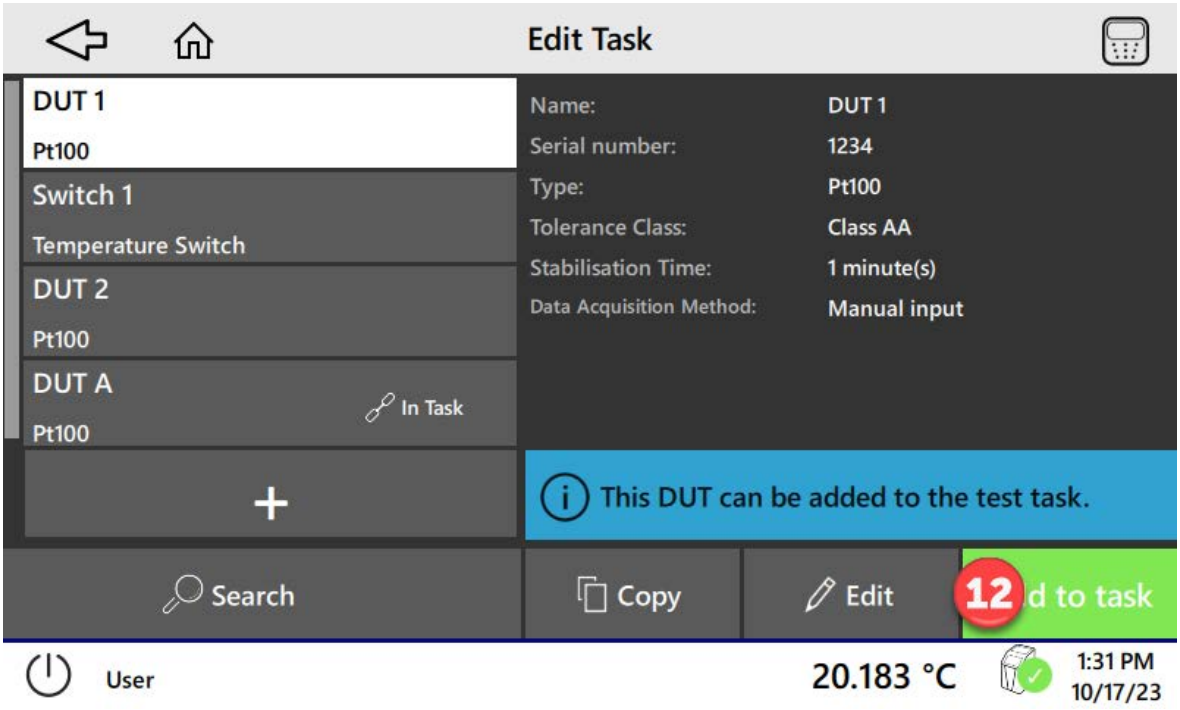


Figure 25: Edit Task

- Tap the device under test.
- Accept your selection: tap the “Add to task” button (12).

6.1.3.4 Select Calibration Function for Task

- In the “Edit (Test) Task” window, tap the (see page 26) the “Select” button (9) in the Select Calibration Function window.

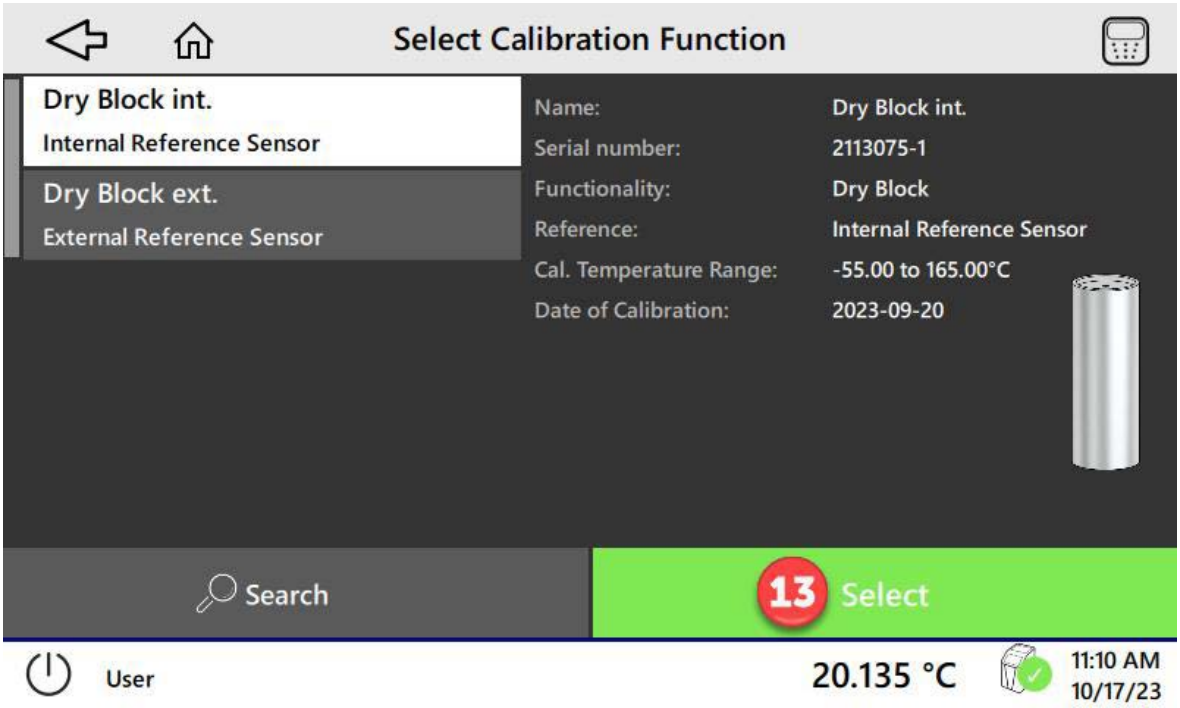


Figure 26: Select Calibration Function

- Tap the wanted calibration function.
- Accept your selection: tap the “Select” button (13).

6.1.4 Manage Calibration Functions

- In the “Calibration Setup” window, tap the “Select” (3) under Calibration Function (page 25).

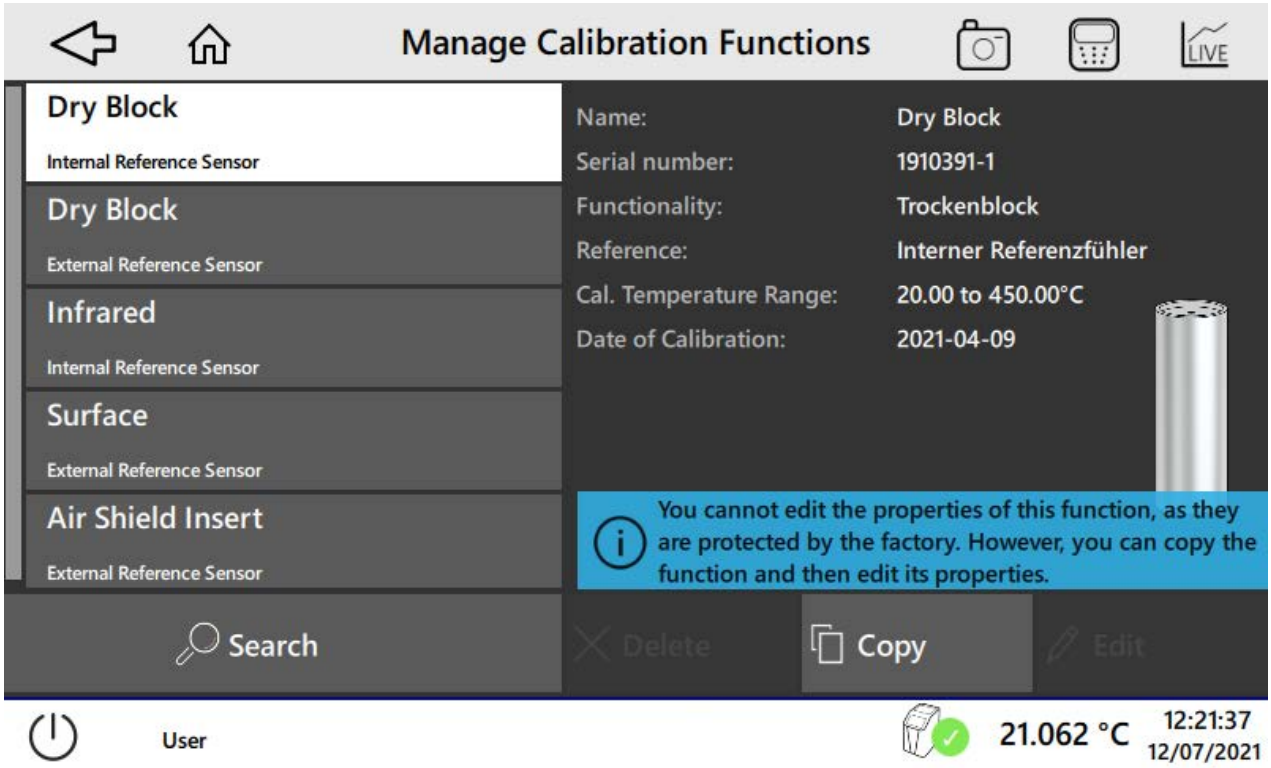


Figure 27: Manage Calibration Functions

- Calibration functions can be deleted, copied or edited. Password-protected functions can only be copied by the user. The copy of a password-protected function can be deleted, copied or edited.

