

Precision-Temperature-Calibrator

Series TP281300

Operating Manual

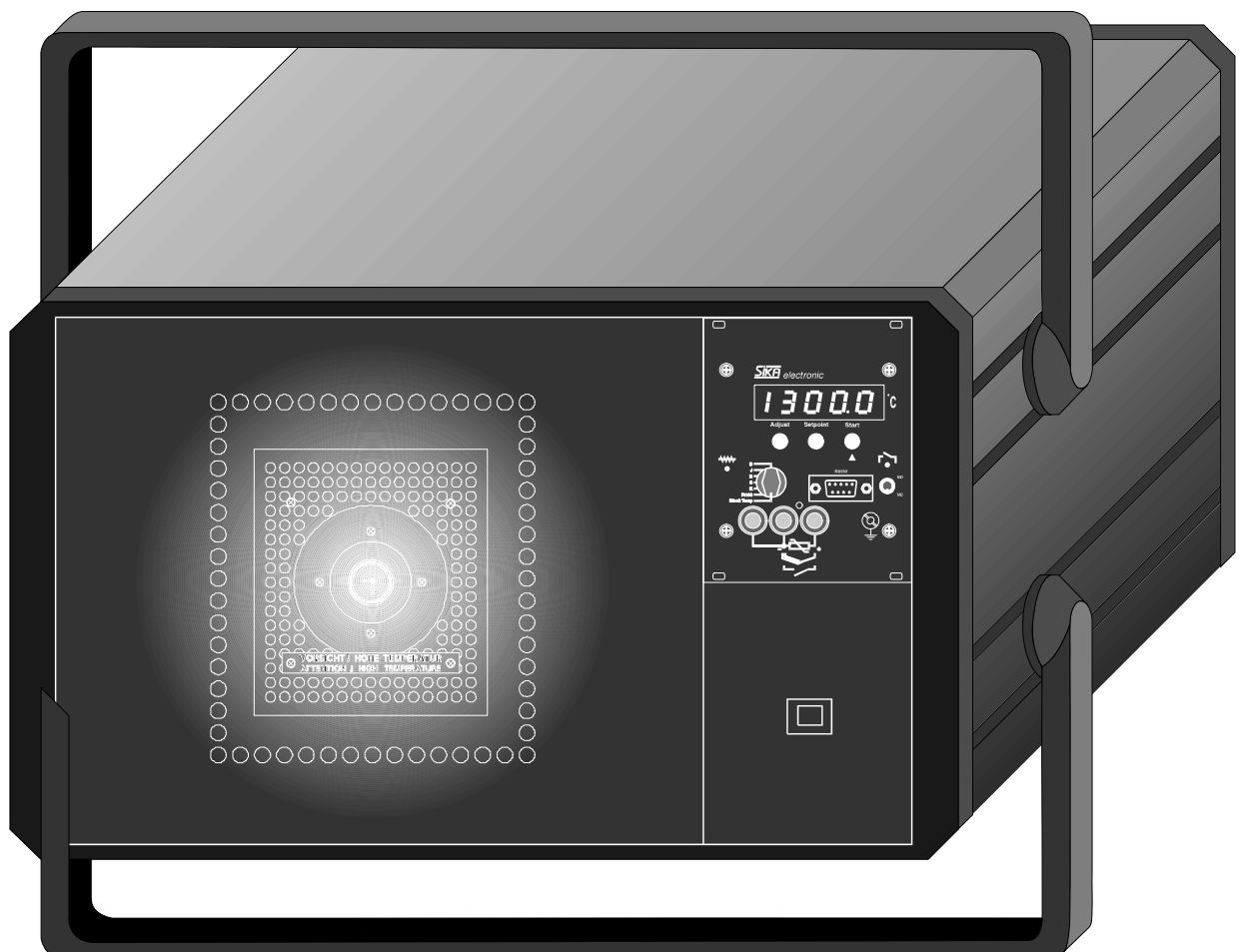


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1 To this manual

The SIKA-Precision-Temperature-Calibrator is an instrument of the TP28000 series. This instrument is exactly a type TP281300 one.

This user manual is focussed to skilled and semi-skilled operators.

Before starting an operation carefully read through the appropriate notes and follow the given sequence of operations.

Read through chapter 'Safety' very thoroughly and exactly remember the pictograms and their meanings.

The instrument is designed for the calibration of temperature switches, thermostats, thermocouples, thermometers and resistance thermometers.

This user manual is divided into eight chapters:

1. General
2. Safety
3. Description of the TP281300
4. Transport, storage and starting the instrument
5. Operating the TP281300
6. Maintenance and care
7. Trouble shooting
8. Specification

For any problems or questions possibly arising, please contact your supplier or SIKA directly:



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2 Safety

The TP281300 represents the state of the art. This applies to measuring accuracy, functional principle and safe instrument operation. Warranting safe operation, however, requires expert and safety-reliable user attitude.

You will find the necessary notes in this chapter below. Warnings, especially related to single operating processes or manipulations, are given at the respective paragraphs of this manual. These warnings are marked by the following symbols:



Caution: High temperature!

This symbol refers to a situation being hazardous for persons.



Danger! Injurious to Health!

This symbol refers to jeopardizing persons by electric power.



Attention: Material damage!

This symbol refers to an action causing damages of the instrument.



Note: This symbol stands for important notes.

The warning:

Attention! High temperature

is directly placed on the instrument as shown below:

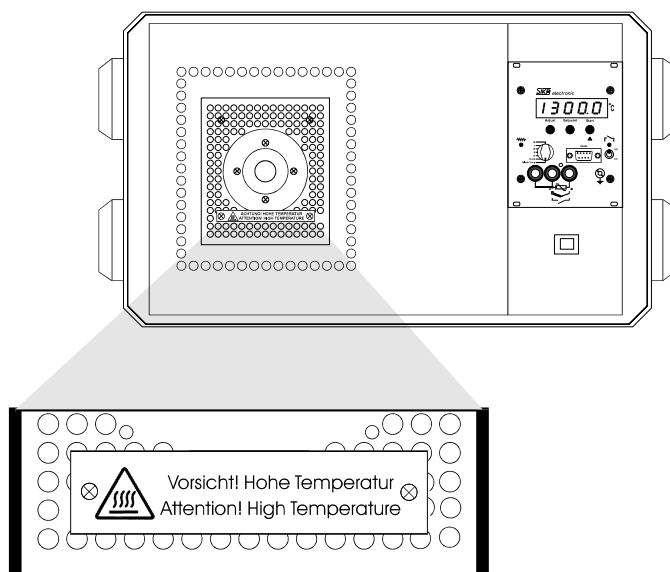


Fig. 1: Magnification enlarge detail

Specific safety notes



Note: The TP281300 has to be exclusively used for testing temperature switches, thermostats, thermometers, thermocouples, and resistance thermometers.

