

Operating instructions



Precision Temperature Calibrator

TP 38 ... / TP 38 ... E



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1 Instrument description and intended use

The calibrator is a portable unit for service, industry and laboratory tasks. The SIKA temperature calibrators are intended to

calibrate thermometers,
temperature switches/thermostats,
resistance thermometers and
thermal elements.

The operational safety of the supplied instruments is only guaranteed if they are operated according to their intended use (inspection of temperature sensors). Specified limit values (see "Technical Data") should never be exceeded.

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

Various instrument versions are manufactured. The respective type plate on the calibrator displays the version of each device.

These operating instructions apply to the following calibrator types:

TP 38 165 (cooling and heating)	-35 °C up to 165 °C	(with integrated measuring instrument)
TP 38 165 E (cooling and heating)	-35 °C up to 165 °C	(without integrated measuring instrument)
TP 38 650 (heating)	ambient temperature up to 650 °C	(with integrated measuring instrument)
TP 38 650 E (heating)	ambient temperature up to 650 °C	(without integrated measuring instrument)

The temperature calibrator consists of a controllable metal block that is capable of heating and cooling. The metal block features the holder for the probe. You have to enter a setpoint value via an operator panel. The nominal and actual values of the calibrator are displayed on the screen.

During the calibration, the temperature measured by the probe is compared to that displayed by the calibrator. Various types of probes can be calibrated.

- Thermometers/SIKA machine thermometers/bimetal thermometer/dial thermometer
These are checked by comparing the temperature measured and displayed by the probe to that displayed by the calibrator. Thereby take note of the test instructions of the thermometer producer.
- Temperature switches/Thermostats
The probe is inserted into the metal block and connected to an external display. The switch setting or switch point is signaled via this monitoring display. In the case of calibrators with integrated measuring instrument, the probe can be connected directly. An automatic temperature switch test can be performed. Thereby take note of the test instructions of the thermometer producer.
- Resistance thermometers and thermocouples
A separate temperature measuring instrument is required for the test. These devices are checked by comparing the temperature displayed on the external measuring instrument with the block temperature. In the case of TP 38... calibrators with integrated measuring instrument, the probe can be connected directly. An automatic calibration can be performed.

The calibrators TP38 165 and TP38 650 are equipped with an integrated measuring instrument at which the test specimen can be attached directly. TP 38 165 E and TP 38 650 are supplied without an integrated measuring instrument.

2 Safety instructions

Always read the operating instructions carefully prior to using the new product. Always adhere to the instructions contained herein, especially the safety instructions; otherwise, there is a potential risk of operator injury and damage to the calibrator and the sensors being tested.

Even though SIKA provides assistance for the use of the product through personal consultation or the respective literature, it is the responsibility of the customer to determine the suitability of the product for the specific application.

The temperature calibrator is a state-of-the-art device. This relates to the accuracy, functioning and the safe operation of the calibrator. However, professional and safety conscious conduct of the operator is required to ensure safe operation.

2.1 Qualified personnel

- The personnel entrusted with start-up, operation and maintenance of the calibrator / micro calibration bath have to be suitably qualified; the required knowledge can be gained via training courses or appropriate on-the-job instruction. The personnel have to be familiar with the contents of these instructions, which have to be available to them at all times.
- The electrical connection should only be carried out by a fully qualified electrician.
- All work has to be carried out in accordance with existing national regulations on accident prevention and safety at work and with any internal regulations of the operator, even if they are not specified in these instructions.
- Always observe the safety information contained in these operating instructions.

2.2 Basic safety regulations

- Only operate the calibrator when it is in correct, fully functional condition.
- The calibrator is energized with hazardous voltages via a mains cable. Improper use can result in personal injuries.
- Correct and safe operation of the calibrator demands correct transport, storage, installation and assembly, as well as proper use and careful operation and maintenance.
- The calibrator should only be used for its intended purpose. Furthermore, hazardous media should not be used and all technical specifications have to be observed.
- If faults cannot be cleared, immediately shut down the calibrator and ensure that it cannot be started up accidentally.
- Repairs should only be carried out by the manufacturer. Tampering with or modifying the calibrator is strictly prohibited.
- Prior to replacing the safety fuse, always de-energize the calibrator completely by disconnecting the mains cable from the mains outlet.
- Ensure that the complete operating instructions are always available in excellent condition at the calibrator installation site.
- Ensure that calibrator operators receive regular instruction in the various aspects of occupational health and safety and environmental protection and have full knowledge of these operating instructions and the safety information contained herein.
- The customer is to verify the applicability of the product on the basis of our technical details. By this checking, hazards and risks are subrogated to the customer and our warranty expires.

2.3 Safety instructions for TP 38 ... / TP 38 ... E

- Remove all highly combustible media from the vicinity of the calibrator and ensure that the calibrator cannot come into contact with easily inflammable or explosive substances.
- Make sure that the integrated fans can always deliver sufficient cooling air. Do not impair the air supply by placing the calibrators on a soft, resilient surface.
- Connect the calibrators to a power circuit with minimum risk of a power failure, since it will no longer be possible to supply cooling air in the case of a power failure

- Make sure that the adapter inserts and probes are not contaminated with any substances (e.g. oil) that may cause ignition or explosion during heating.
- **Attention**
Never fill liquids into the adapter sleeve.
- **Danger of burn!**
Before touching the block or the adapter insert, check the current block temperature since a heated calibrator bears the imminent risk of burns.
- Never remove adaptor inserts from a heated block since heated adapter inserts bear a fire hazard.
- Never remove probes from a heated block since these bear the imminent risk of burns.
- Never leave a heated calibrator unattended.
- Always let a heated calibrator cool to below 50 °C before disconnecting it from the mains.
- Transport the calibrator only after it has completely cooled.
- Since the housing of the calibrator is made of metal, only power cables with ground wire may be used. Operate the calibrator exclusively with the power cable provided. The power cable connector is on the bottom of the calibrator, i.e. when using a different type of cable, the calibrator may topple over.
- If the calibrator is not used for an extended period of time, humidity may penetrate into the heating element due to the material used (magnesium oxide).
After transporting or storing the calibrator in a humid environment, the heating elements must thus be heated slowly when starting the calibrator. During the drying process the calibrator will not have attained the isolation voltage required for protection class I (refer to chapter 5).
- The noise levels of all block calibrators of the TP 38... / TP 38... E series are below 70 dbA.

2.4 Ground wire monitoring (TP 38 650 and TP 38 650 E)

For checking the basic isolation of the heater, the calibrator is equipped with a ground wire monitor. The monitoring unit operates independently of the other controller components and switches off the power supply of the heater as soon as the calibrator loses the connection to the ground wire system of the isolation. This condition can only be noticed by the fact that the calibrator will be cooled to room temperature. Once the connection to the ground wire system has been re-established, the monitoring unit automatically reconnects the heating circuit to the power system (refer to chapter "Troubleshooting").

If problems or questions arise, please contact your supplier or the manufacturer directly:



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Struthweg 7-9 • D - 34260 Kaufungen • Germany
☎: 05605-803 0 • 📠 05605-803 54
info@sika.net • www.sika.net

3 Unpacking and inspecting the delivery

⇒ Unpack your calibrator.

The calibrator is delivered in special protective packaging. Keep this protective packaging for sending the instrument for recalibration or repairs to the manufacturer.

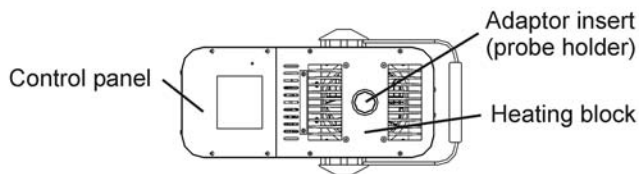
⇒ Inspect the delivery first.

Standard delivery temperature calibrator:

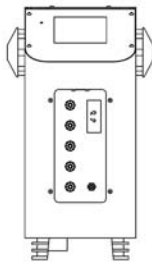
- Calibrator
- Sleeve remover
- Mains connection cable
- Test certificate
- Operating instructions

4 Structure of the temperature calibrator

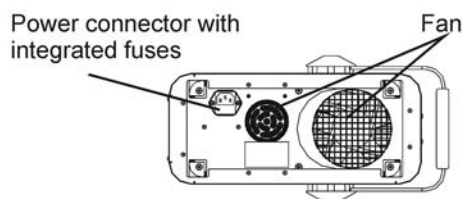
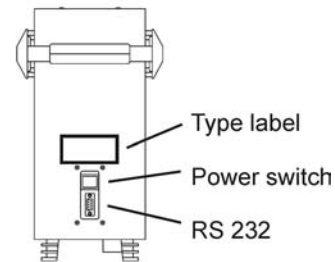
Device top with control panel and probe holder



Device front with connector panel and integratable measuring instrument



Rear of device with power switch and RS 232 interface



Device bottom with power connector and fan

4.1 Overview of components

The temperature calibrators consists of a control unit with operator panel and a metal block. The two components are accommodated in a robust metal housing together with fans. In the center of the metal block there is a bore for holding the probe. Ex works, an integrated measuring instrument can be installed in the front side of the calibrator (refer to chapter 4.4).

The overview shows a temperature calibrator of the TP 38 165 / TP 38 165 E series, identified by the cooling fins on the upper side of the calibrator. Instead of the fins, the TP 38 600 / TP 38 600 E calibrator features a grid for protection against the hot areas of the heating block.

Calibrator TP 38 165 / TP 38 165 E

The TP 38 165 / TP 38 165 E calibrators for temperature ranges from -30°C to 165°C work with Peltier elements. The calibrator must be able to cool to generate temperatures below ambient temperature. For this purpose, the metal block is connected to a cooling element that is cooled by a strong fan. For technical reasons, the max. attainable temperature is limited to 165°C . The min. attainable temperature is -30°C at an ambient temperature of 23°C .

Calibrator TP 38 650 / TP 38 650 E

The TP 38 650 / TP 38 650 E calibrators for temperature ranges from ambient temperature up to 650°C work with resistance heating elements. Depending on the upper limit temperature, different block materials are used. Brass, bronze or scale-resistant steels.

4.2 The control panel

Fig. 1: Control panel

The control panel with the keyboard, the pilot lamp and the graphic display are on the front of the calibrator.

Description:

- | | |
|---|--|
| A Standby/On pilot lamp | G Block of 14 keys for entering numbers with sign |
| B Standby/On switch | H Status bar of the display |
| C Cursor and Select keys for marking and selecting | I Main display area |
| D Back key for going back one step | J Info line of the display |
| E Enter key for entering data | K Control / Calibrate switch |
| F Clear keys for deleting data | |

4.3 The metal calibration block

Both the dry well calibrators are fitted with an electronic temperature-controlled metal block. This metal block is fitted with a 28 mm x 150 mm bore for holding the adapter insert. It contains one or several bores with different diameters for thermally coupling thermometers of various thicknesses to the metal block. Good thermal coupling between the block, the adapter insert and the thermometer is very important for keeping measuring inaccuracies during calibration to a minimum. The metal block is thermally insulated against the housing wall.

