Operating Manual

LR-Cal **LTC-DB-9030-35** (-30...+150°C)
LR-Cal **LTC-DB-9050-35** (-50...+120°C)
LR-Cal **LTC-DB-0600-35** (amb.temp...+600°C)
LR-Cal **LTC-DB-1100-44** (+200...+1100°C)
LR-Cal **LTC-DB-1200-35** (+200...+1200°C)

Portable metal dry block temperature calibrators

MANUAL

Portable metal dry block temperature calibrators LR-Cal LTC-DB-...

LR-Cal **LR**

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1. Safety instructions

1.1 Symbols used

WARNING!
Hot surfaces or hot parts

WARNING!
Indicates a potentially hazardous situation that could result in minor or slight injury, property damage, or environmental damage if not avoided.

WARNING!
Risk of electric shock.

Electrical and electronic devices marked with the adjacent symbol must not be disposed of with household waste. In accordance with EU Regulation 2002/96/EC, European users of electrical and electronic devices must dispose of them at appropriate collection points or through their suppliers. Illegal disposal is prohibited and will result in fines.

1.2 Warning

WARNING!
During operation, high voltages are present inside the device. Failure to observe the safety instructions may result in damage to persons or property.
Only qualified personnel who have read and understood this operating manual may work on and with the temperature calibrator. Repair work may only be carried out by the manufacturer or by qualified personnel.

The successful and safe operation of this device depends on its precise handling, operation, use, and maintenance.

Unless otherwise specified, numbers in parentheses refer to operating or reading elements of the calibrator; see the drawing in chapter 5.

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WARNING!
Especially considering that this temperature calibrator can also be used on site as a portable device, ALWAYS ensure that it is properly grounded when connecting it to the power supply.
Maintenance and repair work may only be carried out on the temperature calibrator when it is switched off and the block or calibration bath has cooled down to ambienttemperature.

The upper silver-colored ventilation grille can become very hot. Never touch inserted sensors when the temperature calibrator is in operation.

Never attempt to change the factory-set PID controller basic parameters.
Never use the temperature calibrator in excessively humid, dirty, dusty, or oily environments.
Never connect a voltage to the electrical measurement inputs (devices with option **LTC-MP-3I**) and thermostat test sockets.

This temperature calibrator has the following safety features:
• Protective fuse (power supply)
• Safety temperature switch (protection against excessive temperatures)
• Grounding

Always follow these instructions:
• Never place anything on top of the temperature calibrator.
• Do not store liquids near the temperature calibrator.

After each use at high temperatures, set the set point (target temperature) to room temperature and allow the temperature calibrator to cool down or heat up to this temperature.
See important notes on page 5.

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Device versions LR-Cal LTC-DB-9030-35 + LR-Cal LTC-DB-9050-35:

If the temperature calibrator has been operating at a temperature below 0°C for a long period of time:

- **Set the set point to 95...100°C and allow the temperature calibrator to heat up until ice and water oil have evaporated again.**

- **Then set the set point to a temperature approximately equal to the room temperature and wait until the temperature calibrator has approximately reached this temperature. Only now can you switch off the device.**

Device versions LR-Cal LTC-DB-1100-44 + LR-Cal LTC-DB-1200-35:

The devices lose their grounding current of several mA at a temperature of approx. 1100°C. If your power supply has a particularly sensitive protective circuit that interrupts the supply even in the event of minor current differences to "ground," use a current difference protection circuit with a sensitivity of 30 mA.

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MANUAL | Portable metal dry block temperature calibrators LR-Cal LTC-DB-...

LR-Cal

2. Technical data + description

2.1 Technical data - versions LR-Cal LTC-DB-9030-35 + LR-Cal LTC-DB-9050-35

Specification LR-Cal	LTC-DB-9030-35	LTC-DB-9050-35
Temperature range:	-30...+150°C	-50...+120°C
Display:	Touch screen (color)	
Display accuracy:	±0.15°C full temperature range *	
Units of measure:	°C / °F / K	
Displey resolution:	0.1° / 0.01° / 0.001°	
Mean heating time: (incl. stabilization)	approx. 28 min from +20°C to +140°C	approx. 17 min from ambient temp. to +120°C
Mean cooling time: (incl. stabilization)	approx. 23 min from +20°C to -25°C	approx. 37 min from ambient temp. to -45°C
Stability:	±0.03°C **	
Axial uniformity:	±0.01°C ***	
Hole (block) diameter:	35 mm	
Hole (block) depth:	135 mm	
Insert material:	anticorodal	
Switch test, voltage:	Open/Closed - 4,5 VDC	
Adjustable ramp function:	from 0.1°C /min.	
PC interface:	USB type B	
Automatic calibration:	at 5 temperature points	
External probes:	Optional: Order-Code **LTC-MP-3I** to be ordered together with device	
Operating voltage:	230 VAC (optional 115 VAC) 50/60 Hz	
Electric power:	350 W	400 W
Dimensions:	160 x 350 x 360 mm	
Weight incl. std.accessories	9.3 kg	

2.2 Technical data - version LR-Cal LTC-DB-0600-35

Specification LR-Cal	LTC-DB-0600-35
Temperature range:	from ambient temperature to +600°C
Display:	Touch screen (color)
Display accuracy:	±0.3°C *
Units of measure:	°C / °F / K
Display resolution:	0.1° / 0.01° / 0.001°
Mean heating time: (incl. stabilization)	approx. 40 min. from ambient temperature to +550°
Mean cooling time: (incl. stabilization)	approx. 60 min. from +550°C to +100°C
Stability:	±0.05°C full temperature range **
Axial uniformity:	±0.15°C at +400°C ***
Radial uniformity:	±0.35°C at +400°C
Hole diameter:	35 mm
Hole depth:	185 mm
Block insert material:	nickel plated brass
Switch test, voltage:	Open/Closed - 12 VDC
Adjustable ramp function:	from 0.1°C/min.
PC interface:	USB type B
Automatic calibration:	on 5 temperature points
External probes:	Optional: Order-Code **LTC-MP-3I** to be ordered together with device
Operating voltage:	230 VAC (optional 115 VAC) 50/60 Hz
Electric power:	800 W
Dimensions:	160 x 360 x 350 mm
Weight incl. std.access.	10.0 kg

All values have been measured at ambient temperature of +20°C.

The achievement of stabilization is confirmed by a displayed root symbol √ and an audial beep.

* Temperature deviation between display and reference probe.

** Max. temperature difference at stable temperature over 30 min.

*** Measured from the button up to 60 mm (LR-Cal LTC-DB-0600-35: up to 40 mm).

2.3 Technical data - versions LR-Cal LTC-DB-1100-44 + LR-Cal LTC-DB-1200-35

Specification LR-Cal	LTC-DB-1100-44	LTC-DB-1200-35
Temperature range:	+200...+1100°C	+200...+1200°C
Display:	Touch screen (color)	
Display accuracy:	±3°C full temperature range *	
Units of measure:	°C / °F / K	
Display resolution:	0.1° / 0.01° / 0.001°	
Mean heating time: (incl. stabilization)	approx. 60 min. from ambient temperature to 1000°C	
Mean cooling time: (incl. stabilization)	approx. 330 min. from 1000°C to 100°C	
Stability:	±0.05°C	
Axial uniformity:	3.6° ±0.3 **	1.5° ±0.8 **
Radial uniformity:	±1°C ***	±0.5°C ***
Hole diameter:	44 mm	35 mm
Hole depth:	220 mm	210 mm
Block insert material:	Ceramics (optional Inconel)	
Switch test, voltage:	Open/Closed - 4.5 VDC	
Adjustable ramp function:	from 0.1°C /min.	
PC interface:	USB type B	
Automatic calibration:	at 5 temperature points	
External probes:	Optional: Order-Code **LTC-MP-3I**	not available
Operating voltage:	230 VAC (optional 115 VAC)	230 VAC
Electric power:	900 W	
Dimensions:	170 x 330 x 450 mm	160 x 350 x 385 mm
Weight incl. std. acces.	12 kg	11.5 kg

All values have been measured at ambient temperature of +20°C.

The achievment of stabilization is confirmed by a displayed root symbol √ and an audial beep.

     * Temperature deviation between display and reference probe.

     ** Max. temperature difference at stable temperature over 30 min.

     *** Measured at 1000°C at 40 mm above the button.

2.4 Features - all versions

• Aluminum frame with pull-out carrying handle
• Temperature control with PID microcontroller
  Microprocessor: 32-bit, 216 MHz ARTM cortex-M7; A/D converter: 24-bit
  E2PROM memory + flash memory
  Color touchscreen: TFT 480 x 272 RGB colors
• Block and block insert with holes for inserting probes
• Safety thermostat (surface thermostat)
• Testing of thermostats (working or alarm thresholds, trigger temperatures)
• Forced air cooling system
• Thermally insulated electronic control components
• Power supply with power cord and protective fuse(s)
• Electromagnetic compatibility: Emission EN 50081-1, Immunity EN 50082-2

Notes:

The technical data was determined at a supply voltage of 230 VAC ±10%.

The certified data (factory calibration certificate) are valid for 1 year from the date of issue. After this period, the calibrator must be recalibrated.

The stability time was measured over a period of 6 minutes if the stability values remain within ±0.03°C.

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LR-Cal [LR]

2.5 Intended use

The LR-Cal LTC-DB portable temperature calibrator is designed for the following applications:
• Testing and calibrating temperature measuring devices in the laboratory and in the field in accordance with ISO 9000.
• Testing and calibrating thermostats with visual indication when the contact is closed.
• Thermal material testing

The temperature calibrator has been designed to minimize the EMC effect in accordance with the harmonized regulations for residential, commercial, light, and heavy industry.

NOTE: The range of applications is expanded with the optional Aq2Sp2 PC software as follows:
• Control of the calibrator via PC software via the USB (Type B) connection
• Manual or automated calibration of one or more test objects
• Cyclic tests or stress tests of temperature sensors
• Testing of thermostats with regard to opening and closing of the switching contact
• Output, saving, and printing of the recorded values in compliance with ISO 9000 standards.

2.6 Manufacturer

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2.7 Versions (temperature working ranges)

Version:	Order-Code:	Temperature range:
LR-Cal LTC-DB-9030-35	LTC-DB-9030-35	-30...+150°C
LR-Cal LTC-DB-9050-35	LTC-DB-9050-35	-50...+120°C
LR-Cal LTC-DB-0600-35	LTC-DB-0600-35	ambient temp. ...+600°C
LR-Cal LTC-DB-1100-44	LTC-DB-1100-44	+200...+1100°C
LR-Cal LTC-DB-1200-35	LTC-DB-1200-35	+200...+1200°C

2.8 Temperature generation

In the LR-Cal LTC-DB-9030-35 and LR-Cal LTC-DB-9050-35 versions, the temperature is generated by powerful Peltier elements.

The other versions feature heating resistors that can generated (version dependend) up to 1200°C.

NOTE:
Please remember that generating very high temperatures very frequently reduces the service life of the heating resistors. Generate very high temperatures for as short a time as possible to increase the service life.

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2.9 Ventilation

The internal fan and ventilation grilles on the bottom allow air to circulate for cooling and heat dissipation inside the calibrator.
IMPORTANT: Do not block the ventilation openings with objects. All bottom and rear openings must be kept clear for air to pass through.
Airflow is necessary for the calibrator to function properly. It allows for better temperature control and lowers the temperature of the calibration bath during cooling.

2.10 Block

The material of the metal block depends on the version (e.g., aluminum, or ceramic for versions LR-Cal LTC-DB-1100-44 + LR-Cal LTC-DB-1200-35, optionally made of Inconel 600). Different block inserts with different bore holes are available for each version. See
data sheet "LTC-DB-9030-35_DB-9050-35" for LR-Cal LTC-DB-9030-35 + LR-Cal-LTC-DB-9050-35,
data sheet "LTC-DB-0600-35" for LR-Cal LTC-DB-0600-35, and
data sheet "LTC-DB-1100-44_DB-1200-35" for LR-Cal LTC-DB-1100-44 + LR-Cal LTC-DB-1200-35.
(For data sheets, see the respective product pages at *https://www.druck-temperatur.de*)

2.11 Internal reference temperature sensor

A Pt 100 resistance thermometer (versions LR-Cal LTC-DB-1100-44 + LR-Cal LTC-DB-1200-35: thermocouple), which is permanently installed in the calibrator, is used to regulate the temperature. The calibration data is stored in the memory of the calibrator's microprocessor.