The TP281300 noise level is below 70 dbA.

Remove all easily flammable materials near the instrument and prevent the instrument from contact with easily flammable and explosive materials.

Always ensure sufficient cooling air supply by the built-in fans. Do not hinder air supply by positioning the instrument on a soft and yielding ground.

Connect the instrument to a circuit of low mains-breakdown risk to avoid cooling air supply being stopped in case of mains breakdown.

Take care to keep a distance of at least 1m from devices which react sensitively to electromagnetic fields.

Ensure that transition cases and specimen are not contaminated by media (e.g. oil) causing inflammation or explosion in case of being heated up.

Test the actual heating block temperature before touching the heating block or the transition casing since there is acute danger of being burned.

Never remove transition cases from a heated heating block - heated transition cases can cause inflammation.

Never remove specimen from a heated heating block - acute danger of being burned.

Take note of the DKD technical committee's, "Temperature and Humidity" details for the operation of temperature block calibrators (see appendix).



Note:
Never leave a heated instrument without supervision.

3 Description of the TP281300

3.1 Modular groups and operating components

- | | |
|---------------------------------|---|
| 1) Heating block | 11) NO/NC toggle switch |
| 2) Heating block bore | 12) Interface
(PC connection) |
| 3) Transition casing | 13) Ground Clamp for
specimen's shield |
| 4) Cycle display | 14) Input clamps |
| 5) Display | 15) Rotary switch |
| 6) Mains switch on/off | 16) Note |
| 7) Adjust key | 17) Latching knob |
| 8) Setpoint key | 18) Protective grid |
| 9) Start key | |
| 10) LED - temperature
switch | |

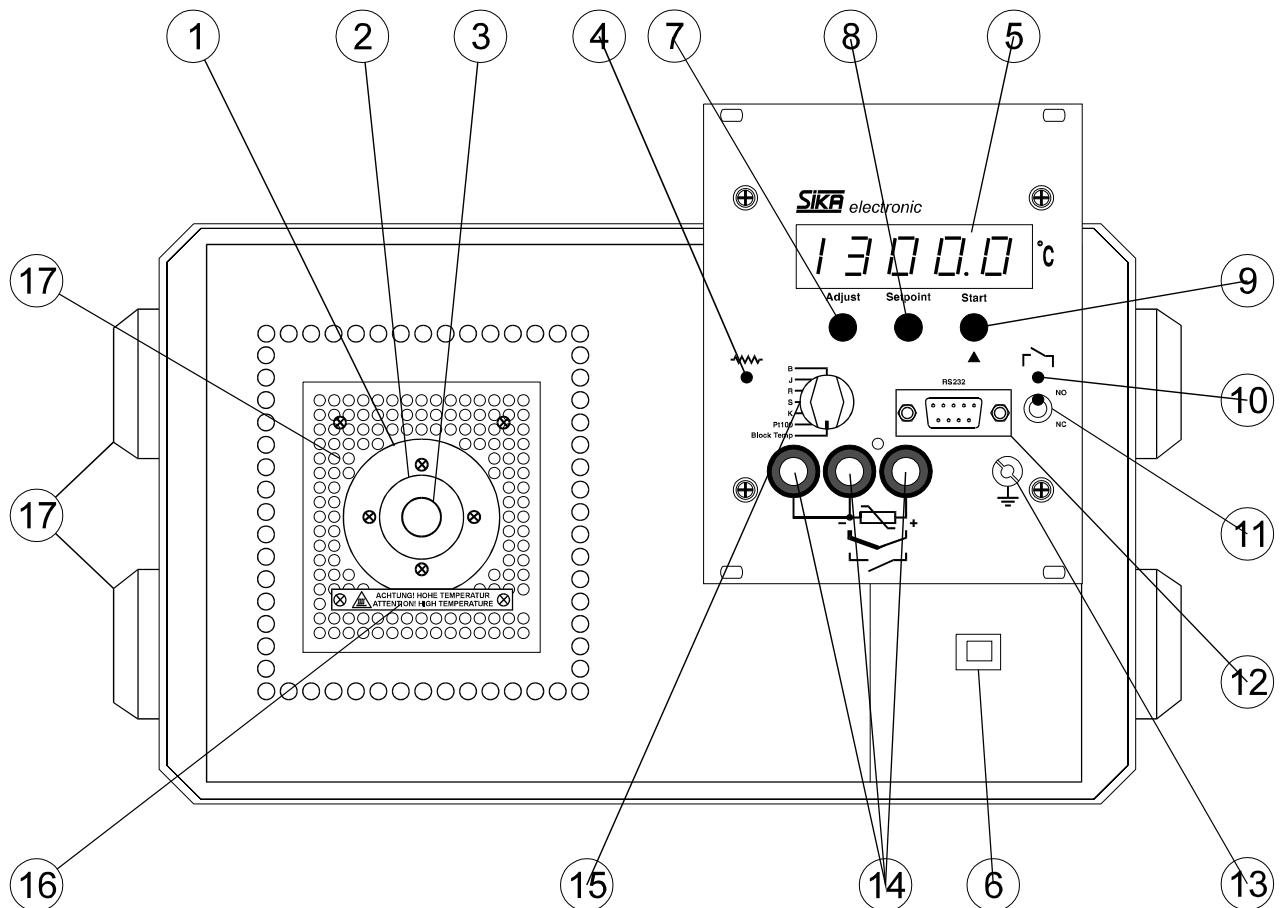


Fig. 2: TP281300 front panel

3.2 Design and function of the TP281300

This precision temperature calibrator is operated by an electronically controlled heating block and allowing to be thermostated up to +1300 °C. The heating block has a bore serving ② as location hole for the specimen. An transition casing ③ can be inserted in that bore. The casing serves as an adapter between specimen (temperature switch, thermostat, thermocouple, thermometer, resistance thermometer) and heating block bore. The heating block is insulated against the housing.