6.2 Calibration Without Certificate

- In the Home screen, tap the “Calibration Without Certificate”..

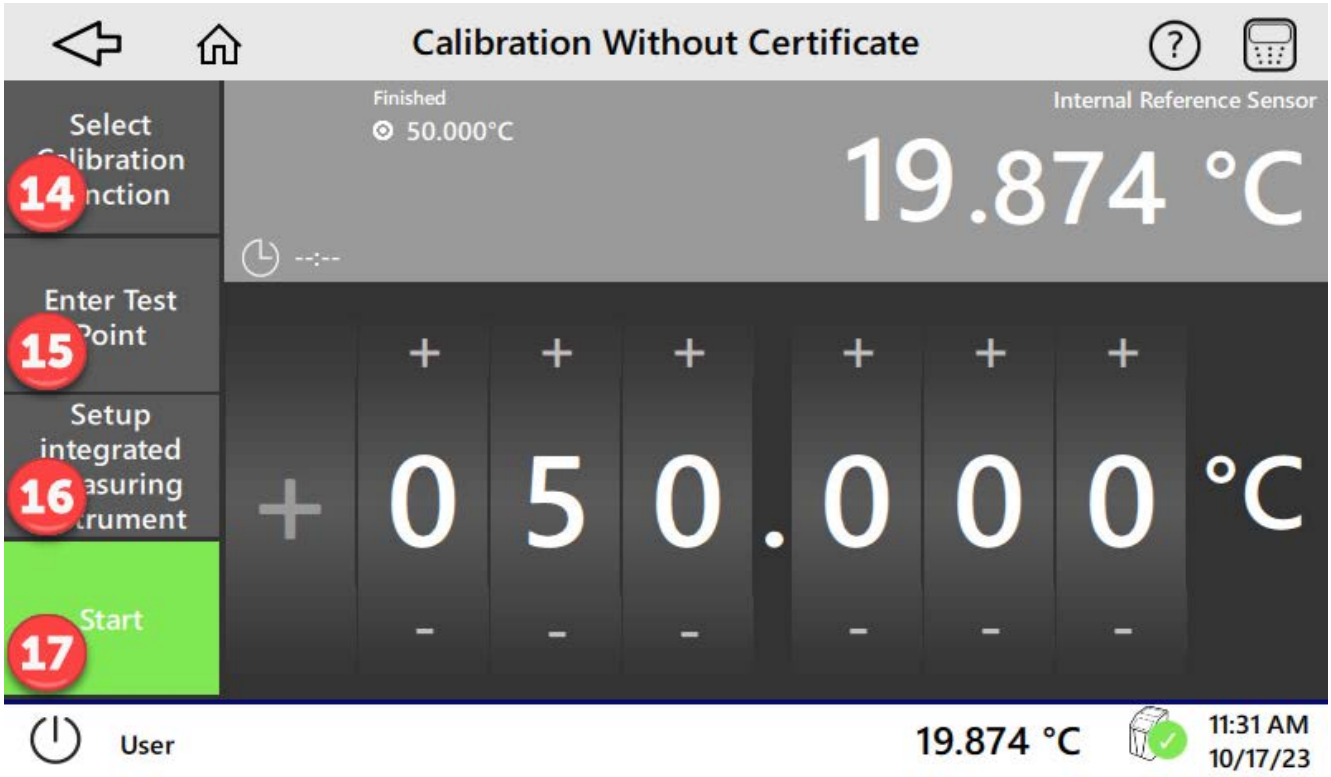


Figure 28: Calibration Without Certificate

- Tap the “Select Calibration Function” button (14) to show a display of available functions.
- Tap the calibration function and then tap the “Select” button.
- Tap the “Enter Test Point” button (15) and set a temperature value.
- Tap the “Start” button (17).
- The test point will be approached and held.
- Enter a new test point if necessary.
- Tap the “Stop” button to stop the calibration.

6.2.1 Set the Integrated Measuring Instrument

- Put the DUT into the device and connect to the Integrated Measuring instrument (refer to Section 3 on page 5 and Section 4.3.6 on page 19).
- Tap the “Setup integrated measuring instrument” button (16) (refer to Section 6.2 on page 31) and set the DUT variables.

- Tap the “Cancel” button (18) to close the display.

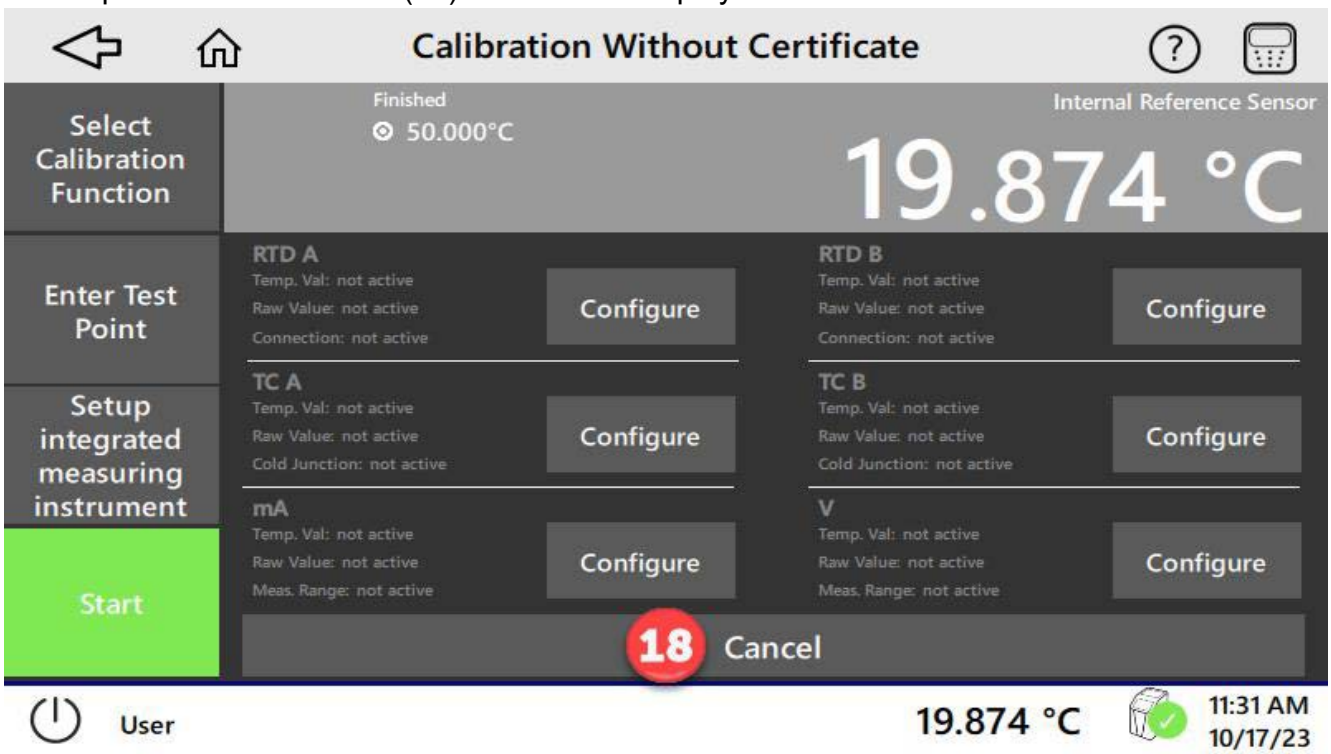
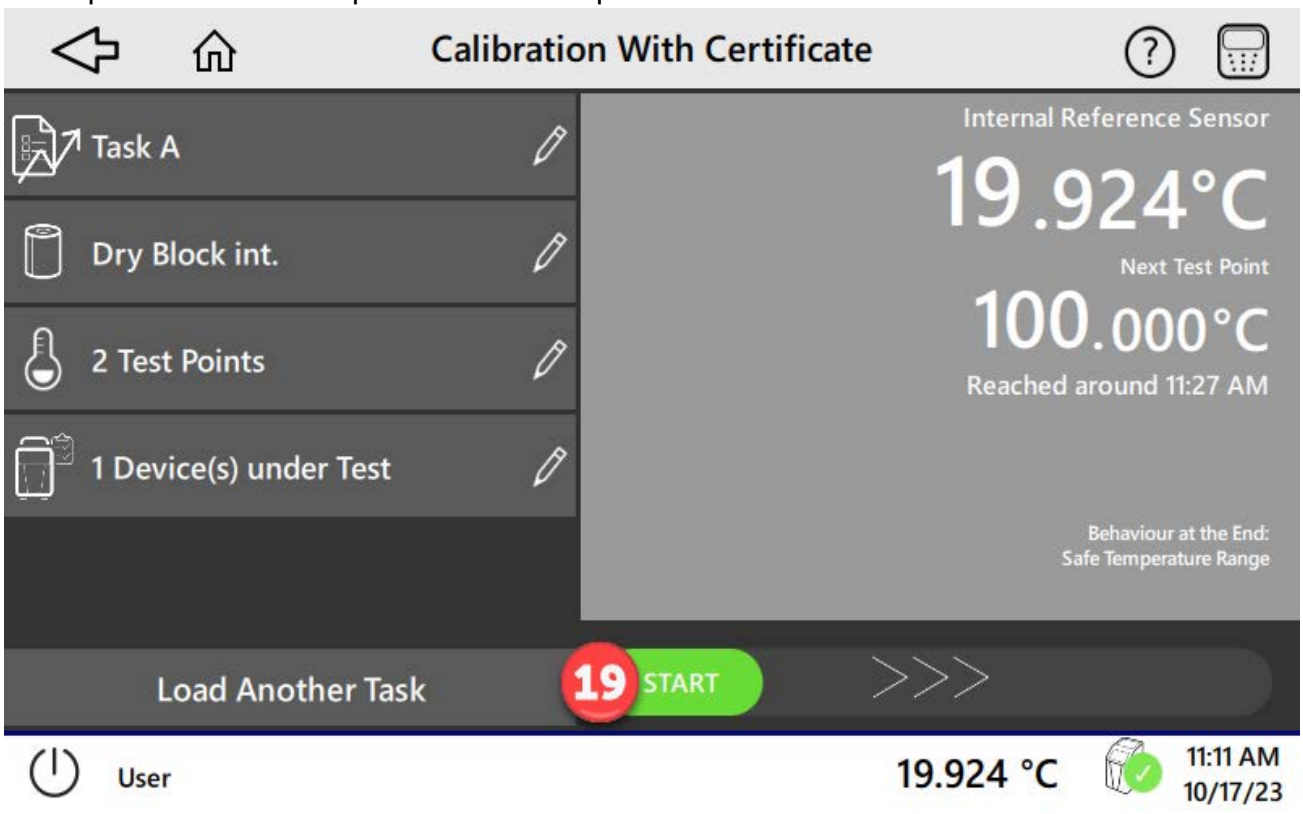