4.4 Integrated measuring instrument

Resistance thermometers, thermo elements and temperature transmitters must be operated with a measuring instrument during calibration that measures the output signals such as thermo-voltages, resistance values and standard 0(4)-20 mA signals and displays them in the form of temperature values. This temperature can then be compared to the set calibrator temperature.

It is far more convenient to use our temperature calibrators with integrated measuring instrument. It performs the tasks of an external measuring instrument and displays the temperature directly on the calibrator display. Our precision temperature calibrators are available in two different configurations:

- without integrated measuring instrument (TP 38... E)
- with integrated measuring instrument (TP 38...)

Any TP 38... E can be upgraded with an integrated measuring instrument at our company at any time.

The integrated measuring instrument also permits parallel connection of a probe and an external reference resistance thermometer. If the probe is too short for the block bore, for example, it is not in the homogenous temperature range and cannot be calibrated. For this reason, an external reference is connected to the integrated measuring instrument and parallelly inserted into the block bore in the same depth. The temperature of the reference, of the probe and the difference of the two are displayed.

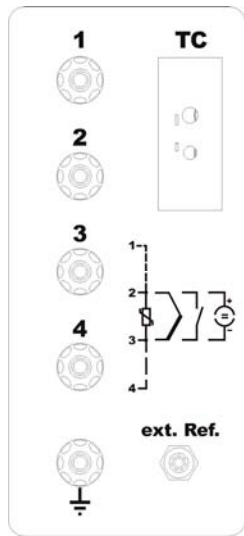
The following probes can be connected to the integrated measuring instrument:

- Resistance thermometers (RTD): Pt100, Pt 500 und Pt 1000 in 2, 3 or 4 conductor circuits
- Thermocouples (TC) of the K, J, N, E, R, T, B, S, L and U types
- 0(4)-20 mA power signals from temperature transmitters (mA), with and without supply voltage
- Temperature switches (switches) with "normally open" and "normally closed" contacts.

In addition to a thermocouple connector (refer to the circuit diagram), 4 mm sockets for plugs, cable lugs and blank wires are available for connecting the probe.

The external resistance thermometer is connected using a 7-pole connector.

Circuit of the integrated measuring instrument



For information on connecting your probe, please refer to the circuit diagram on the left.

The corresponding settings for the type of probe and the integrated measuring instrument are described in chapter 5.

The "ext. Ref." connector is used for connecting an external reference. It influences other displays. The connection and thus display of an external reference is automatically detected by the calibrator, i.e. the calibrator provides values of the external reference.

RTD			TC	mA	switch
4 wire	3 wire	2 wire			
1					
2	2	2	2	2	2
3	3	3	3	3	3
4	4				

RTD = resistance thermometers
mA = mA transmitter

TC = termocouples
switch = temperature switches

4.5 PC connection, power switch and type label

The calibrator is equipped with a serial interface of the RS-232-C type. This interface operates in two directions, i.e. data are sent to a superordinate computer for further processing and data are received from a superordinate computer for programming the calibrator.

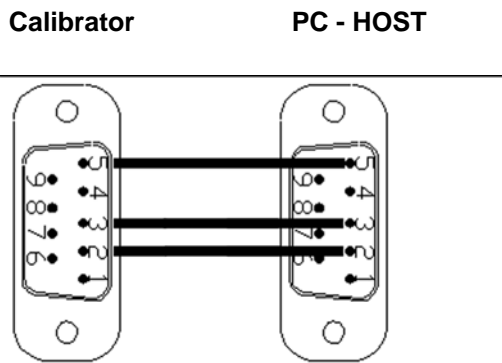
Note: The interfaces of the devices to be connected must comply with IEC 60950.

Interface settings:

9600 Baud, 8 data bits, parity none, 1 stop bit

Connection to a PC

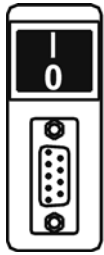
The calibrator is connected to a PC via a commercially available cable, included in the scope of delivery.



Pin 2) ➔RX
Pin 3) ➔TX
Pin 5) ➔GND

Power switch

The power switch (I/O toggle switch) on the rear of the calibrator is used to switch on the power supply of the calibrator.



Switch setting "I" switches the power supply on, switch setting "0" switches the power supply off.

Directly to the right of the power switch is a warning symbol. It means: "Caution, general point of hazard"

Two examples for type label



4.6 Components of the calibrator bottom

The power socket with integrated safety fuses are arranged in the bottom of the calibrator. For this reason, a power cable with an angled inlet connector for non-heating apparatus must be used.

4.7 Warnings used

Since there are high temperatures on the top of the calibrator directly in front of the block bore, the following warning has been attached to this area:



Directly to the right of the power switch is the warning symbol displayed. It means: "Caution, general point of hazard". It advises you to read the corresponding chapters (e.g. chapter 2, chapter 4) of the operating instructions.

4.8 Accessories (included in the scope of delivery)

Power cable

A power cable with a 90 ° angled inlet connector for non-heating apparatuses for the power supply is included with every calibrator«TITLE». Depending on the country the calibrator is delivered to, the power cable is fitted with the locally used power plug.

Important!

Operate the TP 38... / TP 38... E exclusively with the power cable provided. The power cable connector is on the bottom of the calibrator, i.e. when using a different type of cable, the calibrator may topple over.

Insert removal tool

An insert removal tool for simple and easy removal and insertion of the adapter insert into the calibrator block is included in the standard set of accessories of every temperature calibrator«TITLE» of the TP 38... / TP 38... E series.

Test certificate

Each calibrator has been tested ex works and is delivered with a test certificate.

4.9 Optional Accessories

Adaptor inserts

Each calibrator features a block bore with a diameter of 28 mm. Adaptor inserts must be used to guarantee that the heat transfer between the thermometer to be checked and the metal block is as small as possible. If the diameters of your thermometers differ, please order the desired adaptor insert with an internal bore matching the diameter of your thermometer plus 0.5 mm. Inserts have outside dimensions of 28 mm in Ø x a length of 150 mm and are made of brass (scale-free special alloy).

Special adaptor inserts

Special adaptor inserts can be customized in various designs. Inserts with multiple bores are also possible. Limits are placed only by the mechanical machinability of the insert blank.

If you require multiple inserts, please take the following into consideration:

- if possible, the bores should be arranged on a pitch circle to ensure uniform temperature distribution
- for product engineering reasons, there must be a minimum distance between the bores and to the edge of the insert. As a rule, this distance should not be less than 2 mm.
- the bore diameter should be larger than the thermometer to be tested by at least 0.5 mm.

Transport case

We offer a robust transport case for your calibrator as an option. We recommend the use of a transport case, if you frequently use the calibrator for on-site calibrations and thus need to transport it often. The case does not only protect your calibrator against environmental influences such as dust, dirt and humidity but also against mechanical damage that may occur due to impacts and vibrations.

Data cable

A data cable for connecting the calibrator to the RS 232 interface can be ordered from SIKA.

Software

Program package for TP 38... E

- Remote control of the calibrator functions via PC
- Setting of the display values (°C / °F / K, variance, min. and max. value, filter)
- Programmable ramps, level and temperature cycle functions
- System settings via PC (language, date, time, brightness, contrast, alarm)
- Editing of the test data in graphical and ASCII code

Program package for TP 38...

- Remote control of the calibrator functions via PC
- Setting of the display values (°C / °F / K, variance, min. and max. value, filter)
- Programmable ramps, level and temperature cycle functions
- System settings via PC (language, date, time, brightness, contrast, alarm)
- Editing of the test data in graphical and ASCII code
- Processing of probe data
 - RTD Pt100/Pt500/Pt1000
 - TC K/J/N/E/R/T/B/S/L/U
 - Current 0(4)...20 mA
 - Temperature switch
- programming and interpretation of step- and logger function
- automatic creation of certificates incl. the integration of customer data
- Serial test (e.g. for incoming goods inspection)

External calibration reference

Hand sensor appropriate for TP 38... with internal measuring instrument

Customer-specific linearization through EEPROM

Measuring range -50...550 °C

Tolerances +/-0.05 °C in the range of -30.00 °C...199.99 °C
 +/-0.3 °C in the range of 200.00 °C...550.00 °C

Corrosion and acid resistant stainless steel 1.4571

Dimensions: L = 300 mm, D = 3 mm

Robust plastic hand grip (150 mm)

Electric connection via PVC cable (1 m) with 7-pin SIKA connector

Other configurations available on demand.

4.10 DKD Calibration Certificate

The DKD calibration certificate gives you the certainty that the calibration results are based on national standards and the measuring deviations do not exceed the error limits specified.

DKD calibrations are optionally available for all temperature calibrators.

The calibration certificate of a DKD calibration laboratory confirms that the dry well calibrator fulfills the high demands placed on the calibration capabilities of a calibrator of that kind. These requirements are defined in directive DKD-R 5-4.

To check the calibration of dry well calibrators, we recommend periodical measurements using a calibrated thermometer. Without verification measurements using a calibrated thermometer, we strongly recommend annual recalibration of the dry well calibrator.

5 Commissioning of the calibrator

5.1 Intended use

- The introduction of foreign substances such as oil or thermal conduction paste with the aim of enhancing the heat transfer to the probe can damage the calibrator and the adaptor insert.
- In addition, there is a risk of injury due to abruptly evaporating fluids and hazardous gases that may form when fluids evaporate.
- Always ensure that the testing temperature is not too high for the probe. Otherwise, the probe may be destroyed.
- Remove all highly combustible media from the vicinity of the calibrator and ensure that the calibrator cannot come into contact with easily inflammable or explosive media.

5.2 Checks and activities prior to commissioning

Prior to commissioning, the calibrators must be moved to their standard upright operating position. When installing the calibrator, make sure that the fan on the bottom can circulate a sufficient rate of air. Do not use soft, resilient surfaces.

Proceed as follows:

- Check the technical data specified on the type label
- Always place TP 38... / TP 38... E in an upright position. Otherwise uniform temperature distribution in the block cannot be ensured.
- Do not use any filling media.

Additionally observe the following:

- The calibrator must be connected to a power circuit with minimum risk of a power failure, since it will no longer be possible to supply cooling air in the case of a power failure
- All the bores of the adaptor insert must be clean and free of damage and foreign matters
- The probe, the adaptor insert and the bore of the heating block must exactly match. Keep the heat transition resistance as low as possible by using adaptor inserts with test bores, the inside diameters of which is approx. 0.5 mm larger than the diameter of the probe.