Caution! The top side of the heating block is provided with a protective grid ⑱ and an overheat warning.

The display ⑤ indicates - acc. to the position of rotary switch ⑮ - the temperature of the heating block or the specimen. It is a 4 1/2-digit display with an accuracy of 0.5 K.

Set the desired heating block temperature by manipulating the setpoint key ⑧ or the start key ⑨. It is possible to set the desired temperature with an accuracy of 0.5 K. The adjust key ⑦ serves for controlling stable heating block temperature levelling.

The input clamps ⑭ connect the specimen's contacts with the instrument.

The ground clamp ⑬ connects the specimen's shields with the instruments.

The rotary switch ⑮ allows switching over between heating block temperature and the temperature of the respective specimen tested.

LED ⑩ and NO/NC toggle switch ⑪ are necessary for testing temperature switches.

The RS 232C interface ⑫ is used to connect the instrument to a computer.

3.3 TP281300 standard units

3.3.1 Sensor inputs

The following test inputs are standard outfit:

B	Pt30%Rh/Pt16%Rh thermocouple, Typ B (DIN EN 60584-1)
J	Fe/CuNi thermocouple, Typ J (DIN EN 60584-1)
R	Pt13%Rh/Pt thermocouple, Typ R (DIN EN 60584-1)
S	Pt10%Rh/Pt thermocouple, Typ S (DIN EN 60584-1)
K	NiCr/NiAl thermocouple, Typ K (DIN EN 60584-1)
Pt100	Pt100 resistance thermometer, 3-wire (DIN EN 60751)

Block Temp indicating the heating block temperature

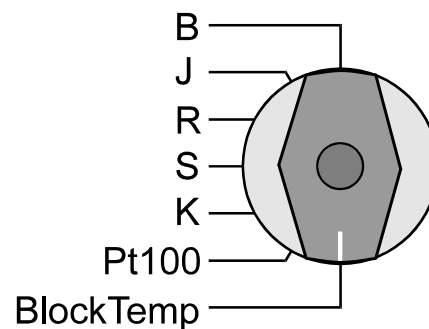


Fig. 3 TP281300 rotary switch

3.3.2 Mains cable

A mains cable for power supply is enclosed to the TP281300.

3.3.3 Casing grab

A grab for taking out the transition casing is enclosed to the TP281300.

3.3.4 PC connection

A data transfer cable is enclosed to the instrument.

The TP281300 is provided with a RS 232C serial interface. It is bidirectional, i.e. it is possible to transmit data for further processing by a superior computer and to receive data for programming the instrument by a superior computer as well.

The transmitting mode continuously transmits a couple of measuring values - the actual block temperature and the temperature value displayed. The transmitting protocol has 16 bytes total. All information is transmitted in ASCII.

Transmitting protocol

Byte	Value	Explanation
0	02	STX (start of text, start of protocol)
1	„B“	The following bytes 2...7 show the information of the block temperature
2	„+“, „-“ „!“	mathematical sign of the block temperature invalid block temperature
3	„0“ ... „9“	10 ³ digit, block temperature
4	„0“ ... „9“	10 ² digit, block temperature
5	„0“ ... „9“	10 ¹ digit, block temperature
6	„0“ ... „9“	10 ⁰ digit, block temperature
7	„0“ ... „9“	10 ⁻¹ digit, block temperature
8	„B“ „P“ „K“ „S“ „R“ „J“ „A“	kind of sensor of the temperature displayed Block temperature Pt100 NiCr/NiAl Pt10%Rh-Pt Pt13%Rh-Pt Fe/CuNi Pt30%Rh-Pt16%Rh
9	„+“, „-“ „!“	mathematical sign of the sensor temperature invalid sensor temperature
10	„0“ bis „9“	10 ³ digit, sensor temperature
11	„0“ bis „9“	10 ² digit, sensor temperature
12	„0“ bis „9“	10 ¹ digit, sensor temperature
13	„0“ bis „9“	10 ⁰ digit, sensor temperature
14	„0“ bis „9“	10 ⁻¹ digit, sensor temperature
15	03	ETX (end of text, end of protocol)

The transmitting parameters are adjusted to:
9600 baud, 8 data bits, 1 stop bit, odd parity.

In the receiving mode the TP281300 can record data for the control of those functions being also adjustable by the setpoint and start keys. This means that a superior control computer can set new required values and actuate temperature switch test release. The receiving protocol has 9 bytes total. All information is received in ASCII.

Receiving protocol

Byte	Value	Explanation
0	02	STX (start of text, start of protocol)
1	„E“	release temperature switch test
	„A“	block temperature switch test
2	„+“	sign required value
	„!“	do not enter new required value
3	„0“ ... „9“ or „X“	10 ³ digit, required value
4	„0“ ... „9“ or „X“	10 ² digit, required value
5	„0“ ... „9“ or „X“	10 ¹ digit, required value
6	„0“ ... „9“ or „X“	10 ⁰ digit, required value
7	„0“ ... „9“ or „X“	10 ⁻¹ digit, required value
8	03	ETX (end of text, end of protocol)

The receiving parameters are adjusted to:
9600 baud, 8 data bits, 1 stop bit, odd parity

Superior control computer transmitting the byte sequence:

Byte	Value	Explanation
0	02	STX (Start of Text, start of protocol)
1	„!“	transmit parameters
2	03	ETX (end of text, end of protocol)

requests the TP281300 to transmit the stored information on instrument type, required value and temperature switch state to the control computer. The TP281300 replies this prompt by singly transmitting the byte sequence:

Byte	Value	Explanation
0	02	STX (start of text, start of protocol)
1 ... 7	„TP28130“	information on kind of instrument
8	„S“	stored required value
9	„+“, „-“	signs of stored required value
10	„0“ ... „9“	10 ³ digit, stored required value
11	„0“ ... „9“	10 ² digit, stored required value
12	„0“ ... „9“	10 ¹ digit, stored required value
13	„0“ ... „9“	10 ⁰ digit, stored required value
14	„0“ ... „9“	10 ⁻¹ digit, stored required value
15	„T“	stored temperature switch state
16	„0“	temperature switch blocked
	„1“	temperature switch released
17	03	ETX (end of text, end of protocol)

Inputs

Input level +/- 30 V max.