Figure 29: Calibration Without Certificate

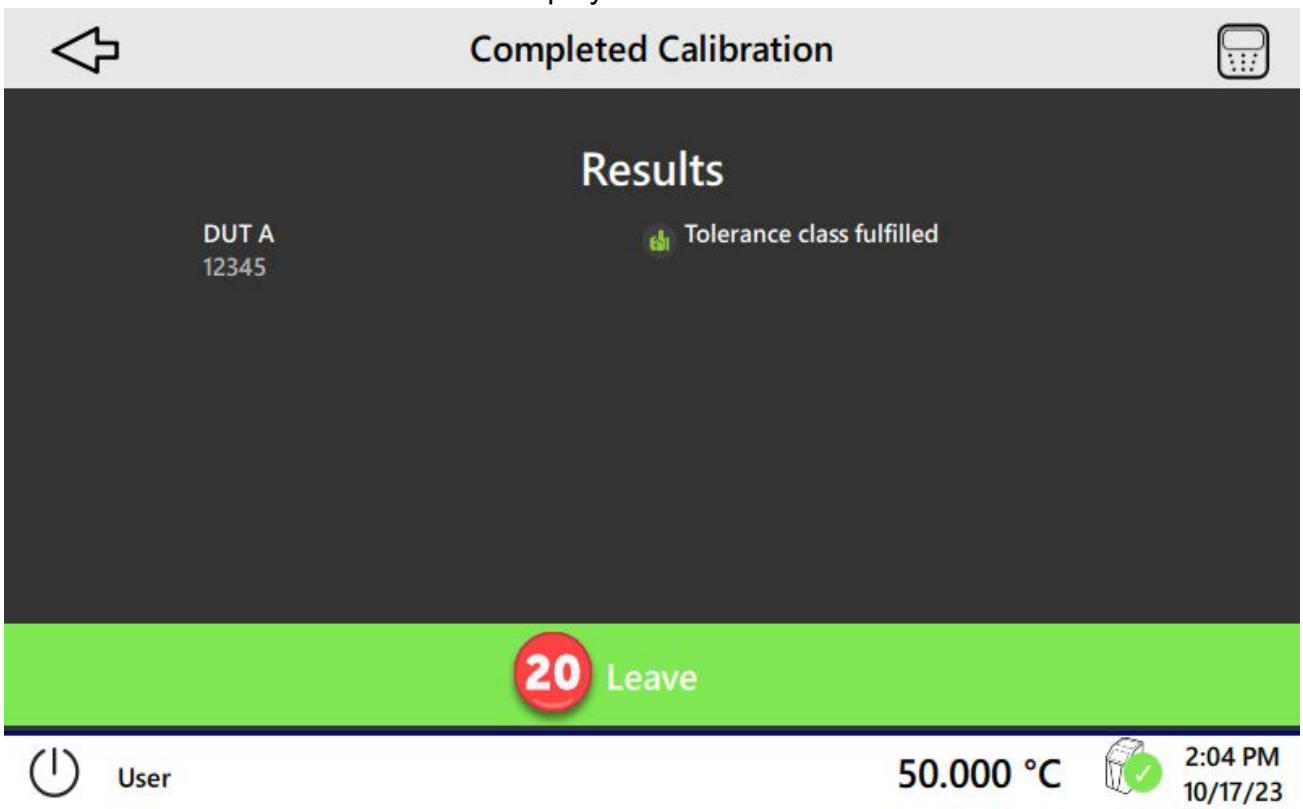
6.3 Calibration With Certificate

- In the Home screen, tap “Calibration With Certificate”.
- Tap a test task and tap “Select” to accept.



- Move the “START” button (19) to the right. The calibration procedure starts.

- When the calibration is done the display will show the results:



- Tap the “Leave” (20).

6.4 Remote Control (WebApp)

INFORMATION **Device uses an Ethernet Point-to-Point connection for connectivity. Thus make sure that any network connection is firewall protected and not connected to the Internet.**

A web browser is available to remotely control the PTC. When used, the PTC creates an internal web server. This is called the WebApp. The WebApp copies the PTC display and controls on a remote web browser. Figure 30 shows an example of the WebApp display in a web browser.

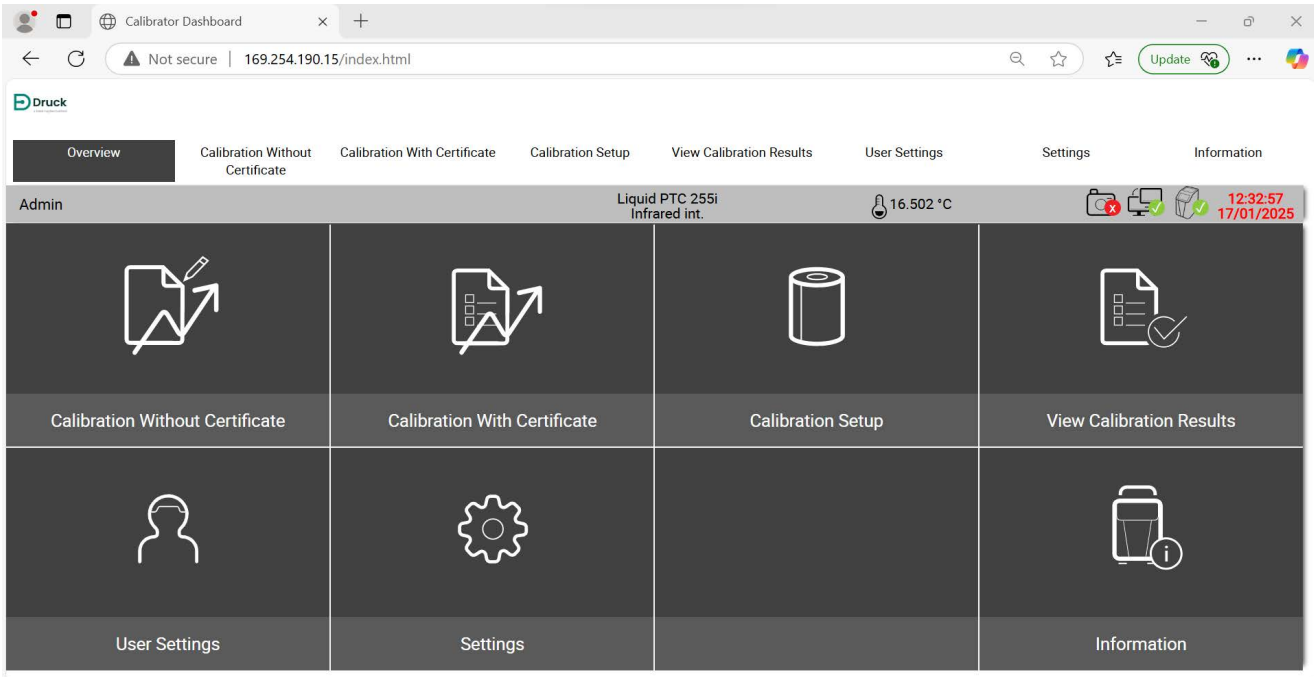


Figure 30: WebApp – PTC Easy Mode Example

Use this procedure to start the WebApp:

1. Attach a computer or smartphone with a web browser to the Ethernet port on the front panel of the PTC.
2. In the Setting menu, set the IP address on the PTC unit.