2.12 Safety thermostat

he calibrator is equipped with a safety thermostat (10) for overtemperature, which intervenes in the event of a malfunction in the heating resistors or Peltier elements.
If the safety thermostat is triggered, wait until the calibrator has reached a temperature close to the ambient temperature. This should allow the safety thermostat to release the calibrator's function again. If not, disconnect the calibrator from the power supply, correct any faults, and then switch the calibrator back on. For more information on the safety thermostat, see chapter 9.
The trigger temperature of the safety thermostat depends on the calibrator version.

2.13 Carrying handle

The calibrator is equipped with a retractable transport handle, so the handle does not "get in the way" during operation.

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2.14 Scope of standard delivery

Please refer to the corresponding data sheet for the standard scope of delivery of your calibrator version. The data sheet is also available for download on the respective product pages on our website: *https://www.druck-temperatur.de*

2.15 Options (NOT for version LR-Cal LTC-DB-1200-35)

- **LTC-MP-3I**   Device version with 3 configurable measurement inputs, including 2 inputs for resistance thermometers/thermocouples and 1 input for analog signals 4...20 mA or 0...10 V

- **LTC-MP-115V**   Device design for 115 VAC (50/60 Hz) power supply
  Note: Version LR-Cal LTC-DB-1100-44 only reaches a maximum of 1000°C.

2.16 Available block inserts

Please refer to the corresponding data sheet for the available block inserts for your calibrator version. The data sheet is also available for download on the respective product pages on our website: *https://www.druck-temperatur.de*

2.17 Other accessories

For available accessories for your calibrator version, please refer to the corresponding data sheet, which is also available for download on the respective product pages on our website: *https://www.druck-temperatur.de*

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3. Notes on inserting probes (e.g. test specimens)

⚠️ **WARNING**
The temperature calibrator controller has been configured with optimal parameters at the factory. Any changes to these parameters by the customer (Section 5.5.3) may cause malfunctions or even injury to persons and damage to equipment, and will also void the warranty/guarantee.

3.1 Metal dry blocks (sketches)

3.1.1 Versions LR-Cal LTC-DB-9030-35 + LR-Cal LTC-DB-9050-35

Test item

Insulation

Block insert

Block and Peltier elements

Optimal zone for calibrations

Internal reference probe

140

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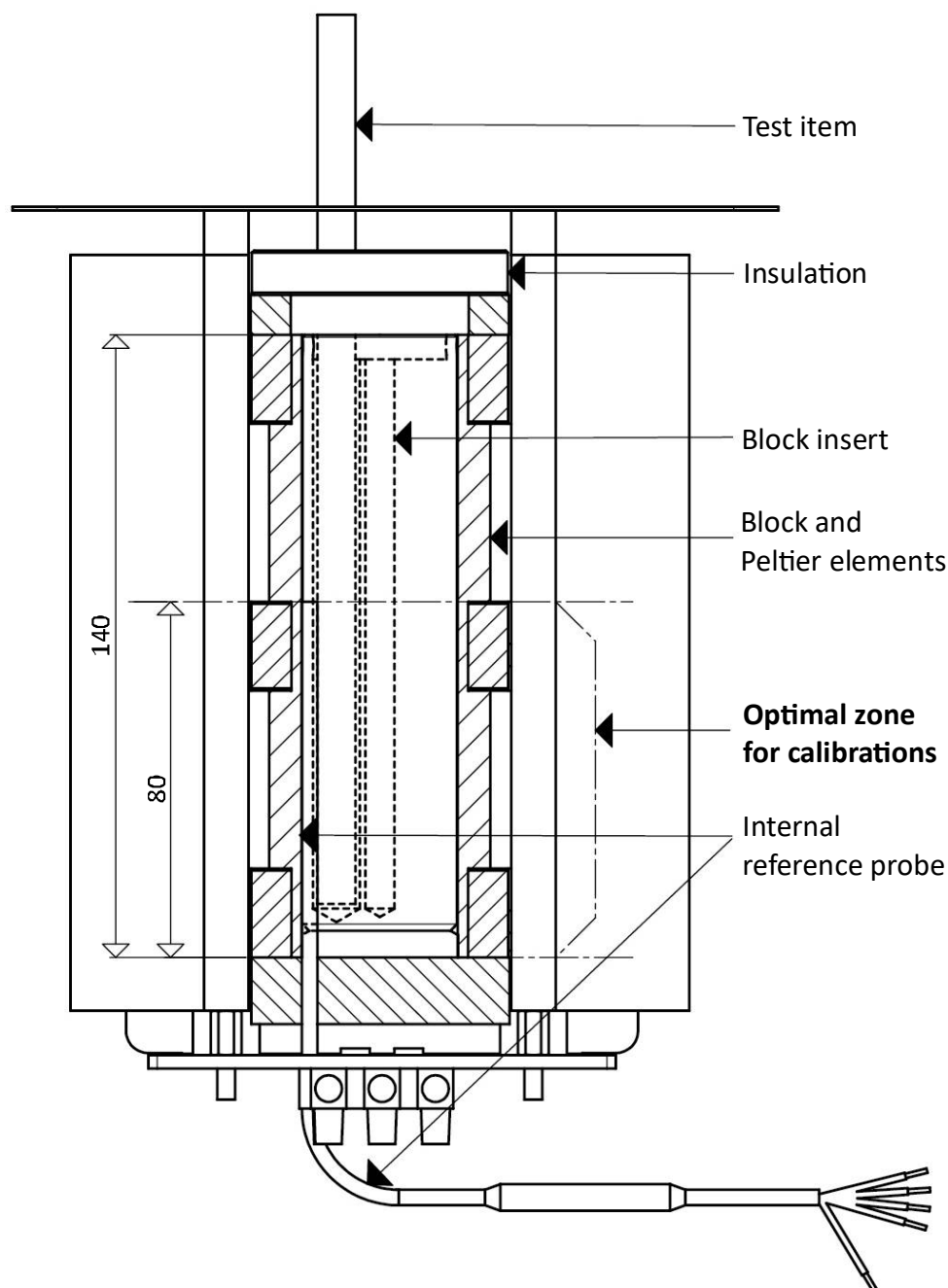
LR-Cal LR

3.1.2 Version LR-Cal DB-0600-35

Test item

Block insert

Block with heater elements

Optimal zone for calibrations

Internal reference probe

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3.1.2 Versions LR-Cal LTC-DB-1100-44 + LR-Cal LTC-DB-1200-35

Insulation

Ceramic tube

Block insert

Heating resistance

Optimal zone for calibrations

Internal reference probe

LR-Cal LTC-DB-1100-44

Insulation

Ceramic tube

Block insert

Heating resistance

Optimal zone for calibrations

Internal reference probe

LR-Cal LTC-DB-1200-35

3.2 Correct positioning (insertion) of temperature sensors in the block insert

- Measure the diameter of the sensor.
- Refer to the drawings in section 3.1 for the optional zone for calibrations.
- Use a block insert with a suitable borehole. The borehole must be at least 0.3 mm larger (1 mm larger for LR-Cal LTC-DB-1100-44 and LR-Cal LTC-DB-1200-35) than the diameter of the sensor to be inserted.
  Never force the probe into a hole in the block insert!
- **Block inserts may only be inserted and removed at ambient temperature using the tool supplied.**
- If you are only inserting one probe, place it on the right-hand side if possible, as this is where the internal reference sensor is located.
- Insert the probe almost to the bottom (see drawings in section 3.1). If you are using a calibrator with option **LTC-MP-3I** and an external reference sensor (at input REF), make sure that the test object and the reference are as close together as possible
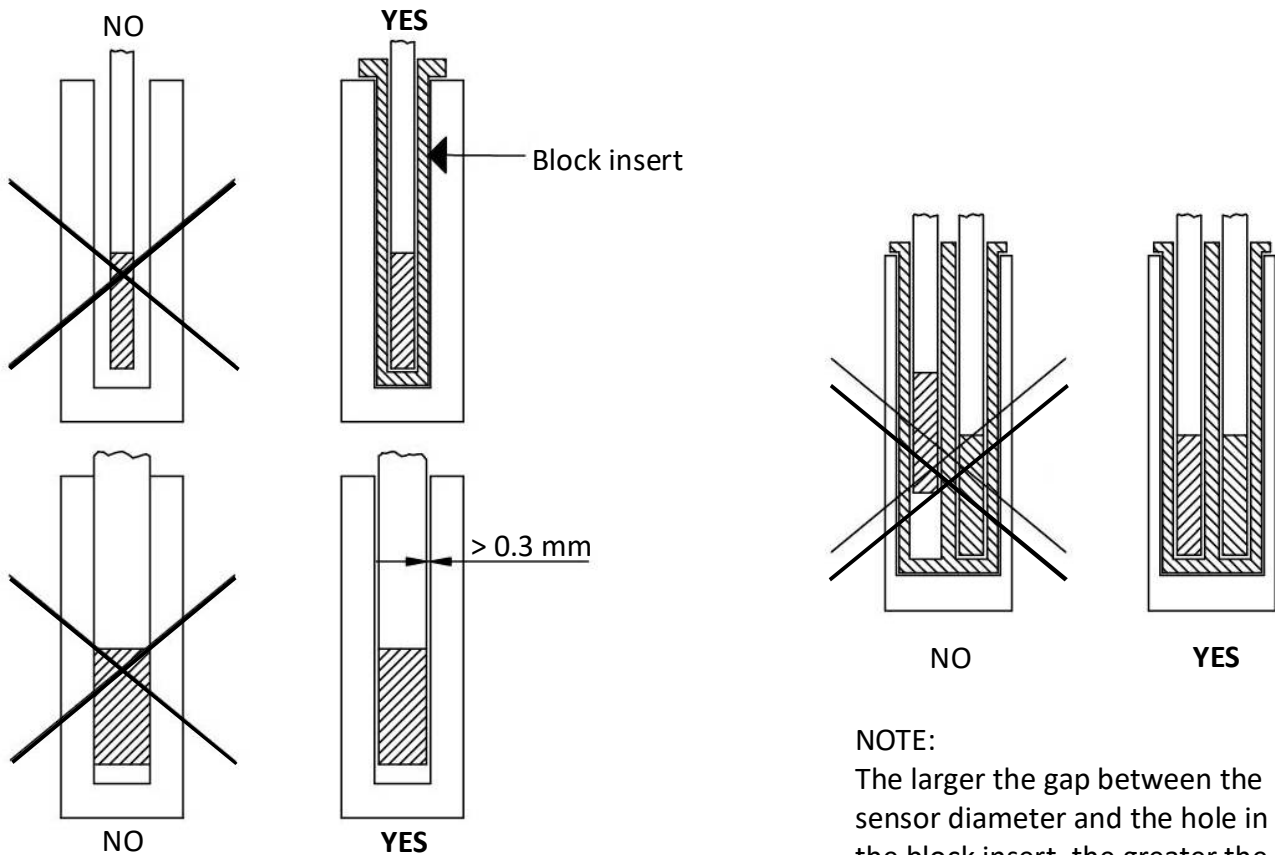.

⚠ **Only use probes that are compatible with the temperature range of your calibrator!**

See scetches on the next page:

MANUAL — Portable metal dry block temperature calibrators LR-Cal LTC-DB-...

LR-*Cal* LR

3.2.1 All versions except LR-Cal LTC-DB-1100-44 + LR-Cal LTC-DB-1200-35

NO

YES

Block insert

> 0.3 mm

NO

YES

NO

YES

NO

YES

NOTE:
The larger the gap between the sensor diameter and the hole in the block insert, the greater the system-related temperature deviation between the test specimen and the reference. Maintain a distance of 0.3 or 1 mm if possible.

