

# PTC200 PTC700 PTC165(i) PTC255(i)

## Premium Temperature Calibrators Instruction Manual





# Introduction

This technical manual provides operating instructions for the PTC Series temperature calibrators.

## Scope

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

## Safety

The manufacturer has designed this equipment to be safe when operated using the procedures detailed in this manual:

- Do not use this equipment for any other purpose than that stated. Incorrect use can prevent the protection given by the equipment from working.
- Use suitably qualified<sup>1</sup> Technicians and good engineering practice for all procedures in this publication.

## Maintenance

The equipment must be maintained using the manufacturer's procedures and should be carried out by authorized service agents or the manufacturer's service departments.

## Software Version

This manual contains operating instructions for PTC Series temperature calibrators with software version 28.









## Technical Advice

For technical advice contact Druck or subsidiary manufacturer of this product.

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1. A qualified technician must have the necessary technical knowledge, documentation, special test equipment and tools to carry out the required 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.
	<p>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).</p> <p>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.</p> <p>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.</p> <p>If you need more information on the collection, reuse, and recycling systems, please contact your local or regional waste administration.</p> <p>Please visit the link below for take-back instructions and more information about this initiative.</p>
<div><a href="https://druck.com/weee">https://druck.com/weee</a></div>	

## 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	Centimetre
cSt	Centistokes
dc	Direct Current
DUT	Device Under Test
e.g.	For example
etc.	And so on
FS	Full Scale
GND	Ground
h	Hour
i.e.	That is
K	Kelvin
lbs	Pounds
LED	Light Emitting Diode
m	Minute
max	Maximum
min	Minimum or minute
mm	Millimetre
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 <sub>R</sub>	Room Temperature
USB	Universal Serial Bus
V	Volts
VA	Volt Ampere
°C	Degrees Celsius
°C/min	Degrees Celsius per minute
°F	Degrees Fahrenheit



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# 1. Description

The PTC Series calibrators are used to test and calibrate temperature measuring instruments and temperature sensors, as well as for measuring temperatures. Typical applications include the test and calibration of thermometers, temperature switches/thermostats, resistance thermometers and thermocouples.

The portable instruments are of compact and robust construction so can be used on-site or in a laboratory.

The PTC Series may be used for service purposes, or industrial and laboratory applications.

## 1.1 Models



PTC200



PTC700



PTC165



PTC255i

Model	Temperature Range	Function	Integrated Measuring Instrument
PTC200	-55°C to 200°C (-67°F to 392°F)	Dry Block	
PTC700	T <sub>R</sub> to 700°C (T <sub>R</sub> to 1290°F)	Dry Block	
PTC165	-35°C to 165°C (-31°F to 329°F)	Micro Bath	
PTC255	T <sub>R</sub> to 255°C (T <sub>R</sub> to 491°F)	Micro Bath	
PTC165i	-35°C to 165°C (-31°F to 329°F)	Micro Bath	✓
PTC255i	T <sub>R</sub> to 255°C (T <sub>R</sub> to 491°F)	Micro Bath	✓

## 1.2 Unpacking



**INFORMATION** The temperature calibrators are delivered in special protective packaging. Save the packaging for returning the instrument safely to the manufacturer for calibration or repair.

Carefully unpack the unit to prevent any damage.

Check the completeness of the delivery based on the delivery note.

**Table 1: 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)			✓

## 1.3 Intended Purpose

The PTC Series of calibrators may only be used for the testing and calibration of suitable temperature measuring instruments, temperature sensors and for measuring temperatures.

The calibrators may not be used for warming up or heating materials or gases. The calibrators have been designed for indoor use only.

The micro baths may only be used with a suitable calibration liquid. The only permitted liquids are silicone oil, see Section 2.4.

Hazardous media (flammable or explosive liquids or gases) may not be used.

The operational safety of the calibrator is only guaranteed by intended use. The specified limits may under no circumstances be exceeded. See Section 13.

It is your responsibility to select the instrument, which is suitable for your specific application, to connect it correctly, to carry out the tests safely and to maintain all components.

## 2. Safety Instructions

Before you use the calibrator, read through this operating manual carefully. If the instructions are not followed, in particular the safety guidelines, this could result in danger for people, the environment, and the calibrator and the system it is connected to.

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

In order to guarantee that the calibrator operates safely, the operator must act competently and be conscious of safety issues.

Druck provides support for the use of its products either personally or via relevant literature. The customer verifies that our product is fit for purpose based on our technical information. The customer performs customer-specific and application-specific tests to ensure that the product is suitable for the intended use. With this verification, all hazards and risks are transferred to our customers; our warranty is not valid.

## **2.1 Qualified Personnel**

- The personnel in charge of the installation, operation and maintenance of the calibrator must hold a relevant qualification. This can be based on training or relevant instructions.
- Personnel must be aware of this operating manual and have access to it at all times.

## **2.2 General Safety Instructions**

- In all work, the existing national regulations for accident prevention and safety in the workplace must be complied with. Any internal regulations of the operator must also be complied with, even if these are not mentioned in this manual.
- Ensure that the complete operating instructions are always available at the calibrator installation site.
- Degree of protection according to EN 60529. Ensure that the ambient conditions at the site of use does not exceed the requirements for the stated protection rating, see Section 13.1.
- Structural safety in accordance with EN 61010-1. The calibrator must be installed in such a way that the requirements for structural safety are met.
- Only use the calibrator if it is in perfect condition. Damaged or faulty calibrators must be checked without delay and, if necessary, replaced.
- If problems cannot be remedied, immediately shut down the calibrator and ensure that it cannot be started up accidentally.
- Never leave the calibrator unattended when it is in operation or in the cooling phase.
- Do not remove or destroy type plates or other markings on the calibrator, or the warranty is rendered null and void.

## **2.3 Special Safety Instructions**

- Thermal protection fuse.
  - a. The calibrator is equipped with a thermal protection fuse that works independently. If there is an over-temperature inside the housing, the power supply to the heating system is cut off. The thermal protection fuse is non-resettable. The calibrator cannot be used anymore.
  - b. After the calibrator has cooled, return the calibrator to Druck.
- Risk of injury from hazardous gases.
  - a. When liquids are heated, evaporation can result in dangerous gases being released.
- The calibrator may not be used in a potentially explosive atmosphere.
  - a. Remove all the easily flammable media from the vicinity of the calibrator.
  - b. Ensure that the calibrator cannot come in contact with easily flammable or explosive media.
- Operate the calibrator only in the temperature range permissible for the DUT.
- Ensure that the DUT is held securely in the calibrator.
  - a. Use only suitable inserts.

- b. When doing so, also ensure that the structural safety of the calibrator is retained.
- Expert mode.
  - a. When selecting the function, DUT and testing tasks, you can switch into the expert mode for administration and configuration. The settings that are made in this mode require detailed knowledge of the calibration and method of working of calibrators. Contact Druck for specific training.
  - b. If the settings are incorrect, the calibrator may be damaged.

## 2.4 Calibration Liquid Safety Instructions

Before using calibration liquids, read the entire safety data sheet thoroughly. Pay particular attention to the information on the physical and chemical properties.

Only use calibration liquids that are suitable for the required 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 adhered to.

Druck recommends the following calibration liquids:

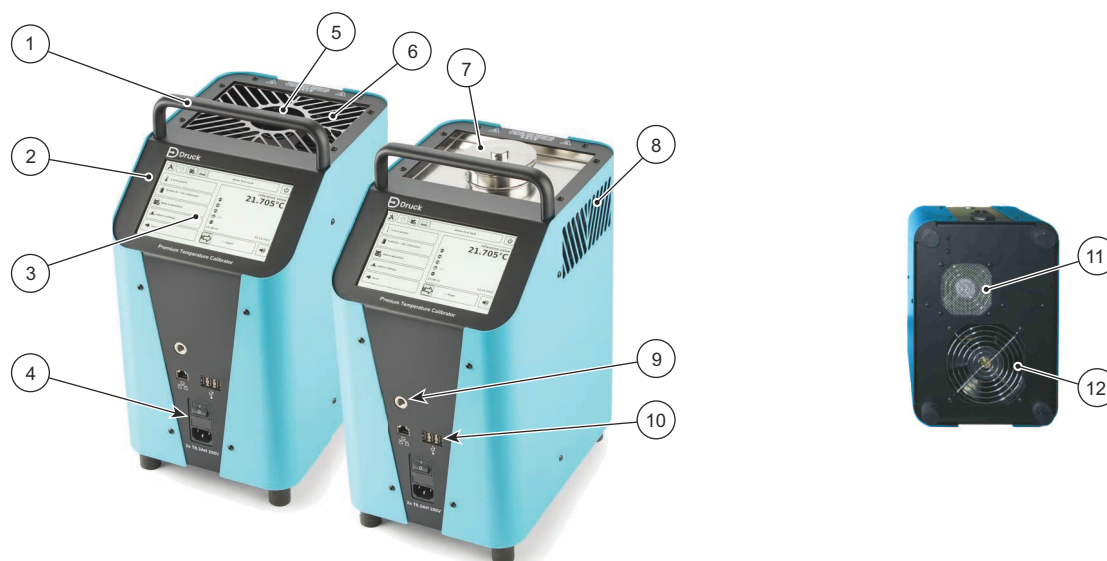
**Table 2: Calibration Liquids**

Model	Calibration Liquid	Calibration Range	Flashpoint
PTC165(i)	XIAMETER™ PMX-200 Silicone Fluid 10 cSt	-35 °C to 155 °C (-31 °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 2.
- Always read the safety data sheet supplied with the silicone oil before using it.
- Always ensure adequate ventilation when working with silicone oil, since hazardous substances can be released.
- Prevent silicone oil from coming into contact with your eyes.
- Silicone oil is hygroscopic. Use the work cover to seal the micro bath after use. Alternatively, 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 Carrying handle.  | 2 Steel housing.                                     |
| 3 Touch screen for operation and measurement value display. | 4 Mains inlet, switch with fuses.                    |
| 5 Dry block.  | 6 Exhaust cooling air through upper housing grilles. |
| 7 Micro bath tank.  | 8 Exhaust cooling air through side housing grilles.  |
| 9 External reference sensor connection.                     | 10 USB ports and network connection.                 |
| 11 Inlet air for housing cooling.                           | 12 Inlet air for dry block / micro bath cooling.     |

**Figure 1: General View**

The calibrator consists of a robust steel housing (2) with integral carrying handle (1). The touch screen display (3) is located on the front panel of the unit.

The mains inlet, switch, and fuses (4) are located on the front of the unit. The external reference sensor is connected to (9). USB and network connections are available at (10).

During operation, cooling air is drawn in from the base of the unit (11, 12) and expelled through grilles (6, 8). PTC200 and PTC700 expel air through the top of the unit (6). PTC165(i) and PTC255(i) expel air through side grilles (8).


The rear section of the housing contains the insulated dry block or micro bath. Heating elements, together with an integrated temperature sensor, are used to regulate the temperature of the dry block / micro bath. Some models contain cooling elements. These allow the temperature to be regulated below room temperature.

### 3.1.1 Integrated Measurement Instrument

The PTC165i and PTC255i are equipped with an integrated measurement instrument.

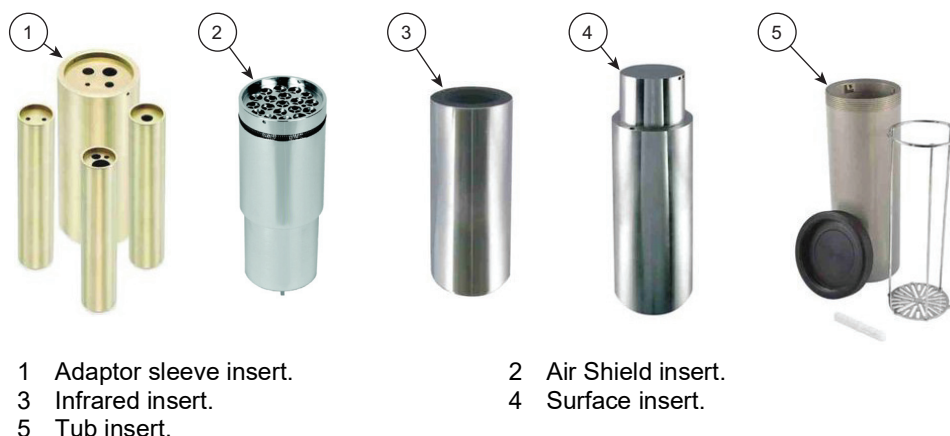


Figure 2: Integrated Measurement Instrument

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 earth connection.
ext. Ref.	External reference sensor connection.