Setup and connection

- ⇒ First fold back the hand grips of the calibrator. For this purpose, pull off the two lateral fasteners of the hand grip to the side and fold the hand grip back towards the rear of the calibrator.
- ⇒ Plug the power cable supplied into the mains socket on the bottom of the calibrator and plug the power connector into the mains socket.

Caution: Since the housing of the calibrator is made of metal, only power cables with ground wire may be used. Use the power cable supplied.

Set up the calibrator such that the power switch (switch for power supply) is easily accessible and can be actuated without any problems.

Set up the calibrator such that the fan on the bottom of the calibrator has sufficient free space to be able to circulate a sufficient cooling air rate. Insufficient venting may cause damage leading to the destruction of the «TITLE»calibrator.

- Connect the calibrator to a power circuit with minimum risk of a power failure, since it will no longer be possible to supply cooling air in the case of a power failure
- Switch on the calibrator at the power switch.

5.3 Start procedure with TP 38 650 / TP 38 650 E

If the calibrator is not used for an extended period of time, humidity may penetrate into the heating elements due to the material used (magnesium oxide).

After transporting or storing the calibrator in a humid environment, the heating elements must thus be heated slowly when starting the calibrator. During the drying, the calibrator will not have attained the isolation voltage required for protection class I.

The setpoint startup value is $T_{anf} = 120 \text{ °C}$ at a dwell time of $t_h = 15 \text{ min}$.

6 Operation of the calibrator

6.1 Description of the controls

6.1.1 Description of the display

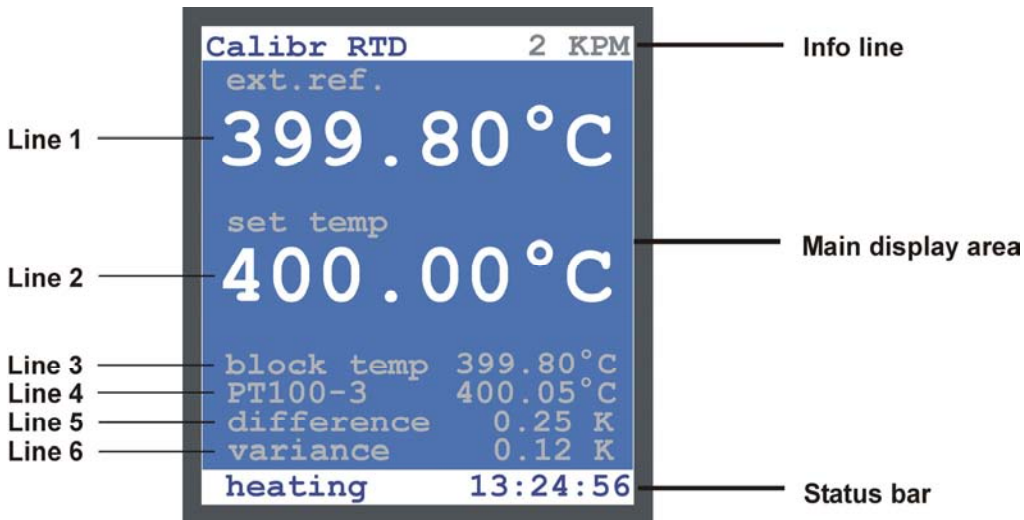


Fig. 2: Display of calibration mode

Info line

In the info line, the current mode is always displayed on the left-hand side. In the example above, this is the calibration of an RTD resistance thermometer. The current temperature gradient is displayed on the right-hand side.

KPM stands for **K**elvin **p**er **M**inute.

All practicable menu points are listed in the table. The points which are bold are available to all calibrator types (TP38... E and TP 38...). The others are only possible by calibrators with an integrated measuring instrument (TP 38...).

Display on the left-hand side of the info line	Description
Control	Operation in control mode
Calibrate	Operation in calibrate mode
Calibr RTD	- without probe type selected
Calibr TC	- with the selected resistance thermometer (RTD) as the probe
Calibr mA	- with the selected thermocouple (TC) as the probe
Switch test	- with the selected mA transmitter (mA) as the probe
Step test	Operation in step test mode
Step RTD	- without probe type selected
Step TC	- with the selected resistance thermometer (RTD) as the probe
Step mA	- with the selected thermocouple (TC) as the probe
Select	Call of the select mode
	The Select mode offers the menu item with access to the submenus
	Check RTD Select RTD
	Check TC Select TC
	Check mA Select mA
	Check switch Select switch
	DataLogger Select Logger

	Step test	Select steps
Select RTD	Submenu for resistance thermometers (RTD)	Select display
Select TC	Submenu for thermocouples (TC)	Select system
Select mA	Submenu for mA transmitters (mA)	Select Info
Select Schalt	Submenu for switch test (switch)	
Select display	Submenu for display values in the display area (display)	
Select Logger	Submenu for DataLogger	
Select steps	Submenu for steps (steps)	
Select system	Submenu for system settings (system)	
Select info	Submenu for information windows (info)	

Display Area

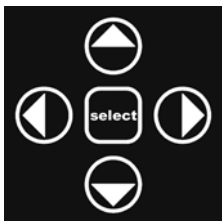
In this area, you can read all the important data such as the block and temperature set-point as well as define settings required for the calibration in the submenus on the respective screen pages.

Status Bar

The status bar displays the statuses of the calibrator and the time. The calibrator may have one of five different statuses:

- **Heating** when the temperature in the block is increased
- **Cooling** when the block is cooled
- **Stable** when the temperature in the block has set to a constant value (for stability, refer to the technical data)
- **Temp-alarm** when an alarm value set in the **select system** submenu has been exceeded
The alarm is signaled only, the control unit will continue operating.
when a switch-off value set in the **select system** submenu has been exceeded
The alarm is signaled. The control unit is switched off and the program automatically branches back to the Control mode. Once the value has dropped below the switch-off value, the control unit can be reactivated via the Control key.
- **Control Off** when the controller of the calibrator was manually switched off via the Control key. The controller cannot be switched off manually while level and switch tests are being performed.

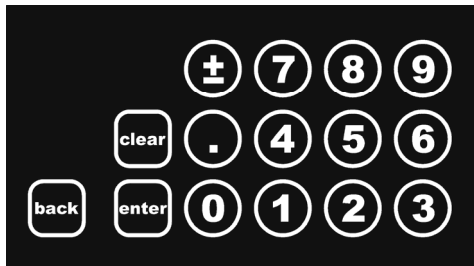
6.1.2 Description of the Cursor Keys / Select Key



The cursor keys are used to select options on the display, e.g. a probe in Select mode. The selected value will be displayed in blue letters on a white field. The Select key is used to confirm your selection.

Using the Select key, you can call the Select mode including the associated submenus even from the standard calibration mode. (please also refer to chapter 6.1.4)

6.1.3 Description of the Block of 14 Keys and the Back Key

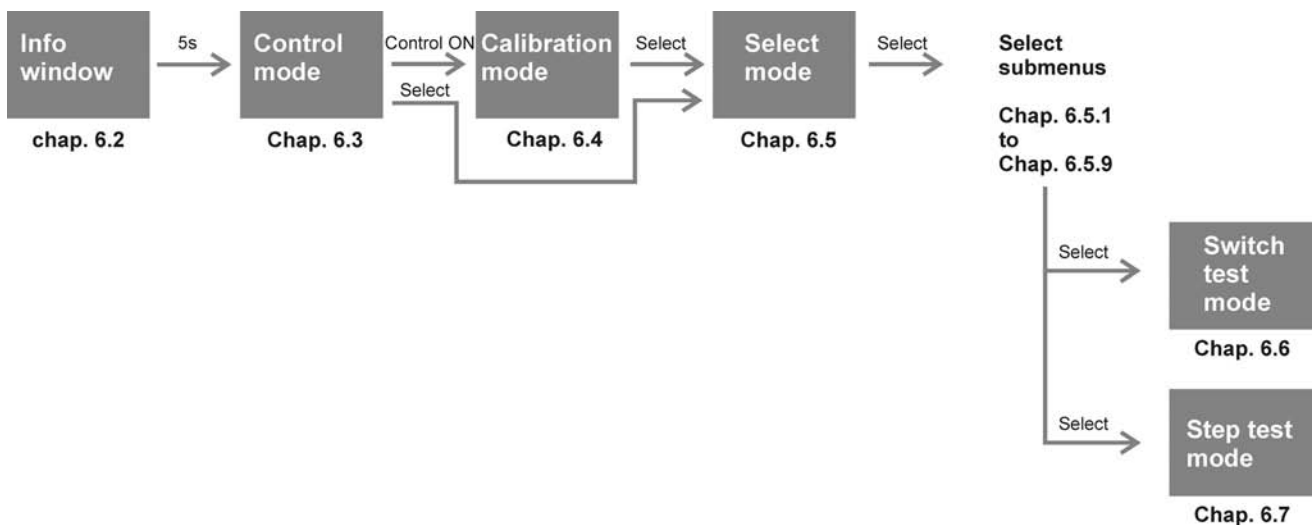


You can enter all the required temperature values and percentages via the block of 14 keys.

In Control and Calibration mode e.g., you can edit the setpoint value. In Select mode, several settings can be edited on one screen page. For this purpose, select the desired value using the cursor keys. The line will then be displayed in blue letters on a white field. Now enter the numeric values including sign and decimal places. Always confirm by pressing the Enter key. Use the Clear key to delete an entry.

The Back key saves the selected and entered values and settings. The save process is briefly displayed in the info line with "Speichern" (Saving) and takes you back one operational step.

6.1.4 Diagram of the Operating Structure



6.2 Starting the Calibrator

Preliminary Note

The setting range depends on the calibrator and specifies the range, in which the controller can be set. The actual operating range may differ from the setting range, since the operating range can be restricted through a switch-off value set in the **select system** submenu. The firmware version number may change after a firmware update.

The individual serial number of the calibrators is specified in the **Info menu** and additionally on the type label on the rear of the calibrator.

Switching On the Calibrator

- Switch on the power switch.
"Loading ..." will be displayed. Then the start data will be displayed in the info window.
- TP 38 165 / TP 38 165 E (Setting range ... -35 °C ... 165 °C)
- TP 38 650 / TP 38 650 E (Setting range ... 40 °C ... 650 °C)

Below this, the firmware version, the date of the last calibration and the internally stored serial number are displayed.



Displayed for 5 s only

Fig. 3: Info windows with start datas

6.3 Description of the control mode

After approx. 5 s, the calibrator will automatically switch to **Control mode** and display the current **block temperature**. The **temperature set-point** is displayed below it. The two displays are permanently visible.