Note: If a Static IP addresses is used, make sure the IP address used is in the same circle or range as that of the IP address on the computer or smart phone. Example: if the IP address on the computer is 192.112.87.2, then the IP address on the PTC can be set to 192.112.87.3.

3. Connect the PTC to a LAN and use DHCP: no manual IP setting is necessary with this method. Another option is open the web browser on the computer or smart phone and enter the same IP address that you set on the PTC.

Note: To control the control\change data on the PTC through the use of the WebApp, put the PTC in the Remote Control Mode. To do this, tap the “Remote Control” option on the PTC home display (refer to page 22) and tap the “Activate Remote Control” button.

6.5 Use of a Web Camera

A Web Camera can attach to one of the USB sockets on the front of the PTC casing, Move this camera to point at the probe display to make an automatic record of each target temperature point as it is reached.

When the whole calibration process is automatically completed, the user transmits the data of the display record to the calibrator or calibration certificate.

Thus, a calibration certificate can be made that includes the visual record of the calibration procedure. The next heading gives the instructions for how to attach and use a Web Camera.

6.6 How to Use a Web Camera to Make a Record of a Calibration

DUT must have a display	Camera must be connected to the USB port on the front of the calibrator

Figure 31: Prepare equipment for use

Put the equipment in position and energize the equipment (switch on). The camera must point at the DUT display. Use these instructions to make a video record of a calibration.

Setup Calibration Task

Use the instructions in “Set the Devices Under Test” on page 24.

Tap **Data Acquisition Method** - tap “USB Camera” and then tap **Select Input Device** and tap **Save**.

On the DUT test window, move “Start” in the bottom right of the window to the right. This starts the calibration.

The camera then captures photos of the reading of the DUT at the test points that have been entered into the Task.

Three points are recorded, at the start of the Dwell time, in the Middle of the Dwell Time and at the end of the Dwell time. The start of the Dwell time is indicated when the LED on the screen changes to green.

At the end of the calibration the display will show “Test Task Completed Successfully”.

Select “OK”.

The calibrator will show three video photos for each temperature point. Take the average value from the three photos and enter it as the “Actual Value Test Point”.

It is possible to save a DUT identification in the form of a digital QR code. Refer to Section 6.8 on page 36 for more information.

After the Actual Value for all the test points is entered, tap the tick icon ☑ at the bottom right of the window to accept the entry.

The display shows the DUT test window again. To stop the task, move the “Stop” button to the left at the bottom right of the window.

6.7 Exporting the Calibration Data

Two methods are available to export calibration data:

1. USB memory stick

- Push a USB memory stick into one of the three USB A ports in the front of the device.
- Move to the Home screen.
- Tap the “View Calibration Results” button and then tap “View Certificate” option.
- Tap the “Export Certificate” button to export data to the mass storage device.
- Click “The certificate shall be exported” to the USB stick.
- Tap the “Unmount USB Storage” button, and then safely remove the memory stick.

An alternative method is to export the results in the form of CSV, Excel or PDF files, to the USB memory stick.

2. The use of the WebApp

- Use the instructions in Section 6.4 on page 34 for how to use the WebApp.
- Tap the “View Certificate” button, select the task and then the tab “Show PDF”. Tap “Open” to show the Certificate.
- Tap the “Download Certificate” option and then tap the “Download” button. The Certificate will be exported in the form of a ZIP file into the computer memory.

6.8 Selection of Barcode gives the option to scan the DUT Barcode

Push the barcode reader connector into one of the USB ports on the front of the calibrator.

Tap the “Barcode:” field on the “Configure Test Task” window and enter the name of DUT into the “Insert name” field. Tap the tick ☑ icon at the bottom right of the window. The barcode is linked to the DUT name and to the calibration task and shown in the “Configure Test Task” window.

For the future calibrations of the device, use the “Search Test Task” on the Home screen to find the calibration test task. This is done by a tap on the “Search Test Task” field in the Home screen and then do a barcode scan: the calibration task is automatically found.

7. Troubleshooting

PREVENT FAILURE Never open the calibrator. Critical parts or components can be damaged. Return the calibrator to Druck.

Refer to Table 8 for trouble shooting guide.

Table 8: Troubleshooting Guide

Problem	Possible Cause	Remedy
User input on calibrator touchscreen does not give results.	The calibrator is in an undefined state.	Turn off the calibrator, wait some minutes, then start again.

Table 8: Troubleshooting Guide

Problem	Possible Cause	Remedy
Sensor break.	External reference sensor not properly connected.	Examine the sensor connection.
	Cable break or short circuit.	Contact Druck Services.
Fan not in operation.	The fan is defective or blocked.	
	The thermal protection fuse has operated.	
Set point temperature not met.	Solid state relay is defective.	
	The heating / cooling element is defective.	
No display.	Controller is defective.	
Calibrator cannot be switched on.	Mains supply not available or fuses broken.	Examine the mains supply and the fuses.
	Residual current circuit breaker has operated because of moisture in the heating elements.	Contact Druck Services.

If you cannot remove the problem, immediately disconnect the calibrator to protect against accidental operation. Send the calibrator back to Druck for repair.

8. Maintenance, Cleaning and Transportation

Before maintenance, the removal of dirt, and transportation, make sure:

1. The calibrator has cooled sufficiently. See Section 4.4.2.
2. The calibrator has been switched off and disconnected from the mains.

8.1 Maintenance

PREVENT FAILURE Never open the calibrator. Critical parts or components can be damaged. Send the calibrator to Druck.

The calibrator is maintenance-free and cannot be repaired by the user. If the calibrator is defective it must be sent to Druck, or an approved service representative for repair.

For safe operation of the calibrator, these checks must be done at regular intervals.

8.1.1 Before Use

1. Examine the calibrator for damage.
2. For micro bath calibrators, make sure the filled height of the calibration liquid is correct. See Section 4.3.5.6.

8.1.2 Annually

1. Visually inspect all parts of the calibrator for corrosion, wear and damage.
2. Have an approved technical person do an electrical safety inspection.

8.1.3 A new calibration

Send the calibrator to Druck to be calibrated again after 36 months, or if the calibrator has been used for approximately 500 hours.

8.1.4 Calibration Liquid

Calibration liquids become contaminated with age and with use. The speed at which this occurs depends greatly on the type of liquid and the usage behavior.

1. Replace contaminated or aged calibration liquid.

8.1.5 Magnetic Stirrer

The magnetic stirrer has mechanical wear and tear in normal operation. The magnetic stirrer has a life limit and must be replaced at regular intervals. The fillet in the middle of the magnetic stirrer decreases the friction of the rotary movement. When this fillet has worn, the friction increases and the stirring function will not longer be as good. Make sure the circular glass spacer is at the bottom as this reduces the wear of the stirrer.

1. Examine the fillet of the magnetic stirrer for wear and tear. Replace the magnetic stirrer if necessary.

8.1.6 Mains Fuses

WARNING Only use fuses of the same type.

For fuse specification, see Section 10.

The mains fuses of the calibrator are on the front side and are part of the mains connection. If mains voltage is on, but the display is dark and the fan is not running, examine the mains fuses. Replace the fuses if necessary.

1. Disconnect the mains connection cable from the calibrator.
2. Use a fingernail or a flat screwdriver to prise open the fuse compartment from the bottom.
3. Remove the compartment that has the fuses.
4. Examine the fuses and replace any broken fuses.

   Note: Always replace both fuses, even if only one has broken.
5. Put the fuse compartment into position and connect the mains connecting cable. See Section 4.2.

Note: The calibrator is possibly defective if the fuses continue to break. Send the calibrator to Druck for repair. There is a thermal fuse inside the case, refer to Section 2.2 on page 3 for more information.

8.2 Calibration

8.2.1 Recalibration

The calibrator is adjusted and tested with measuring equipment before delivery: recognized national standards are applicable to these tasks.