## 3.2 Function

The function of the calibrator is determined by the calibrator model and the installed insert. Figure 3 shows an overview of the available inserts.



**Figure 3: Insert Overview**

Table 3 details the required insert diameter and material for each calibrator model. Use only Druck supplied inserts. Druck inserts have the correct tolerances and materials for the calibrator models.

**Table 3: 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 models with different bore sizes.

Table 4 details the required external reference sensor for each model. It also details the recommended drilling size in the insert to accept the external reference sensor.

**Table 4: 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 specific calibrator. Do not use a different external reference sensor with the calibrator. This will degrade the calibration accuracy.

Table 5 shows the compatibility of insert for each calibrator model. The table also indicates when to use the external reference sensor, or the internal reference sensor. Where it is possible to use







either the external or internal reference sensor, ensure that the correct function is selected. See Table 6.

**Table 5: Insert Compatibility**

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

Table 6 shows the function names as they appear in the “Select Function” window.

**Table 6: Function Names**

Insert	Reference Sensor	Function Name
Adaptor Sleeve	Internal	 dryblock + int.reference dryblock int.ref.
	External	 dryblock + ext.reference dryblock ext.ref.
Air Shield	External	 dryblock + ext.reference air shield insert
Infrared	Internal	 infrared + int.reference
Surface	External	 surface + ext.reference
Tub	External	 tubinsert + ext.reference silicone oil <sup>a</sup>

a. Refer to Section 2.4 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, i.e. direct starting and staying at a temperature, is not possible.

The testing procedure is always started with a testing task, see Section 3.3. This ensures that the calibrator is always started with a defined end of test behavior. See “Behavior at Test End” on page 32.

1. Install a suitable insert into the calibrator, see Section 4.3. Ensure that the insert has a secure fit to ensure optimum heat transfer to the DUT.
2. Once all preparations have been completed, switch on the calibrator. See Section 4.4.1.
3. Select the relevant function in the calibrator software for the insert. See Table 6 on page 8.

**Note:** The inserts have different characteristics. The calibrator is supplied with a set of predetermined functions tailored to each insert. These have been determined by the factory and are write protected. They may 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. As soon as the temperature is stable, the DUT can be calibrated.

5. Repeat step 3 for all the required calibration set points.

### 3.3 Test Tasks



**INFORMATION** The function and the DUT are independent. During the configuration of test tasks (Section 6), the respective expert mode can be entered. This allows administration and configuration when selecting the function or DUT.

**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 recurring testing processes, for standardizing test sequences and for generating measurement logs.

All required settings and configurations for the calibration of a DUT are compiled in a test task. The parameters of the testing task are saved and linked to the selected function and DUT. See Section 6.

The operation concept of the calibrator is based on pre-installed and self-defined test tasks. They are a central component of the function and operation of the calibrator.

The emphasis of the operating manual is on the use of test tasks during operation of the calibrator.

The calibrator is shipped with pre-defined functions, test samples and testing tasks. These have been defined in the factory, in which the basic settings of the calibrator have been stored.

The protected test tasks can be neither be deleted nor edited. They serve as templates for your own self-defined test tasks. They can be copied and then modified. This task must not be completed without specific training from Druck.

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

Upon switching on the calibrator, the first test task of the selection list is loaded automatically, with the relevant parameters.

## 4. Commissioning and Operation



**WARNING** The calibrator may become very hot during operation. If the calibrator is operated without supervision, third-party persons in the vicinity could get injured. Moreover, flammable material could come into contact with the calibrator and cause significant harm to personnel and/or damage to property.

**Never leave the calibrator unattended when it is in operation or in the cooling down phase.**

For safe operation of the calibrators, a formal commissioning procedure is necessary.

Commissioning includes the installation, electrical connections, preparation for the calibration as well as correct switching on and off of the calibrator.

Further, a visual inspection for damage is required before use.

The required steps are described in the following sections.

## 4.1 Operating Conditions



**INFORMATION** The plug of the mains connecting cable serves as a emergency stop device. Ensure that the plug is always easily accessible and easy to reach. In an emergency, pull the plug so that the calibrator is isolated from the mains.

Select a safe installation site for commissioning the calibrator.

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

- Only suitable for indoor use, do not use outdoors.
- Operate only in the vertical position on an even surface. The surface must be stable, clean, and dry.
- If the operational conditions do not conform to 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, supporting surface.
- Ensure sufficient clearance around the calibrator. On the front side > 1 m, behind and to the sides > 0.5 m. Ensure that there is sufficient head clearance and sufficient clear space above the calibrator.
- Ensure sufficient ventilation.
- Do not operate in the vicinity of flammable materials.
- Do not install in a cupboard or other similar confining location.
- The ventilation openings must not be blocked or covered.
- The calibrator must be installed so that it can be switched off at any time.

## 4.2 Electrical Connection



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

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

**Use only a Druck specified mains cable.**

**Ensure that the mains outlet is adequately rated and has a protective earth connection.**

**Before turning on the power, make sure that the calibrator is properly connected to the protective earth. The protective earth is connected to the calibrator through the mains plug.**

Check the following points before you connect the calibrator:

1. Check the specified operating mains supply voltage range for the calibrator. See Section 13.
2. Ensure that the mains voltage range is the same as that specified on the rating plate.
3. Only connect the calibrator to a properly installed and earthed 3-pole socket for mains plugs with earthing contact.
4. Only use extension cables or adaptor plugs with a protective earth connection.

### 4.2.1 Electrical Connection Procedure

1. Insert the mains cable into the mains inlet socket of the calibrator.
2. Insert the plug of the mains cable in a suitable mains outlet with earthing contact.

## 4.3 Calibrator Preparation



**HOT SURFACE** The calibrator may become very hot when in operation. Touching hot parts can result in 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).

Allow the calibrator to cool before you remove the DUT, change the insert or 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 may cause inserts to become stuck in the calibrator.

The preparations for the micro bath must be carried out with the calibrator switched off and cooled to room temperature.

The function of the calibrator is determined by the installed insert. The required insert is installed into the opening of the dry block or micro bath. By using inserts, it is easy to switch between dry block, infrared, surface and micro bath functions.

For an overview of insert compatibility, see Section 3.2 on page 7.

### 4.3.1 Adaptor Sleeve Insert

Adaptor sleeves with single or multiple holes are used for the calibration of straight temperature sensors. For adaptor sleeve insert compatibility, see Section 3.2 on page 7.



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

**Figure 4: Adaptor Sleeve Inserts**

To achieve the specified accuracy of the calibrator, the DUT and the adaptor sleeve must be matched to one another:

1. The borehole of the adaptor sleeve must be no greater than 0.5 mm of the DUT diameter.
2. The measurement element of the DUT must be located in the homogeneous temperature zone of the adaptor sleeve. See Figure 4, dimension h.

#### 4.3.1.1 Installation



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

The adaptor sleeve is inserted into the dry block using the insert exchange tool, see Figure 4 item 3.

#### 4.3.1.2 External Reference Sensor

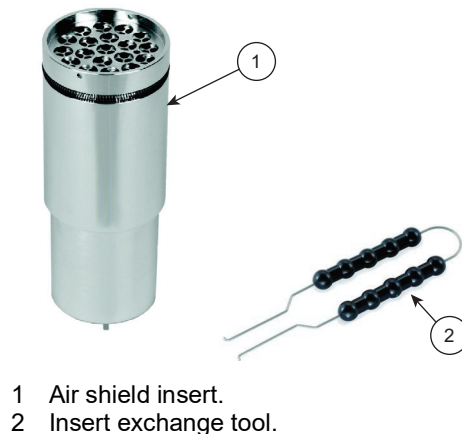
Align the adapter sleeve so that the hole for the external reference sensor is located at 12 o'clock.

#### 4.3.1.3 Removal and Cleaning

1. Allow the calibrator cool before the adaptor sleeve is removed.
2. Pull the adaptor sleeve out of the dry block with the help of the insert exchange tool, see Figure 4 item 3.
3. Clean the adaptor sleeve and the dry block to prevent inserts from getting stuck in the dry block.

#### 4.3.2 Air Shield Insert

The air shield insert provides optimum radial and axial temperature distribution. For air shield insert compatibility, see Section 3.2 on page 7.



**Figure 5: Air Shield Insert**

#### 4.3.2.1 Installation

The air shield is inserted into the dry block using the insert exchange tool, see Figure 5 item 2.

#### 4.3.2.2 External Reference Sensor

Align the air shield so that the hole for the external reference sensor is located at 12 o'clock.

#### 4.3.2.3 Removal and Cleaning

1. Allow the calibrator cool before the air shield is removed.
2. Pull the air shield out of the dry block with the help of the insert exchange tool, see Figure 5 item 2.
3. Clean the air shield and the dry block to prevent inserts from getting stuck in the dry block.

### 4.3.3 Infrared Insert

The infrared insert is used for contact-less measurement infrared thermometers. The infrared insert has a specially designed surface and surface coating on the inside. As a result, an emissivity of 0.9994 (black body) is achieved.



**Figure 6: Infrared Insert**

The additional holes in the border, see Figure 6 item 2, are for external reference sensors. This allows the exact temperature of the inside face of the infrared insert to be determined.

#### 4.3.3.1 Installation

1. The infrared insert is inserted into the dry block using the insert exchange tool, see Figure 6 item 3.
2. Centre the infrared insert so that there is an even air gap between the infrared insert and the dry block.

#### 4.3.3.2 Removal and Cleaning

1. Allow the calibrator cool before the infrared insert is removed.
2. Pull the infrared insert out of the dry block with the help of the insert exchange tool, see Figure 6 item 3.
3. Clean the infrared insert and the dry block to prevent inserts from getting stuck in the dry block.

#### 4.3.3.3 Application Tips

1. The measuring spot of the infrared thermometer must project itself onto the floor of the infrared insert during the calibration. The measuring spot must be smaller than the inner diameter and must not touch the wall of the infrared insert.
2. Ice or condensation can form in the infrared insert at temperatures of less than 0 °C (32 °F) in high humidity levels. This can affect the emissivity of the infrared insert and degrade the calibration accuracy. Ice or condensation formation can be reduced by:
  - a. Covering the measuring opening of the infrared insert.
  - b. Keeping the measuring opening closed for as long as possible.
  - c. Only opening the measuring opening briefly for the calibration.

**Note:** Ice or condensation can be removed by gently heating the infrared insert.

#### 4.3.4 Surface Insert

The surface insert is used for calibrating surface temperature sensors. The surface insert is hollow in construction. When installed, the top portion of the surface insert protrudes 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 7: Surface Insert**

The additional holes in the border, see Figure 7 item 2, are for external reference sensors. This allows the exact temperature of the surface insert to be measured.

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

##### 4.3.4.1 Installation

1. The surface insert is inserted into the dry block using the exchange tool, see Figure 7 item 3.
2. Centre the surface insert so that there is an even 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 located at 12 o'clock.

##### 4.3.4.3 Removal and Cleaning

1. Allow the calibrator cool before the surface insert is removed.
2. Pull the surface insert out of the dry block with the help of the exchange tool, see Figure 7 item 3.
3. Clean the surface insert and the dry block to prevent inserts from getting stuck in the dry block.

##### 4.3.4.4 Application Tips

When using an external reference sensor, insert the sensor into the borehole so that its measuring element is situated under the middle of the calibration surface.

#### 4.3.5 Tub Insert



**WARNING** Wear safety goggles. Calibration liquid may be ejected when working with the tub insert. Always wear safety goggles when handling calibration liquids.



**INFORMATION** Direct filling of the PTC with liquid is not supported. Use a tub insert to contain the calibration liquid.

The tub insert is a removable calibration liquid container. It is designed to be inserted and used in the micro bath tank of the calibrator. It is used for calibrating sensors with special shapes or dimensions. Direct contact between the sensor and the calibration liquid ensures excellent heat transfer.



**Figure 8: Tub Insert**

The tub insert is inserted into the micro bath using the insert exchange tool, see Figure 8 item 3. The tub insert is supplied with a transport cover to prevent spillage of the calibration liquid during transportation.

The calibration liquid is poured directly into the tub insert.