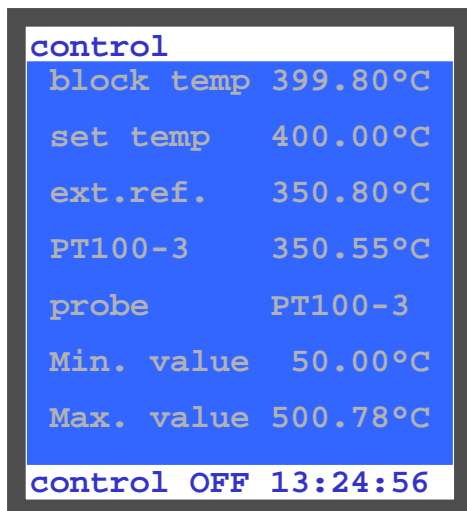


Fig. 4: Display in control mode

In addition, five other displays may appear depending on the equipment and selection. The figure above shows the maximum scope of displays.

ext. Ref displays the value of the external reference.

PT100-3 (probe)	An internal measuring instrument is available and switched on and a probe has been selected. (in this example: Pt 100 in 3 conductor circuit)
Min/Max value	The display of the minimum and maximum value is enabled. The min. and max. values can be reset at any time by pressing the ENTER key. In Control mode, a control response time (on the right-hand side of the info line) cannot be specified (refer to Calibration mode).

When the calibrator has been switched to control mode, this is displayed in the status bar. "Control off" will be displayed.

- ⇒ In this mode, you can define a new setpoint value using the block of 14 keys.
Confirm your entry by pressing the Enter key, the controller will save the value.
- ⇒ Press the Control key once to start the controller. Calibration mode will be called.

6.4 Entering setpoint values and description of the calibration mode

The calibration mode will be displayed as soon as you have pressed the control key.

Calibration mode provides all the required displays for you to enter the setpoint value.

⇒ Define a new setpoint value using the block of 14 keys. Confirm your entry using the Enter key. The controller will save the value. The calibrator accepts only setpoint values within its setting range.

Description of the calibration mode

Fig. 5 below shows the maximum possible displays that are visible depending on the equipment and the selected function.

Info Line

The following displays are possible in the info line:

- **Calibrate** There is no internal measuring instrument. A probe was not selected

If a internal measuring instrument is exist, the info line displayed „Calibr“ and behind if a resistance thermometer (RTD), a thermocouple (TC) or a current output (mA) is connected.

- **Calibr RTD** A resistance thermometer was connected as probe and selected.
- **Calibr TC** A thermocouple was connected as probe and selected.
- **Calibr mA** A sensor with current output was connected as probe and selected.

The temperature gradient is displayed on the right-hand side of the info line.

Display Area

The first line displays the current block temperature **Block temp** of the calibrator, the second line displays the temperature set-point (see fig. 5b). Irrespective of the equipment of your calibrator, the two displays are always visible. In the **set temp** (temperature set-point) line you have to enter the desired temperature set-point as described above.

If the calibrator is equipped with an internal measuring instrument there are additional displays possible like in figure 5a:

During the connection ext. ref. this appears in line 1, then the block temperature is represented small in line 3. In line 4 the type of the test specimen and its temperature can be registered. The selection of the test specimen you can take at the select mode (cap.6.5).

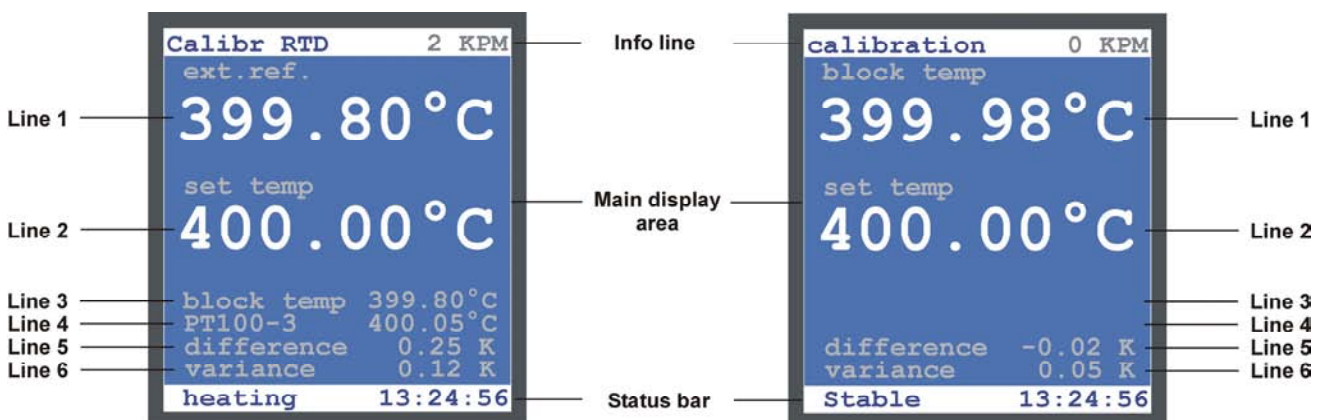


Fig. 5a: Display with external reference

Fig. 5b: Display without external reference

The line **5 difference** is always displayed. Depending on the equipment and selection, the temperature difference is displayed as follows:

- Without internal measuring instrument or with the internal measuring instrument switched off:
Difference = block temperature (internal reference) – temperature set-point (Fig. 6)

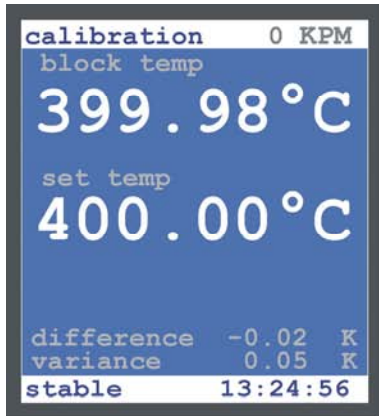


Fig. 6

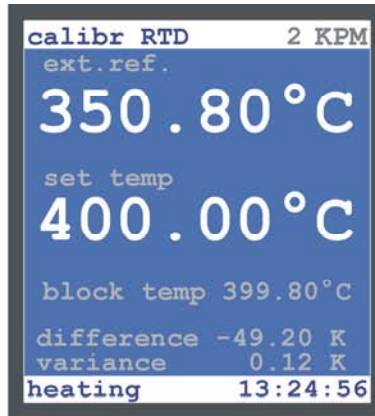


Fig. 7

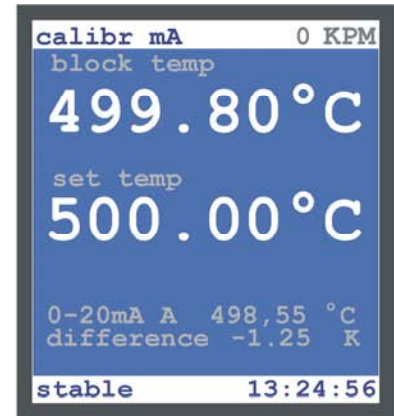


Fig. 8

With the internal measuring instrument switched on and

- Probe selected and external reference connected:
Difference = probe – external reference (Fig. 5a)
- Probe selected and external reference not connected:
Difference = probe – block temperature (internal reference) (Fig. 8)
- Probe not selected and external reference connected:
Difference = external reference - temperature set-point (Fig. 7)
- Probe not selected and external reference not connected:
Difference = block temperature (internal reference) - temperature set-point (Fig. 6)

The line **variance** is displayed only if selected in the "select display" submenu. It specifies by which value the controlled block temperature varies.

Status Bar

The status bar can display four different statuses:

- heating** when the temperature in the block is increased
- cooling** when the block is cooled
- stable** when the temperature in the block has set to a constant value
- temp-alarm** when an alarm value/switch-off value set in the "Select System" submenu has been exceeded

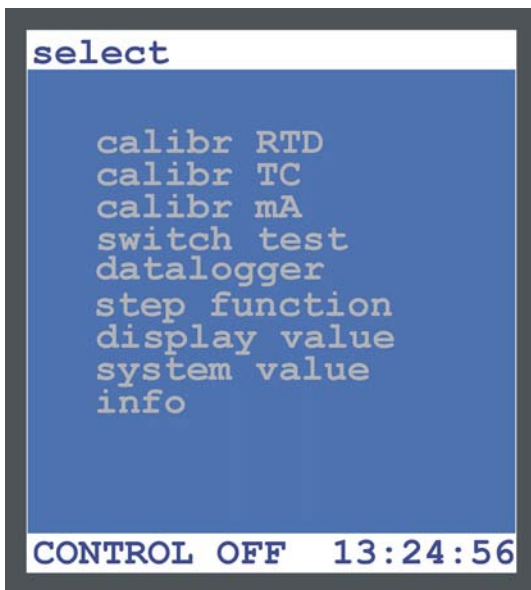
When the internal measuring instrument is switched off and on again, all the probes are switched to "OFF".

6.5 Settings and Descriptions in Select Mode

- ⇒ Press the select button The select mode will be called
- ⇒ Select the individual menu items using the cursor keys and open the selected submenu by pressing the Select key. Press the Back key to exit the submenus.
- ⇒ When you have made a selection in the submenus, always confirm your selection by pressing the Select key.

Description of the Select Mode

The figure below shows the maximum possible displays that are visible depending on the equipment and the selected function. The display varies depending on the equipment, e.g. if an internal measuring instrument is not available, the first four menu items will be hidden.



For information on the settings, please refer to

- 6.5.1
- 6.5.2
- 6.5.3
- 6.5.4
- 6.5.6*
- 6.5.5*
- 6.5.7
- 6.5.8
- 6.5.9

Fig. 9: Select mode with maximal possible displays

Info Line

Only one display is possible in the info line:

- **Select** Call of the "select mode"

The temperature gradient is displayed on the right hand side of the info line.

Display Area

In select mode, you will find all the required settings and options in the submenus.

The cursor will automatically be placed on the topmost menu item, which can directly be selected.

Status Bar

The status bar can display five different statuses:

- **heating** when the temperature in the block is increased
- **cooling** when the block is cooled
- **stable** when the temperature in the block has set to a constant value
- **temp-alarm** when an alarm value/switch-off value set in the "select system" submenu has been exceeded
- **control off** when the control key was pressed and the control unit was thus switched off

When the internal measuring instrument is switched off and on again, all the probes are switched to "OFF".

*Since the step test is the basis of DataLogger it is first described.

6.5.1 Select RTD menu

This menu item is displayed if an internal measuring instrument is available and switched on.

After selecting the "calibr RTD" menu item in Select mode using the cursor key and confirming your selection with the Select key, the "Select RTD" submenu will be displayed.

The settings for the connected resistance thermometer are made in this menu.

- Make your selection using the cursor keys.
- Activate your selection using the Select key.

If the check or calibration of an RTD resistance thermometer is enabled with "ON", operation will be initiated in "calibr RTD" mode.