Low level: + 2.5 ... +30V

High level: -30 ... +0.8V

Input impedance: 3...7 K

RxD Received data

CTS Clear to send

Outputs

Output level +/- 9 V, +/- 5 V min.

Low level: + 5 V min.

High level: - 5 V min.

TxD Transmitted Data

RTS Request to send

3.3.5 PC terminal plann

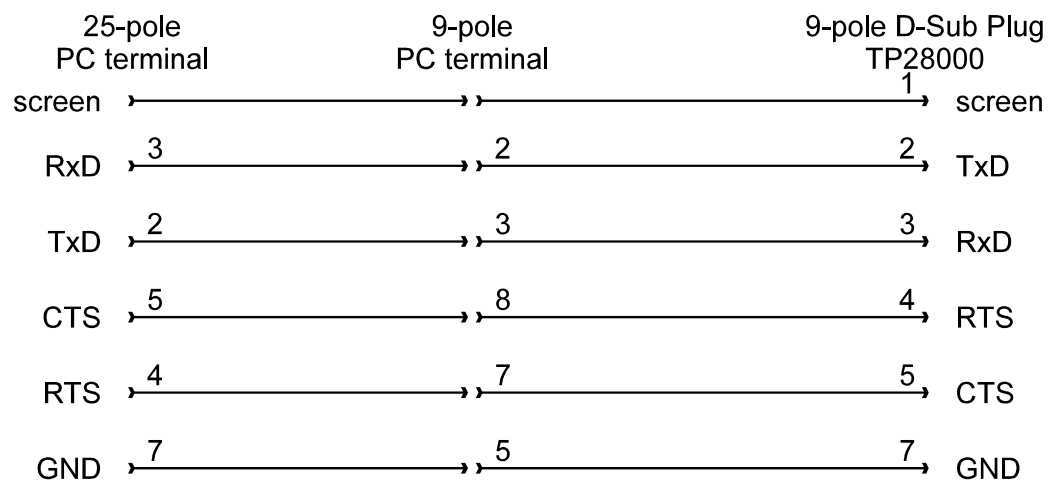


Fig. 3: PC terminal plann

3.4 Accessories

3.4.1 Transition casings

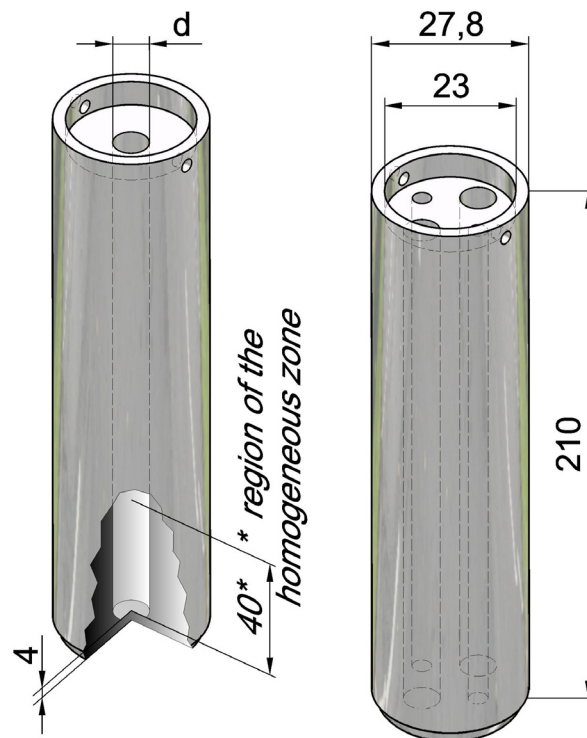
Transition casings are necessary to keep the differences in temperature between the test piece and the heating block as low as possible.

The 28mm diameter of the heating block borehole is reduced to the size of the outer diameter of the test piece using the transition casing.

Therefore, the bore hole of the transition casing may be at most 0.5mm larger than the outer diameter of the test piece within the temperature range of 400...660 °C, and at most 1.0mm within the range of 660...1300 °C.

The transitional casings can be supplied with an inner diameter of 1.5...25mm in 0.5mm intervals.

The transition casings can be manufactured in various designs, according to customer requirements. Transition casings are also available with multiple bore holes.



3.4.2 Software

Efficient software is available for TP28000 series instruments. This software allows the remote control of the instrument by a PC and carrying out data acquisition and evaluation.

4 Transport, storage and starting the instrument

4.1 Transport

The TP281300 testing instrument is a portable unit for versatile service purposes as well as for industrial and laboratory tasks. It is provided with a handle attached on its side and being brought to any position by depressing the lateral latching knobs ^⑰. For bearing the instrument bring the handle into vertical position until handle locks.



Attention:

For transport, e.g. to recalibration, use original packing to avoid any damage

4.2 Storage

Store the TP281300 dust-proof and at a dry place. The ambient temperature between -10 °C and +80 °C during storage has to be warranted.

4.3 Starting the instrument

4.3.1 Proper use

Use the TP281300 exclusively for testing temperature switches, thermostats, thermocouples, thermometers and resistance thermometers within the given temperature range.

4.3.2 Expectable misuse

Ensure that the testing temperature is suitable for the specimen to prevent the specimen from being destroyed.



Caution: Remove all easily flammable media from the surrounding of the instrument and prevent the instrument from contact with easily flammable and explosive materials

4.3.3 Positioning and connecting the TP281300

Check-ups before starting



Attention: When positioning the instrument ensure that the fan in the instrument's bottom can supply enough air. Do not position the instrument on a soft and yielding ground.



Attention: When installing the TP281300, take care to keep a distance of at least 1m from devices which react sensitively to electromagnetic fields.

Before starting bring the instrument in its normal operating position.

Procedure:

- Always position the TP281300 in vertical position.
- If the TP281300 is not being vertically positioned an even temperature distribution within the heating block is not warranted.
- Check specifications.
- Compare the label with specification.



Caution:
Check the heating block bores for being clean and undamaged. Do not use filling media.

Check for:

- the specimen
- the transition casing
- the heating block bore exactly matching to each other.
- Keep the thermal contact resistance as low as possible.