##### 4.3.5.1 Work Cover



**Figure 9: Work Cover**

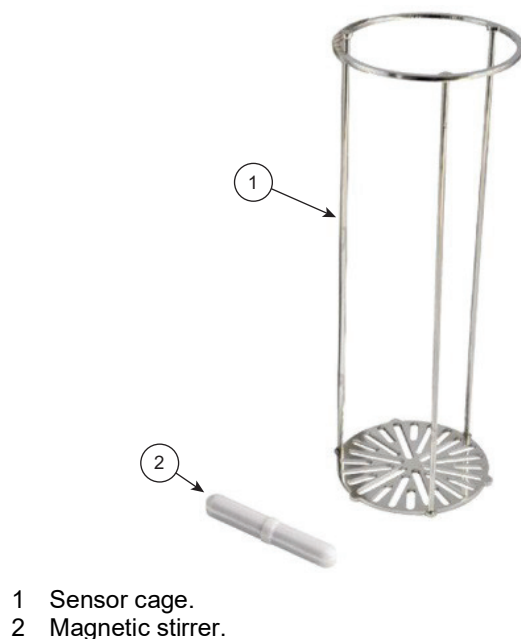
The work cover is used to:

- Reduce evaporation of the calibration liquid.
- Reduce the cooling of the surface of the calibration liquid.
- Provide 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 unused openings can be closed with the suitable silicone plugs.

#### 4.3.5.2 Sensor Cage and Magnetic Stirrer

The sensor cage protects the magnetic stirrer. It prevents the DUT from stopping the magnetic stirrer from rotating.



**Figure 10: Sensor Cage and Magnetic Stirrer**

The magnetic stirrer ensures a uniform temperature distribution in the calibration liquid. The user interface on the touch screen can be used to control the speed of the magnetic stirrer.

**Note:** The magnetic stirrer is subject to mechanical wear and tear during normal operation. The magnetic stirrer has a limited lifetime and requires periodic replacement. See Section 8.1.

#### 4.3.5.3 Drain Syringe and Magnetic Lifter

The drain syringe is used to pump out the calibration liquid from the tub insert. The magnetic stirrer is removed with the help of the magnetic lifter.



**Figure 11: Magnetic Lifter**

#### 4.3.5.4 Notes on Calibration Liquid



**WARNING** Wear safety goggles. Calibration liquid may be ejected when working with the tub insert. Always wear safety goggles when handling calibration liquids.

Different calibration liquids give different calibration results due to their specific characteristics. Adjustment to the respective calibration liquid has to be carried out by the manufacturer.

In order to achieve the best possible accuracy of a tub insert, it has to be filled with a suitable calibration liquid. The calibration liquid is poured directly into the tub insert.

**Note:** It is recommended to use silicone oil as the calibration liquid.

When using silicone oil as the calibration liquid:

- Always read the safety data sheet supplied with the silicone oil before use.

- Always ensure adequate ventilation when working with silicone oil. Hazardous substances may be released.
- Spilled or leaked silicone oil results in an extreme danger of slipping. Always clean up spills.
- Silicone oil is hygroscopic. Use the work cover to seal the micro bath after use. Alternatively, remove the tub insert from the calibrator and 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 lead to a contamination of the calibration liquid. Contamination can lead to smeary gel effect on the bottom of the tub insert due to the rotation of the magnetic stirrer. 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 exceed the maximum fill level during operation. Overflow of calibration liquid causes contamination and may cause damage to the calibrator.

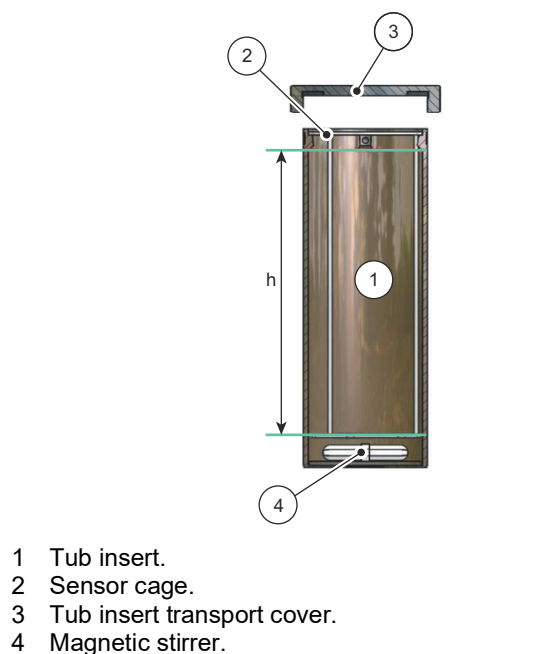


**INFORMATION** Incorrect calibration liquid fill level results in inaccurate calibration. Filling above the maximum fill level leads to excessive heat dissipation, preventing compliance with specified tolerances.

The fill level in the tub insert rises as a result of:

- a. Thermal Expansion – Calibration liquids expand to varying degrees as a result of heating. The increase in fill level depends on the calibration liquid in use and the applied temperature.
- b. Displacement by Sensors – The volume displaced by DUT must be taken into account in determining the filling amount.
- c. Rise due to Stirring – The rotation of the magnetic stirrer forms a whirlpool in the liquid. This raises the fill level at the wall.

The maximum fill levels are shown below:



**Figure 12: 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** Pay attention to maximum calibration liquid filling level, see Section 4.3.5.6.

When filling, leave enough room for thermal expansion, displacement by the DUT and level rise due to stirring.



**Figure 13: Filling with Calibration Liquid**

Tub insert filling procedure:

1. Unscrew the transport cover of the tub insert.
2. Insert the tub insert into the micro bath tank using the sleeve exchange tool.
3. Place the magnetic stirrer into the tub insert.
4. Insert the sensor cage.
5. Insert the DUT into the sensor cage, before filling, to account for its volume.

6. Fill the tub insert with calibration liquid.

**Note:** Observe the maximum fill level and leave sufficient reserve space for an additional rise in the level.

7. If necessary, remove the DUT.
8. Screw the work cover into place.
9. Insert the DUT through the work cover into the tub insert.

#### 4.3.6 Integrated Measuring Instrument

The following section applies to PTC165i and PTC255i with the integrated measuring instrument.

##### 4.3.6.1 Connecting the DUT (Thermocouple)

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

##### 4.3.6.2 Connecting the DUT (mA or V)

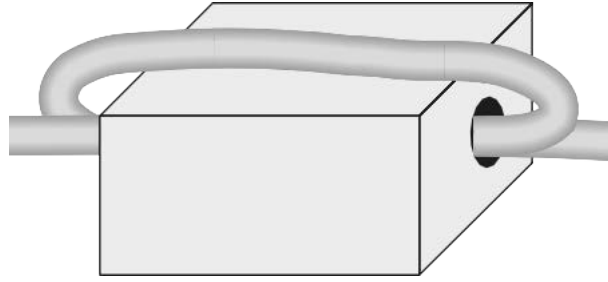
Connect the temperature sensor to the integrated measuring instrument as follows:

- 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 suitable 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

If the DUT cable has no cable screen and the measurement result is affected by electromagnetic interference, Druck recommends using a clamp-on ferrite. Insert the DUT cable into the clamp-on ferrite. It is recommended to wrap the DUT cable with multiple turns around the clamp-on ferrite. For optimum results, match the ferrite's damping properties to the interference frequency.

#### 4.3.7.1 Attaching the Clamp-on Ferrite



**Figure 14: DUT Cable with Clamp-on Ferrite**

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

**Note:** Attach the clamp-on ferrite as close as possible to the calibrator's measurement connectors.

3. Wrap the DUT cable with multiple turns around the clamp-on ferrite, see Figure 14.
4. Close the clamp-on ferrite.

#### 4.3.7.2 Removing the Clamp-on Ferrite

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

### 4.4 Switching On, Cool Down and Switching Off

For reasons of safety, when switching on the calibrator, the fan runs at the fastest speed. As soon as the internal reference sensor has measured a safe temperature, the fan speed is adjusted accordingly.

#### 4.4.1 Switching On



**WARNING** The calibrator must be securely connected to protective earth, otherwise there is a danger to life from electric shock.

Before turning on the power, make sure that the earth connection of the calibrator is properly 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. During this process, the calibrator has not yet reached the required electrical insulation for protection class I.

To dry the heating elements, set the calibrator to 120 °C (248 °C) for at least 15 minutes.



**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 Druck logo appears on the screen.
3. The type designation and the current software version are displayed.
4. The main window is displayed and the calibrator is ready for operation.

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

#### 4.4.2 Cooling Down the Calibrator



**HOT SURFACE** The calibrator may become very hot when in operation. Touching hot parts can result in 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).

Allow the calibrator to cool before you remove the DUT, change the insert or switch off 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 between the micro bath / dry block and the housing is nonetheless guaranteed.

To avoid 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 “Safety Temperature Value” on page 32.

#### 4.4.3 Switching Off



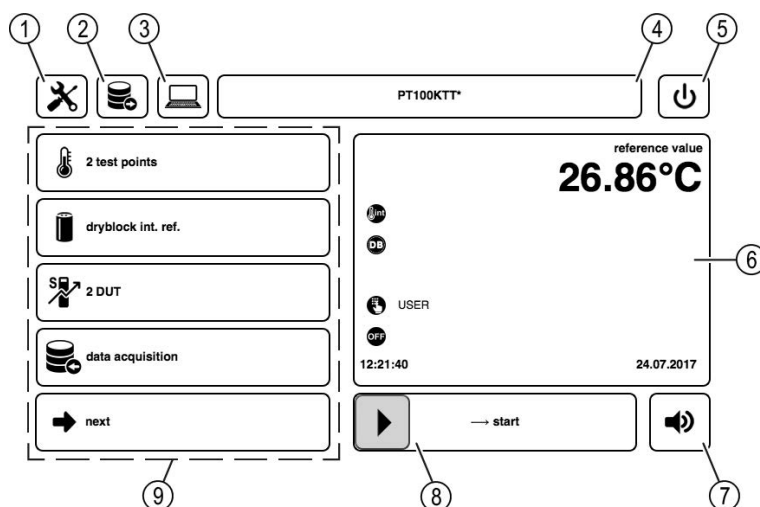
**INFORMATION** Only switch off the calibrator when the dry block / micro bath has reached room temperature.

When switching off at high temperatures, the calibrator and/or the DUT may be damaged.









1. Tap the  icon until the main window is displayed.
2. Tap the  icon to shutdown 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 displayed.
4. When the safe temperature has been reached, the message “You can now switch off the device” is displayed.
5. Switch off the calibrator via the mains switch.
6. Disconnect the calibrator from mains power if no further testing is required.
7. Unplug the power cord from the wall outlet.
8. Clean the calibrator after use, see Section 11.3.

## 5. User Interface

### 5.1 Main Window



**Figure 15: Main Window**

Ref	Function	Description
1	Calibrator Setup	Tap the  icon to open the “Calibrator Setup” window. The calibrator settings can be change. See Section 7.
2	Measurement Logs	Tap the  icon to open the “Select Log Data” window. Saved measurement logs can be selected and viewed. See Section 9.
3	Remote Control	Enables remote communication and control via Ethernet. See Section 5.4 and Section 7.1.
4	Test Task	Tap this area to open the “Select Test Task” window. Saved test tasks can be selected. New test tasks can also be created. See Section 6.1.
5	Shutdown	Tap the  icon to shutdown the calibrator. See Section 4.4.
6	Display Range	This window shows the reference temperature, set point temperature and additional information related to the selected test task. See Section 5.2.
7	Alarm Signal	The alarm signal can be muted  , or unmuted  . Use the “Alarm settings” window to define under what criteria the alarm signal is activated. See Section 6.2.6.
8	Start / Stop Slider	The start / stop slider is used to start  or end  the testing process.
9	Configuration Range	Tap this area to open the “Configuration range” window. Tap the  icon to open additional options.

## 5.2 Display Range

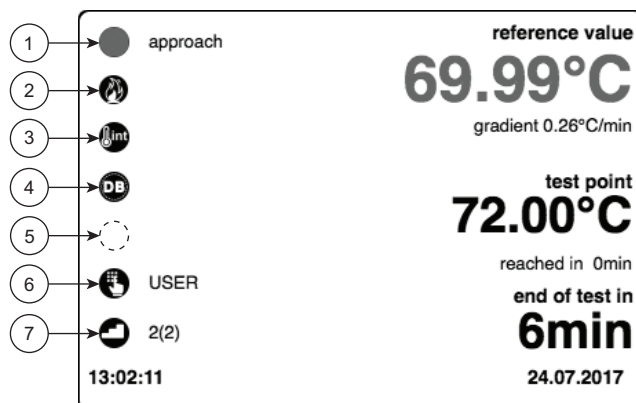


















Figure 16: Display Range Window

Ref	Icon Group	Icon	Description
1	Status		Status of reference sensor and DUT.
2	Controller		Heating
			Cooling
			Stable with standard deviation.
			Controller off.
3	Reference Sensor		Internal reference sensor.
			External reference sensor.
4	Function		Micro bath: (Not supported on PTC Series calibrators)
			Tub insert
			Dry block
			Infrared
			Surface
			Reference thermometer.
			Factory settings.
5	Alignment		Customer specific settings.