3.2.2 Versions LR-Cal LRC-DB-1100-44 + LR-Cal LTC-DB-1200-35

NO

NO

> 1 mm

YES

NO

YES

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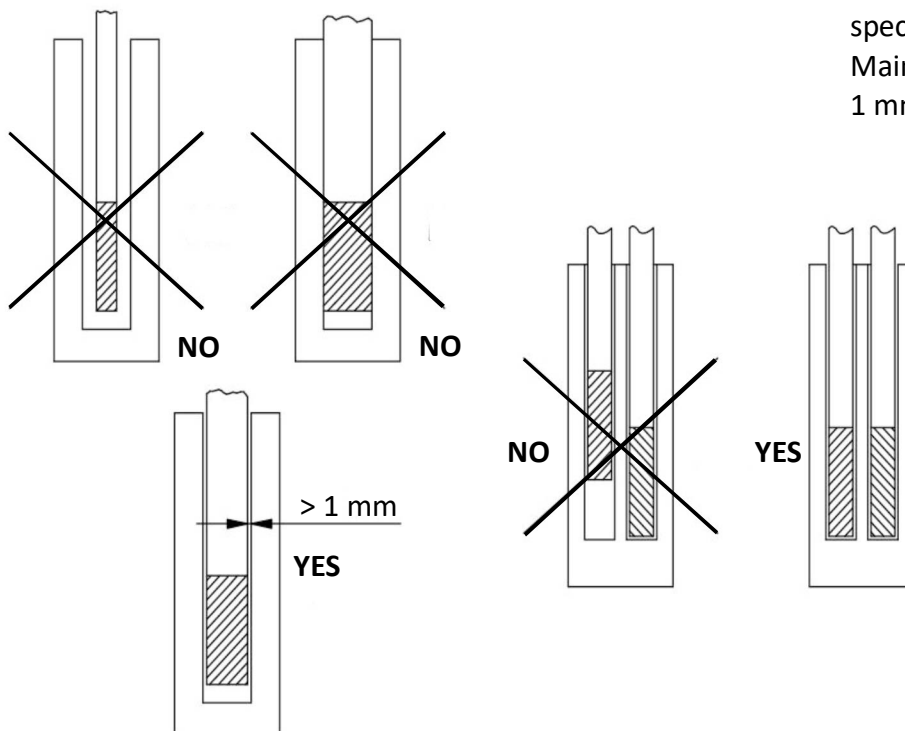
4. Installation of the temperature calibrator

4.1 Installation

4.1.1 Removing the packaging
The temperature calibrator was delivered in transport packaging suitable for standard shipping.
We recommend that you keep this packaging (e.g., for returns/recalibrations).
If external damage to the transport packaging is visible upon delivery, contact the transport company with a complaint.

4.1.2 Setting up the temperature calibrator
Place the temperature calibrator on a level, stable, and clean surface for operation.

The temperature calibrator can generate high temperatures. There is a risk of burns and fire. Keep the temperature calibrator away from highly flammable materials. No liquid may be poured into the holes in the block inserts or in the block.

4.1.3 Power supply for the temperature calibrator
Ensure that your mains voltage matches the value specified on the type plate on the bottom of the housing (underside). The temperature calibrator is designed for a mains voltage of 230 VAC (50/60 Hz) (optionally with option **LTC-MP-115V**: 115 VAC, except version LR-Cal LTC-DB-1200-35).
A connection cable approx. 2.5 meters long (3 x 1 mm²) is included in the scope of delivery.
Before switching on the temperature calibrator, you must ensure that it is correctly earthed.

If you have the calibrator without the LTC-MP-115V option, it is designed for 230 VAC and the connection cable has a Schuko plug. Do NOT use an adapter to avoid losing the correct grounding!
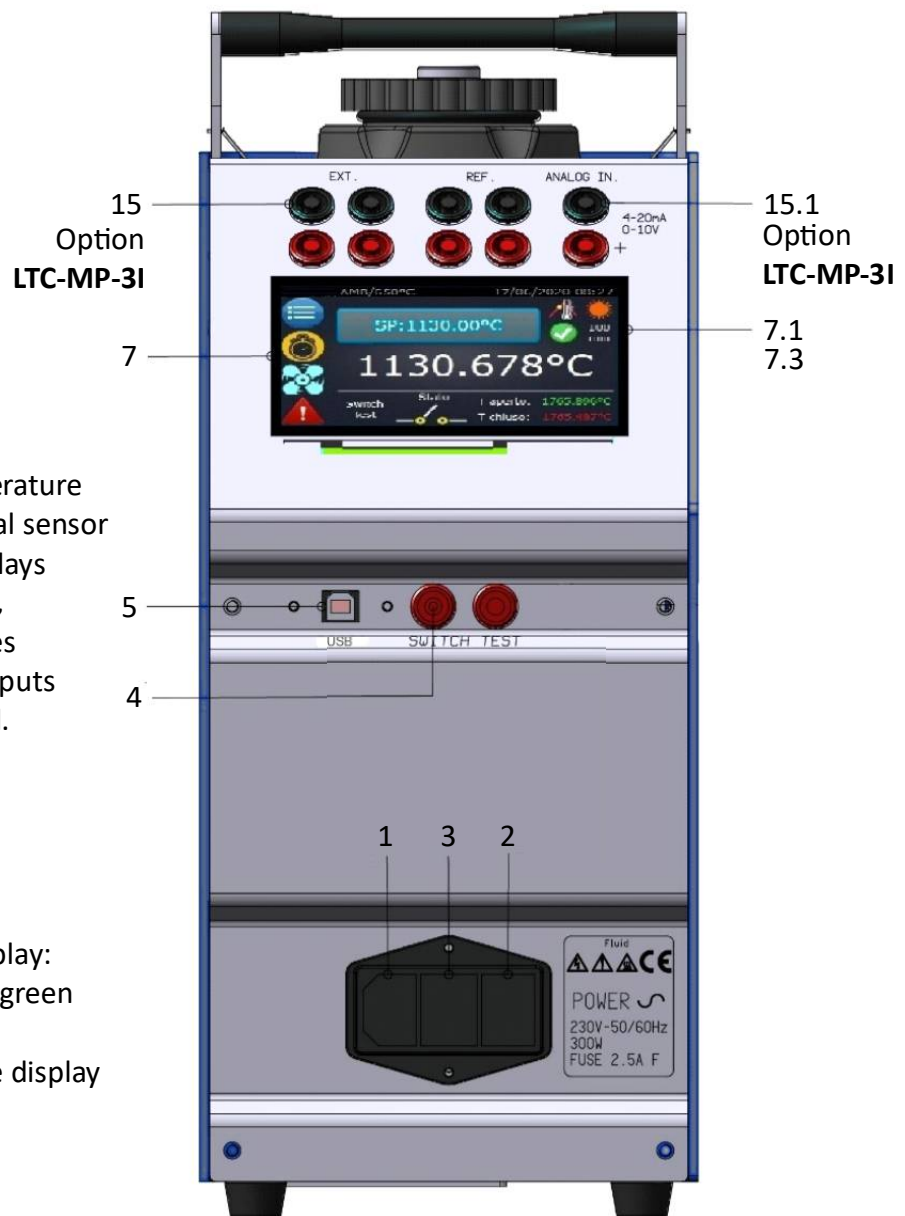
Versions LR-Cal LTC-DB-1100-44 + LR-Cal LTC-DB-1200-35:

At a temperature of approx. 1100°C, the devices lose their grounding current of several mA. If your power supply has a particularly sensitive protective circuit that interrupts the supply even in the event of minor current differences to "ground," use a current difference protection circuit with a sensitivity of 30 mA.

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LR-Cal LR

5. Description of controls and displays

5.1 Front of the device

(1) = Socket for power supply cable

(2) = Main switch

(3) = Safety fuse(s)

(4) = Sockets for switch test (thermostat tests)

(5) = USB type B interface

(7) = Touchscreen
Line 1: Set point temperature
Line 2: Temp. of internal sensor
Line 3: Switch test displays
With option **LTC-MP-3I**,
the display of the values
at the measurement inputs
can be set here instead.

(7.1) = „Heating" symbol

(7.2) = „Cooling" symbol

(7.3) = „Stability reached" display:
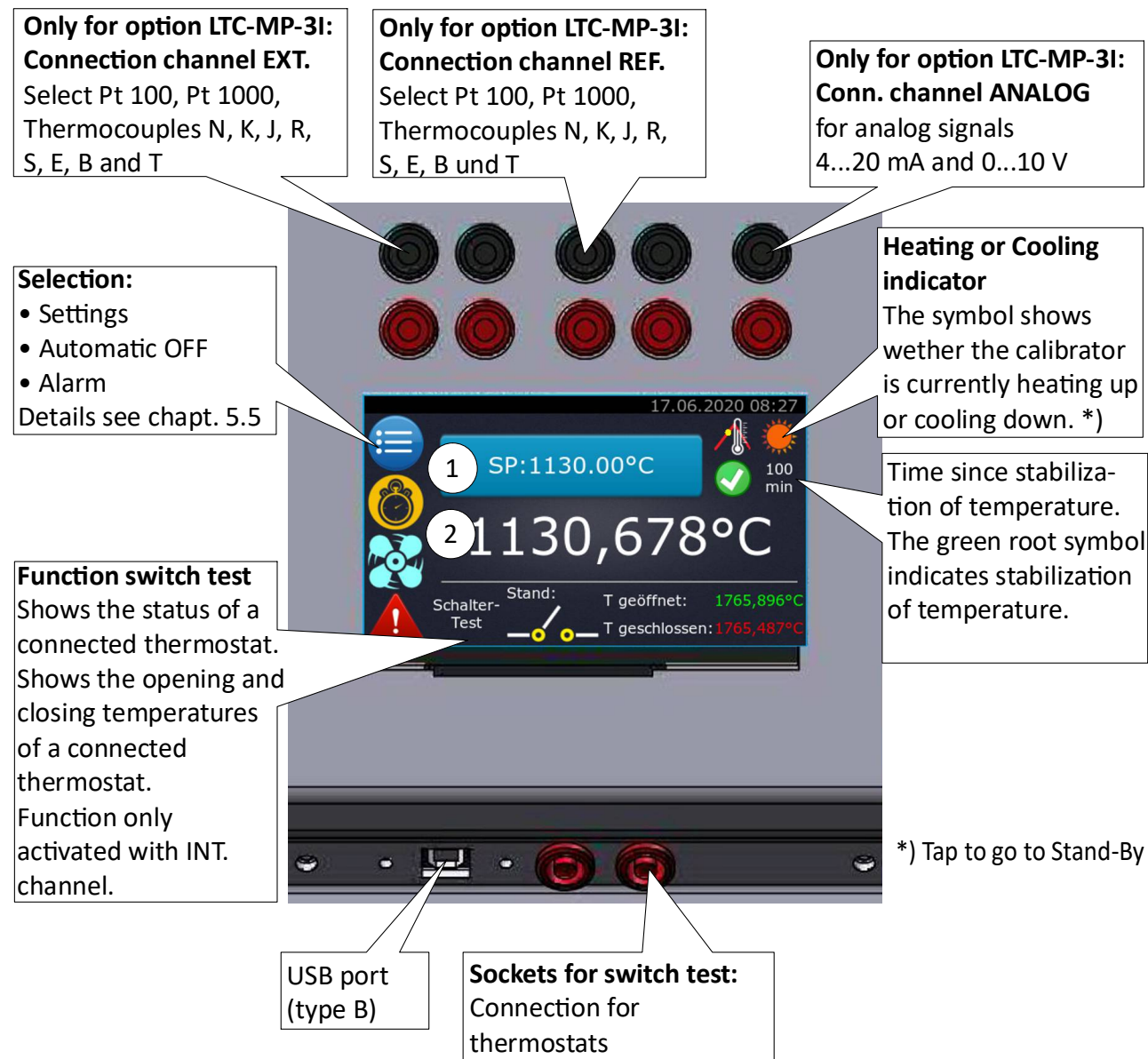white root symbol in a green
cycle
„Ramp function" active display

Only with option LTC-MP-3I:
(15) = Sockets for measurement inputs (resistance thermometers/thermocouples)
(15.1) = Sockets for analog signal 4...20 mA or 0...10 V

Note: The version LR-Cal LTC-DB-1200-35 is **NOT** available with option **LTC-MP-3I**.

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5.2 Overview of the touchscreen

Only for option LTC-MP-3I:
Connection channel EXT.
Select Pt 100, Pt 1000, Thermocouples N, K, J, R, S, E, B and T

Only for option LTC-MP-3I:
Connection channel REF.
Select Pt 100, Pt 1000, Thermocouples N, K, J, R, S, E, B und T

Only for option LTC-MP-3I:
Conn. channel ANALOG
for analog signals
4...20 mA and 0...10 V

Selection:
• Settings
• Automatic OFF
• Alarm
Details see chapt. 5.5

Heating or Cooling indicator
The symbol shows wether the calibrator is currently heating up or cooling down. *)

Function switch test
Shows the status of a connected thermostat.
Shows the opening and closing temperatures of a connected thermostat.
Function only activated with INT. channel.