Connect the instrument to a circuit of low mains breakdown risk to avoid cooling air supply stoppage in case of mains breakdown.

Check for:

- the fan starting operation when being connected to the mains.



Take note of the DKD technical committee's, "Temperature and Humidity" details for the operation of temperature block calibrators (see appendix).

5 Operating the TP281300

5.1 Operating and setting up the TP281300

5.1.1 Before starting the TP281300

Select place

Position the TP281300 so that there is enough space for the fan in the instrument's base to produce sufficient cooling air. Otherwise, insufficient cooling causes damage and destructs the instrument.

Take care to keep a distance of at least 1m from devices which react sensitively to electromagnetic fields.



Note:

Put the TP281300 into vertical position for calibrating to warrant optimal temperature spreading and transmission.

You can vary the position of the TP281300 carrying handle by depressing the grey pushbuttons in it's rotary joint.

Ground state before switching on

Turn rotary switch into position „BlockTemp“.

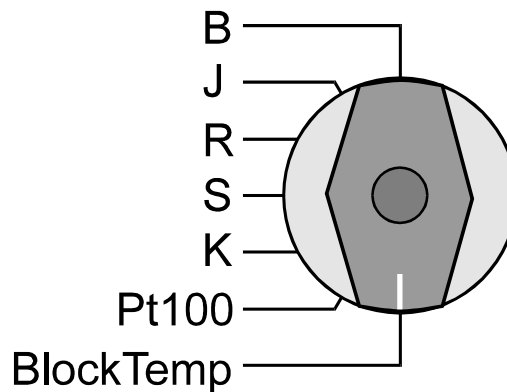


Fig. 4 Rotary switch ground position

5.1.2 Establishing the Initial state

To clear all stored values of the TP281300, you can set the instrument to a defined initial state.

Procedure:

1. Apply mains voltage.
The fan in the instrument's base begins to operate.
2. Depress setpoint key and keep it depressed.
3. Turn mains switch into EIN (ON) „I“.
4. Release setpoint key.
5. For some seconds "CAL" appears on the display (Calibration of the built-in electronic).
6. You hear a click with „StOP“ appearing on the display. The fan steps into the second stage
7. Depress start key.

5.1.3 Starting the TP281300

The testing temperature set last remains stored in the TP281300. After starting the TP281300 the temperature of the heating block rises up to that one stored.

Procedure:

1. Apply mains voltage.
The fan in the instrument's base begins to operate.
2. Turn mains switch into EIN (ON) „I“.
3. For some seconds "CAL" appears on the display (Calibration of the built-in electronic) and then "StOP".
4. You hear a click with „StOP“ appearing on the display. The fan steps into the second stage.
5. Depress start key.
The heating block is now heated up to the testing temperature set last.
6. Turn rotary switch into position „BlockTemp“.
The actual temperature of the heating block is displayed.
7. Depress setpoint key.
Flashing „SOLL“ is displayed.
8. Depress start key.
Flashing required temperature (testing temperature) is displayed.



Note: For changing the set testing temperature - see paragraph 5.1.4 „Setting the testing temperature“.

5.1.4 Setting the testing temperature

Set new testing temperature as described below.

With the aid of the setpoint and start keys you can set the testing temperature with an accuracy of 1/10 K.

The temperature is displayed in 0,5 °C intervals.

Procedure:

1. Apply mains voltage.
2. Turn mains switch into EIN (ON) „I“.
3. Turn rotary switch into „BlockTemp“.



Note: Undepressed key for approx. 30 sec stops programming for safety reasons and resets the instrument on „StOP“. Then you have to start the instrument again - see paragraph „Starting the TP281300“).

4. Depress start key.
5. Depress setpoint key.
Testing temperature set is displayed.
6. Depress start key again.
Flashing 1/10-digit of testing temperature is displayed.
7. Depress start key frequently until the desired 1/10-value is displayed.
8. Depress setpoint key.
1/10-digit confirmed, flashing unit place is displayed.
9. Depress start key frequently until desired unit place is displayed.
10. Depress setpoint key.
Unit place confirmed, flashing ten's place is displayed.
11. Depress start key frequently until desired ten's place is displayed.
12. Depress setpoint key.
Ten's place confirmed, flashing hundred's place is displayed.
13. Depress start key frequently until desired hundred's place is displayed.
14. Depress setpoint key.
Hundred's place confirmed, flashing thousand's place is displayed.

15. Depress start key frequently until desired thousand's place is displayed.
16. Depress setpoint key.
Thousand's place confirmed, flashing „SoFF“ is displayed.
17. Depress setpoint key again.
The actual heating block temperature is displayed.
18. The heating block is heated up to the set testing temperature.



Note: During programming it is important that the desired set value is within the temperature range 400,0 and 1300,0 °C. Set values outside of this range will be interpreted as an error from the fitted micro-processor and the error message "Err" is displayed. After pressing the "Start"-key a correct set value must be programmed.



Note:
If the instrument should be cooled down to ambient temperature, the set value "000.0" must be programmed.

Fine balancing of the testing temperature

After having programmed the TP281300 for a new required value, the heating block is heated up or cooled down to the new temperature. For reasons of external interference it can happen that the heating block does not directly attain the testing temperature set. This would mean a difference between the required temperature (testing temperature) and the actual one displayed. The TP281300, however, has an automatic adjusting function serving for automatic difference balancing. The incorporated microprocessor is continuously calculating the actual-/required-value difference and thus controlling the heating block.

Fine balancing is useful, only after heating block temperature control levelled out on the final temperature value level. The microprocessor checks for calling up fine balancing.

The microprocessor does fine balancing with the following fine balancing preconditions fulfilled:

1. Actual heating block temperature deviation from set testing temperature not more than $\pm 25K$.
2. Actual heating block temperature does no longer vary (constant temperature displayed).

With the aid of the adjust key you can check for the fine balancing already done by the microprocessor.

Procedure:

1. Depress adjust key.
2. Flashing „Adj“ is displayed when the heating block temperature is levelled out. If the display remains dark the heating block temperature isn't still levelled out.
3. Wait for some minutes, then carry out the test a second time.
4. Depress adjust key again.
5. The temperature of the heating block is displayed.

5.1.5 Block and sensor temperature stability**Block temperature stability**

As long as the heating block temperature display is flashing the heating block isn't still levelled out on the set required value. In case of constant heating block temperature display the temperature is on the set level.