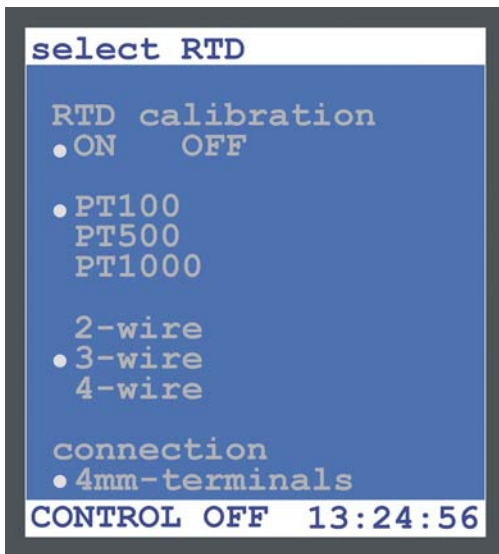


Fig. 10: Submenu „select RTD“

Switching ON/OFF

In the second line you can switch the resistance thermometer check on or off. In the third line you can select the type of probe.

Probe Types

- | | | |
|----------|--------------------------------|--------------------------------|
| • PT100 | Pt 100 resistance thermometer | in 2 or 3 or 4 wire connection |
| • PT500 | Pt 500 resistance thermometer | in 2 or 3 or 4 wire connection |
| • PT1000 | Pt 1000 resistance thermometer | in 2 or 3 or 4 wire connection |

Connection

The "4 mm terminals"-connection does not include setting options since resistance thermometers can only be connected to 4 mm terminals.

6.5.2 Select TC menu

This menu item is displayed if an internal measuring instrument is available and switched on.

After selecting the "calibr TC" menu item in Select mode using the cursor key and confirming your selection with the Select key, the "Select TC" submenu will be displayed.

The settings for a connected thermocouple are made in this menu. Make your selection using the cursor keys. Activate your selection using the Select key.

If the check or calibration of a TC thermocouple is enabled with "ON", operation will be initiated in "calibr TC" mode.

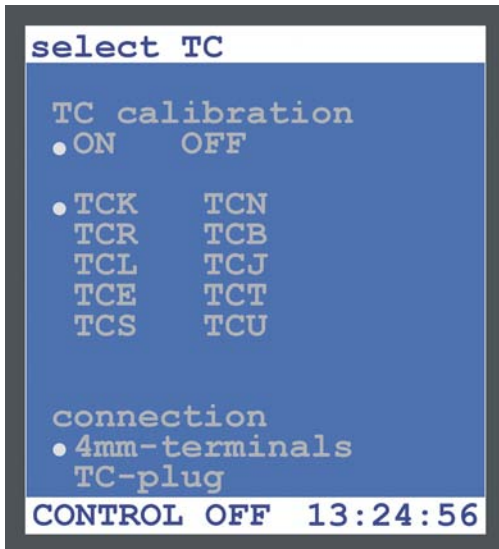


Fig. 11: Submenu „select TC“

Switching ON/OFF

In the second line you can switch the thermocouple check on or off. In the third line you can select the type of probe.

Probe Types

- TCK Thermocouple type K (NiCr-NiAl)
- TCR Thermocouple type R (Pt13Rh – Pt)
- TCL Thermocouple type L (Fe-CuNi)
- TCE Thermocouple type E (NiCr-CuNi)
- TCS Thermocouple type S (Pt10Rh-Pt)
- TCN Thermocouple type N (NiCrSi – NiSiMg)
- TCB Thermocouple type B (Pt30Rh-Pt6Rh)
- TCJ Thermocouple type J (Fe-CuNi)
- TCT Thermocouple type T (Cu-CuNi)
- TCU Thermocouple type U (Cu-CuNi)

Connection

Below the "Connection" line you have to select, whether the probe is connected to a 4 mm terminals or a TC-plug.

6.5.3 Select mA menu

This menu item is displayed if an internal measuring instrument is available and switched on.

After selecting the "calibr mA" menu item in Select mode using the cursor key and confirming your selection with the Select key, the "select mA" submenu will be displayed.

The settings for the connected temperature sensor with current output are made in this menu. Make your selection using the cursor keys. Activate your selection using the Select key.

If the check or calibration of a mA temperature transmitter is enabled with "ON", operation will be initiated in "Kalibr mA" (calibrate mA) mode.

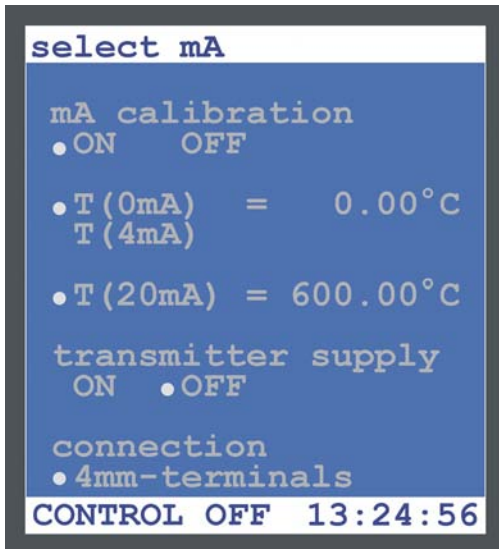


Fig. 12: Submenu „select mA“

Switching ON/OFF

In the second line you can switch the temperature transmitter check on or off. In the third line you can select the type of probe.

Probe types

- T (0 mA) / T (20 mA) Temperature transmitter with an output signal of 0-20 mA
- T (4 mA) / T (20 mA) Temperature transmitter with an output signal of 4-20 mA

Setting options

The temperature value is entered using the block of 14 keys. The temperature values entered are confirmed using the ENTER key. The Clear key can be used to delete the selected numeric value.

The values specified on the temperature transmitter must match the values entered here.

Transmitter supply

Underneath the "Versorgung" (Supply) line, you can switch on or off the internal transmitter supply integrated in the calibrator.

0...20 mA must always be supplied via the external transmitter supply, i.e. if you select 0...20 mA, the "Versorgung" (Supply) menu item will not offer any option. The setting will be "AUS" by default.

4...20 mA signals however can be operated with or without internal transmitter supply. If you switch on the internal transmitter supply by selecting "EIN" (ON), you have to switch off any external transmitter supply. Otherwise your transmitter may be destroyed.

If you select "AUS", you switch the internal transmitter supply off and must thus use an external transmitter supply.

Connection

The "4 mm-terminals" connection does not include setting options since mA power signals can only be connected to 4 mm terminal.

6.5.4 Select switch menu

This menu item is displayed if an internal measuring instrument is available and switched on.

After selecting the "switch test menu item in Select mode using the cursor key and confirming your selection with the Select key, the "select switch" submenu will be displayed.

The settings for a temperature switch test are made in this menu. Make your selection using the cursor keys. Activate your selection using the Select key.

If the check or calibration of a temperature switch is enabled with "ON", operation will be initiated in switch test mode.

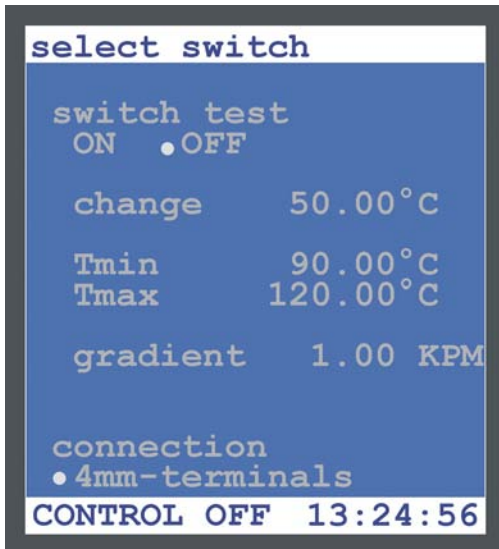


Fig. 13: Submenu „select switch“

Switching test ON/OFF

In the second line you can switch the switch test on or off. In the third line you can set the conditions for the temperature switch program.

Setting options

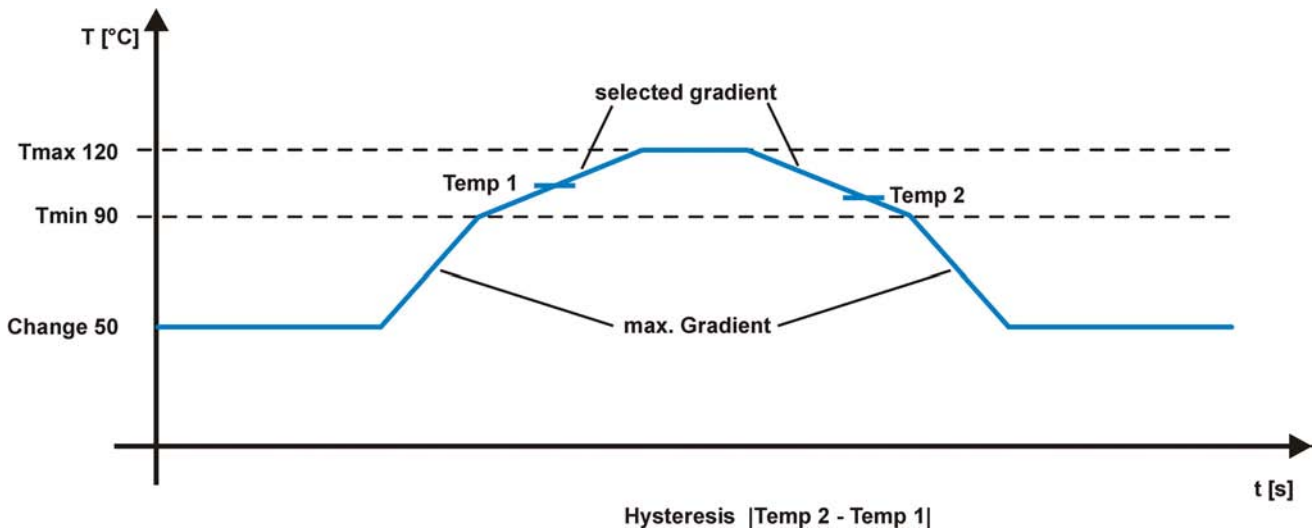
The temperature value is entered using the block of 14 keys. The temperature values entered are confirmed using the ENTER key. The Clear key can be used to delete the selected numeric value.

- **change** Here you define the start and end point of the test. At this temperature, the switch can be placed into the calibrator and removed from it.
- **Tmin/Tmax** This is where you define the temperature range, in which the switch test is performed with a preset gradient.
- **gradient** Here you can define the gradient (**Kelvin per minute**), with which the calibrator passes through the selected temperature range.

Description of the temperature switch program

⇒ Important!

If the temperature of change (± 1 K) is reached you start the switch test with the **ENTER**-key.