Ref	Icon Group	Icon	Description
6	Data Acquisition		Data acquisition disabled.
			User input data acquisition.
			Automatic data acquisition.
7	Operating Mode		Step/Cycle
			Switch test.

## 5.3 Toolbar

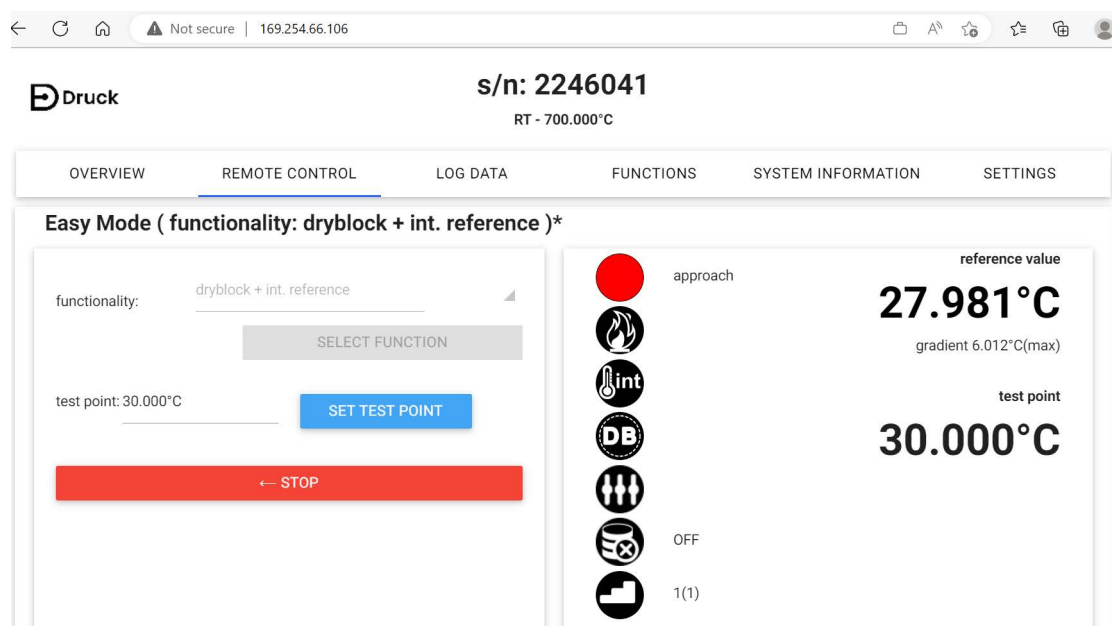
The following icons are used:

Icon	Name	Description
	Cancel / back	Return to the previous window. Changes are discarded without saving.
	Input Confirmation / Save	The selected value or setting is confirmed and saved.
	Configure	Switch to expert mode.
	Manage / Configure	The selected entry in the list is processed and the relevant window is displayed.
	Copy	The selected entry in the list is copied and the relevant window is displayed.
	Create New	A new entry is generated in the list and the relevant window is displayed.
	Delete	The selected entry in the list is deleted.
	Search	The list is searched for an entry and the result is displayed. Tapping the icon once again shows the entire list.
	Sort A-Z	The list is sorted alphabetically in ascending order.
	Sort Z-A	The list is sorted alphabetically in descending order.
	Export	The selected entry in the list is copied and the relevant window is displayed.

## 5.4 Remote Control (WebApp)

The PTC can be controlled remotely using a web browser. When enabled, the PTC creates an internal web server. This is called the WebApp. The WebApp replicates the PTC display and

controls on a remote web browser. Figure 17 shows an example of the WebApp display in a web browser.



**Figure 17: WebApp – PTC Easy Mode Example**

Connect a computer or smartphone with a web browser to the Ethernet port on the PTC front panel. Use the web browser to log onto the WebApp. The WebApp requires no additional software to be installed on the computer or smartphone.

Refer to Druck document 176M3205 for full WebApp instructions. The document can be downloaded from the following link:



## 6. Test Task

In the main window, tap the “Test Task” area, see Figure 15 item 4.

## 6.1 Select Test Task

Select a test task and confirm your selection.

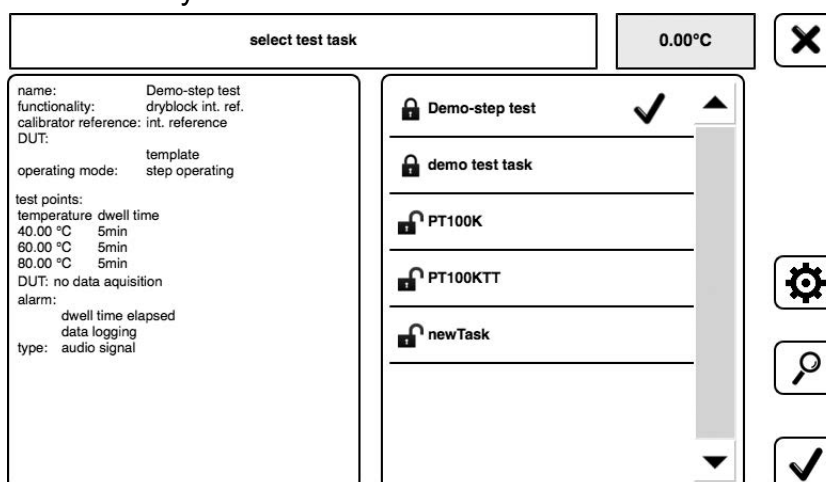



Figure 18: Select Test Task Window

## 6.2 Configure Test Task

1. Select the desired test task and tap the  icon.

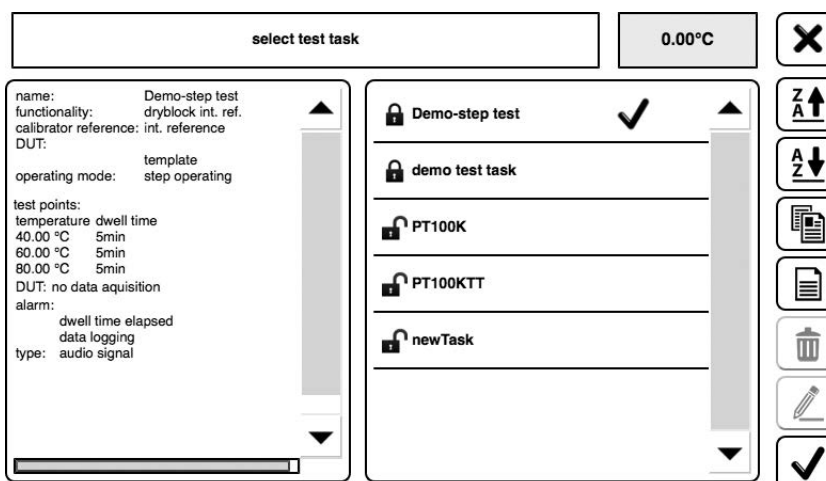





Figure 19: Select Test Task Window

**Note:** Protected  test tasks cannot be edited. Make a copy of the test task first.

2. Create a new test task  or edit  an unprotected test task.

3. Configure the test task with the required parameters.

configure test task - newTask 0.00°C

name: newTask

data acquisition

functionality: dryblock int. ref.

DUT: 3 DUTs


test points: 1

alarm settings

barcode: no barcode

**Figure 20: Configure Test Task Window**

### 6.2.1 Name of Test Task

1. In the “Configure Test Task” window, see Figure 20, tap the “Name”  icon.
2. Enter the new name of the test task and confirm the input.

### 6.2.2 Data Acquisition

1. In the “Configure Test Task” window, see Figure 20, tap the “Data Acquisition”  icon.

#### 6.2.2.1 Change the Name of the Measurement Log

1. Tap “Record name”.
2. Enter the new name of the measurement log and confirm the input.


#### 6.2.2.2 Select the Data Acquisition Type

1. Tap “Data Acquisition”.
2. Select the desired type of data acquisition and confirm the selection.


### 6.2.3 Functionality



**INFORMATION** The selected function must be suitable for the calibrator type (Section 3.2) and the insert (Section 4.3).

1. In the “Configure Test Task” window, see Figure 20, tap the “Functionality”  icon.

### 6.2.3.1 Link Function to Test Task

1. Select the desired function and confirm the selection with the  icon.

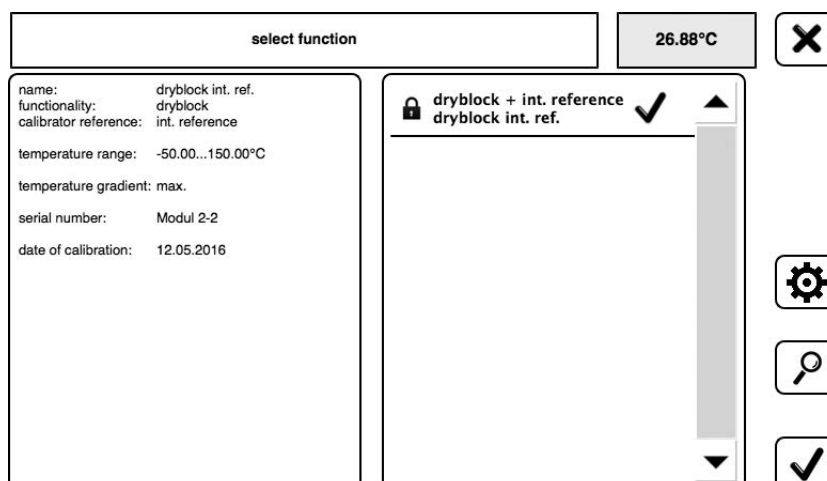


Figure 21: Link Function to Test Task

### 6.2.3.2 Configure the Function

1. Select the desired function and tap the  icon.

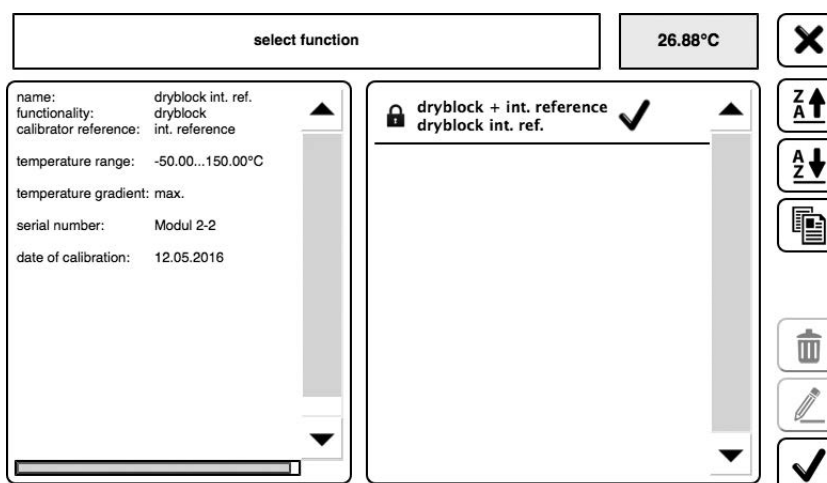




Figure 22: Select Function Window

**Note:** Protected  test tasks cannot be edited. Make a copy of the function first.

2. Tap the  icon.
3. Configure the function with the required parameters.

### Alignment Types

The value pairs Ax to Nx are used for:

- Adjustment values measured by the customer
- Functions using the internal calibrator reference sensor (intRef).
- Functions using the external calibrator reference sensor (extRef).

The Callendar-Van Dusen coefficients are used for:


- Callendar-Van Dusen coefficients documented in the certificate.
- Functions using the external calibrator reference sensor (extRef).

Either the factory setting or a selected alignment method applies.

## Stability Range

The stability range defines the maximum deviation from the set point which the calibrator should detect as stable. The smallest permitted value is 0.001.