The calibrator must be inspected at applicable intervals to meet the ISO 10012 standard: these intervals depend on how often the calibrator is used.

Send the calibrator to Druck to be calibrated again after 36 months, or if the calibrator has been used for approximately 500 hours.

8.3 Cleaning

8.3.1 Exterior Chassis

Use a dry or slightly damp lint-free cloth to clean the calibrator. Do not use sharp objects or aggressive materials to do this.

Make sure that your cleaning agent cannot be a source of danger from a reaction with parts of the calibrator or the materials inside. If not sure of cleaning agent compatibility, contact Druck Services for information.

8.3.2 Vent Grilles for Inlet Air

INFORMATION **If there is a blockage in the vent grilles, the thermal protection fuse can become too hot to operate and breaks the supply of power. The thermal protection fuse cannot be used again: also the calibrator cannot be used. The calibrator must be sent to Druck for repair. Make sure that the grille openings are always kept clear.**

The grille openings, see Figure 2 items 11 and 12, in the base of the calibrator must be cleaned at regular intervals. The cleaning interval depends upon on the air pollution in the area in which the calibrator operates and the amount of use.

1. Use a brush of a vacuum to clean the grille openings.

8.3.3 Inserts

INFORMATION **Before a long shutdown of the calibrator, remove the Insert from the dry block or micro bath.**

In usual operation, the Inserts create small metal particles. These particles can make it difficult to remove an Insert from the dry block:

1. Use the sleeve exchange tool to remove the Insert from the dry block.
2. Clean the insert and the dry block at regular intervals.

8.3.4 Tub Insert

Before the clean operation remove as much as possible of the contents from the tub Insert.

Obey the instructions in the safety data sheet for the calibration liquid.

8.3.4.1 Silicone Oil

1. Remove the sensor cage from the tub Insert.
2. Use the magnetic lifter to remove the magnetic stirrer. Also remove the circular glass spacer from the bottom of the tub insert.
3. Clean the tub insert, sensor cage, magnetic stirrer and glass spacer. Use water, to which a large amount of detergent has been added.
4. Remove the soapy water.
5. Fully dry the tub Insert, sensor cage, magnetic stirrer, and the glass spacer.

8.4 Return Goods/Material Procedure

If the device has to be calibrated or is unserviceable, return it to the nearest Druck Service Centre listed at: **https://druck.com/service**.

Contact the Service Department to obtain a Return Goods/Material Authorization (RGA or RMA). Give this information for a RGA or RMA:

- Product (e.g. PTC700).
- Serial number.
- Details of defect/work to be done.
- Include any error code(s).
- Conditions of use.

8.4.1 Safety Precautions

INFORMATION Service by sources not approved for this type of work will have an effect on the warranty and possibly on future performance.

You must tell Druck if the product has touched a dangerous or poisonous material.

The contents of related COSHH or in the USA, MSDS, must be understood and used when dangerous materials are touched.

9. Decommissioning and Disposal

9.1 Before Decommissioning

Before devices are decommissioned make sure that the calibrator and its accessories have fully cooled down. See Section 4.4.2.

9.2 Decommissioning

1. Remove all connected sensors and devices.
2. Switch off (de-energize) the calibrator and disconnect the mains plug.
3. Use the Insert exchange tool (page 11) to remove the Tub Insert from the liquid well and empty the tub of calibration liquid.

9.3 Discard the Calibration Liquid

CAUTION Discard the calibration liquid. The Technical Safety Data Sheet gives related information.

9.4 Disposal of Calibrator

See “Marks and Symbols on the Equipment” on page ii for details of the Druck WEEE take-back scheme.

10. Specification

10.1 Shared Specification

Specification	All Models
Display:	
Type	17.8 cm (7″) Color Touch Screen
Resolution	0.1 / 0.01 / 0.001 °C / °F / K
Display units.	°C / °F / K
Display for sensor failure.	On-screen message.
Sensor failure behavior.	The control is switched off.
Response to too high temperature.	Thermal fuses interrupt the power supply when the temperature becomes too high inside the housing.
Environmental:	
Operating temperature range.	0°C to 50 °C (32°F to 122 °F)
Transportation and storage temperature.	-10 °C to 60 °C (14 °F to 140 °F)
Relative humidity.	< 80 % to 31 °C (87.8 °F), reducing linearly to 50 % at 40 °C (104 °F) (none condensing)
Operating conditions:	
- Location	Indoor use only.
- Altitude	Up to 2000 m (6561 ft)
- Operating position	Vertical (as shown on manual's front cover).
EMC	Obeys the standard EN 61326-1, class A (Industrial environments)
Electrical Properties:	
PC interfaces	Ethernet, 3 × USB
Mains cable	H05VV-F 3 G 0.75 mm^2 with angled protective contact plug and cold equipment plug. Length ~ 2 m (6.6 ft)
Safety	Over-voltage (Installation) Category II Pollution Degree 2 according to IEC 61010-1
Protective ground	Protective ground conductor (PE) must be available.

10.2 PTC200 Specification

Specification	PTC200	
Temperature range[a]	-50 °C to 200 °C (-58°F to 392 °F)	
Setting range	-60 °C to 200 °C (-76°F to 392 °F)	
Control sensor (switchable)	**External Reference Sensor**	**Internal Reference Sensor**
Dry Block:		
Display accuracy	± 0.27 °C (± 0.486 °F)	± 0.34 °C (± 0.612 °F)
Temperature stability	± 0.003 °C (± 0.0054 °F)	± 0.020 °C (± 0.036 °F)
Temperature distribution:		
- Axial	± 0.250 °C (± 0.450 °F)	
- Radial	± 0.070 °C (± 0.126 °F)	
Influence of load	± 0.070 °C (± 0.126 °F)	± 0.220 °C (± 0.0.396 °F)
Stabilization Time:		
- to ± 0.05 °C (± 0.09 °F)	From 1 min	–
- to ± 0.005 °C (± 0.009 °F)	From 5 min	–
Hysteresis	± 0.010 °C (± 0.018 °F)	
Dimension of the Dry Block:		
Borehole diameter	28 mm (1.10″)	
Depth	150 mm (5.91″)	
Homogeneous temperature area	Bottom 40 mm (1.58″) of the adapter sleeve.	
Electrical Characteristics:		
Power supply	100…240 V ac, 50/60 Hz	
Power consumption	Approx. 555 W	
Fuse	2 off 5 × 20 mm T6.3H250V	
Case:		
Dimensions		
- Width	210 mm (8.27″)	
- Height + Handle	380+50 mm (15.0+2.0″)	
- Depth	300 mm (11.8″)	
- Weight	~ 15 kg (~ 33.1 lbs)	

a. At an ambient temperature of 20 °C (68 °F).

10.3 PTC700 Specification

Specification	PTC700	
Temperature range[a]	T_R to 700 °C (T_R to 1292 °F)	
Setting range	0 °C to 700 °C (32°F to 1292 °F)	
Control sensor (switchable)	**External Reference Sensor**	**Internal Reference Sensor**
Air Shield:[b]		
Display accuracy	± 0.27 °C (± 0.486 °F)	n/a
Temperature stability	± 0.015 °C (± 0.027 °F)	n/a
Temperature distribution:		
- Axial	± 0.400 °C (± 0.720 °F)	n/a
- Radial	± 0.020 °C (± 0.036 °F)	n/a
Influence of load	± 0.020 °C (± 0.036 °F)	n/a
Dry Block:[b]		
Display accuracy	n/a	± 0.43 °C (± 0.774 °F)
Temperature stability	n/a	± 0.100 °C (± 0.180 °F)
Temperature distribution:		
- Axial	n/a	± 0.400 °C (± 0.720 °F)
- Radial	n/a	± 0.040 °C (± 0.072 °F)
Influence of load	n/a	± 0.180 °C (± 0.324 °F)
Time to become stable:		
- to ± 0.05 °C (± 0.09 °F)	From 1 min	–
- to ± 0.005 °C (± 0.009 °F)	From 5 min	–
Hysteresis	± 0.015 °C (± 0.037 °F)	
Dimension of the Dry Block:		
Borehole diameter	29 mm (1.14″)	
Depth	150 mm (5.91″)	
Homogeneous temperature area	Bottom 40 mm (1.58″) of the adapter sleeve.	
Electrical Characteristics:		
Power supply	110…115 V ac, 60 Hz 230 V ac, 50 Hz	
Power consumption	Approx. 1100 W	
Fuse	2 off 5 × 20 mm T10H250V	
Enclosure:		
Dimensions		
- Width	210 mm (8.27″)	

Specification	PTC700
- Height + Handle	330+50 mm (13.0+2.0″)
- Depth	300 mm (11.8″)
- Weight	~ 10 kg (~ 22.1 lbs)

a. The PTC700 can be operated up to 700 °C (1292 °F): optimum accuracy up to 660 °C (1220 °F) is possible.
b. All values measured at 660 °C (1220 °F).