The calibrator first heats/cools with the max. gradient. When "Tmin" has been reached, the calibrator passes through the temperature range* specified with the selected gradient.

If a switching function is detected, the value is displayed as "Temp 1" in switch test mode. The calibrator will then immediately cool/heat with the selected gradient, until another switching function is detected. This value is also recorded in switch test mode as "Temp 2". The calibrator will then approach the programmed removal temperature with the maximum gradient. The hysteresis results from the absolute value function $|T_2 - T_1|$.

The modifications max gradient to selected gradient and switching to Tmax it takes place 1 K before achieving of Tmin.

Attention!

While the temperature switch program is enabled, you cannot enable control mode using the Control key. When the switch test mode is enabled, the menu items "calibr RTD", "calibr TC", "calibr mA" and "step function" are hidden and cannot be selected.

The switch test can be broken off only directly in the menu **select switch**.

Possible Sources of Error

If it is no switching function identified the calibrator goes back to the withdrawal temperature after achieving of the programmed Tmax value with maximally gradient.

Temp 1, Temp 2 and hysteresis are demonstrated with „- -“.

Connection

The "4 mm-terminals" connection does not include setting options since temperature switches can only be connected to 4 mm-terminals.

6.5.6 Step function menu

Important!

Take the settings for the step test only in „CONTROL OFF" mode.

After selecting the "step function" menu item in Select mode using the cursor key and confirming your selection with the Select key, the "select steps" submenu will be displayed.

The settings for a step test are made in this menu. Make your selection using the cursor keys.

Activate/deactivate your selection using the Select key.

If the check or calibration is enabled with "upward" or "down" , operation will be initiated in step test mode.



Fig. 14: Submenu „select steps“

Switching ON/OFF

In the first line you can switch the step test ON respectively OFF.

- Switching ON: Activation of field "upward" and/or of field "down". (√ characterizes the possibility of multiple choice)
- Switching OFF: field "OFF" („●" characterizes the individual choice)
- **Off** Switches the level test off
- **upward** Levels are passed in ascending order
- **down** Levels are passed in descending order
- **upward/down** Levels are passed in ascending and descending order

Setting Options

- **Steps**
You can enable/disable levels 1...6. In this case, "√ " identifies multiple selection options. The temperature value is entered using the block of 14 keys. The temperature values entered are confirmed using the ENTER key. The Clear key can be used to delete the selected numeric value.
- **Tolerance**
Stability limits of the programmed temperature level
- **Gradient**
defined heating and cooling of the calibrator
- **Time**
Length of the dwell time on the programmed temperature level
- **Cycles**
Number of repetitions

Description of the temperature step program

In this program, up to 6 different temperature steps can be programmed separate or together. Every single temperature level can be set to any desired temperature within the operating range of the calibrator. The resolution is 0.01 K.

The individual temperature levels are serially numbered from 1 to 6. If the "upward" function is enabled, the levels are approached in the order 1, 2, 3, 4, 5 and 6. If the "down" function is enabled, the levels are approached in the order 6, 5, 3, 4, 2 and 1. If the "upwards/down" functions are enabled, the levels are approached in the order 1, 2, 3, 4, 5, 6, 5, 4, 3, 2 and 1. In this case, disabled levels are skipped.

Using the **gradient** function, defined heating and cooling of the calibrator can be set. The value for the gradient is set in KPM with a resolution of 0.01 K.

The upper level for the gradient is determined through the heating power of the respective calibrator. This means that the calibrator with the gradient function enabled cannot heat at a faster rate than the calibrator without the gradient function.

Using the **tolerance** and **time** the stability and length of the dwell time on a temperature level can be set. If the dwell time is to be 5 minutes with a constancy of ± 0.1 K after the temperature set point has been reached the duration must be set to 5 min. and the tolerance to 0.1 K. In this case, the timer will start when the actual temperature differs by less than 0.1 K from the temperature set point. If the temperature remains below this tolerance for 5 min, the time period for the next level will be approached after the present time period has elapsed. If fluctuations occur during this time that exceed the set tolerance, the timer is reset and restarted. The tolerance can be set within the limits of 0.01 K and 5.00 K, the duration within the range of from 1 min to 100 min.

Using the cycles function the calibrator can approach the temperature levels continuously. If e.g. the temperature levels 1, 2 and 3 are enabled and the "upward" function has been selected, the levels 1, 2 and 3 are approached one after the other depending on the set cycles: with a number of cycles of 3 this would be 1, 2, 3, 1, 2, 3, 1, 2 and 3. If the "upward" and "down" functions have been selected, the calibrator will proceed as follows: 1, 2, 3, 2, 1, 2, 3, 2, 1, 2, 3, 2 and 1.

Attention!

While the temperature level program is enabled you cannot enable control mode using the control key. When the level test mode is enabled the menu item "Switch test" in select mode is hidden and cannot be selected.

Probe Types

The probe types are not directly set in the "Select steps" submenu. Depending on the probe enabled in Select mode, there are various options for the level test.

- without probe type selected
- with the selected resistance thermometer (RTD) as the probe
- with the selected thermocouple (TC) as the probe
- with the selected mA transmitter (mA) as the probe

6.5.6 Datalogger menu

The menu option DataLogger appears only in the list of select mode (fig. 9), if you selected a test probe (cap. 6.5.1 until 6.5.3).

Thereafter select DataLogger from the select menu with the cursor key and confirm it with the select key. It appears the submenu select logger.

With the help of DataLogger you save the temperature values automatically in the step test (actual value and set point) and you can read off here either directly or appropriate for a PC download.

You have the possibility to admit up to 6 values per calibration and to save all together 8 calibrations (set 1 until 8).

You make the selection with the cursor keys. The activation / deactivation takes place with the select key.

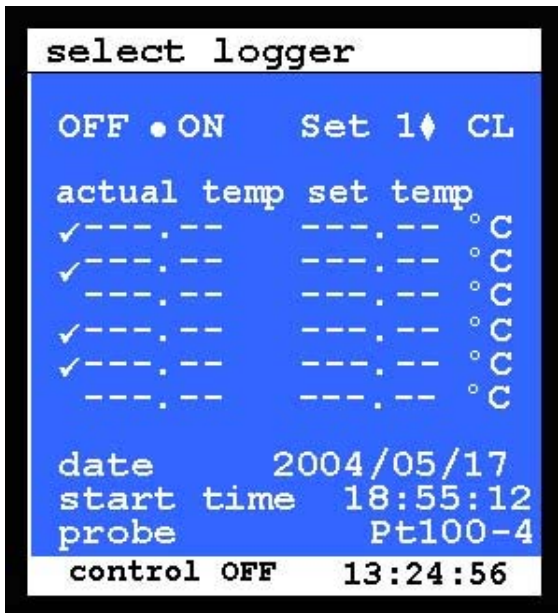


Fig. 15: Submenu select logger

OFF/ON

Here you can switch the DataLogger on respectively off.

As long as the DataLogger stands on OFF, you can make changes (e. g. selection of another memory).

set 1...8

Here you can select the memory set 1...8 in which the calibration values are saved. They are presented until they are deleted by CL.

Attention!

Saved values of calibration are overwritten with repeated selection of the memory.

CL

With this selection you delete the saved values you have put in the selected memory.

actual temp/set temp

Here are indicated the actual and being produced in the step test. Those with „√“ characterized values correspond to those selected in the step test.

date/starting time/probe

Indication of date, time and the selected test probe. These indications are also specified on the inspection record.

Operation steps DataLogger

⇒ Select a test specimen (cap. 6.5.1 until 6.5.3).

- ⇒ Choose the DataLogger at the select menu
- ⇒ Assign the memory set 1...8 and select **ON**. There are showed the „√“ in front of the selected values.
- ⇒ Go to the menu point **step function** and program the desired step test now (like in cap. 6.5.5 described) and start it.
- ⇒ Select again the menu point **DataLogger**. The calibrator starts the step test and each set point is registered together with the inherent actual value when the appropriated step of the step test was started.

You can transfer the saved data with help of RS 232 C on the computer and with the calibration and test software TP 38... of SIKA you can continue the process trouble-free (e. g. construction of calibration tickets).

6.5.7 Display value menu

After selecting the "Display value" menu item in Select mode using the cursor key and confirming your selection with the Select key, the "select display" submenu will be displayed.

The settings for the display area are made in this menu. Make your selection using the cursor keys. Activate/deactivate your selection using the Select key.

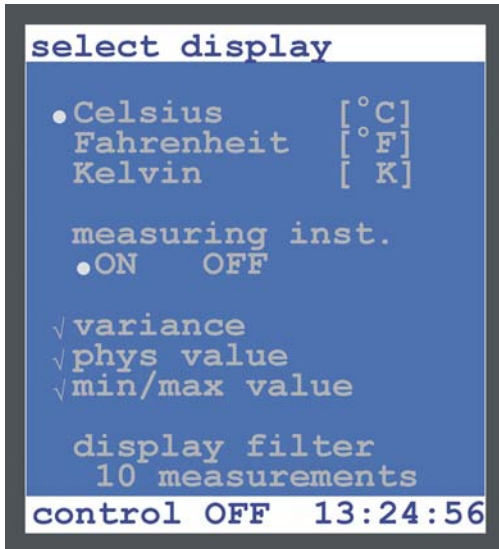


Fig. 16: Submenu select display

Setting Options

Single or multiple selection is possible. In this case, "•" identifies a single selection, "v " identifies multiple selection.

- **Unit selection**
You can choose between degrees Celsius °C, Fahrenheit °F or Kelvin K. The selected temperature units are displayed in the Control, Calibration, Switch test, Level test and Select modes.
- **Measuring inst.**
This menu item is displayed only if an internal measuring instrument is integrated. This is where you can switch it on and off.
- **Variance**
The variance specifies the numeric value of the controlled block temperature stability. The value 0 e.g. means there is no scattering. If an external reference is connected, the variance is based on this external reference. If no external reference is connected, the variance is based on the internal reference. The selection is displayed in Calibration and Level test mode.
- **Phys value**
This menu item is displayed only if an internal measuring instrument is integrated and switched on. If "phys value" is selected:
 - The resistance value of the probe is displayed in Ohm (0.01) for the RTD resistance thermometer
 - The thermal voltage is displayed in μV (0.001) for the TC thermocouples, and
 - The current is displayed in mA (0.001) for mA temperature transmitters.
 If you did not select " phys value", the measured value is displayed as a temperature value in the unit selected, e.g. in °C. The selection is displayed in Control, Calibration and Level test mode.
- **Min/Max value**
Here you can enable/disable the display of the minimum and maximum value. Press the ENTER key to reset these values.
If an external reference is connected, the min/max value is based on this external reference. If no external reference is connected, the min/max value is based on the internal reference. The selection is displayed in Control mode.