Time since stabilization of temperature. The green root symbol indicates stabilization of temperature.

17.06.2020 08:27
SP:1130.00°C
100 min
1130,678°C
Schalter-Test   Stand: T geöffnet: 1765,896°C   T geschlossen: 1765,487°C

*) Tap to go to Stand-By

USB port
(type B)

Sockets for switch test:
Connection for thermostats

① **Display line 1 (blue):** Displays the set point. Tap to adjust.

② **Display line 2:** Displays the temperature of the INT channel. If multiple channels are activated, this line shows the active channel. Tap to select a channel.

Note: The version LR-Cal LTC-DB-1200-35 is **NOT** available with option **LTC-MP-3I**.

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MANUAL Portable metal dry block temperature calibrators LR-Cal LTC-DB-...

LR-Cal LR

5.2.1 Description of symbols and buttons

✓	Enabling or disabling a feature
◉	Selecting an option, e.g., from a drop-down list
▬	Input field - opens a pop-up window with a virtual keyboard
🏠	Icon HOME - Display returns to the main screen
↩	Icon BACK - any changes made will NOT be saved (cancel)
✓	Icon CONFIRM - all entries/changes made will be accepted

Buttons on the main page:

☰	Menu button - Call up various calibrator settings
⏱	"Automatic shutdown" button—opens a pop-up window with a virtual keyboard for entering a time. after which the calibrator should go into standby mode once temperature stability has been reached
⚠	"Alarm" button - opens a pop-up window with an error code in the event of a fault
SP:1130.00°C	"Set Point" button - for changing the setpoint temperature. There are two different possible actions: If the ramp or switch test function is active, the switch test window opens. Otherwise, a pop-up window opens. Window with virtual numeric keypad for entering a new value. When the calibrator is in standby mode is located, the font changes between red and white when entered.

Icons auf der Hauptseite:

🌡	Indicates whether the calibrator is in standard mode or whether the ramp or switch test function is active.
☀ ❄	Shows whether the calibrator is currently heating (sun) or cooling (snow). Tap to switch to standby mode.
✓ 100 min	Indicates that the temperature in the calibrator is stable and displays the time since stability was achieved.

Switch Test State	**Swtich test** Displays the current status of a thermostat (test object) connected to the sockets (4), as well as the switching temperatures.

5.3 Main switch of the temperature calibrator

The main switch (2) is located on the front of the device. It is an assembly that also includes the socket for the power supply cable and the protective fuse.

Only 5 x 20 mm fuses may be used, namely:

Version LR-Cal	230 VAC	115 VAC *)	
LTC-DB-9030-35	2.5 A F	3.0 A F	
LTC-DB-9050-35	2.5 A F	3.0 A F	
LTC-DB-0600-35	5.0 A F	10.0 A F	
LTC-DB-1100-44	5.0 A F	10.0 A F	(2 pcs.)
LTC-DB-1200-35	5.0 A F	-/-	(2 pcs.)

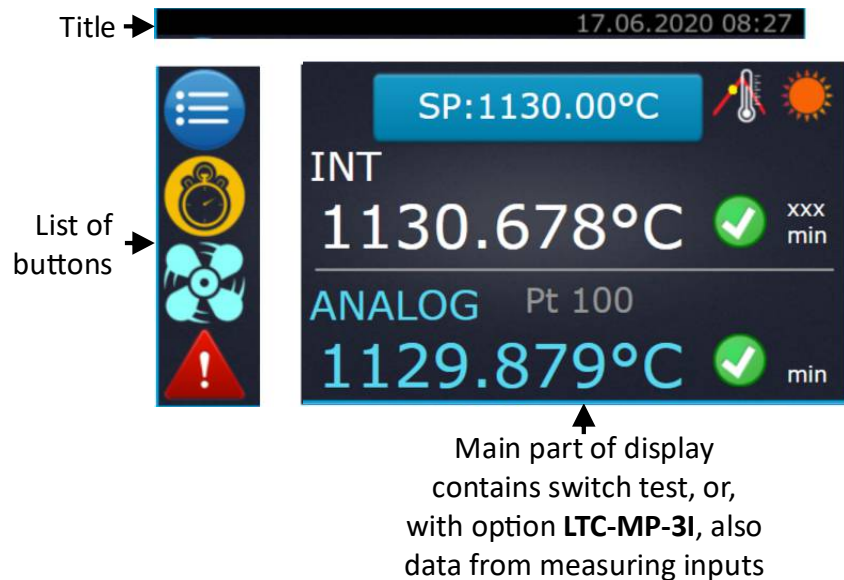*) Option **LTC-MP-115V** (except version LTC-DB-1200-35)

⚠ **The temperature calibrator may only be operated by personnel who have read and understood these instructions in full. The instructions for commissioning must be observed.**

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5.4 Main screen

The main screen displays:
- Title bar (device version and limit values at top left, date and time at top right)
- On the left: List of buttons
- On the right: Measured values, etc.
- Some windows have a footer showing the current set point and measured value of the internal reference sensor

Title ➤

List of buttons ➤

Main part of display contains switch test, or, with option **LTC-MP-3I**, also data from measuring inputs

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MANUAL | Portable metal dry block temperature calibrators LR-Cal LTC-DB-...

LR-Cal **LR**
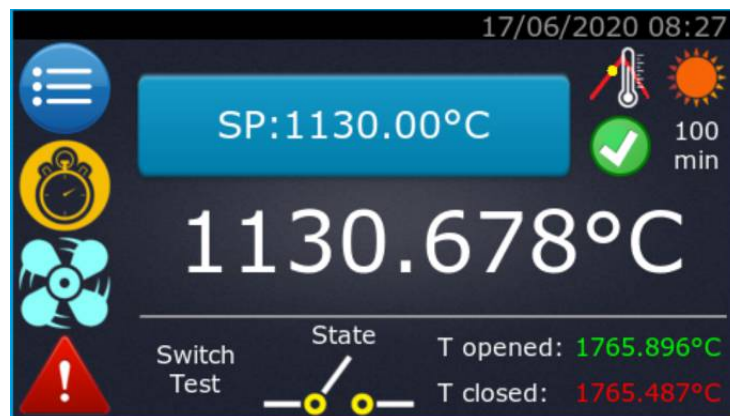
5.4.1 Main screen functions

5.4.1.1 All device versions

Without activating a channel (only devices with option **LTC-MP-3I**), the main screen displays the measured value of the internal reference sensor. By adjusting the calibrator settings (menu screen), the temperature unit and display resolution can be varied.
 When the target temperature is stable, a white root symbol on a green circle is displayed, next to it the time in minutes since the calibrator has been maintaining a stable temperature.
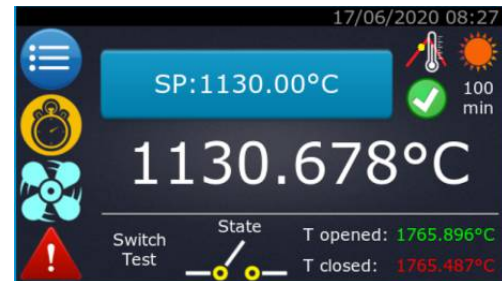
Main screen without activated channels

Information about the switch test function is displayed at the bottom of the screen if this function is active. If the switch test function is active, you will find information here about the current switching status of a connected thermostat and the last measured switching temperatures. See chapter 7.1.

5.4.1.2 Device version with option **LTC-MP-3I** (three measurement inputs)

If more than one channel is activated, the main page displays the measured values of the internal reference sensor and the measured values of the activated channels.

Each channel has its own display color:
• ANALOG: blue
• EXT: green
• REF: yellow

The currently measured temperatures are displayed. When the setpoint temperature is stable, a white root symbol on a green circle is displayed, along with the time in minutes since the calibrator has been maintaining a stable temperature.

Main screen with 1 activated channel

The selected type of external sensor is displayed above the temperature values (only for EXT and REF channels). Tapping on such an EXT or REF value opens a pop-up window "Probe selection", while tapping on ANALOG opens the "Signal type" pop-up window -
 here you can set whether the ANALOG channel should measure current or voltage and the option of a 2-point conversion of the current or voltage signal into temperature.

Main screen with 2 activated channels

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5.4.2 Areas in the main window that open functions when tapped

	CLOCK	see point 7 in chapter 5.5.3
	SUN SNOW	Button „Standby": Sets the calibrator to standby mode manually. Heating or cooling process is canceled.
SP:1130.00°C	SP	Opens window for entering temperature set point
	ALARM	If the calibrator displays an error status, tapping this button will display the error code.

	Font color:	
1130,678°C	**white**	Opens a window showing the current temperatures of the two cold junction compensators.

Only at devices with option **LTC-MP-3I**:

|	Font color:	
1230.987°C	**green**	Opens window for channel EXT, to specify the sensor type
1340.678°C	**yellow**	Opens window for channel REF, to specify the sensor type
1129.879°C	**blue**	Opens window for ANALOG channel to select current or voltage and set parameters for conversion to temperature

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5.5 Menu screen

The menu screen displays:
- Title bar
  (top left: device version and limit values; top right: date and time)
- On the left: button(s)
- On the right: scrollable menu entries, accessed by tapping

Header →

Button →

scroll

Footer →
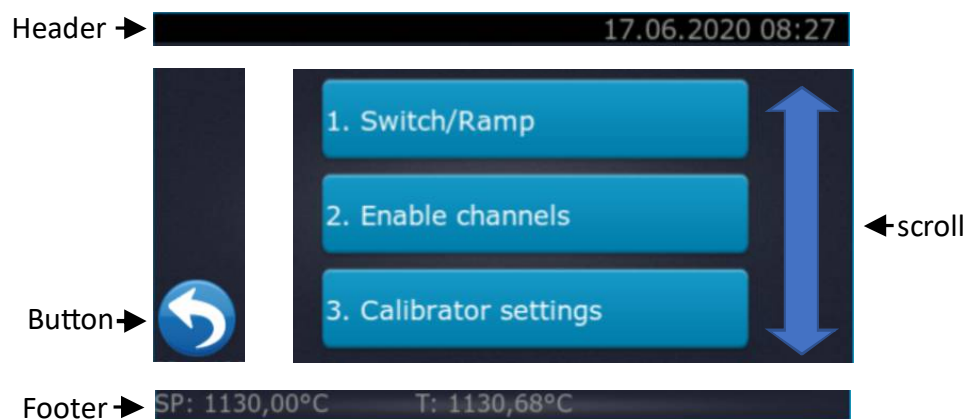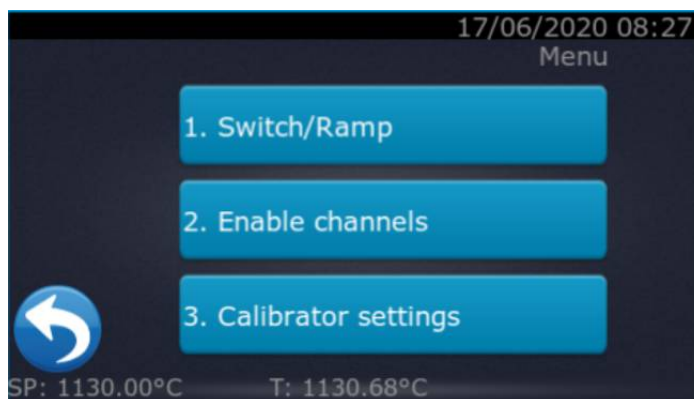
5.5.1 Pop-Up window
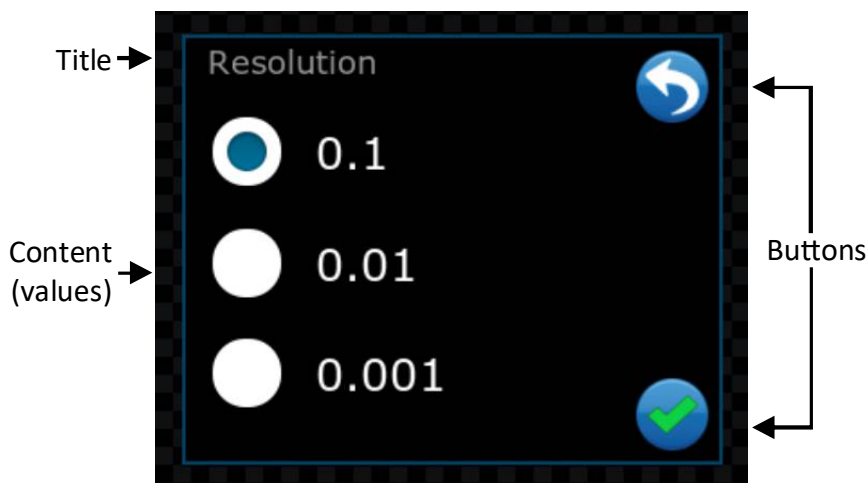
The pop-up windows are used to interact with the user.
There are three options:
- View: Display of data, without the option to make changes, i.e., no confirmation button
- Set: Display of data, with the option to make changes, with a confirmation button
- Enter: Virtual keyboard (numeric or alphanumeric) for entering data

Title →

Content (values) →

Buttons

Example of a pop-up window

5.5.2 Menu screen functions

Tap the menu button to display the menu screen.