10.4 PTC165(i) Specification

Specification	PTC165(i)	
Control sensor (switchable)	**External Reference Sensor**	**Internal Reference Sensor**
Air Shield (DB):		
Temperature range[a]	-30 °C to 160 °C (-22 °F to 320 °F)	n/a
Display accuracy	± 0.07 °C (± 0.126 °F)	n/a
Temperature stability	± < 0.001 to 0.005 °C (± < 0.0018 to 0.009 °F)	n/a
Temperature distribution:		
- Axial	± 0.060 °C (± 0.108 °F)	n/a
- Radial	± 0.010 °C (± 0.018 °F)	n/a
Influence of load	± 0.010 °C (± 0.018 °F)	n/a
Infrared (IR):		
Temperature range[a]	n/a	-30 °C to 165 °C (-22 °F to 329 °F)
Display accuracy	n/a	± 0.5 °C (± 0.9 °F)
Stability	n/a	± 0.02 °C (± 0.036 °F)
Emission factor	n/a	0.9994
Tub Insert (TI):		
Temperature range[a, b]	-30 °C to 155 °C (-22 °F to 311 °F)	n/a
Display accuracy	± 0.20 °C (± 0.36 °F)	n/a
Temperature stability	± 0.010 °C (± 0.018 °F)	n/a
Temperature distribution:		
- Axial	± 0.350 °C (± 0.630 °F)	n/a
- Radial	± 0.080 °C (± 0.144 °F)	n/a
Influence of load	± 0.040 °C (± 0.072 °F)	n/a
Surface (SU):		
Temperature range[a]	-25 °C to 150 °C (-13 °F to 302 °F)	n/a
Display accuracy	± 1.00 °C (± 1.80 °F)	n/a
Stability	± 0.150 °C (± 0.270 °F)	n/a
Stabilization Time:		
- to ± 0.05 °C (± 0.09 °F)	From 1 min	–
- to ± 0.005 °C (± 0.009 °F)	From 5 min	–
Hysteresis	± 0.010 °C (± 0.018 °F)	
Dimension for the Calibration Insert:		
Diameter	60 mm (2.36″)	
Length	170 mm (6.69″)	
Electrical Characteristics:		

Specification	PTC165(i)
Power supply	100…240 V ac, 50/60 Hz
Power consumption	Approx. 375 W
Fuse	2 off 5 × 20 mm T6.3H250V
Case:	
Dimensions	
- Width	210 mm (8.27″)
- Height + Handle	380+50 mm (15.0+2.0″)
- Depth	300 mm (11.8″)
- Weight	~ 13 kg (~ 28.7 lbs)

a. At an ambient temperature of 20 °C (68 °F).
b. Silicone oil 10 cSt, see Section 2.3.

10.5 PTC255(i) Specification

Specification	PTC255(i)	
Temperature range	T_R to 255 °C (T_R to 491 °F)	
Setting range	0 °C to 255 °C (32°F to 491 °F)	
Hysteresis	± 0.010 °C (± 0.018 °F)	
Control sensor (switchable)	**External Reference Sensor**	**Internal Reference Sensor**
Air Shield (DB):		
Display accuracy	± 0.08 °C (± 0.144 °F)	n/a
Temperature stability	± 0.01 °C (± 0.018 °F)	n/a
Temperature distribution:		
- Axial	± 0.080 °C (± 0.144 °F)	n/a
- Radial	± 0.050 °C (± 0.090 °F)	n/a
Influence of load	± 0.025 °C (± 0.045 °F)	n/a
Infrared (IR):		
Display accuracy	n/a	± 0.5 °C (± 0.9 °F)
Stability	n/a	± 0.05 °C (± 0.09 °F)
Emission factor	n/a	0.9994
Tub Insert (TI):[a]		
Display accuracy	± 0.35 °C (± 0.63 °F)	n/a
Temperature stability	± 0.05 °C (± 0.09 °F)	n/a
Temperature distribution:		
- Axial	± 0.300 °C (± 0.540 °F)	n/a
- Radial	± 0.150 °C (± 0.270 °F)	n/a
Influence of load	± 0.100 °C (± 0.180 °F)	n/a
Surface (SU):		
Display accuracy	± 1.0 °C (± 1.8 °F)	n/a
Stability	± 0.2 °C (± 0.36 °F)	n/a
Dimension for the Calibration Insert:		
Diameter	60 mm (2.36″)	
Length	170 mm (6.69″)	
Electrical Characteristics:		
Power supply	110…115 V ac, 60 Hz 230 V ac, 50 Hz	
Power consumption	Approx. 1100 W	
Fuse	2 off 5 × 20 mm T10H250V	
Case:		
Dimensions		

Specification	PTC255(i)
- Width	210 mm (8.27″)
- Height + Handle	330+50 mm (13.0+2.0″)
- Depth	300 mm (11.8″)
- Weight	~ 8.5 kg (~ 18.7 lbs)

a. Silicone oil 50 cSt, see Section 2.3.

10.6 Integrated Measuring Instrument

Note: Only applicable to models PTC165i and PTC255i.

Specification	Integrated Measuring Instrument
Resistance Thermometer:	
Number of channels	2
Connection	4 × 4 mm safety sockets per channel
Connection type	2, 3 or 4-wire
Resistance range:	
- Pt100	0 to 400 Ω
- Pt1000	0 to 4000 Ω
Accuracy:	
--> Pt100	± 0.03 °C (± 0.054 °F)
--> Pt500	± 0.12 °C (± 0.216 °F)
--> Pt1000	± 0.06 °C (± 0.108 °F)
--> Ni100	± 0.02 °C (± 0.036 °F)
--> Ni500	± 0.08 °C (± 0.144 °F)
--> Ni1000	± 0.04 °C (± 0.072 °F)
Thermocouple:	
Number of channels	2
Connection	2 × thermocouple (mini) sockets
Measuring range	-10 to 100 mV
Accuracy:	
- Cold junction	± 0.30 °C (± 0.540 °F)
- Type B	± 0.5 °C (± 0.9 °F)
- Type E	± 0.06 °C (± 0.108 °F)
- Type J	± 0.07 °C (± 0.126 °F)
- Type K	± 0.08 °C (± 0.144 °F)
- Type N	± 0.13 °C (± 0.234 °F)
- Type R	± 0.78 °C (± 1.404 °F)
- Type S	± 0.73 °C (± 1.314 °F)

Specification	Integrated Measuring Instrument
- Type T	± 0.09 °C (± 0.162 °F)
Current Measurement:	
Number of channels	1
Connection	4 mm safety socket
Measuring range	0 to 24 mA
Accuracy	0.01 % full-scale
Voltage Measurement:	
Number of channels	1
Connection	4 mm safety socket
Measuring range	0 to 12 VDC
Accuracy	0.01 % full-scale
Switch Test:	
Number of channels	2
Transmitter Supply:	
Output current	24 mA (maximum)
Output voltage	24 VDC

10.7 Heating and Cooling Times

Note: The parameters of the test task and the ambient conditions, control the times to heat and cool the instrument.

The times in the graphs in this section are approximate values. They are measured at a room temperature of 23 °C (73.4 °F) and do not include transient effects.