The microprocessor checks up the following heating block stable temperature criteria:

1. Actual heating block temperature does no longer vary (constant temperature displayed).
2. The difference between programmed actual and required temperature value is less than 0.5 K.

Sensor temperature stability

Turn rotary switch into the symbol for the temperature sensor connected.

Flashing sensor temperature display means a still varying one. With the final sensor temperature level being attained sensor temperature is constantly displayed.

5.2 Connecting specimens



Attention:

**Connect specimens acc. to their specification
Connect the specimens shield to the ground clamp.**

Different specimens can be calibrated:

- thermometers
- temperature switches
- thermostats
- thermocouples
- resistance thermometers

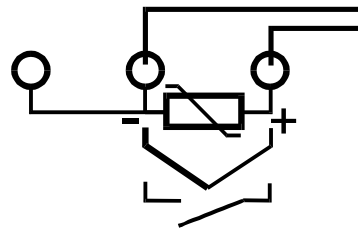
Insert the thermometer into the appropriate transition casing.



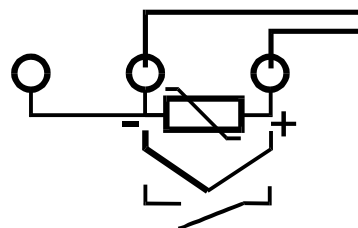
Caution: Injurious to health - cracking thermometer.

Always observe the maximum temperature capacity of the thermometer.

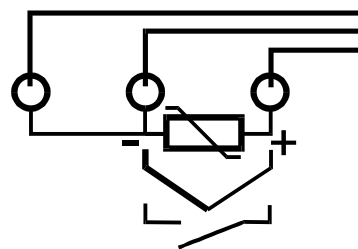
- Temperature switches and thermostats switching on or off after having attained the temperature set.
Connect the temperature switch as shown below:



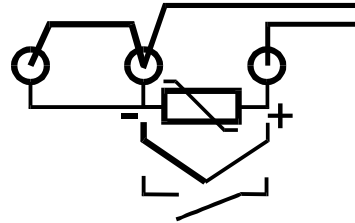
- Thermocouples measuring an actual temperature:



- 3-wire circuited resistance thermometers measuring an actual temperature.
Connect the resistance thermometer as shown below:



- 2-wire circuited resistance thermometers measuring an actual temperature.
Connect the resistance thermometer as shown below:



5.2.1 Testing temperature switch



Caution:

Burning heat: Let the TP281300 cool down after use (see paragraph „Cool down heating block“).

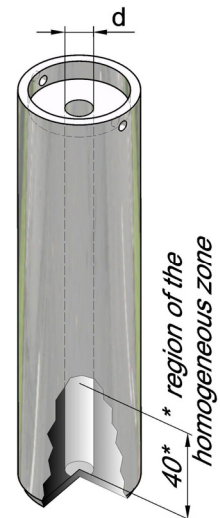


Note:

To obtain an exact measuring result the specimen has to fit properly in the bore of the heating block or of the transition casing.

Prerequisites for exact results:

- The outer diameter of the test piece matches the inner diameter of the bore hole (--->Sect. 3.4.1 "Transition casings").
- The calibrating instrument is in vertical position.
- Unbended specimen.
- Insert the specimen in dry state directly into the bore of the heating block or in that one of the appropriate transition casing.
- The measuring element of the sensor is located in the region of the homogeneous zone* of the calibrator heating block.



Note:

Before starting the measurement the specimen must have obtained the temperature of the block.

Give the specimen enough time for coming up to the block temperature level.

Procedure:

1. Turn rotary switch into position „BlockTemp“.
2. A temperature switch can open or close when reaching the test temperature.
 - For testing a closer set toggle switch on position „NO“.
 - For testing an opener set toggle switch on position „NC“.
3. Set test temperature of the heating block (see paragraph „Setting the test temperature“).
4. Depress setpoint key.
Flashing „SOLL“ is displayed.
5. Depress setpoint key again.
Flashing „SOFF“ (SOFF = switch: off) is displayed.
6. Depress start key.
Flashing „SON“ (SON = switch: on) is displayed.
7. Depress setpoint key.
Actual heating block temperature is displayed.
8. The specimen switches (closes or opens) when the resp. test temperature is attained.
 - The calibrating instrument indicates the switching of the specimen by the green LED and by an acoustic signal.

To finish temperature switch testing heating block the testing function as follows:

1. Depress setpoint key.
Flashing „SoLL“ is displayed.
2. Again depress setpoint key.
Flashing „SoFF“ (SoFF = switch: off) is displayed.
3. For input confirmation: Depress setpoint key.
Actual heating block temperature is displayed.

5.2.2 Testing thermocouples and resistance thermometers



Caution:

Burning heat: Let the TP281300 cool down after use (see paragraph „Cool down heating block“).



Note:

To obtain an exact measuring result the specimen has to fit properly in the bore of the heating block or of the transition casing.

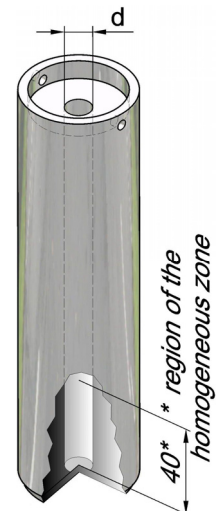


Caution:

Burning heat around the specimen's diameter. The specimen adapts the heating block temperature which can be up to 1300 °C. Remove specimen only after complete cooling-down of the heating block.

Prerequisites for exact results:

- The outer diameter of the test piece matches the inner diameter of the bore hole (--->Sect. 3.4.1 "Transition casings").
- The calibrating instrument is in vertical position.
- Unbended specimen.
- Insert the specimen in dry state directly into the bore of the heating block or in that one of the appropriate transition casing.
- The measuring element of the sensor is located in the region of the homogeneous zone* of the calibrator heating block.



Note:

Before starting the measurement the specimen must have obtained the temperature of the heating block.

Give the specimen enough time for coming up to the heating block temperature level.