There are several menu items that can be accessed by scrolling; see the next page.

5.5.3 Menu items

1. Switch/Ramp:

Function:	Description:
Switch test	Opens window "Switch test and ramp" to view/edit both functions. See chapter 7.1
Ramp	Opens windows regarding the ramps, can be increasing/decrasing. See chapter 7.2

2. Channel enablement *(only at devices with option LTC-MP-3I):*

Function:	Description:
EXT or REF channel	Activation of the EXT and/or REF channels for sensors connected to sockets (15). When a channel is activated, tapping on the green EXT value or the yellow REF value on the main page displays a window. Here you can select the type of sensor connected to the selected channel. See chapter 6.1.2
ANALOG channel	Activation of the ANALOG channel for sensors connected to sockets (15.1). When activated, tapping on the blue ANALOG value displays a window. Here you can enter the current or voltage input as well as parameters for conversion to temperature. See chapter 6.1.2

3. Calibrator Setup

Function:	Description:
Language selection	Opens window to select user language
Info Calibrator	Opens widow with information about the calibrator
Touch calibration	Opens window to calibrate the touch screen. See chapter 8.2
Setting date + time	Opens window to enter/change date + time
Serial communication	Opens window with serial communications parameter. See chapter 11
Ethernet	DEACTIVATED

4. Parameter Setup

Function:	Description:	
Unit of measurement	Opens window to select temperature unit (°C/°F/K)	
Resolution	Opens window to select display resolution (1, 2 or 3 digits after decimal point)	
Hidden Function:	**Description: (Password must be entered to get access)**	
Wait On/Off	Opens window to change standby settings: After which time the calibrator changes to standby or standard mode	
PID parameter	Opens window to see/edit PID parameter settings:	
	Proportional band:	expressed as % of full scale value Bereich innerhalb des Messbereichs, innerhalb dessen die Leistungsregelung erfolgt.
	Integral time:	expressed in seconds The integrative effect reduces the error between the setpoint value and the the temperature achieved solely by the proportional effect to zero. The integral time is the time required for the integrative effect to double the proportional effect.
	Derivative Time:	expressed in seconds In the event of a sudden temperature change, the derivative effect causes a stronger initial control effect, so that the calibrator achieves higher performance than would be the case with the proportional and integral effects alone. If the error persists, the derivative effect reduces its effect and leaves it to the integrative effect to reduce the error.
Calibration	Access to the 3rd menu level, to recalibrate channels INT, EXT and REF. See chapter 10	

Only make changes here if you know exactly what you are doing. Any changes to the parameters will immediately void your warranty.

5. Password

Function:	Description:
Password	User password. Access to hidden functions within the Parameter Setup menu. Default password: **1234**

7. Auto Power OFF

Function:	Description:
Auto Power OFF	The indication of the temperature(s) are continuously updated until the target temperature is stable. After that, the set waiting time is observed, then the calibrator enters the standby mode. The last measured values are saved and are available to the user until the next cycle. To activate this function, set the automatic shutdown by tapping the corresponding box and enter the time to wait until the calibrator has reached temperature stability. This function can also be accessed by tapping the yellow clock icon on main screen.

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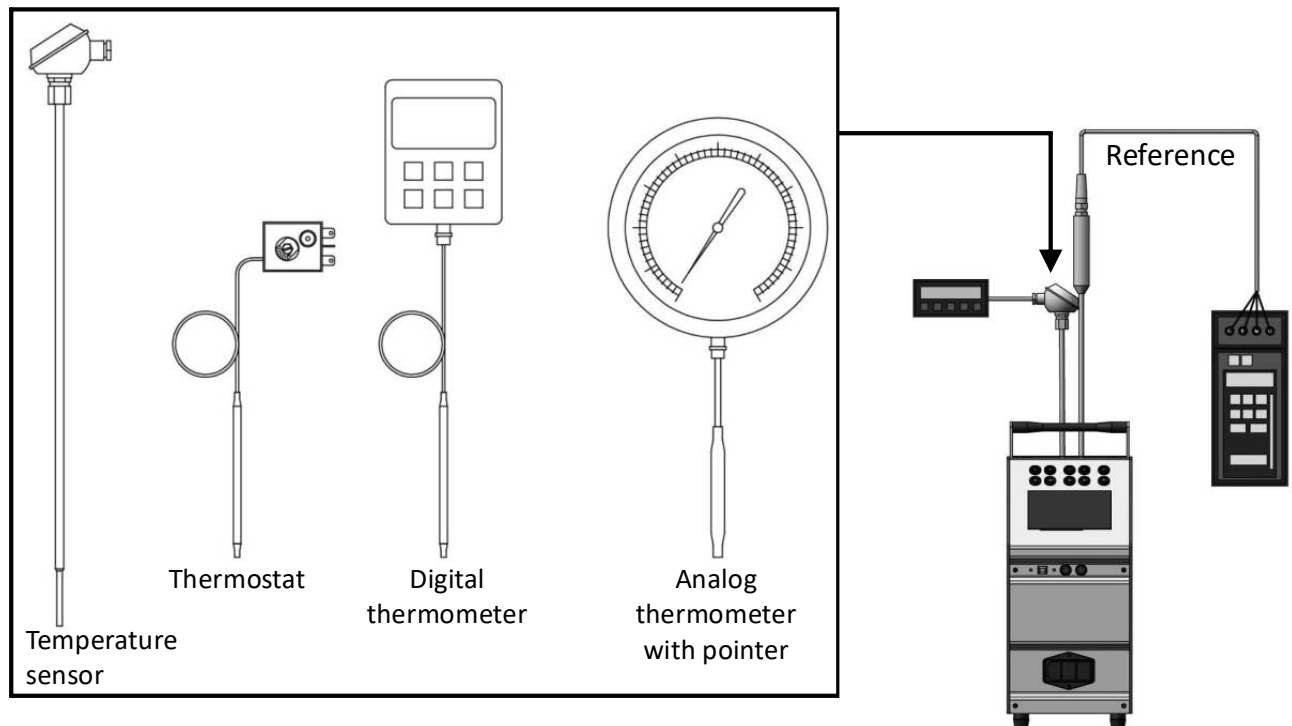
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6. Operation

• For a description of the controls and displays, see chapter 5.
• Dry block and insertion of probes in holes of block insert, see chapter 3.

6.1 Applications of the temperature calibrator

The LR-Cal LTC-DB calibrators are designed for testing and calibrating
• Resistance thermometers and sensors
• Thermocouples and sensors
• Thermostats; temperature switches
• Digital thermometers
with temperature measuring ranges that match your calibrator version.

Temperature sensor

Thermostat

Digital thermometer

Analog thermometer with pointer

Reference

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### 6.1.1 Calibrations with calibrator versions WITHOUT the LTC-MP-3I option

Comparative calibrations with these calibrator versions can be performed using two different methods:

a) Calibration with the calibrator's internal reference sensor (7) as the reference standard

b) Calibration with an external reference thermometer (sensor and display) as the reference standard

The main page only displays information related to the internal reference sensor:
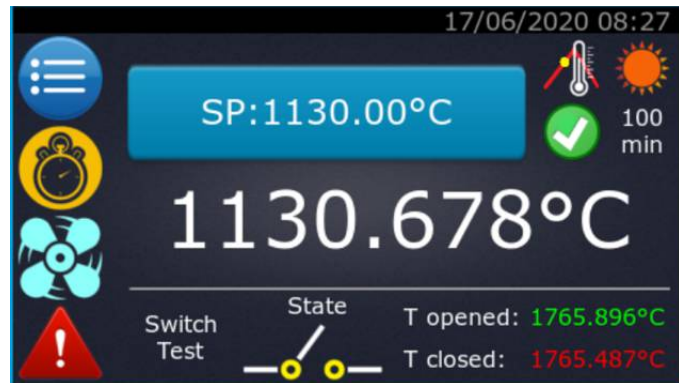
If you tap on the second display line (white on black) showing the internally measured reference temperature, a pop-up window labeled "Cold Spot Compensation" will open on some versions of the LR-Cal LTC-DB calibrator, displaying the values.
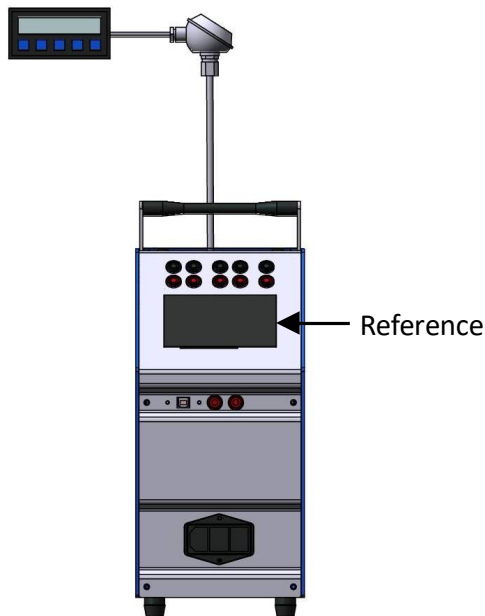
The test item is compared with the calibrator display as a reference.
The reference value is shown in the second display line (white on black).
It may need to be corrected in accordance with the information in the certificate.
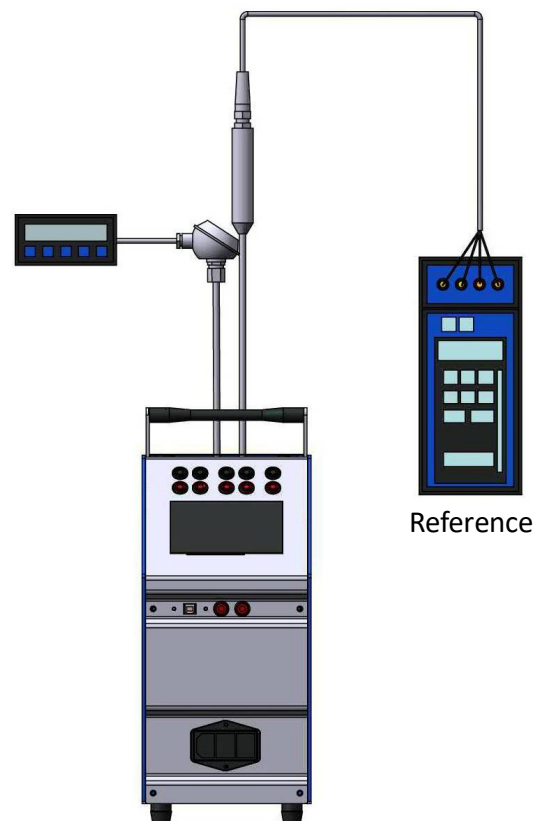
The test item is compared with an external reference.
The calibrator acts purely as a temperature source.
The sensors of the test object and the reference must be inserted into the calibration bath.
The reference value is read on the display of the external reference.

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6.1.2 Calibrations • with calibrator versions WITH LTC-MP-3I option

6.1.2.1 Calibration with EXT and REF inputs

If your calibrator is equipped with the **LTC-MP-3I** option (three measurement inputs) and you have external reference sensors (e.g., LR-Cal LRT-F), the "EXT" and "REF" channels can be activated to perform calibration using one of the following methods.

a) Calibration with the calibrator's internal reference sensor (7) as the reference
b) Calibration with external reference sensor (e.g., LR-Cal LRT-F) connected to the "REF" measurement input of the calibrator
c) Calibration with external reference thermometer (sensor and display) as reference
See next page.