### 6.2.4 Device Under Test (DUT)

1. In the “Configure Test Task” window, see Figure 20, tap the “DUT”  icon.

#### 6.2.4.1 Link DUT to Test Channel

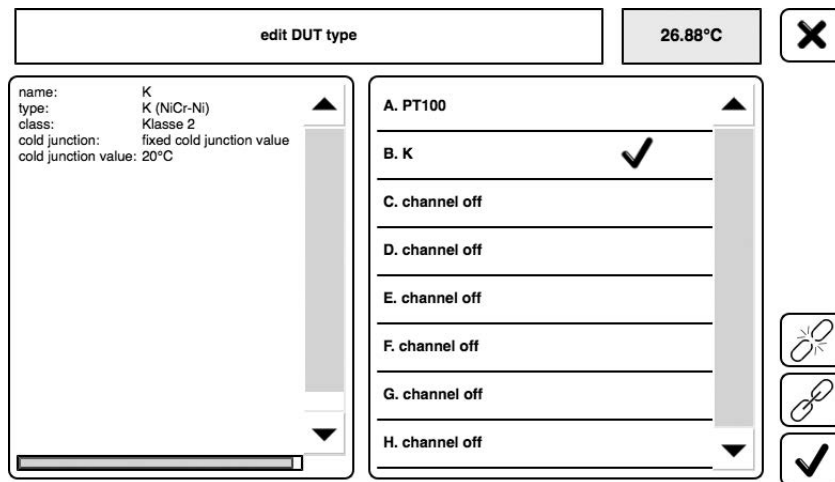






Figure 23: Link DUT to Test Channel Window


1. Tap the desired test channel.
2. Tap the  icon.
3. Select a DUT and confirm the selection.


#### 6.2.4.2 Unlink the DUT from the Test Channel

1. Tap the desired test channel.
2. Tap the  icon.

#### 6.2.4.3 Configure the DUT

1. Tap the desired test channel.
2. Tap the  icon.
3. Tap the  icon.

**Note:** Protected  DUT cannot be edited. Make a copy of the DUT first.

4. Tap the  icon.
5. Configure the DUT with the required parameters.

## Switch Test

If you have selected automatic data acquisition (Switch Test) and switch as DUT type, you must set the type of the switch contact:

1. Tap “Switch Type Selector”.
2. Select the type of contact type of the switch:
  - a. NO (Normally Open), or
  - b. NC (Normally Closed)

3. Confirm the selection.

### Waiting Time

The waiting time is a manually entered time delay to allow the DUT to stabilize before data acquisition.

**Note:** The waiting time is only used if user input was selected for data acquisition.

### Gradient

The gradient is used when the internal measuring instrument or TTScan is selected for data acquisition. If the gradient falls below the set value, the DUT is stable.

### Customer Specific Tolerance Value

Customer-specific tolerance values are used if the DUT has not been linked to a standard tolerance class or if a standard signal (current or voltage) is used.

1. Tap “Tolerance class”.
2. Select customer-specific and confirm the selection.
3. Tap “Tolerance value”.


Tolerance value = Percent Value [% of reading] + Constant Value [constant]

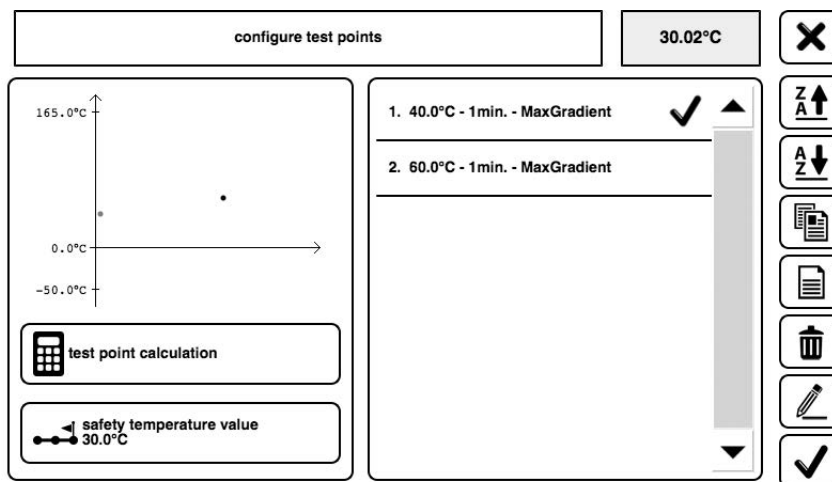
4. Confirm the input.

### 6.2.5 Test Points




**INFORMATION** If the automatic data acquisition (Switch Test) is selected and the DUT type is set to switch, the test points “Starting Temperature”, “Test Area Beginning” and “Test Area End” are specified. “Test Point Calculation” is not available.

1. In the “Configure Test Task” window, see Figure 20, tap the “Test Points”  icon.




**Figure 24: Configure Test Points Window**

#### 6.2.5.1 Create Test Points

1. Tap the  icon.
2. Enter temperature and dwell time and confirm the respective input.

#### 6.2.5.2 Edit Test Points


1. Tap the  icon.

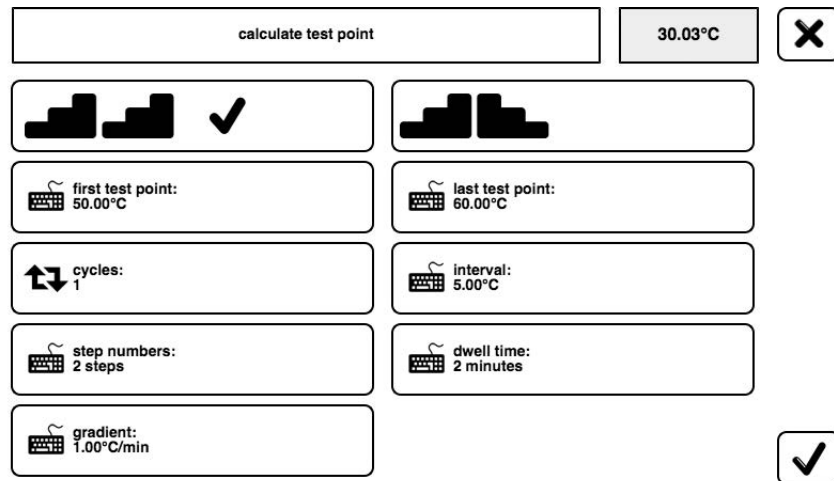
2. Change temperature and dwell time and confirm the new values.

### 6.2.5.3 Test Point Calculation

Use Test Point Calculation to automatically calculate the intervening test points between a specified first and last test point.


**Note:** When a parameter is changed, the other dependent parameters are automatically recalculated.

1. Tap the  icon.




**Figure 25: Calculate Test Point Window**

#### Step, One-Sided

The one-sided step  calculates the intervening test points in succession from the first test point to the last test point.

#### Step, Two-Sided


The two-sided step  calculates the intervening test points in succession from the first test point to the last test point, then back to the first test point.

#### Define First and Last Test Points

1. Tap on the fields, enter the new values and confirm the input.
2. The intervening test points are automatically recalculated.
3. The screen returns to the previous window.

#### Cycles

Determines the number of cycles (repetitions) of a whole test sequence.

1. Tap the “Cycles”  icon.
2. Enter the new value and confirm the input.
3. The screen returns to the previous window.

#### Set Interval

For fixed intervals:

1. Tap the “Interval” field.
2. Enter the desired step width and confirm the input.
3. The number of steps are automatically calculated.

**Note:** If necessary, the last test point is also adjusted to match.

4. The screen returns to the previous window.

### Defining the Number of Steps

**Note:** The total number of resulting test points is always one higher than the entered number of steps.

1. Tap the field “Number of Steps” to change the number of steps.
2. Enter the new value and confirm the input.
3. The number of steps is applied and the interval is automatically recalculated.

### Set Dwell Time

1. Tap the field “Dwell Time”.
2. Enter the new value and confirm the input.
3. The screen returns to the previous window.

### Set Gradient

1. Tap the field “Gradient”.
2. Enter the new value and confirm the input.
3. The screen returns to the previous window.

### Behavior at Test End

Set the behavior of the calibrator at the end of the test.


1. Tap the field “Behavior at Test End”.
2. The “Select Behavior at Test End” window appears.

**Figure 26: Behavior at Test End Window**

3. Select the desired behavior and confirm the input.
4. The screen returns to the previous window.

### Safety Temperature Value

**Note:** The “Safety Temperature Value” field is only visible if “Safety Temperature Value” has been selected as the behavior at the end of the test. See “Behavior at Test End” on page 32.

1. Tap the “Safety Temperature Value”  icon.
2. Enter the new value and confirm the input.
3. The screen returns to the previous window.

## 6.2.6 Alarm Settings

Use the alarm settings to configure how and when the calibrator activates the alarm signal.

1. In the “Configure Test Task” window, see Figure 20, tap the “Alarm Settings”  icon.

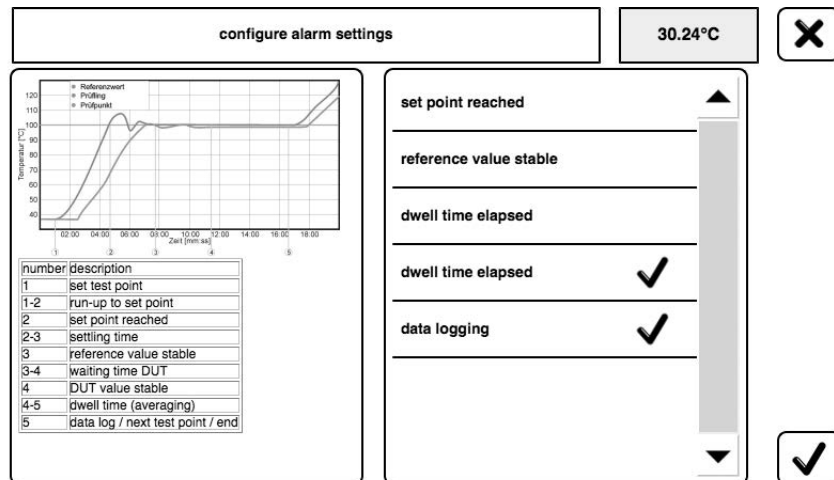



Figure 27: Alarm Settings Window

2. Select the desired entries from the list.
3. Confirm the selection.


## 6.2.7 Barcode

The calibrator can be configured to input a barcode and link it to a test task.

The barcode can be entered manually through the screen, or by using a compatible USB barcode scanner.

1. In the “Configure Test Task” window, see Figure 20, tap the “Barcode”  icon.
2. Select the desired entry from the list.
3. Confirm the selection.

# 7. Calibrator Setup

1. In the main window, see Figure 15, tap the “Calibrator Setup”  icon.

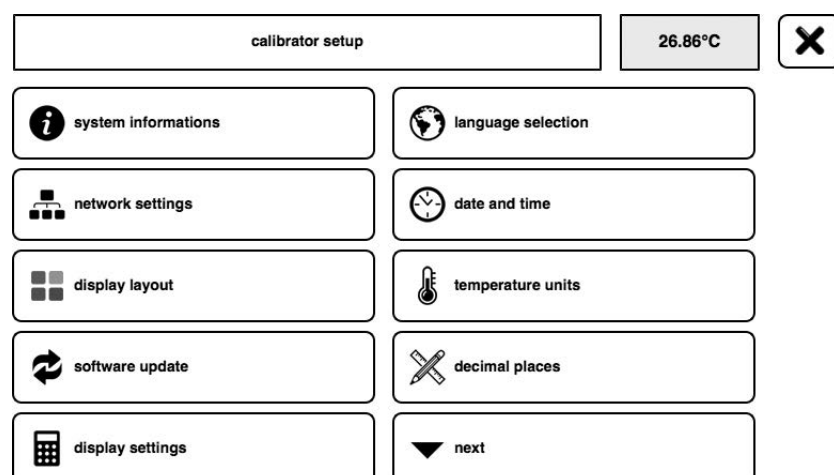
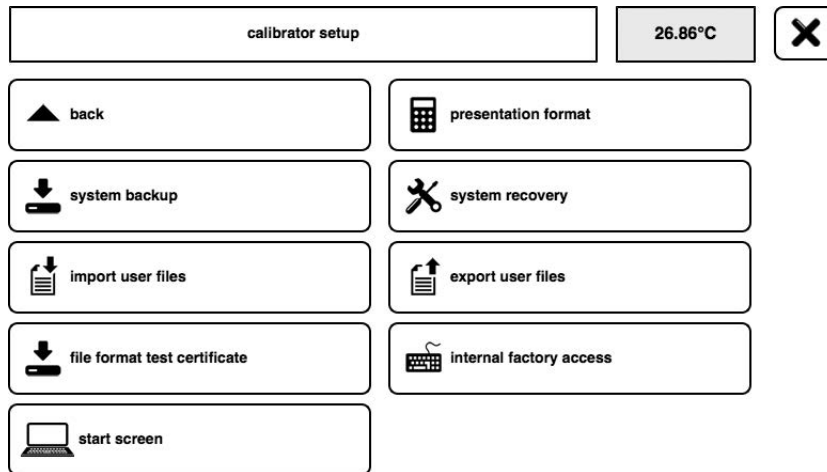


Figure 28: Calibrator Setup Window (Page 1 of 2)




**Figure 29: Calibrator Setup Window (Page 2 of 2)**

**Note:** Use “next” and “back” to navigate between the configuration pages.

## 7.1 Configure Network



**INFORMATION** The product is designed to use an Ethernet point-to-point connection for connectivity. Ensure that any network connection is firewall protected and non-Internet facing.