- **Display filter**
Below the "display filter" line you can set the display attenuation. The display filter is calculated through averaging. The values are entered using the block of 14 keys. The values entered are confirmed using the ENTER key. The Clear key can be used to delete the selected numeric value. A value of "1" means that display attenuation is not performed. You can select a value between 1 and 99. 10 is preset works. The set display filter is displayed in the Control, Calibration, Switch test, and Level test modes.

6.5.8 System value menu

After selecting the "systemvalue" menu item in Select mode using the cursor key and confirming your selection with the Select key, the "Select System" submenu will be displayed.

The settings for the calibration system are made in this menu. Make your selection using the cursor keys. Activate your selection using the Select key.



Fig. 17: Submenu select system

Setting options

The temperature values and percentages are entered using the block of 14 keys. The values entered are confirmed using the ENTER key. The Clear key can be used to delete the selected numeric value.

- **Language**
In the first line you can select the desired language.
The selected language is displayed in the Control, Calibration, Switch test, Step test and Select modes.
- **Time/Date**
This is where you can refresh the time and date.
The set time is displayed in the Control, Calibration, Switch test, step test and Select modes on the right hand side of the status bar.
- **Brightness and contrast**
Change of the display brightness and contrast in percent. The settings take effect in the Control, Calibration, Switch test, Step test and Select modes. The contrast can be adjusted only by the factory.
- **Alarm**
Here you can enter a temperature, at which the calibrator displays an alarm but continues performing its control functions. The "TEMP-ALARM" alarm message is displayed in the Control, Calibration, Switch test, Step test and Select modes on the left hand side of the status bar.
- **Switch-off**
Here you can enter a temperature, at which the calibrator displays an alarm and switches off the control unit. After switch-off, the program will branch to Control mode. The "TEMP-ALARM" alarm message is displayed in the Control mode on the left hand side of the status bar. The calibrator will remain in Control mode and can be reactivated via the Control key.

- **Working hours**
Displays the total operating time of your calibrator.
- **Work factor**
This is an internal information specifying whether your calibrator was frequently operated in the vicinity of the setting range limits.

6.5.9 Select info menu

After selecting the "info" menu item in Select mode using the cursor key and confirming your selection with the Select key, the "Select Info" submenu will be displayed.

The start screen of the calibrator is displayed. Since it includes only displays set ex works, settings are not possible.



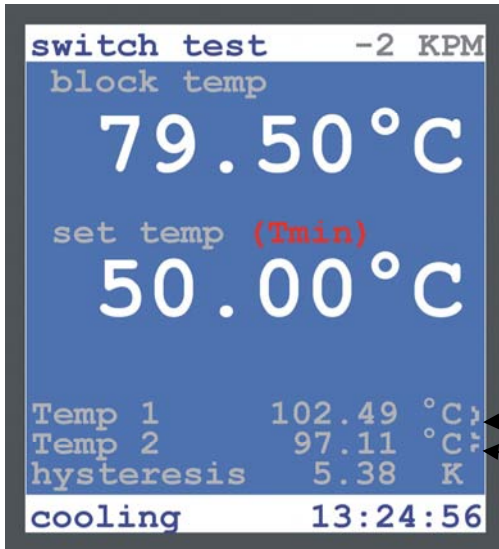
Fig. 18: Submenu select Info

6.6 Description of the switch test mode

Switch test mode is displayed only if an internal measuring instrument is available and switched on.

For a detailed description of the switch test program, please refer to chapter 6.5.4.

⇒ To call switch test mode, you have to select the "Select switch" submenu (refer to chapter 6.5.4) in Select mode and activate it.



The sign behind of the temperature value means:

← The switch is closed

← The switch is open

Fig. 19: Switch test mode

6.7 Description of the step test mode

For a detailed description of the temperature step program, please refer to chapter 6.5.5.

The step test can be performed with and without probe.

The following can be used as probes:

- RTD resistance thermometer
- TC thermocouples
- mA temperature transmitter

⇒ To call up the step test mode **without probe**, you have to select the "Select Stufen" (Select levels) submenu (refer to chapter 6.5.5) in Select mode and activate it.

⇒ To call up the step test mode **with probe**, you have to select the desired probe in Select mode. Selection of the probe is described in the submenus "Select RTD" (chapter 6.5.1), Select TC (chapter 6.5.2) and Select mA (chapter 6.5.3). Thereafter, the "Select steps" submenu (refer to chapter 6.5.5) must be selected and activated.

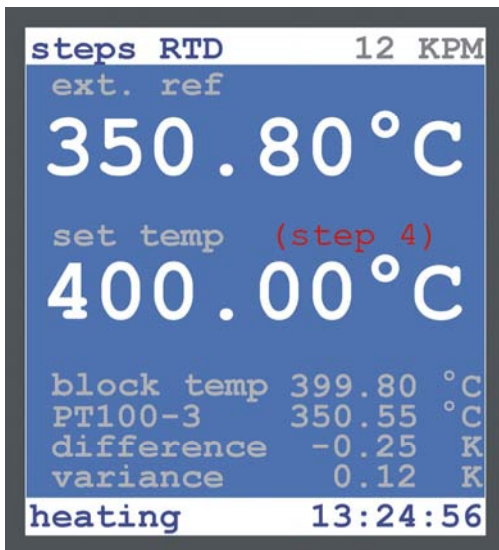


Fig. 20: Step test mode

7 Cooling of the block and replacing the insert

7.1 Cooling of the block

Caution: Risk of burns!

Depending on the type, the block of a calibrator may reach temperatures of up to 650 °C. There is always an imminent hazard of burns.

- Let the calibrator cool after using it.
- Only transport the calibrator after it has cooled completely. The Block temperature should be below 50 °C.
- Then touching the surface of the block, the adaptor insert or the probe, or even when approaching them, there may be an imminent hazard of burns. Never touch these surfaces if you are not absolutely sure that these parts are cold.
- Never leave the «TITLE»temperature calibrator unattended during or after use. Wait until the block has reached room temperature, i.e. 25 °C before «TITLE» packaging it.
- You can accelerate the cooling process by setting the testing temperature to the smallest value possible.

7.2 Replacing the adaptor inserts

Caution! Risk of burns!

The adaptor inserts may reach temperatures of up to 650 °C. Remove the inserts only when they have cooled.

- Let the calibrator cool .
- Use an insert removal tool for removing the adaptor insert, press it together and insert it into the bores provided on the adaptor insert. Then cautiously pull the insert straight up out of the block without canting it.
- Place the insert on a solid, temperature resistant surface.

Do not let the adaptor inserts fall. The edges may be damaged which may lead to jamming of the insert when sliding it back in the block.

8 Troubleshooting

8.1 Replacing the Fuses

The calibrators are equipped with a safety fuse. They are located on the bottom of the calibrator, integrated in the power connection. If the fan does not start of the display remains dark, check the fuse and replace it, if it has blown.

- Replace defective fuses only with fuses with the ratings specified in the present manual.

Calibrator	Fuse	Note
TP 38 165 / TP 38 165 E (for 100...230 V)	6.3 A (T6.3A250V)	slow blowing
TP 38 650 / TP 38 650 E (for 230 V)	6.3 A (T6.3A250V)	slow blowing
TP 38 650 / TP 38 650 E (for 115 V)	10 A (T10A250V)	slow blowing

If a replaced fuse blows repeatedly, the calibrator is probably defective. In this case, send the calibrator to the manufacturer for repair.

8.2 Eliminating Faults

Important!

In view of any warranty claims and your own safety, do not perform repairs yourself. Never open the housing. The housing does not accommodate any components that can be serviced or by the user.

The faults you can eliminate yourself and how to eliminate them is described in the following table.

Fault	Possible cause	Corrective action
Calibrator does not work properly	External influences, e.g. magnetic fields, incorrect supply voltage	Check the applied mains voltage against the supply voltage specified on the type label. Disconnect the power plug. Check the fuse and replace it if defective.
Calibrator is working but heater does not work	Ground wire monitor active	Check the ground wire connection of the calibrator. Re-establish the connection to the ground wire system

9 Recalibration and Adjustment

The temperature calibrators of the TP 38... / TP 38... E series have been calibrated and tested according to accepted standards. Recalibration and adjustment of the calibrator, however, is recommend if used periodically.

There are no compulsory regulations for recalibration intervals of temperature calibrators since these depend on the conditions of application and are thus in the responsibility of the user.

Independent of this fact, we recommend annual recalibration at our DKD calibration workshop. Any recalibration performed by SIKA additionally includes free checking of the functions and internal system parameters. During this process, any measuring deviations are reduced to a minimum within the scope of measurement inaccuracy by proper adjustment. Firmware updates can also be performed.

The DKD calibration certificate gives you the certainty that your calibration results are based on national standards and the measuring deviations do not exceed the error limits specified.

Calibration is a matter of trust. For this reason, entrust only competent DKD calibration workshops that have been certified in compliance with the applicable standard (currently DIN EN ISO/IEC 17025) with the calibration of your valuable calibrators.

Package the calibrators you are shipping for recalibration with great care and use the original packaging, if possible.

To guarantee that the calibration process is performed as fast as possible, we recommend contacting our calibration workshop by phone in advance to make an appointment. Call our calibration laboratory.

The address of our laboratory:

SIKA Dr. Siebert & Kühn GmbH & Co.KG
DKD-Kalibrierstelle
Struthweg 7-9
D-34260 Kaufungen

Germany

Phone no.: (+49) 5605 - 803 -0

Fax no.: (+49) 5605 - 803 - 54

eMail: info@sika.net

10 Transport and Storage

The calibrators TP 38... / TP 38... E are portable units that can be used as flexible calibrators for service purposes on site as well as for operational and laboratory tasks.

- If possible, transport the calibrator in its original case (optionally available). The robust case is tailored to the dimensions and weight of the calibrator and protects it against environmental influences such as impacts, shock, dust, splash water and external damage.
- Wait until the block has reached room temperature, i.e. 25 °C before «TITLE» packaging it.
- Store the TP 38... / TP 38... E devices in a dry place and protect them against dust. The ambient temperature for storage must be between -10 °C and +80 °C.

11 Care and Maintenance

- Always keep the TP 38... / TP 38... E clean and never leave them in dusty or humid rooms.
- Periodically clean the block and inserts to prevent "caking".
- Clean the calibrators after using them. Disconnect the power plug before cleaning them and make sure that the block temperature is below 50 °C.
- Do not use any aggressive cleaning agents. Use a slightly humid, lint-free cloth instead.
- Prevent errors of measurement by keeping the block bores clean at all times. Do not use any filling media for performing measurements.
- If your TP 38... / TP 38... E cannot be switched on, you might have to check and replace the fuse. For more information, please refer to the chapter "Troubleshooting".

12 Disposal

SIKA provides for appropriate disposal of used dry well calibrators. For this purpose, simply return the temperature calibrators of the TP 38... / TP 38... E series to us carriage prepaid.