If more than one channel is activated on the calibrator with option **LTC-MP-3I**, the main page displays the values of the internal reference sensor and the values of an external reference sensor (yellow), as well as the values of a test object (green).
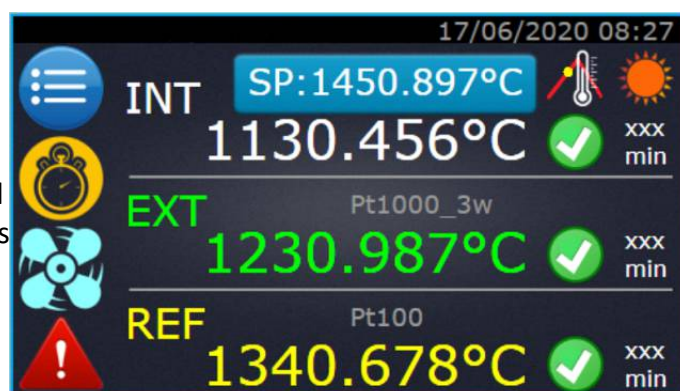
Use the REF channel (yellow on black background) **for the external reference sensor and the EXT channel** (green on black background) **for a test object.**

To activate the channels on calibrators with option **LTC-MP-3I**, proceed as follows:
• Tap the menu button on the main page.
• Tap the "2. Activate channels" button; a pop-up window will appear.
• Here you can now activate a maximum of two channels, whose values will then be shown on the display.

When you tap on the green EXT value or the yellow REF value, a window appears where you can determine the type of sensor connected. This window is two "screens" high. The first page lists 11 standard sensor types, while the second page lists customer-specific sensors.
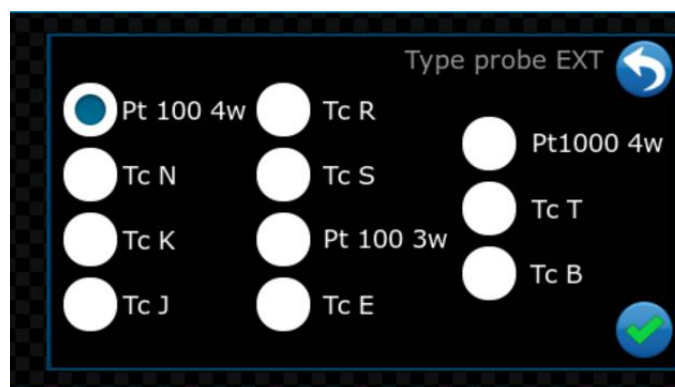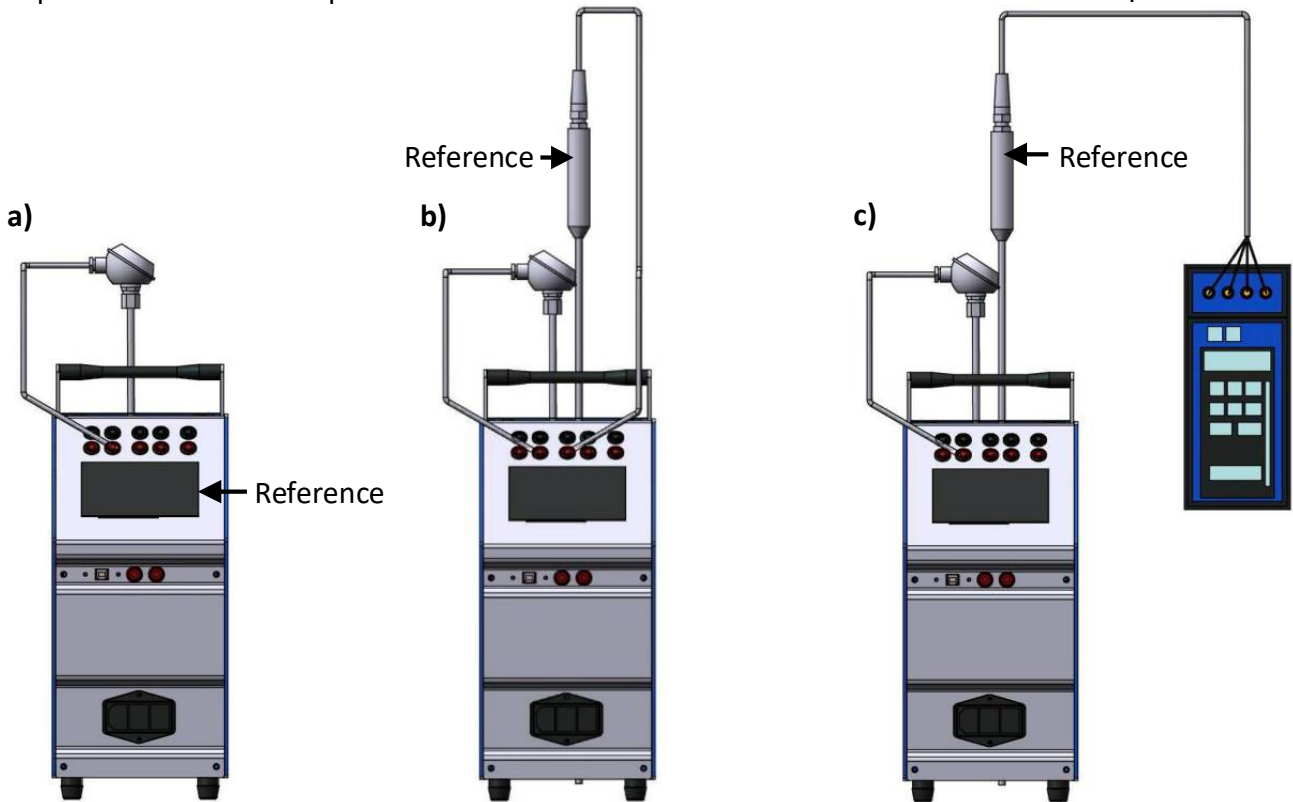
Connection of sensors to the EXT and REF measurement inputs (15) see section 6.1.2.2.

The use of the EXT and REF channels is described below.

Please always connect an external reference probe (e.g. LR-Cal LRT-F) to the REF connection.

Explanation of the three possible calibration methods for devices with the **LTC-MP-3I** option:

a)

Reference →

b)

Reference →

c)

→ Reference

← Reference

a) Calibration with internal reference sensor (7) of the calibrator as reference

• Connect the test object to the EXT measurement input.

• Insert the test object into the dry block insert.

• Compare the values displayed for INT (internal reference, white) and EXT (test object, green).

b) Calibration with external reference sensor as reference

• Connect the external reference probe to the measurement input REF.

• Connect the test object to the measurement input EXT.

• Place the test object and external reference into the dry block insert.

• Compare the values displayed at REF (external reference, yellow) and EXT (test object, green).

c) Calibration with external reference thermometer (sensor and display) as reference

• Connect the test object to the EXT measurement input.

• Insert the test object and the sensor of the reference thermometer into the dry block insert.

• Compare the values displayed at EXT (test object, green) and on the display of the reference thermometer.

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6.1.2.2 Connecting external RTD or TC sensors to EXT and REF inputs

When the measurement input channels are activated on calibrators with the
LTC-MP-3I option, the values of externally connected sensors can be read.
The following sensors can be connected:

• Thermocouples (TC) types J, K, R, S, N, E, T, and with automatic
  cold junction compensation.

• Resistance temperature detectors (RTD) Pt 100 (2-, 3-, and 4-wire) + Pt 1000.

Tap the green EXT or yellow REF channel. Here
you can then select the sensor type.

Connect the sensor terminals to the sockets (15)
as shown opposite:

• Thermocouples to pins 2 and 4, bridge between pins 1 and 3.

• Pt 100 4-wire to pins 1, 2, 3, and 4.

• Pt 100 3-wire to pins 1, 2, and 3, bridge between pins 3 and 4.

• Pt 100 2-wire to pins 2 and 4, bridge between pins 1 and 2
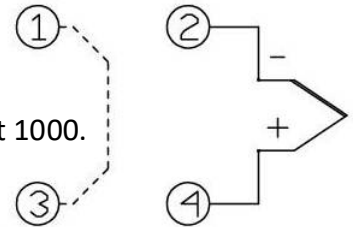 and bridge between pins 3 and 4.

Use cables that are as short as possible for the bridges.

If the connection or configuration is incorrect,
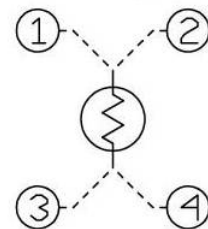"0.0°" will be shown on the display.

**Never connect voltages greater than 5 V
to the input sockets (15).**

Connection: thermocouples:

Connection: Pt 100 4-wire
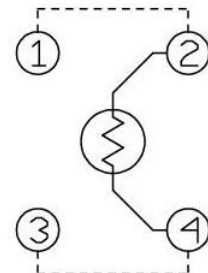
Connection: Pt 100 3-wire:

Connection: Pt 100 2-wire

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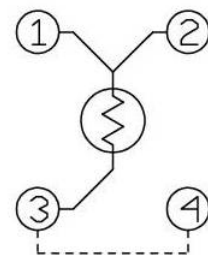
6.1.2.3 Calibrations with ANALOG input

For calibrator versions with the **LTC-MP-3I** option, the analog measurement input (channel) can also be activated.

When the ANALOG channel is activated, the main screen displays the measured value of the internal reference sensor and the ANALOG input.

To activate the ANALOG channel on devices with the **LTC-MP-3I** option, proceed as follows:
• Tap the menu button on the main page.
• Tap the "2. Activate channels" button.
• Select "Analog."

When the ANALOG channel is activated, it is possible to read current or voltage signals and convert them to temperature.

When you select ANALOG, a window opens in which you can specify whether current (mA) or voltage (V) is to be measured. You can also set the conversion to temperature via two points.
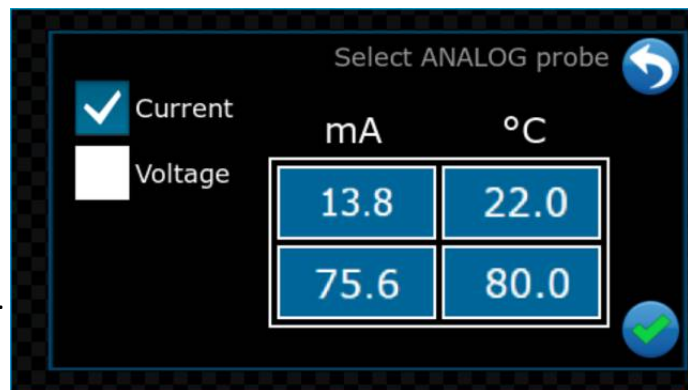
Explanation of the two possible calibration methods for devices with the **LTC-MP-3I** option with the ANALOG input activated:

a) Calibration with the calibrator's internal reference sensor (7) as the reference.
b) Calibration with an external reference sensor (e.g., LR-Cal LRT-F) connected to the calibrator's "REF" measurement input.

See next page.

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Explanation of the 2 possible calibration methods with ANALOG input, only with option **LTC-MP-3I**:
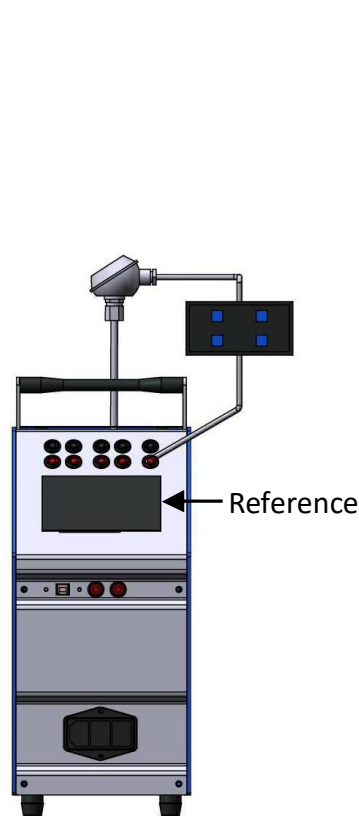
Reference

Reference

Calibration with internal reference sensor (7) of the calibrator as reference

- Connect the test object to the ANALOG measurement input.