1. In the “Calibrator Setup” window, see Figure 28, tap the “Network Settings”  icon.
2. The network settings have the following two configuration options:


Network Mode	Description
DHCP	The IP address and subnet mask are automatically assigned.
Manual	The IP address and subnet mask are entered manually.

**Note:** If unsure, contact your network administrator.

## 7.2 Update Calibrator Software

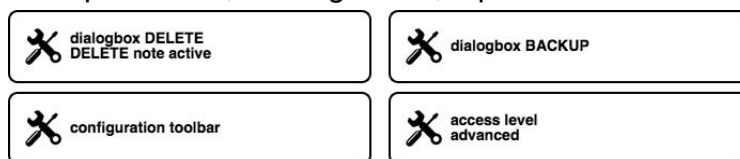
**Note:** The calibrator software version is displayed in menu:

Calibrator Setup >> System Information

1. Download the latest calibrator software from: <https://druck.com/software>
2. Unpack the downloaded ZIP archive.
3. Save the file “update.tar” in the root directory of the USB flash drive.
4. Plug the USB flash drive into the calibrator.
5. In the “Calibrator Setup” window, see Figure 28, tap the “Software Update”  icon.
6. Follow the on-screen instructions.

## 7.3 Configure Presentation Format

1. In the “Calibrator Setup” window, see Figure 29, tap the “Presentation Format”  icon.



**Figure 30: Presentation Format Configuration Window**

The following configuration options for dialog boxes, the configuration toolbar and access level are available.

### Dialogbox DELETE

Configure whether a warning message is displayed before an item is deleted.

### Dialogbox BACKUP


Setting	Description
Note Settings	Configure whether to prompt for a system backup when the calibrator starts.
Backup Interval	Prompt for a system backup after a specified number of completed test tasks has elapsed.

### Configuration Toolbar

Configures which entries are displayed in the configuration bar on the main screen. The order in which entries are displayed in the configuration bar can also be configured.

### Access Level

Select an access level:

Access Level	Description
Standard	Test task parameters cannot be changed.
Advanced (Default)	Test task parameters can be changed after tapping the  icon.
Expert	Test task parameters can be changed without prior confirmation.

## 8. Testing Process / Calibration



**HOT SURFACE** The calibrator may become very hot when in operation. Touching hot parts can result in 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).

Allow the calibrator to cool before you remove the DUT, change the insert or switch off the calibrator.



**INFORMATION** For optimum performance, allow the calibrator to warm up for at least an hour before use.

### 8.1 Before Starting

Before starting the testing process, check that:

1. The calibrator has a suitable installation site and operational position. See Section 4.1.
2. The electrical connections have been made correctly. See Section 4.2.
3. The correct insert has been selected for the testing. See Section 4.3.
4. The insert is clean and dry.

**Note:** Ice and condensation can be removed from the insert by gently heating above 100 °C (212 °F).

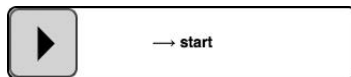
5. The DUT is held securely in the calibrator.
6. The calibrator has sufficient structural stability.

## 8.2 Starting the Testing



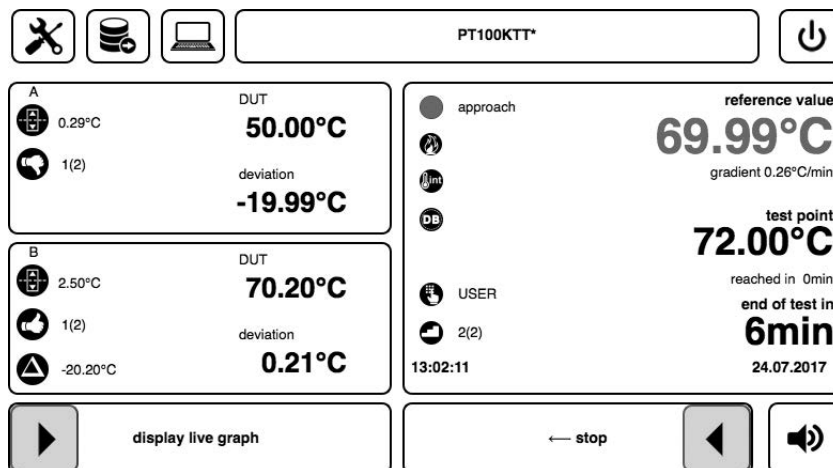
**INFORMATION** During testing, all user controls except the Start/Stop slider and the Alarm Signal are disabled.

1. Slide the start/stop slider completely to the right. The slider text changes from “start” to “stop”.



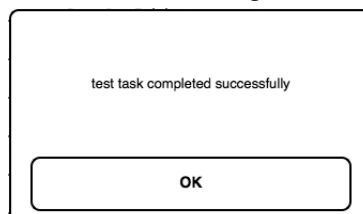
**Figure 31: Start/Stop Slider - Starting the Test Task**

2. The test task is started.



**Figure 32: Example Test Task**

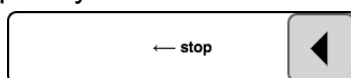
3. The status of the test task is displayed on the display range window. See Section 5.2.
4. On successful test task completion, the following message is displayed.



**Figure 33: Test Task Completed Successfully Message**

## 8.3 Canceling the Testing

1. Slide the start / stop slider completely to the left. The slider text changes from “stop” to “start”.



**Figure 34: Start/Stop Slider - Stopping the Test Task**

2. The test task is aborted.
3. The calibrator goes to the “Test End” temperature defined by the test task. See “Behavior at Test End” on page 32.


**Note:** Do not leave the calibrator unattended at high temperatures. See Section 4.4.2.

4. Wait until the calibrator has cooled down sufficiently.

## 8.4 After the Testing

1. Allow the calibrator to cool to room temperature. See Section 4.4.2.
2. If necessary, drain the tub insert with the syringe.
3. Clean the calibrator. See Section 11.3.

## 9. Measurement Log Management


1. In the main window, see Figure 15, tap the “Measurement Logs”  icon.




**Figure 35: Measurement Logs Window**

2. Select the desired measurement log and confirm the selection.
3. The “View Data Log” window appears.


### Diagram

1. Tap the “Diagram”  icon.
2. A diagram with the set points and test points is displayed.


### Table

1. Tap the “Table”  icon.
2. Select the desired channel and confirm the selection.

### Export Log Data

1. Tap the “Export Log Data”  icon.
2. Follow the on-screen instructions.

### Export All Log Data

1. Tap the “Export All Log Data”  icon.
2. The measurement log is exported in the desired file format.

**Note:** Select the desired export file format in menu:

Calibrator Setup >> File Format Test Certificate

## 10. Troubleshooting



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

Refer to Table 7 for trouble shooting guide.

**Table 7: Troubleshooting Guide**

Problem	Possible Cause	Remedy
Calibrator touchscreen is not responsive to user input.	The calibrator is in an undefined state.	Turn off the calibrator, wait a few minutes, then restart.
Sensor break.	External reference sensor not properly connected.	Check connection.
	Cable break or short circuit.	
Fan not running.	The fan is defective or blocked.	Contact Druck Services.
	The thermal protection fuse has tripped.	
Set point temperature is not achieved.	Solid state relay is defective.	
	The heating / cooling element is defective.	
No display.	Controller is defective.	
Calibrator cannot be switched on.	Mains not available or fuses blown.	Check the mains supply and the fuses.
	Residual current circuit breaker has tripped due to moisture in the heating elements.	Contact Druck Services.

If you are unable to remedy the problem, immediately disconnect the calibrator to protect against unintended operation. Return the calibrator to Druck for repair.

## 11. Maintenance, Cleaning and Transportation

Before maintenance, cleaning and transportation, ensure:

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

### 11.1 Maintenance



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

The calibrator is maintenance-free and cannot be repaired by the user. In case of a defect, the calibrator must be returned to Druck, or approved service representative for repair.

For safe operation of the calibrator, the following checks must be carried out at regular intervals.

#### 11.1.1 Before Use

1. Check the calibrator for damage.
2. For micro bath calibrators, check the filled height of the calibration liquid. See Section 4.3.5.6.

### 11.1.2 Annually

1. Visually inspect all parts of the calibrator for corrosion, wear and damage.
2. Have a trained technical person carry out an electrical safety inspection.

### 11.1.3 Recalibration

It is recommended to send the calibrator to Druck for recalibration after 36 months, or after a maximum of 500 operating hours, whichever is sooner.

### 11.1.4 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.

### 11.1.5 Magnetic Stirrer

The magnetic stirrer is subject to mechanical wear and tear during normal operation. The magnetic stirrer has a limited lifetime and requires periodic replacement. The fillet in the middle of the magnetic stirrer reduces the friction during the rotary movement. Once the fillet has worn, the stirring function can no longer be guaranteed because of the increased friction.

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

### 11.1.6 Mains Fuses



**WARNING** Only use fuses of the same type.

For fuse specification, see Section 13.

The mains fuses of the calibrator are located on the front side and are integrated in the mains connection. If mains voltage is present, but the display is dark and the fan is not running, check the mains fuses. Replace the fuses if necessary.

1. Disconnect the mains connection cable from the calibrator.
2. Prise open the fuse compartment from the bottom with a fingernail or a flat screwdriver.
3. Remove the compartment with the fuses.
4. Check the fuses and replace any blown fuses.

**Note:** Always replace both fuses, even if only one has blown.

5. Fit the fuse compartment back in place and connect the mains connecting cable. See Section 4.2.

**Note:** Should the fuses blow repeatedly, there is probably a fault with the calibrator. Send the calibrator to Druck for repair.

## 11.2 Calibration

### 11.2.1 Recalibration

The calibrator is adjusted and tested with measuring equipment in accordance with recognized national standards prior to delivery.

The calibrator should, depending on the application situation, be inspected at appropriate intervals on the basis of ISO 10012.

It is recommended to send the calibrator to Druck for recalibration after 36 months, or after a maximum of 500 operating hours, whichever is sooner.

### 11.2.2 Adjustment



**INFORMATION** Only functions and DUTs marked with the  icon can be adjusted.

**All test tasks or DUTs that use adjusted functions are affected by the adjustment.**

In practice, the usage conditions during testing can vary from the measurement conditions at the time of the factory calibration.

Due to this, the calibrator offers the facility to store its own adjustment values. It is possible to have adjustments for user defined functions and DUTs.

The number of adjustment values can be freely selected. The calibrator can be directly aligned to an on-site standard thermometer, therefore achieving maximum display accuracy. It is not necessary to send the calibrator back to the manufacturer.

**Note:** The factory calibration is always retained. Adjustments can be removed at any time, resetting the calibrator back to the factory calibration.

Adjustment values can be entered:

- a. In the “Configuration Range” of the main window, see Figure 15 item 9, or
- b. In the DUT configuration window, see Section 6.2.4.3.

## 11.3 Cleaning

### 11.3.1 Exterior Chassis

Clean the calibrator with a dry or slightly damp lint-free cloth. Do not use sharp objects or aggressive agents for cleaning.

Ensure that your cleaning agent cannot be a source of danger from a reaction with parts of the calibrator or the materials inside. If unsure of clean agent compatibility, contact Druck Services.

### 11.3.2 Vent Grilles for Inlet Air



**INFORMATION** If the vent grilles become obstructed, the thermal protection fuse may trip. The thermal protection fuse is non-resettable. The calibrator cannot be used anymore. The calibrator must be returned to Druck for repair. Ensure that the grille openings are always kept clear.