Procedure:

1. Turn rotary switch into position „BlockTemp“.
2. Clamp specimen.
3. Check kind of sensor.

The following sensors can be chosen:

- | | |
|----------|--|
| B | Pt30%Rh/Pt16%Rh thermocouple, Typ B (DIN EN 60584-1) |
| J | Fe/CuNi thermocouple, Typ J (DIN EN 60584-1) |

Switch setting

R	Pt13%Rh/Pt thermocouple, Typ R (DIN EN 60584-1)
S	Pt10%Rh/Pt thermocouple, Typ S (DIN EN 60584-1)
K	NiCr/NiAl thermocouple, Typ K (DIN EN 60584-1)
Pt100	Pt100 resistance thermometer, 3-wire (DIN EN 60751)

Block Temp indicating the heating block temperature

4. Turn rotary switch into the respective position.
The temperature measured by the specimen is displayed.
5. Turn rotary switch into position „BlockTemp“.
Actual heating block temperature is displayed.
6. Compare heating block temperature with the temperature display of the specimen.

5.3 Cooling down heating block



Caution:

Burning heat. Let the TP281300 cool down after use.

Transport the TP281300 only after being completely cooled down.

Burning heat on the heating block's surface.

Burning heat at specimen.

Never touch heating block or specimen surface.

Never leave the TP281300 unobserved after use.

Wait until the heating block has attained ambient temperature before packing the TP281300.

It is possible to enhance cooling by zeroing the test temperature (see paragraph „Setting the test temperature“).

Remove transition cases.



Caution:

Burning heat. The transition cases can be heated up to 1300 °C. Only remove the cases in cooled state.

1. Compress supplied casing grabs and fit into the transition casing bores.
2. Remove transition casing.

6 Maintenance and Care

6.1 Care



Attention:

Always keep the TP281300 clean and do not leave it in dusty and moisty rooms.

Clean the TP281300 after each use.



Attention:

Avoid measuring errors by always keeping the heating block bores clean and never using filling media for measuring.

6.2 Maintenance

When switching on your TP281300 is not possible check the fuses and exchange, if necessary.

Fuses inside the TP281300 housing.



Danger:

Electric voltage.

Before exchanging the fuses disconnect mains plug.

Check the fuses

(see paragraph „Checking and exchanging the fuses“).

Exchange fuse in case of defect.

6.2.1 Recalibration

The TP281300 is adjusted and tested by the manufacturer acc. to the accepted standards.

On the basis of the DIN ISO 10 012 standard the TP281300 has to undergo testing within fixed intervals of time.



Note:

Use original packing to mail the TP281300.

Therefore, we recommend to send the TP281300 to our factory for recalibration or readjustment within intervals of at maximum 12 months or after 500 operating hours.

6.2.2 Checking and exchanging the fuses

The TP281300 is equipped with two fuses which have to be checked and exchanged, if necessary.

1. Mains unit fuse

Check the fuse at mains input when switching on the TP281300 and

- in case the fan does not start, or
- nothing appears on display.

Procedure:



Danger:

Electric voltage, injurious to health.

Before exchanging the fuses, disconnect mains plug.

1. Disconnect mains plug.
2. Put instrument's topside down.
3. Pull out mains cable.
4. Using a screw-driver turn out mains cable cap.
5. Remove cap.
Now fuse (T6.3 250V) is visible.
6. Check fuse.



Warning: avoid the destruction of the TP281300.

Only use fuses with the values of T6,3 250V (6,3A delay action, 250VAC).

7. In case of defect fuse can be exchanged for spare one in the cap.
8. Exchange fuse and refix cap.

2. Electronics fuse

Check electronics fuse when switching on the TP281300 and nothing appears on display.

Procedure:



Danger:
Electric voltage, injurious to health.
Before exchanging the fuses, disconnect mains plug.

1. Disconnect mains plug.
2. Loosen all four screws on front plate.

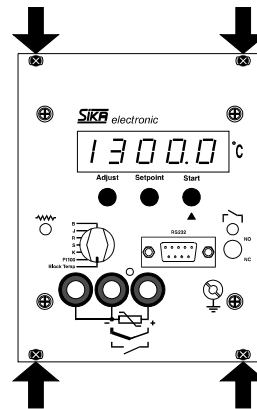


Fig. 5: Electronics unit front plate



Note: Stiff plug-and-socket connection of electronics unit.

3. Slowly pull electronics unit ① upward until electronics is disconnected

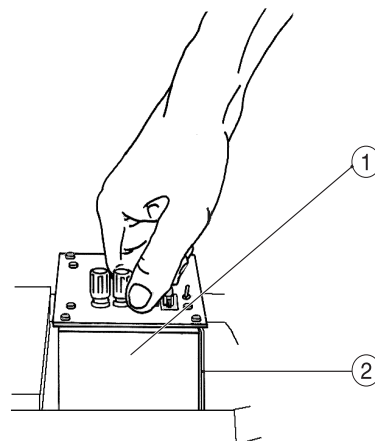


Fig. 6: Removing electronics unit

4. Remove electronics unit and reverse.
Fuse position is now visible.

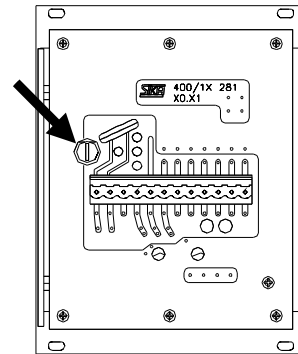


Fig. 7: Back of the electronics unit

5. Screw out fuse and check.
6. In case of defect fuse always insert a new T40 250 V
(40 mA slow, 250 VAC) one.
7. Screw in fuse.



Note:

Insert electronics unit ① together with guide plate ② into guide bar.

8. Insert electronics and tighten.

6.2.3 Recycling

SIKA factory guarantees for expert recycling.
Therefore return the TP281300 free of charge.

7 Trouble shooting



Note:

This table shows how to carry out trouble shooting.