- Insert the test object into the block insert.

- Compare the values displayed for INT (internal reference, white) and ANALOG (unit under test, blue).
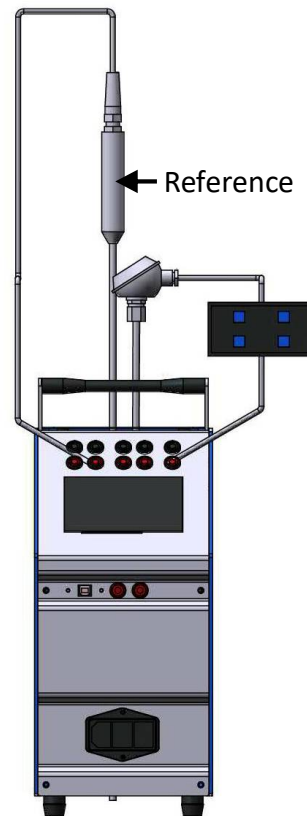
Calibration with external reference sensor as reference

- Connect the external reference to the REF measurement input.

- Connect the test object to the ANALOG measurement input.

- Place the test object and external reference into the block insert.

- Compare the values displayed at REF (external reference, yellow) and ANALOG (test object, blue).

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6.1.2.4 Connecting sensors to ANALOG input

When the ANALOG measurement input channel is activated on calibrators with option **LTC-MP-3I**, sensors with a linear output signal of 4...20 mA or 0...10 V can be connected.
Sensors.

To activate the ANALOG channel, tap the menu button on the main screen. Then select "2. Activate channels". The main screen now displays the values of the internal reference sensor INT and the values of the selected channels.

Tap on the ANALOG value displayed in blue. A window will open in which you can select "Current" (mA) or voltage (V). Conversion to temperature can also be performed after entering two corresponding values.

Connect the sensor with analog output signal to the sockets (15.1):
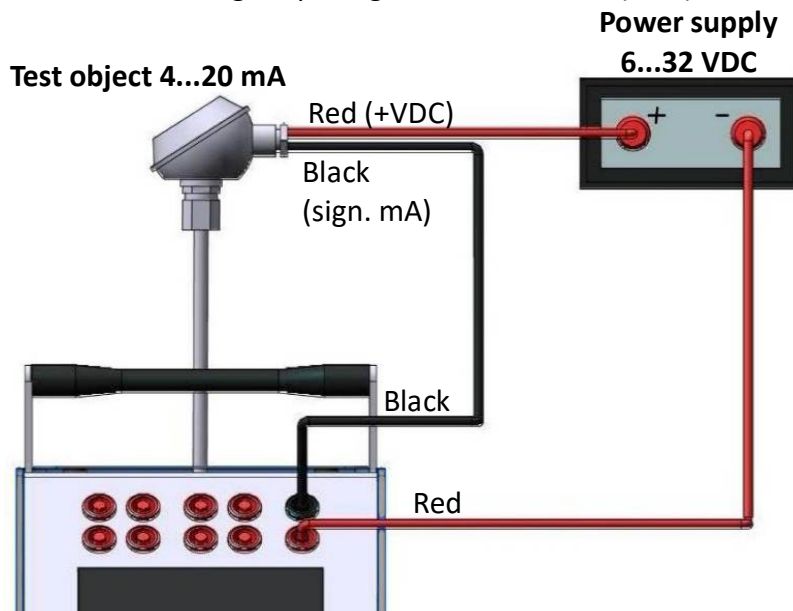
Example: Connection of a probe with current output signal

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6.2 Calibration of test specimens

Follow these recommendations for all calibration methods:
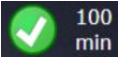
• Ensure that the calibrator is at room temperature. Inserting probes when the calibrator is too hot can damage them, cause drift, or endanger the operator.

• Insert the probes into the dry block inserts, see chapter 3.1.7.

• Switch on the calibrator at the main switch (2) and wait for the self-test to finish.

• Set the temperature value at which you want to calibrate as the set point.
Tap the blue SP (set point) button and set the desired value in the pop-up window that appears. Tap the white check mark in the green circle to confirm.

• Wait until the calibrator has reached the target temperature and stabilized.

• Stability (temperature fluctuations max. ±0.5°C over 10 minutes) is indicated by a root symbol, next to which is displayed how many minutes the calibrator has already been maintaining the target temperature at a stable level.

• If you want to calibrate at additional temperature points, set the next target temperature value and wait until the new temperature has stabilized.
The target temperature display and the internal reference sensor display may change at different speeds. This is due to the different sensor types and different positions in the block insert.

• The temperature displayed by the internal reference sensor is shown with the accuracy specified in the data sheet and certificate. If higher accuracy is required, an external reference must be used - here, the position of the test specimen and reference in the container is also more similar and therefore more comparable.

• For setting ramps, see section 7.2.

⚠ **DO NOT remove the inserted probes if the calibrator is still at particularly low or high temperatures: risk of temperature shock and burns or frostbite to the operator.**

6.3 Achievable minimum temperatures

The minimum temperature that can be reached depends on the calibrator version and the ambient temperature. The higher the ambient temperature, the higher the minimum temperature of the calibrator.

This is particularly relevant for the LR-Cal LTC-DB-9030-35 + LR-Cal LTC-DB-9050-35 versions.

LR-Cal LTC-DB-9030-35
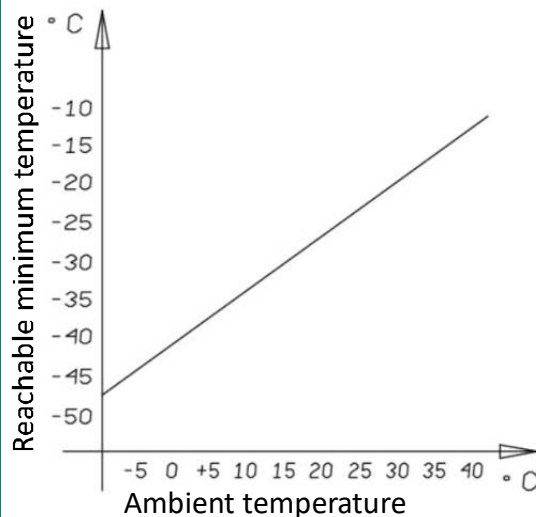
LR-Cal LTC-DB-9050-35
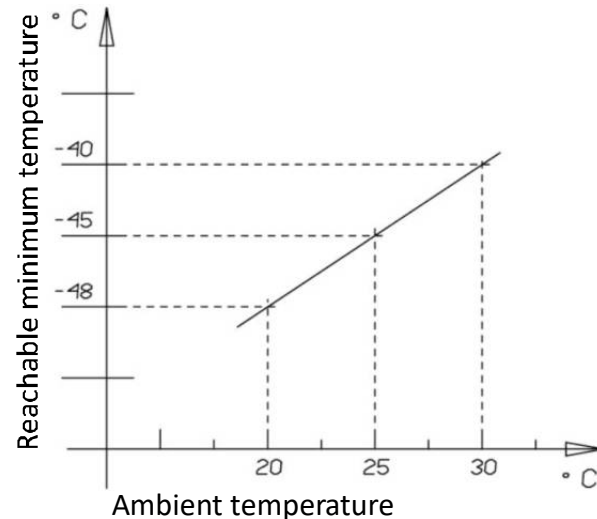
6.4 After completion of the calibration work

CAUTION: Risk of burns or frostbite
Before switching off the calibrator, it must be at a temperature very close to the ambient temperature. Set a target temperature value as the set point that corresponds approximately to the room temperature and wait until the calibrator has reached this temperature.
Please note the information on page 5!

Only then switch off the calibrator at the main switch (2) and disconnect the power supply cable. Close the container with the lid provided.

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Cooling times take a certain amount of time at high temperatures. This is particularly relevant for the LR-Cal LTC-DB-1100-44 and LR-Cal LTC-DB-1200-35 versions.
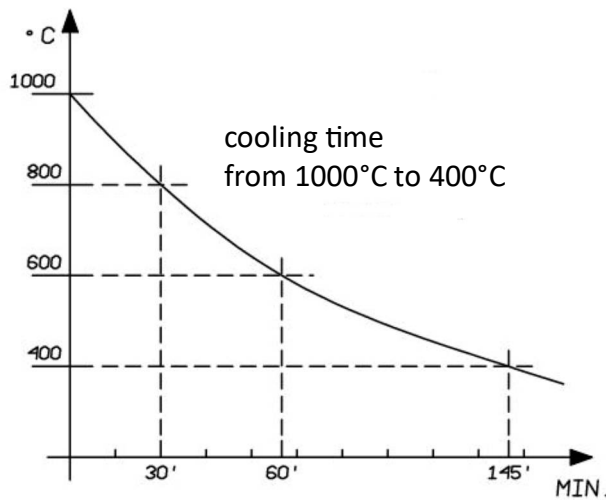
LR-Cal LTC-DB-1100-44
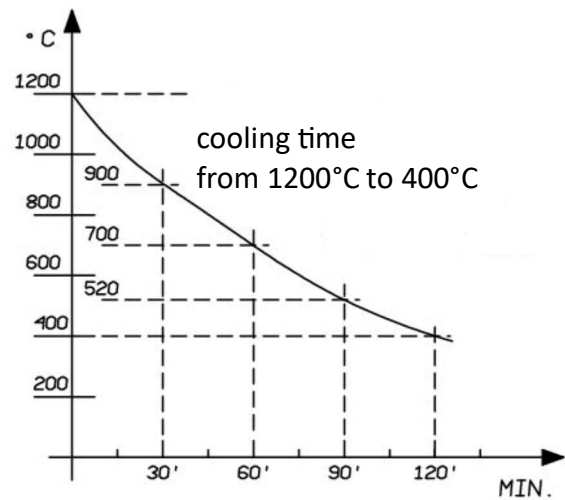
LR-Cal LTC-DB-1200-35

6.5 Communication via the computer interface

The calibrator can be connected to a PC via the USB (type B) port (5). Special commands can be used to read or change parameters such as the set point, external channels on devices with the **LTC-MP-3I** option, ramp function, etc.
For communication parameters, see Chapter 11.
After switching on the calibrator and performing the self-test, tap the button
to activate the interface.

⚠ **The connected PC must comply with the IEC 950 safety standard.**

We recommend the Windows® PC software LR-Cal Aq2Sp2, available as an accessory.
Order-Code **LTC-AQ2SP2**.

7. Special functions

The following pages describe special functions of the temperature calibrator:

• Testing and adjusting temperature switches/thermostats

• Ramp function

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7.1 Switch test - Checking thermostats

You can check the switching temperatures and the switching status of thermostats.

• Insert the thermostat sensor into the calibration bath.
• Connect the thermostat to the connection sockets (4).
• Switch on the calibrator and wait for the self-test to complete.
• Tap the menu button in the main window and then select the entry "1. Switches/Ramps" in the selection window.

The main screen displays information about the connected thermostat at the bottom (unless

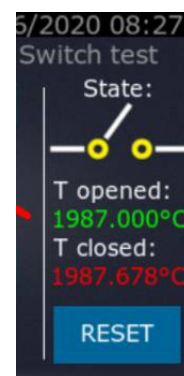devices with the **LTC-MP-3I** option display the values of connected sensors there – in this case, the "Ramps" page can be displayed on the screen.

For configuration of the ramp function, see chapter 7.2.

   Never connect a voltage higher than 5 V to the sockets (4).

7.2 Ramps - Ramps for rising and falling temperatures

• Tap the menu button on the main screen and then select "1. Switches/Ramps" from the selection window.

A window opens where you can configure all ramp settings on the left side.
On the right side of the window, switch test information is displayed, see Chapter 7.

Notes on ramps:
When the ramp function is activated, the calibrator reaches a preset temperature with the desired gradient G, starting at the temperature at which the ramp was confirmed.

When the ramp is active, the ramp symbol appears on the display, followed by the setpoint, which moves at the speed specified by the set gradient G.
If the ramp is deactivated, the ramp symbol disappears from the display.

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The ramp can be single or continuous:

• Single ramp:
  When the calibrator temperature reaches the set temperature SP2, the ramp function is automatically deactivated. The value reached is adopted as the new setpoint and the calibrator stabilizes at this temperature.