The grille openings, see Figure 1 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 at the installation site and the amount of use.

1. Clean the grille openings by vacuuming or brushing.

### 11.3.3 Inserts



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

During normal operation, the inserts create small quantities of metal dust. This can result in an insert getting stuck in the dry block.

1. Remove the insert from the dry block with the aid of the sleeve exchange tool.
2. Clean the insert and the dry block at regular intervals.

### 11.3.4 Tub Insert

Before cleaning, the tub insert must be drained as much as possible using the draining syringe.

Observe the instructions in the safety data sheet of the calibration liquid.

#### 11.3.4.1 Silicone Oil

1. Remove the sensor cage from the tub insert.
2. Remove the magnetic stirrer with the aid of the magnetic lifter.
3. Clean the tub insert, sensor cage, magnetic stirrer with water to which a generous amount of detergent has been added.
4. Remove the soapy water as much as possible using the draining syringe.
5. Thoroughly dry the tub insert, sensor cage, magnetic stirrer and the draining syringe.

### 11.4 Return Goods/Material Procedure

If the unit requires calibration 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). Provide the following information for a RGA or RMA:

- Product (e.g. PTC700).
- Serial number.
- Details of defect/work to be undertaken.
- Include any error code(s).
- Operating conditions.

#### 11.4.1 Safety Precautions



**INFORMATION** Service by unauthorized sources will affect the warranty and may not guarantee further performance.

You must inform Druck if the product has been in contact with any hazardous or toxic substance. The relevant COSHH or in the USA, MSDS, references and precautions to be taken when handling.

## 12. Decommissioning and Disposal

### 12.1 Before Decommissioning

Prior to decommissioning, ensure that:

1. The measurement set up is switched off and is in a safe de-energized state.
2. The calibrator and its accessories have completely cooled down. See Section 4.4.2.

### 12.2 Decommissioning

1. Remove all connected sensors and devices.
2. Switch off the calibrator and disconnect the mains plug.
3. Empty the micro bath of residual calibration liquid.

## 12.3 Disposal of Calibration Liquid



**CAUTION** Dispose of the calibration liquid in accordance with the Technical Safety Data Sheet.

## 12.4 Disposal of Calibrator

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

# 13. Specification

## 13.1 Shared Specification

Specification		All Models
<b>Display:</b>		
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.	
Excess temperature behavior.	Thermal fuses interrupt the power supply on excessive temperature inside the housing.	
<b>Environmental:</b>		
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	Standing upright / vertically.	
EMC	Tested in accordance with EN 61326-1, class A (Industrial environments)	
<b>Electrical Characteristics:</b>		
PC interfaces	Ethernet, 3 × USB	
Mains cable	H05VV-F 3 G 0.75 mm <sup>2</sup> 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 earth	Protective earth conductor (PE) must be available.	

## 13.2 PTC200 Specification

Specification		PTC200	
Temperature range <sup>a</sup>		-55 °C to 200 °C (-67°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 zone	Bottom 40 mm (1.58") of the adaptor 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).

## 13.3 PTC700 Specification

Specification		PTC700
Temperature range <sup>a</sup>	T <sub>R</sub> to 700 °C (T <sub>R</sub> 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: <sup>b</sup>		
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: <sup>b</sup>		
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)
Stabilization Time:		
- 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 zone	Bottom 40 mm (1.58") of the adaptor 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	
Case:		
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). It achieves optimum accuracy up to 660 °C (1220 °F).
- b. All values measured at 660 °C (1220 °F).

## 13.4 PTC165(i) Specification

Specification		PTC165(i)	
Control sensor (switchable)	External Reference Sensor	Internal Reference Sensor	
Air Shield (DB):			
Temperature range <sup>a</sup>	-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 <sup>a</sup>	n/a	-35 °C to 165 °C (-31 °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 <sup>a, b</sup>	-35 °C to 155 °C (-31 °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 <sup>a</sup>	-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
<b>Case:</b>	
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 2.4.

## 13.5 PTC255(i) Specification

Specification		PTC255(i)	
Temperature range		T <sub>R</sub> to 255 °C (T <sub>R</sub> 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): <sup>a</sup>			
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 2.4.

## 13.6 Integrated Measuring Instrument

**Note:** Only applicable to models PTC165i and PTC255i.

Specification	Integrated Measuring Instrument
<b>Resistance Thermometer:</b>	
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)
- Pt1000	± 0.06 °C (± 0.108 °F)
<b>Thermocouple:</b>	
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 K	± 0.08 °C (± 0.144 °F)
- Type J	± 0.07 °C (± 0.126 °F)
- Type N	± 0.13 °C (± 0.234 °F)
- Type E	± 0.06 °C (± 0.108 °F)
- Type T	± 0.09 °C (± 0.162 °F)
- Type R	± 0.78 °C (± 1.404 °F)
- Type S	± 0.73 °C (± 1.314 °F)
<b>Current Measurement:</b>	
Number of channels	1
Connection	4 mm safety socket
Measuring range	0 to 24 mA

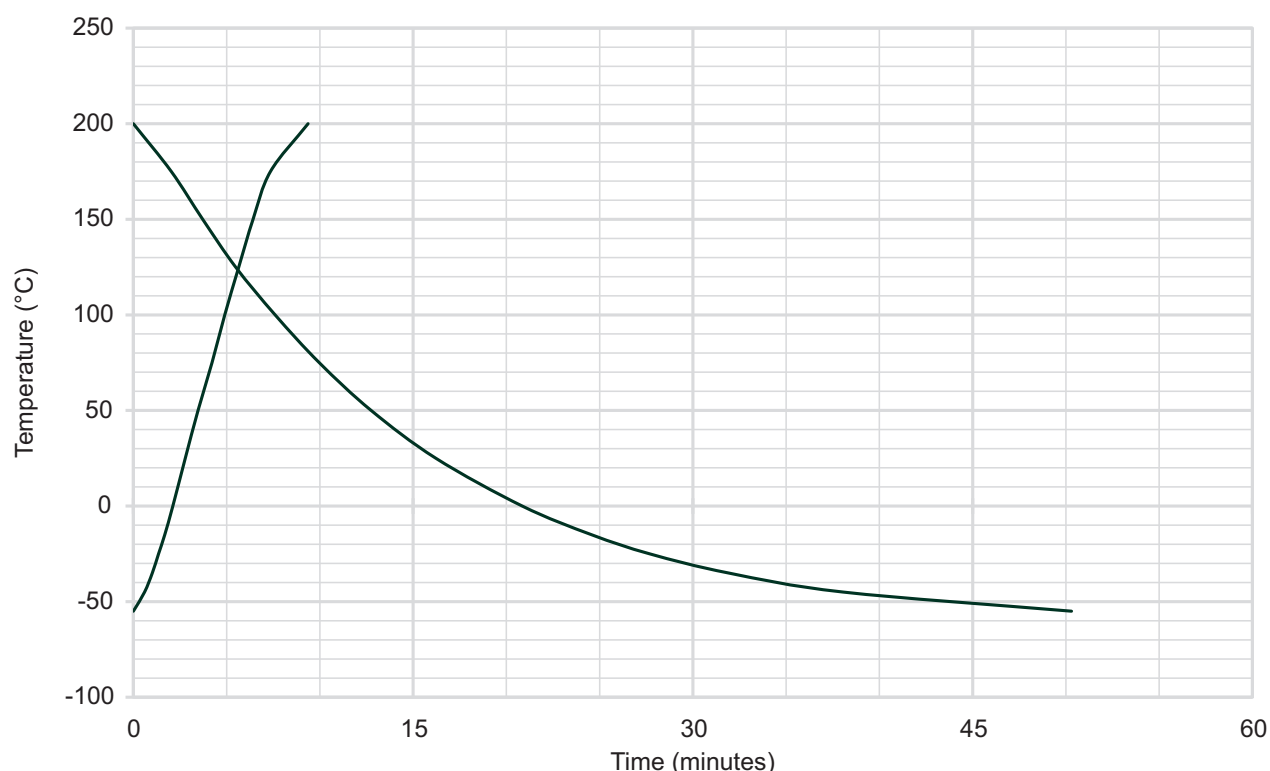
Specification	Integrated Measuring Instrument
Accuracy	0.01 % full-scale
<b>Voltage Measurement:</b>	
Number of channels	1
Connection	4 mm safety socket
Measuring range	0 to 12 VDC
Accuracy	0.01 % full-scale
<b>Switch Test:</b>	
Number of channels	2
<b>Transmitter Supply:</b>	
Output current	24 mA (maximum)
Output voltage	24 VDC

## 13.7 Heating and Cooling Times

**Note:** The heating and cooling times are dependent on the parameters of the test task and the ambient conditions.

The following times are guide values only. They are measured at a room temperature of 23 °C (73.4 °F) and do not include transient effects.