13 Technical Data

13.1 TP 38 165 / TP 38 165 E (-35 to 165 °C)

Block control unit	with PID controller
Setting of the block temperature	via the calibrator display through a self-explanatory menu structure.
Setting range of the block temperature	between -30 °C and +165 °C
Behavior in the case of excess temperature	Automatic circuit breaker switches off the power supply to cooling/heating elements in the case of illegal heating inside the calibrator
Stability of the heating block controller	+/- 0.01K
Measuring inaccuracy	at 100 °C 0.1 K
Resolution	0.01 K
Accuracy of the heating block controller	+/-0.03 K
Gradients	axially above 4 cm at 160 °C < 0.06 K axially above 4 cm at -35 °C < 0.04 K
Digital actual value display	monochrome display with graphics capabilities with a resolution of 0.01 K
Display in the case of sensor breakage	1
Test bore in the block	Ø 28 mm
Immersion depth	150 mm
Adaptor inserts	with bores from 1.5 mm to 25 mm in increments of 0.5 mm
Power supply	100 ... 240 VAC, +10%/-15%, 50/60 Hz
Power consumption	400 W
Fuse	6.3 A, slow blowing (T6.3A250V)
Width	160 mm
Height	420 mm
Depth of the calibrator	320 mm
Footprint	512 cm ²
Weight	10 kg
Ambient temperature	0...40 °C
Standard ambient conditions	Use permissible indoors only Height up to 2000 m
Overvoltages	Overvoltage category II transient overvoltage as they normally occur in the supply network
Degree of pollution	Degree of pollution 2
Storage temperature	-20...40 °C
Humidity	0...90 % relative humidity
Protection class	IP20
CE conformity	EN61326-1, EN61010-1

13.2 TP 38 650 / TP 38 650 E (Ambient Temperature up to 650 °C)

Block control unit	with PID controller
Setting of the block temperature	via the calibrator display through a self-explanatory menu structure.
Setting range of the block temperature	between ambient temperature and 650 °C
Behavior in the case of excess temperature	Automatic circuit breaker switches off the power supply to the cooling/heating elements in the case of impermissible heating inside the calibrator
Stability of the heating block controller	at 100 °C +/- 0.01 K at 650 °C +/- 0.05 K
Measuring inaccuracy	at 100 °C 0.1 K at 650 °C 0.5 K
Resolution	0.01 K
Accuracy of the heating block controller	+/- 0.1 K
Gradients	axially above 4 cm at 600°C < 0.4 K axially above 4 cm at 100°C < 0.06 K
Digital actual value display	monochrome display with graphics capabilities with a resolution of 0.01 K
Display in the case of sensor breakage	1
Test bore in the block	Ø 28 mm
Immersion depth	150 mm
Adaptor inserts	with bores from 1.5 mm to 25 mm in increments of 0.5 mm
Power supply	230 VAC, +10%/-15%, 50/60 Hz (optional 115 VAC, +10%/-15%, 50/60 Hz)
Power consumption	1,000 W
Fuse (for 230 V)	6.3 A, slow blowing (T6.3A250V)
Fuse (for 115 V)	10 A, slow blowing (T10A250V)
Width	160 mm
Height	420 mm
Depth of the calibrator	320 mm
Footprint	512 cm ²
Weight	10 kg
Ambient temperature	0...40 °C
Standard ambient conditions	Use permissible indoors only Height up to 2000 m
Overvoltages	Overvoltage category II transient overvoltage as they normally occur in the supply network
Degree of pollution	Degree of pollution 2
Storage temperature	-20...40 °C
Humidity	0...90 % relative humidity
Protection class	IP20
CE conformity	EN61326-1, EN61010-1

13.3 Heat-up and Cool-down times

Measuring conditions:

- All periods relate to a reference sensor Pt100/4, D = 6 mm, stainless steel casing
- At full depth the reference sensor is located in the middle of the sleeve
- All periods are throughput periods and do not take the respective required setting time into consideration
- The measurements were carried out at a room temperature of approx. 23 °C

TP38165, TP38165 E:

Heating up:	Period	Cooling down:	Period
-30 °C to -25 °C	0:30 min	165 °C to 150 °C	0:51 min
-25 °C to -15 °C	0:45 min	150 °C to 125 °C	1:13 min
-15 °C to 0 °C	1:01 min	125 °C to 100 °C	1:20 min
0 °C to 25 °C	1:49 min	100 °C to 75 °C	1:35 min
25 °C to 50 °C	2:05 min	75 °C to 50 °C	1:59 min
50 °C to 75 °C	2:31 min	50 °C to 25 °C	2:47 min
75 °C to 100 °C	3:11 min	25 °C to 0 °C	3:55 min
100 °C to 125 °C	4:17 min	0 °C to -15 °C	4:09 min
125 °C to 150 °C	5:46 min	-15 °C to -25 °C	5:35 min
150 °C to 165 °C	8:19 min	-25 °C to -30 °C	5:51 min

TP38650, TP 38650 E:

Heating up:	Period	Cooling down:	Period
25 °C to 40 °C	1:07 min	650 °C to 600 °C	2:30 min
40 °C to 50 °C	0:26 min	600 °C to 550 °C	2:48 min
50 °C to 100 °C	1:31 min	550 °C to 500 °C	3:11 min
100 °C to 150 °C	1:20 min	500 °C to 450 °C	3:45 min
150 °C to 200 °C	1:18 min	450 °C to 400 °C	4:26 min
200 °C to 250 °C	1:25 min	400 °C to 350 °C	5:00 min
250 °C to 300 °C	1:30 min	350 °C to 300 °C	6:03 min
300 °C to 350 °C	1:38 min	300 °C to 250 °C	7:16 min
350 °C to 400 °C	1:46min	250 °C to 200 °C	9:06min
400 °C to 450 °C	2:00 min	200 °C to 150 °C	12:03 min
450 °C to 500 °C	2:04 min	150 °C to 100 °C	18:03min
500 °C to 550 °C	2:15 min	100 °C to 50 °C	37:27 min
550 °C to 600 °C	2:34 min	50 °C to 40 °C	16:22 min
600 °C to 650 °C	3:02 min	40 °C to 25 °C	1:09:36 min

13.4 Technical data of the sensor inputs

Sensor inputs

Resistance thermometer (RTD)

Pt100, Pt500, Pt1000 2, 3 or 4 conductor technology in keeping with DIN EN 60751

Thermocouples (TC)

NiCr/NiAl, type K in keeping with DIN EN 60584-1

NiCr/Ni, type N in keeping with DIN 60584-1

Pt10%Rh/Pt, type S in keeping with DIN EN 60584-1

Pt13%Rh-Pt, type R in keeping with DIN EN 60584

Pt30%Rh-Pt6%Rh, type B in keeping with DIN EN 60584

NiCr/CuNi, type E in keeping with DIN EN 60584-1

Fe/CuNi, type J in keeping with DIN EN 60584-1

Fe/CuNi, type L in keeping with DIN 43710

Cu/CuNi, type T in keeping with DIN EN 60584-1

Cu/CuNi, type U in keeping with DIN 43710

Normal signal input (mA)

0(4)-20 mA, programmable

(The 24V DC transmitter supply can be switched on and off, $I_{\max} = 30 \text{ mA}$)

Resolution and measuring inaccuracy
(Ambient Temperature $T_U = 25 \text{ }^\circ\text{C}$)

Pt100 (DIN EN 60751), 4 conductor technology:

-90.00 up to +850.00 $^\circ\text{C}$: $\pm 0.005 \%$ of the final value $\pm 0.01 \text{ }^\circ\text{C}$

NiCr/NiAl (DIN EN 60584-1):

-90.00 up to +999.99 $^\circ\text{C}$: $\pm 0.007 \%$ of the final value $\pm 0.01 \text{ }^\circ\text{C}$

+1,000.0 up to +1,370.0 $^\circ\text{C}$: $\pm 0.005 \%$ of the final value $\pm 0.1 \text{ }^\circ\text{C}$

Pt10%Rh/Pt (DIN EN 60584-1):

0.00 up to +999.99 $^\circ\text{C}$: $\pm 0.05 \%$ of the final value $\pm 0.01 \text{ }^\circ\text{C}$

+1,000.0 up to +1,760.0 $^\circ\text{C}$: $\pm 0.03 \%$ of the final value $\pm 0.1 \text{ }^\circ\text{C}$

Pt13%Rh/Pt (DIN EN 60584-1):

0.00 up to +999.99 $^\circ\text{C}$: $\pm 0.05 \%$ of the final value $\pm 0.01 \text{ }^\circ\text{C}$

+1,000.0 up to +1,760.0 $^\circ\text{C}$: $\pm 0.03 \%$ of the final value $\pm 0.1 \text{ }^\circ\text{C}$

Pt30%Rh/Pt6%Rh (DIN EN 60584-1):

0.00 up to +999.99 $^\circ\text{C}$: $\pm 0.05 \%$ of the final value $\pm 0.01 \text{ }^\circ\text{C}$

+1,000.0 up to +1,820.0 $^\circ\text{C}$: $\pm 0.03 \%$ of the final value $\pm 0.1 \text{ }^\circ\text{C}$

Fe/CuNi (DIN EN 60584-1):

-90.00 up to +900.00 $^\circ\text{C}$: $\pm 0.005 \%$ of the final value $\pm 0.01 \text{ }^\circ\text{C}$

Fe/CuNi (DIN 43710):

-90.00 up to +900.00 $^\circ\text{C}$: $\pm 0.005 \%$ of the final value $\pm 0.01 \text{ }^\circ\text{C}$

Cu/CuNi (DIN EN 60584-1):

-90.00 up to +400.00 $^\circ\text{C}$: $\pm 0.01 \%$ of the final value $\pm 0.01 \text{ }^\circ\text{C}$

Cu/CuNi (DIN 43710)

-90.00 up to +600.00 $^\circ\text{C}$: $\pm 0.01 \%$ of the final value. $\pm 0.01 \text{ }^\circ\text{C}$

NiCr/CuNi (DIN EN 60584-1):

-90.00 up to +700.00 $^\circ\text{C}$: $\pm 0.005 \%$ of the final value $\pm 0.01 \text{ }^\circ\text{C}$

Normal signal input:

$\pm 0.015 \%$ of the final value $\pm 0.01 \text{ mA}$

Cold junction compensation:

integrated for ambient temperatures between 0 and 60 $^\circ\text{C}$

Precision of the cold junction:

4 mm sockets Pt100 DIN class A ($\pm 0.15 \text{ }^\circ\text{C} + 0.002 * [T]$)

DIN TC- connection Pt100 DIN class B ($\pm 0.3 \text{ }^\circ\text{C} + 0.005 * [T]$)