• Continuous ramp:
  The blue T button switches to SP1 (to be set). The internal temperature of the calibrator fluctuates between the two values SP1 and SP2.

Functions adjustable by the operator:
• G (Gradient):
  Specifies the number of steps after which the setpoint temperature changes (increases with a positive value and decreases with a negative value).
• T / SP1:
  For a single ramp, the internal temperature is specified.
  For a continuous ramp, it switches to SP1 – this corresponds to the temperature that the calibrator reaches after reaching T / SP2 (Set Point 2).
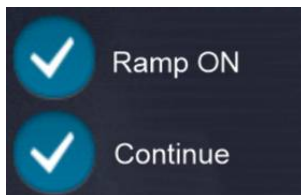
Ramp ON: Switch on of ramp function

Continue: Changement of ramp mode (single/continuously)
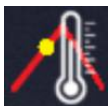
This symbol shows, that the ramp function is active.

Example of use for a single ramp:

• Suppose the calibrator is currently at room temperature and you want to increase the temperature to 150°C with a gradient of 2°C/min:

• Call up the "1. Switches/Ramps" menu.

• The "Continuous" function must NOT be activated.

• Set the temperature value SP2 to 150°C.

• Set the gradient G to 2°C/min.

• Tap the "Ramp ON" button. The ramp function is now active.

The controlled temperature of the calibrator now rises at the specified rate. In the first section of the ramp, there are fluctuations (which do not correspond to the ramp rate), but after a short time, the temperature in the calibrator follows the ramp.

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Example of use for a continuous ramp:

• Suppose the calibrator is currently at room temperature and you want to fluctuate the temperature between 50°C and 150°C with a gradient of 2°C/min.

• Call up the "1. Switches/Ramps" menu.

• Activate the "Continuous" function. The blue T button changes to SP1.

• Set the temperature value SP1 to 50°C.

• Set the temperature value SP2 to 150°C.

• Set the gradient G to 2°C/min.

• Tap the "Ramp ON" button. The ramp function will now start.

The calibrator will now continuously move the temperature between 50°C and 150°C with the set gradient until you deactivate the ramp function again.

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8. Maintenance

The device does not require any special maintenance. Please contact us for repairs and recalibrations: *dt-export@leitenberger.de*.

⚡ Replace fuses as necessary, but first disconnect the power cord from the power supply. See chapter 5.3.

8.1 Cleaning

Keep the calibrator clean to maintain its condition. Before cleaning the temperature calibrator:
• The device must be cooled down (or warmed up) to room temperature.
• The calibrator must be disconnected from the power supply. Unplug the power cord from your power outlet.
• Clean the outside of the device with a damp cloth. The electrical connections must not come into contact with moisture.

⚠ **WARNING:**
Improper cleaning can damage the device.
Do NOT use aggressive cleaning agents or alcohol.
Do NOT use sharp or hard objects.

Cleaning the block and inserts:
Abrasive dust can settle in the openings of the calibrator and cause the block insert to become blocked. To prevent this, regularly remove the insert from the block and blow compressed air into the opening of the block and insert. Clean these parts with a dry cloth only.

Cleaning the fan grilles:
There is a ventilation grille on the underside of the calibrator through which cooling air is directed to the calibrator. This area must also be kept clean at all times.

Cleaning the outer surfaces:
Clean the outer surfaces of the calibrator housing with a damp cloth. Do NOT use solvents.

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MANUAL Portable metal dry block temperature calibrators LR-Cal LTC-DB-...
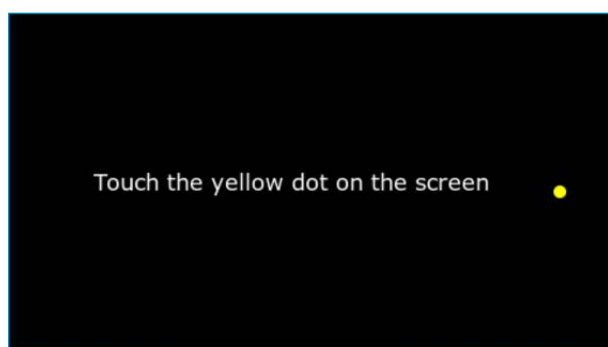
LR-*Cal* LR

8.2 Recalibrating the touchscreen

If the touchscreen does not respond to inputs (taps) as expected, it can be recalibrated. Tap the menu icon to open the menu screen. Then select the "Touchscreen calibration" menu item under "3. Calibrator settings."

Tapping the "Start" button opens the window for recalibrating the touchscreen. This window can also be displayed automatically immediately after switching on the temperature calibrator if the calibrator does not find a valid touchscreen calibration file in its memory.

To calibrate the touchscreen, follow the instructions displayed, which require you to tap three different yellow dots on the screen precisely. This calibrates the touchscreen. Finally, tap the confirmation button. If you miss the yellow dots significantly when tapping, the changes cannot be applied.

If performed correctly, a message will indicate that the calibration has been successfully completed. After a few seconds, the next screen will be displayed.

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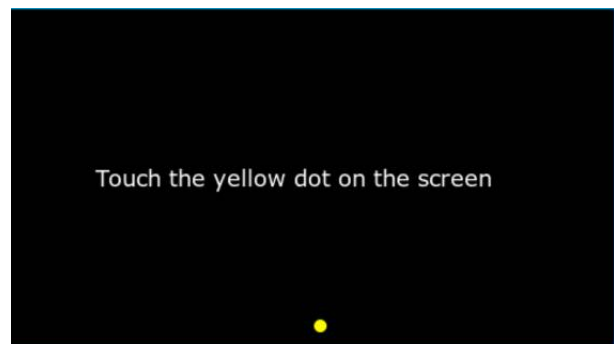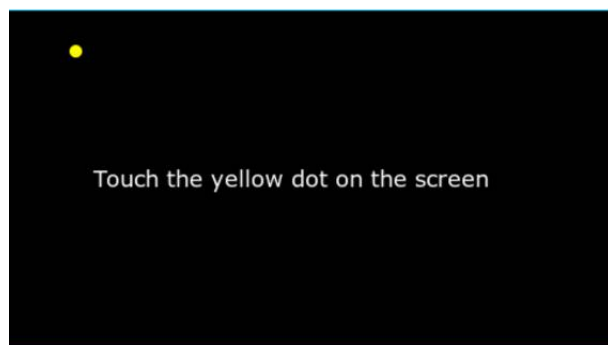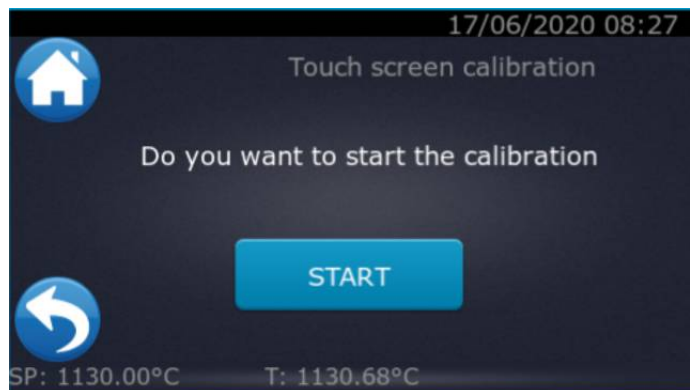
9. Possible malfunctions and how to fix them

You can try to fix the following errors yourself:

• Although the calibrator is connected to a power source and the device is switched on, it is not working : Replace the fuse (3), see section 5.3, or replace the power cable. If the error persists, please contact us: *DT-Export@Leitenberger.de*.

BFor all other errors, please contact us by email at *DT-Export@Leitenberger.de*, for example in the following cases:
• The fuse (3) trips as soon as the power supply cable is connected and the main switch is activated.
• The control system is working properly, but the temperature in the calibrator does not increase or decrease.
• The temperature displayed in the temperature calibrator deviates from the temperature measured in the calibration bath - more than specified in the technical data.
• The temperature change does not stop when the setpoint is reached.
• The heating or cooling capacity of the calibrator does not correspond to the specifications or other information in the datasheet or this manual..
• „Memory Fail" is shown on the touchscreen.
• „Internal sensor fail" is shown on the touchscreen.
• A constant temperature is shown on the display and the red alarm symbol is displayed.
• The cooling fan of the temperature calibrator is not working.
• The calibrator does not stabilize after reaching the setpoint temperature.

In these cases, switch off the temperature calibrator immediately and allow it to cool down to room temperature. Then empty the calibration bath container and clean it according to the instructions in chapter 8.1. Contact us (*DT-Export@Leitenberger.de*) to arrange a repair appointment and send us the device, well packaged (in the original packaging if possible). Please enclose our completed "Return Declaration" form.

Return declaration form:

https://www.druck-temperatur.de/images/pdf/ formular-ruecksendeerklaerung-EN.pdf

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10. Recalibration of the temperature calibrator

If you have the appropriate training and the necessary calibration standards, you can recalibrate the device yourself instead of sending it to us for recalibration (see Chapter 12.1). Instructions for this are available for download below.

If in doubt, we always recommend sending the temperature calibrator to us for recalibration, see chapter 12.1. On request, we can also take care of device management for you and remind you in good time when recalibration is required.

11. Communication protocol of the computer interface

If you would like to program your own software for communicating with the temperature calibrator instead of using the LR-Cal Aq2Sp2 PC software (Order-Code: **LTC-AQ2SP2**) that we offer, a communication protocol is available for this purpose.

The instructions for recalibration and the communication protocol are available for download only:

https://www.druck-temperatur.de/images/pdf/anleitungen/LTC-INSTRUCTIONS-Recalibration-Communication_protocol.pdf

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12. Returns and disposal

12.1 Returns

⚠️ **WARNING!**
Please note the following when shipping the device:
All devices delivered to DRUCK & TEMPERATUR Leitenberger GmbH must be free of hazardous substances (acids, alkalis, solutions, etc.).

Use the original packaging or suitable transport packaging to return the device.

To avoid damage:
1. Wrap the device in antistatic plastic film.
2. Place the device in the packaging with the insulation material. Insulate evenly on all sides of the transport packaging.
3. If possible, include a bag of desiccant in the packaging.
4. Mark the shipment as transport of a highly sensitive measuring device.

Please fill out our "Return Declaration" form and enclose it with your return shipment to us::
https://www.druck-temperatur.de/images/pdf/formular-ruecksendeerklaerung-EN.pdf

12.2 Disposal
Improper disposal can pose a risk to the environment.
Dispose of device components and packaging materials in an environmentally friendly manner in accordance with country-specific waste treatment and disposal regulations.

 Please note that the device must not be disposed of with household waste.
Disposal must be carried out by returning it to the retailer or through the appropriate municipal authorities (see EU Directive 2002/96/EU).

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Appendix A: Declaration of conformity

The manufacturer DRUCK & TEMPERATUR Leitenberger GmbH, Bahnhofstr. 33, 72138 Kirchentellinsfurt, GERMANY, certifies that the system

• Portable temperatur calibrator - Metal dry block temperature calibrator
  LR-Cal LTC-DB-9030-35　　　　　LR-Cal LTC-DB-9050-35
  LR-Cal LTC-DB-0600-35
  LR-Cal LTC-DB-1100-44　　　　　LR-Cal LTC-DB-1200-35
complies with the requirements of the following European directives:

• Low Voltage Directive 2014/35/EU
• EMC Directive 2014/35/EU

It has been developed in accordance with the following harmonized standards:
• EN 61326-1: 2020　　　　Emission and immunity
• EN 61010-1/61010-2-010　Safety requirements for electrical equipment of measurement, control, and laboratory use
.

Conformity is confirmed by affixing the CE marking to the product.

DRUCK & TEMPERATUR Leitenberger GmbH
Kirchentellinsfurt, January, 2026

(Gernot Coulon)
General Manager / C.E.O.

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Appendix B: Drawings

**Versions
LR-Cal LTC-DB-9030-35 +
LR-Cal LTC-DB-9050-35:**

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Version
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7

SWITCH TEST

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11

17

ELECTRIC SUPPLY

9

10

8

12

15.1

7.1
7.3

6

15

7

5

4

ANALOG IN

+-20mA
0-10V

REF

EXT

SWITCH TEST

MAX. TEMP.

POWER
230Vac 50/60Hz
300W
FUSE F2.5A F

1

3 2

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Version
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LR-Cal

LR-Cal **LR**

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