10.7.1 PTC200

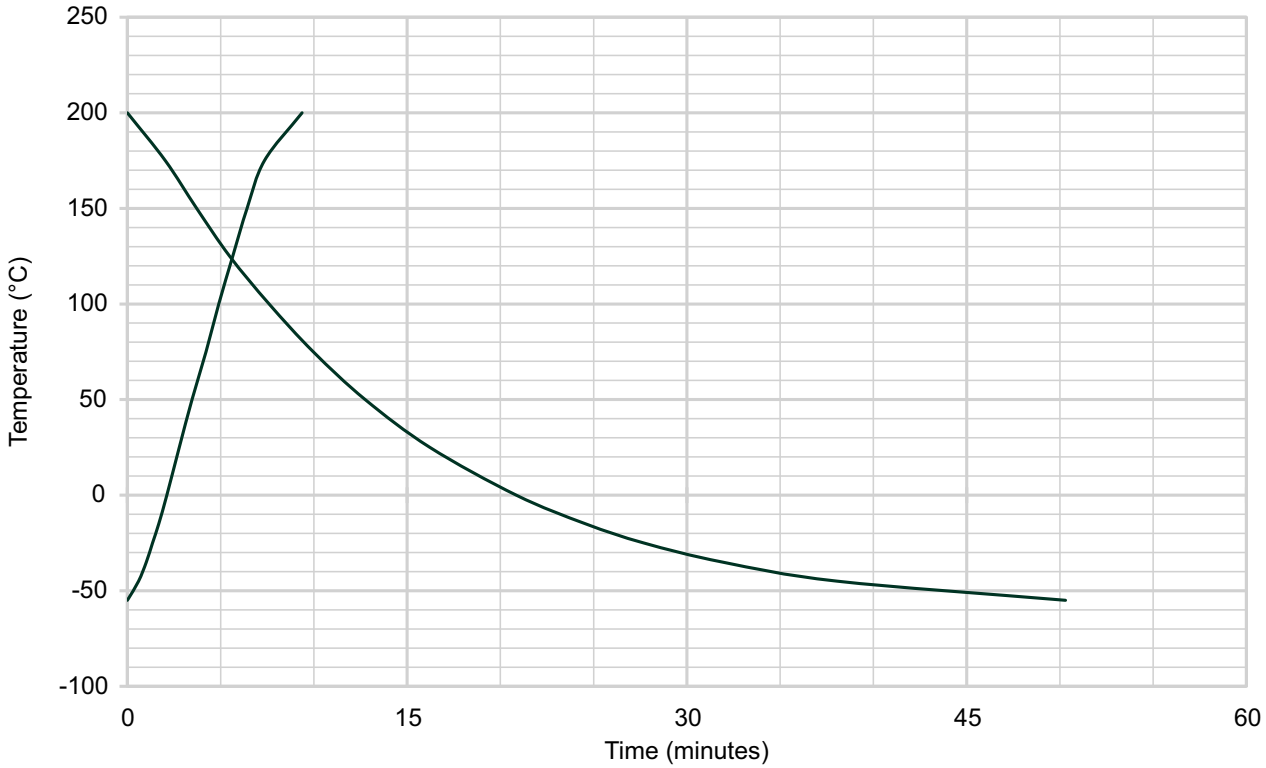


Figure 32: PTC200 Times to Heat and Cool

10.7.2 PTC700

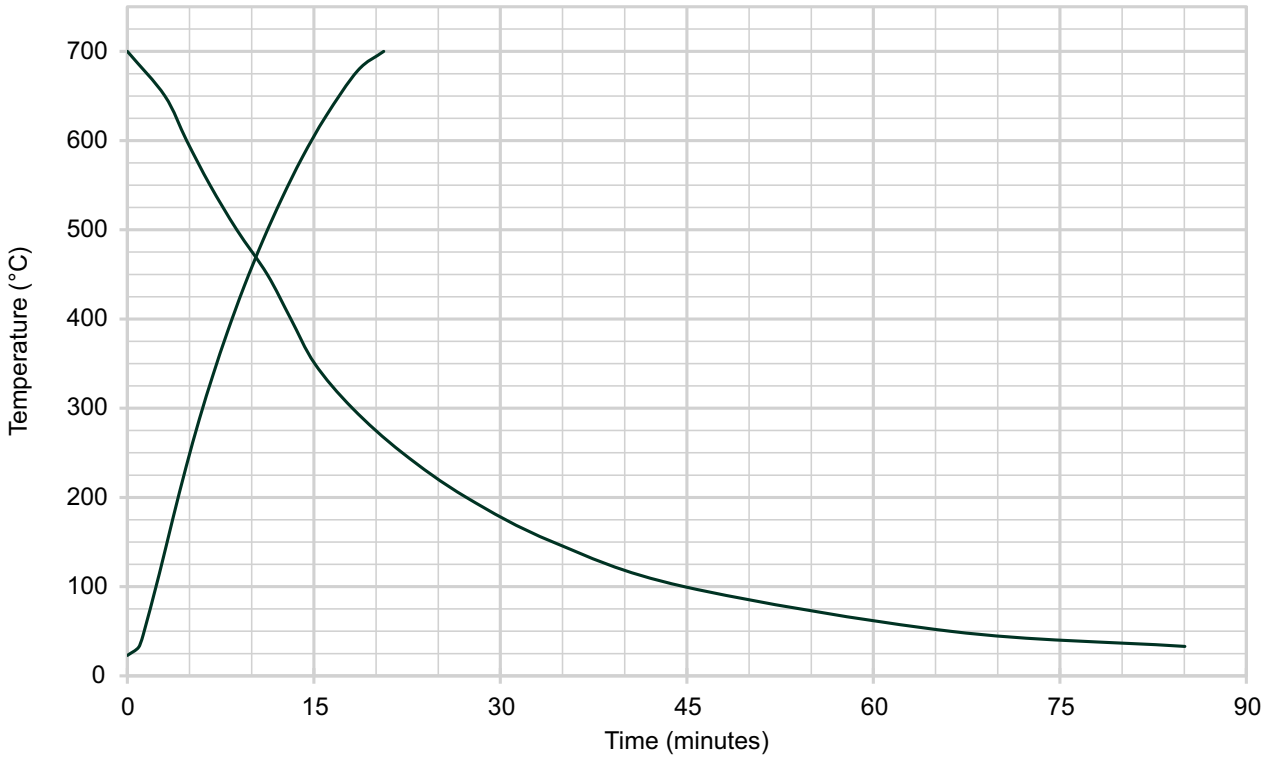


Figure 33: PTC700 Times to Heat and Cool

10.7.3 PTC165(i)

10.7.3.1 Dry Block, Infrared and Surface Inserts

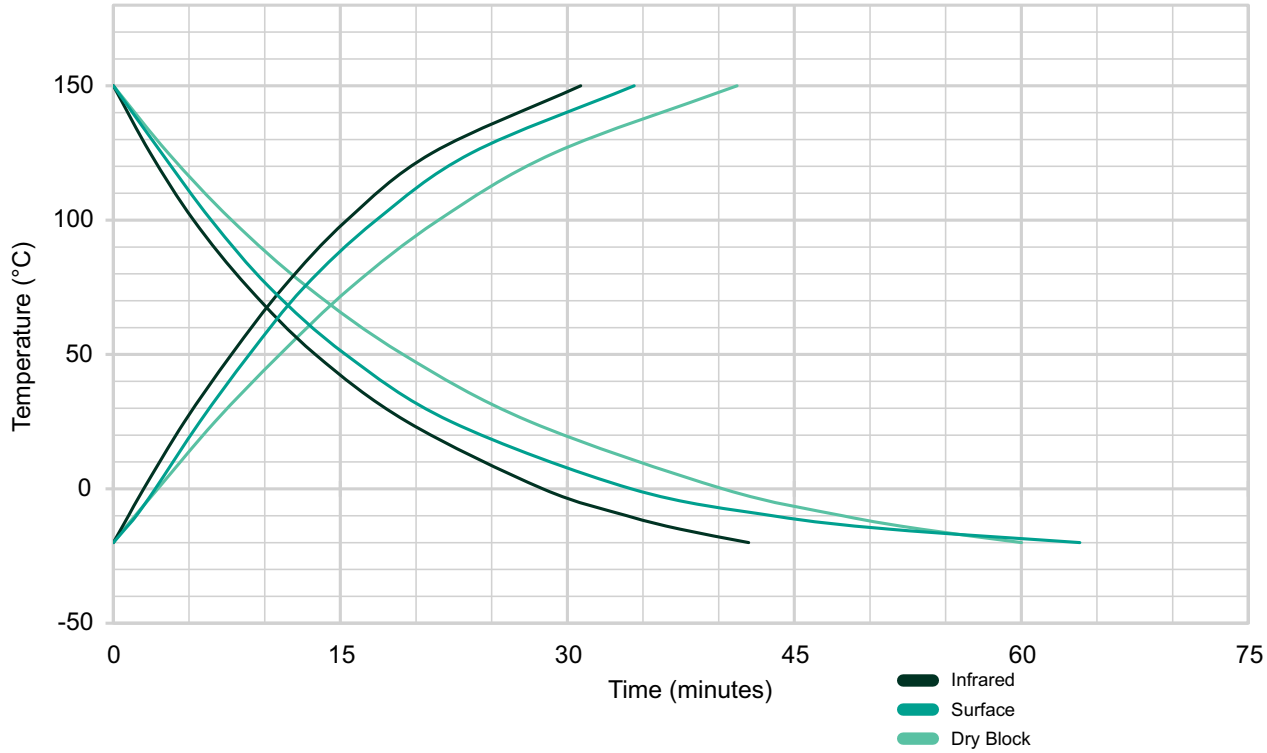


Figure 34: PTC165(i) Times to Heat and Cool

10.7.3.2 Silicone Oil (10 cSt)

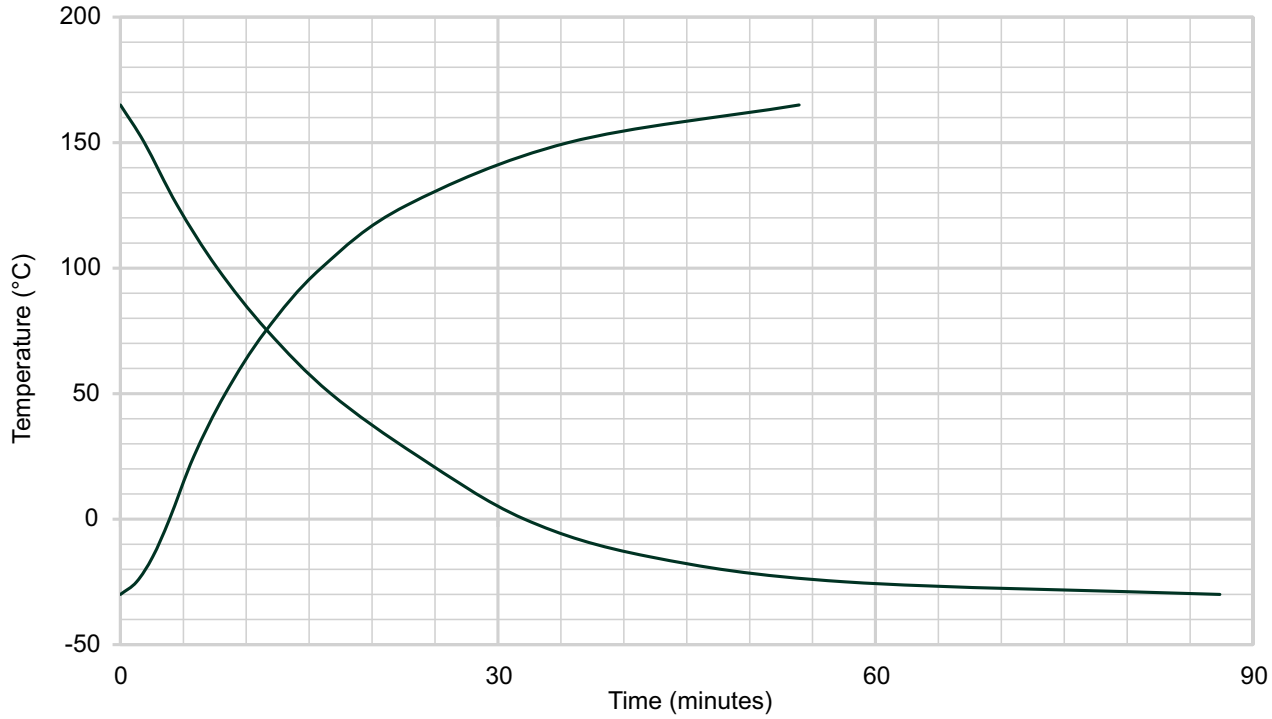


Figure 35: PTC165(i) Times to Heat and Cool