### 13.7.1 PTC200



**Figure 36: PTC200 Heating and Cooling Times**

13.7.2 PTC700

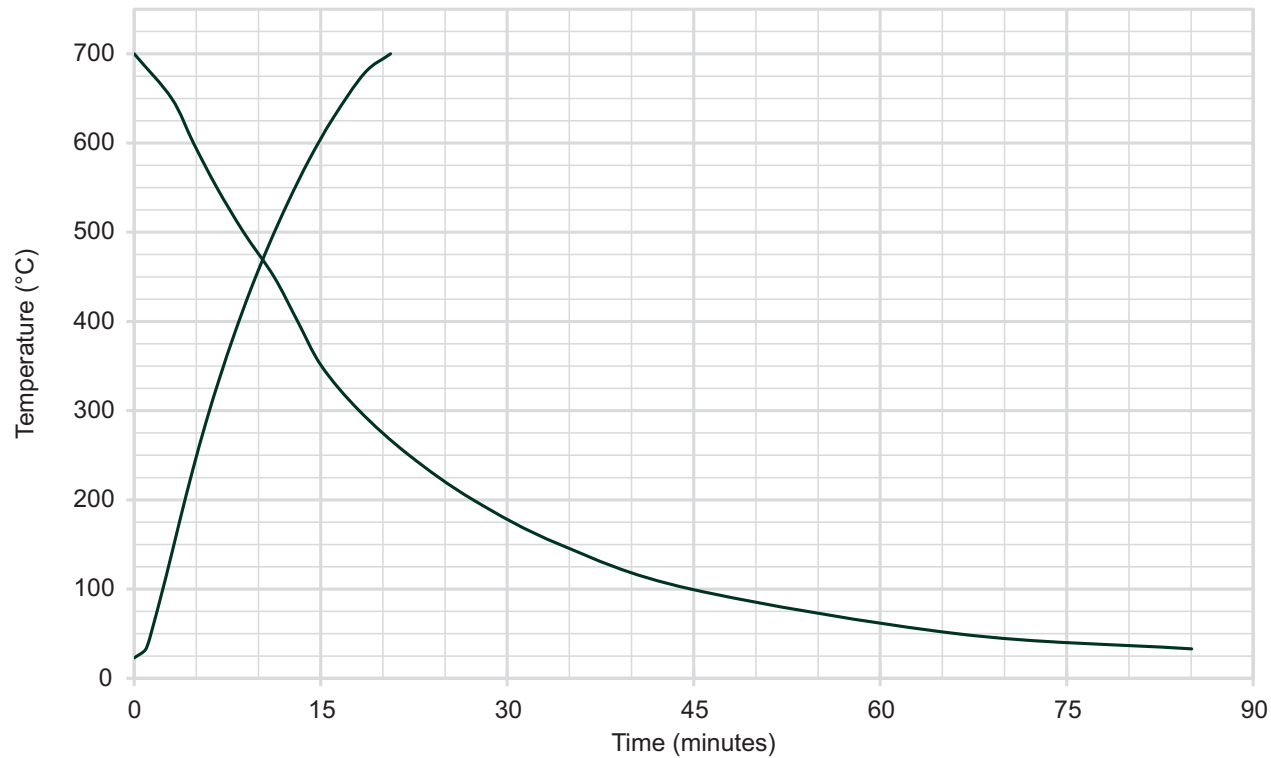


Figure 37: PTC700 Heating and Cooling Times

13.7.3 PTC165(i)

13.7.3.1 Dry Block, Infrared and Surface Inserts

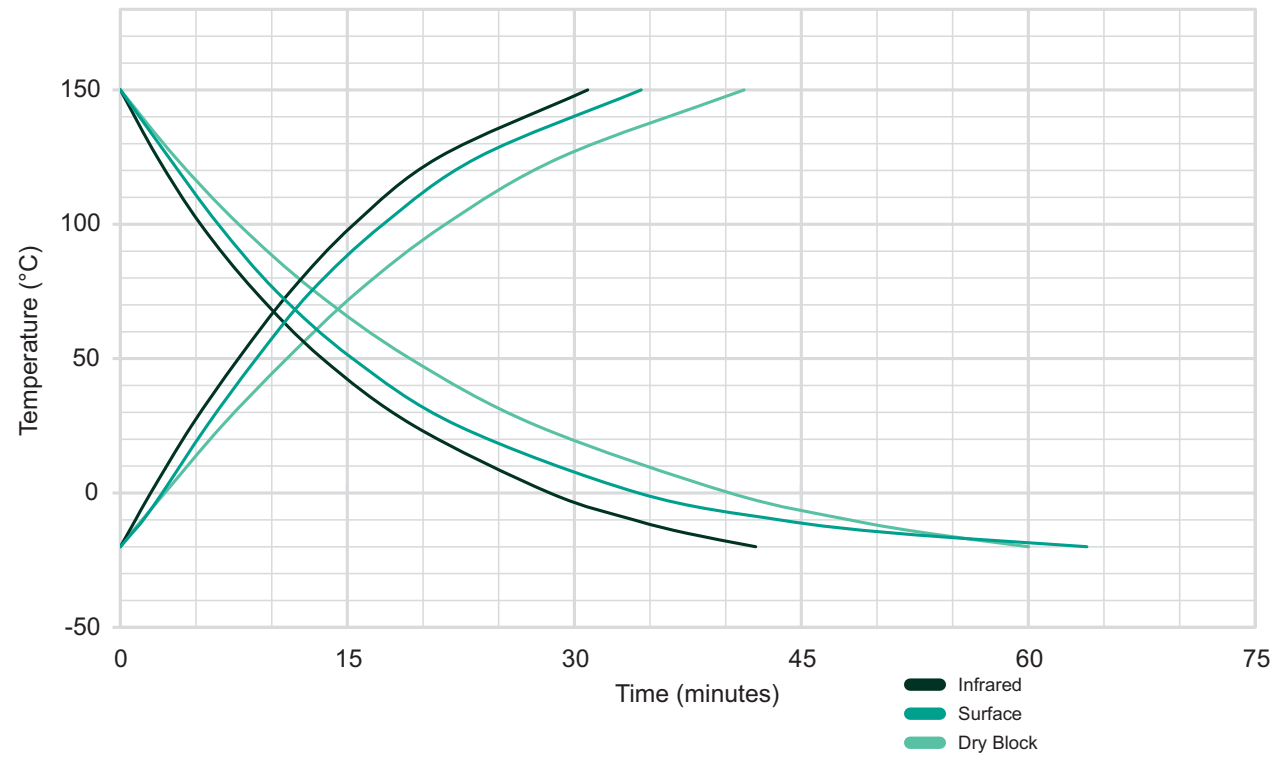


Figure 38: PTC165(i) Heating and Cooling Times

13.7.3.2 Silicone Oil (10 cSt)

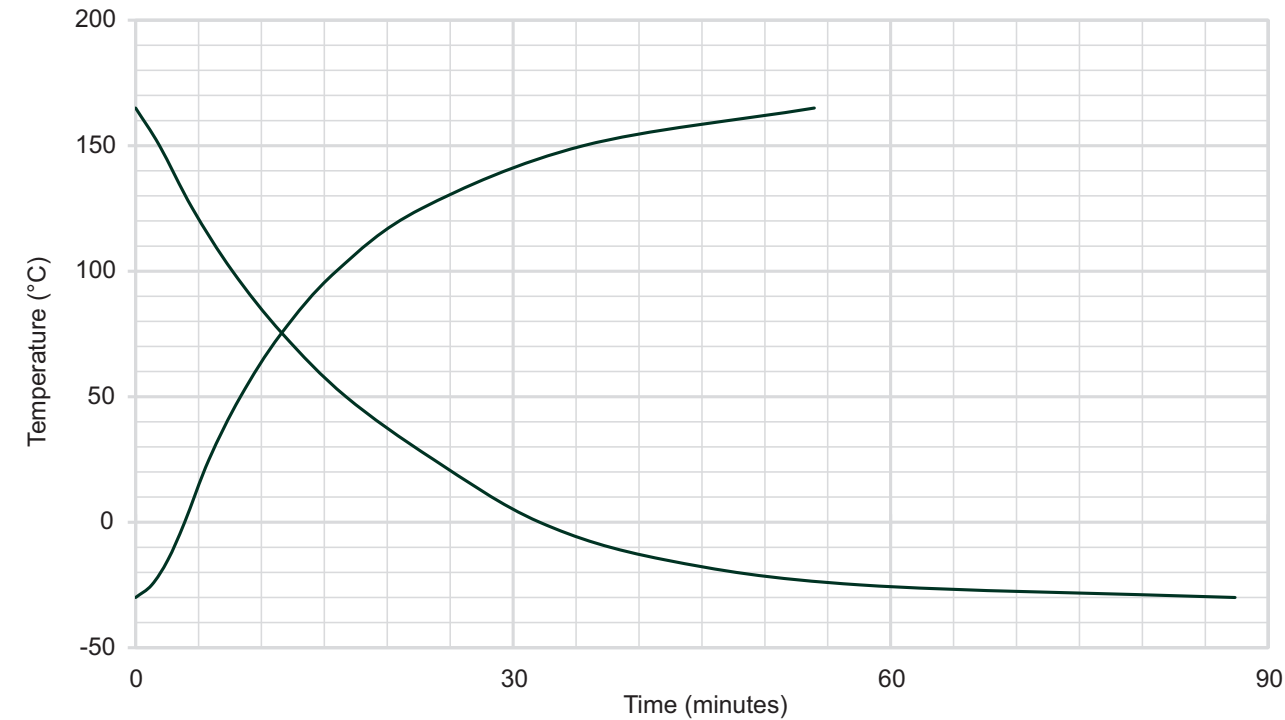


Figure 39: PTC165(i) Heating and Cooling Times

13.7.4 PTC255(i)

13.7.4.1 Dry Block, Infrared and Surface Inserts

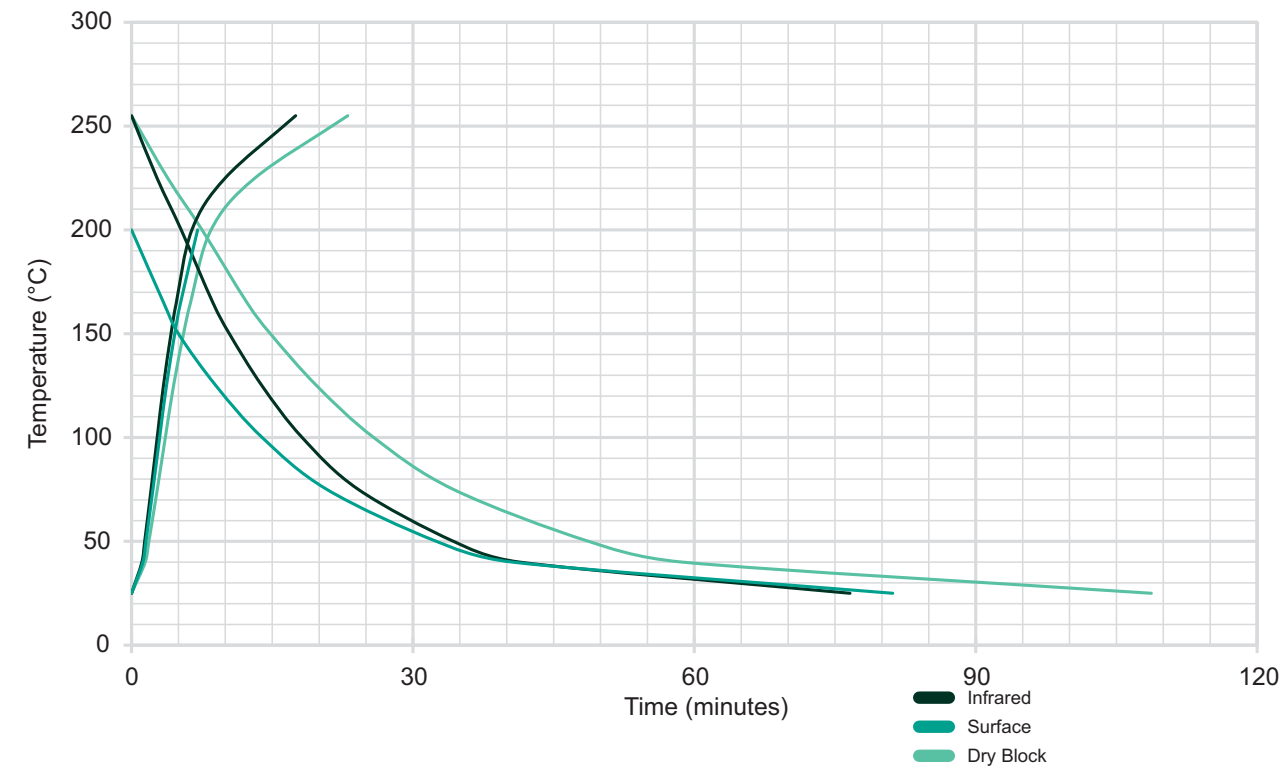


Figure 40: PTC255(i) Heating and Cooling Times

13.7.4.2 Silicone Oil (50 cSt)

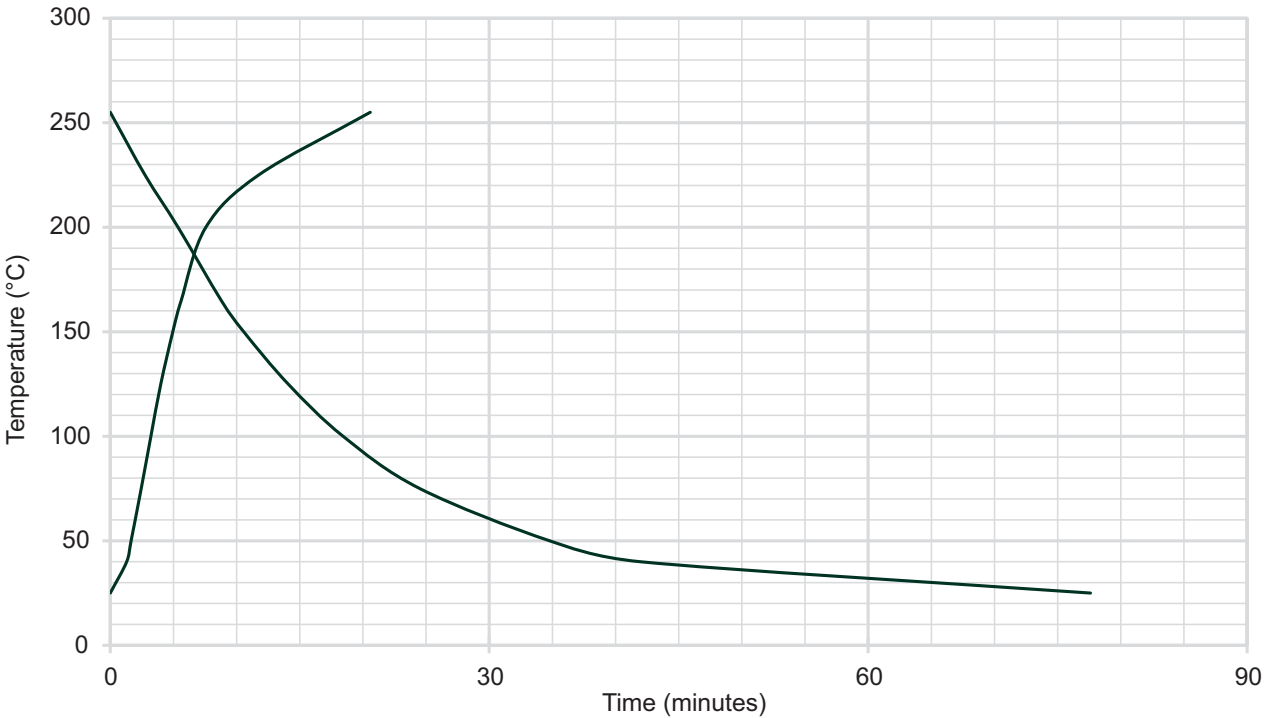


Figure 41: PTC255(i) Heating and Cooling Times





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