10.7.4 PTC255(i)

10.7.4.1 Dry Block, Infrared and Surface Inserts

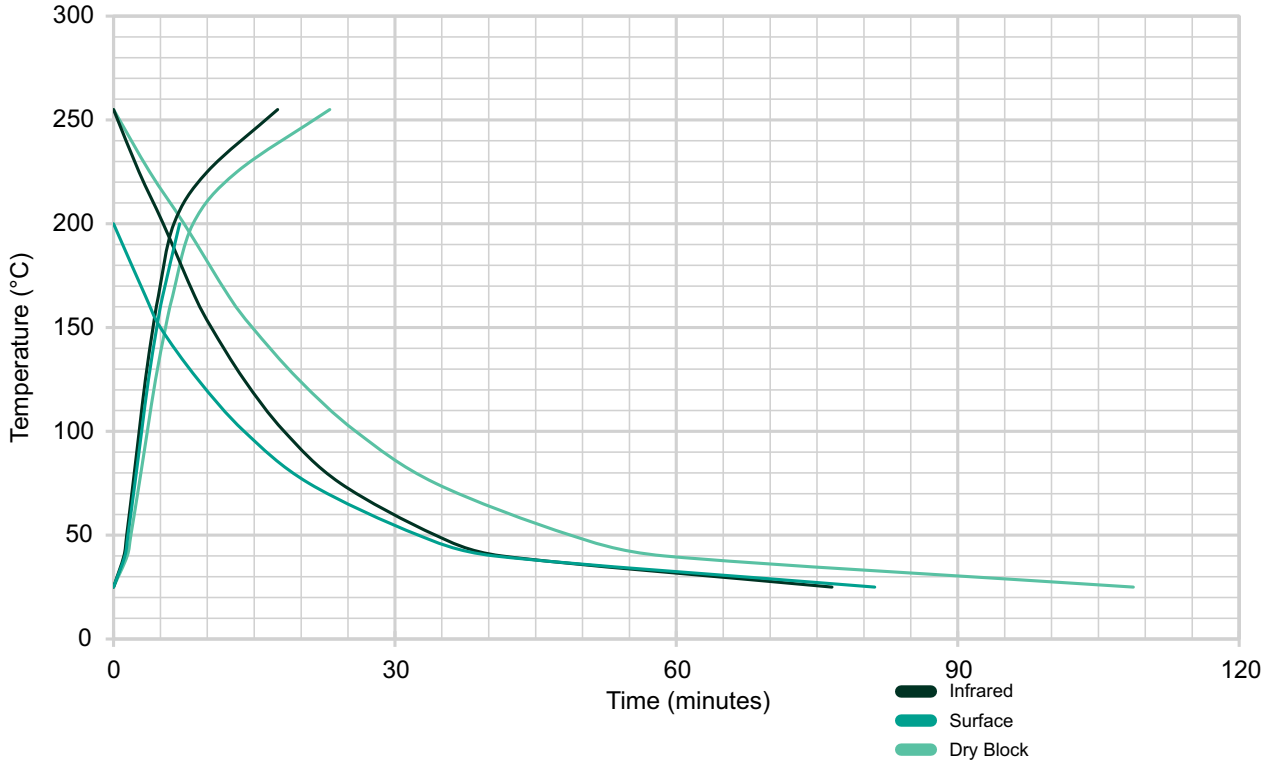


Figure 36: PTC255(i) Times to Heat and Cool

10.7.4.2 Silicone Oil (50 cSt)

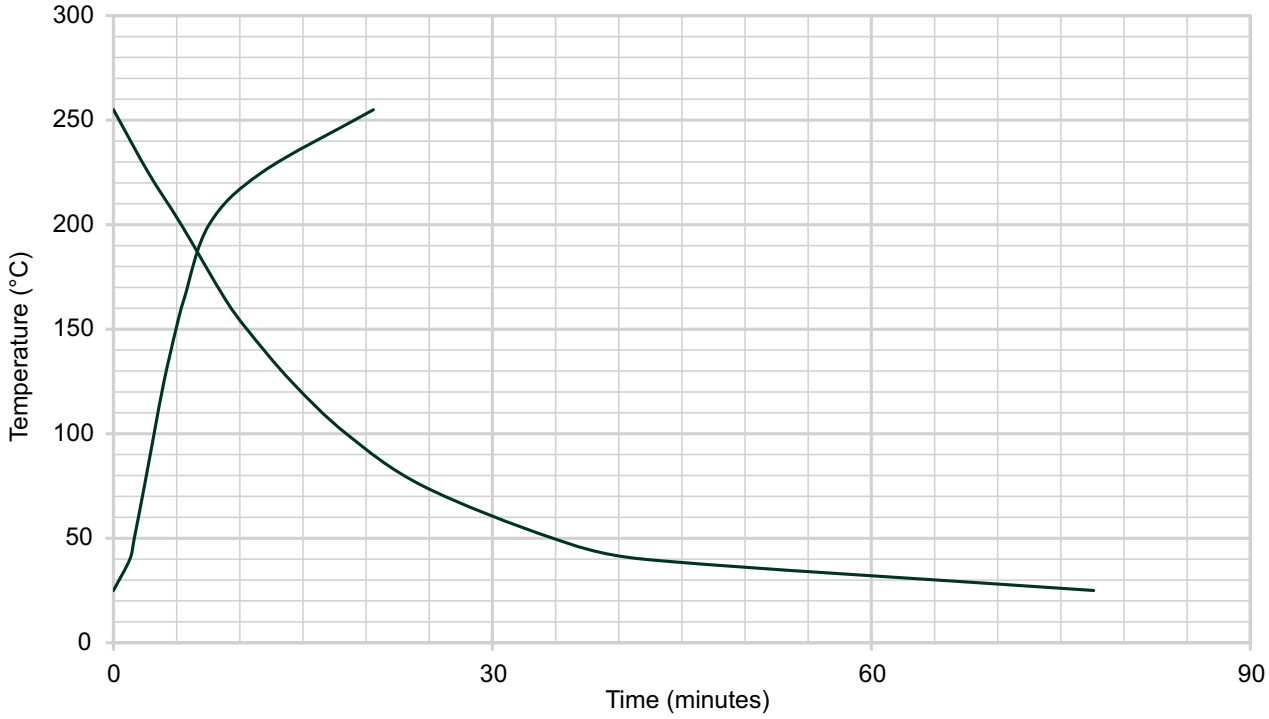


Figure 37: PTC255(i) Times to Heat and Cool

Office Locations

https://druck.com/contact

Services and Support Locations

https://druck.com/service

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