Trouble	Cause	Remedy
TP281300 not in proper function.	External influence, e.g. magnetic fields, incorrect supply voltage.	Test applied mains voltage and compare to that one given on the label. Disconnect mains plug. Check fuses and exchange in case of defect.
Nonsensical symbols and values displayed.	-/-	Set instrument into ground state (see par. 5.1.2).
TP281300 goes into standby. „StOP“ is displayed. Display zeigt: „ERR“	Adjust, setpoint or start keys were depressed. Programming not finished.	Again depress start key, then TP281300 starts measuring procedure.
TP281300 goes into error position. „Err“ is displayed.	Wrong testing temperature programmed.	Depress start key and repeat entry.
TP281300 goes into error position. „Err“ is displayed.	Internal heating block sensor defect.	Heating block sensor exchange at the manufacturer.
The heating block heats up to a temperature of approx. 1315 °C. The TP281300 switches the stabiliser off Display shows "ERR"	Failure of the internal block sensor.	Heating block sensor exchange at the manufacturer.
	Automatic switch off when controls overshoot.	Let instrument cool down. The control system will turn back on at < 1300 °C. If needed, initially approach a lower control input.
The entire heating circuit is switched off by a temperature fuse.	The heating block heats up to a temperature of approx. 1330 °C.	Let instrument cool down. A factory inspection is necessary if the error occurs again.



Note:

In case the instrument is still in improper function after the above trouble shooting it has to be checked at the manufacturer.

8 Specification

Setting the heating block temperature:

by required value programming
check by „Adjust“ function between 400,0°C and 1300,0 °C

Heating times:

Changing temperature	Heating-up time *)
400°C to 1300°C	90 min
400°C to 600°C	90 min
600°C to 800°C	80 min
800°C to 1000°C	75 min
1000°C to 1200°C	70 min

*) It is necessary to factor in an additional 30 minutes of adjustment time

Cooling times:

Changing temperature	Cooling times *)
1300°C to 1000°C	20 min
1000°C to 800°C	20 min
800°C to 600°C	30 min
600°C to 400°C	50 min

*) It is necessary to factor in an additional 30 minutes of adjustment time

Heating block temperature balancing:

400 ... 1300 °C with 0,5 K resolution

Heating block control accuracy:

± 2 K

Heating block control stability:

± 0,5 K

Heating block control / Measuring element in heating block:

PID-controller / Pt10%RH-Pt with automatic cold-junction compensation for environmental temperatures between 0°C and 60°C.

Actual value display:

4 ½ -digit / 7-segment LED of 14 mm height

Exceeding range / sensor break:

„-OFLO“/„OFLO“ display

Sensor break for control unit:

Heating voltage switched off, „ERR“ displayed

Temperature safety system in case of exceeding limit:

2 independently operating safety devices by approx. 1315 °C und 1330 °C, heating voltage switched off

Power supply / power consumption:

230 V, 50/60 Hz, ca. 1200 VA

(optionally): 115 V, 50/60 Hz, ca. 1200 VA**Heating block bores:**

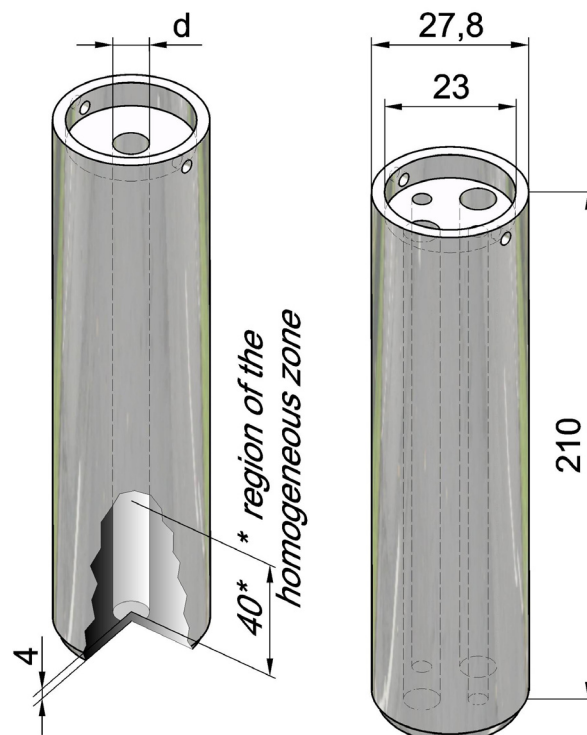
TP281300/28/200: depth 200 mm, diameter Ø 28 mm

Transition casing bore:

TP281300/28/200:

The transition casings can be supplied with an inner diameter from d 1.5...25mm in 0.5mm intervals.

Special transition casings can be manufactured in various designs according to customer requirements. Transition casings are also available with multiple bore holes.



Temperature sensor inputs:

Pt100, 2- or 3-wire acc. to DIN EN 60751
NiCr/NiAl, K type acc. to DIN EN 60584-1
Pt10%Rh/Pt, S type acc. to DIN EN 60584-1
Pt13%Rh/Pt, R type acc. to DIN EN 60584-1
Fe/CuNi, J type acc. to DIN EN 60584-1
Pt30%Rh/Pt6%Rh, B type acc. to DIN EN 60584-1

Resolution and measuring inaccuracy of the measuring instrument for external sensors (test pieces):**Pt100 (DIN EN 60751), 3-wire:**

-90,0 bis +200,0 °C: $\pm 0,1$ % f.s. $\pm 0,5$ °C

+200,0 bis +850,0 °C: $\pm 0,1$ % f.s. $\pm 0,5$ °C

NiCr/NiAl (DIN EN 60584-1):

-90,0 bis +200,0 °C: $\pm 0,1$ % f.s. $\pm 0,5$ °C

+200,0 bis +1370,0 °C: $\pm 0,1$ % f.s. $\pm 0,5$ °C

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

0,0 bis +200,0 °C: $\pm 0,2$ % f.s. $\pm 0,5$ °C

+200,0 bis +1760,0 °C: $\pm 0,2$ % f.s. $\pm 0,5$ °C

Fe/CuNi (DIN EN 60584-1)

-90,0 bis +200,0 °C: $\pm 0,1$ % f.s. $\pm 0,5$ °C

+200,0 bis +900,0 °C: $\pm 0,1$ % f.s. $\pm 0,5$ °C

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

0,0 bis +200,0 °C: $\pm 0,2$ % f.s. $\pm 0,5$ °C

+200,0 bis +1760,0 °C: $\pm 0,2$ % f.s. $\pm 0,5$ °C

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

+100,0 bis +1820,0 °C: $\pm 0,2$ % f.s. $\pm 0,5$ °C

Cold junction compensation:

built-in for ambient temperatures between 0 and 60 °C

Digital interface:

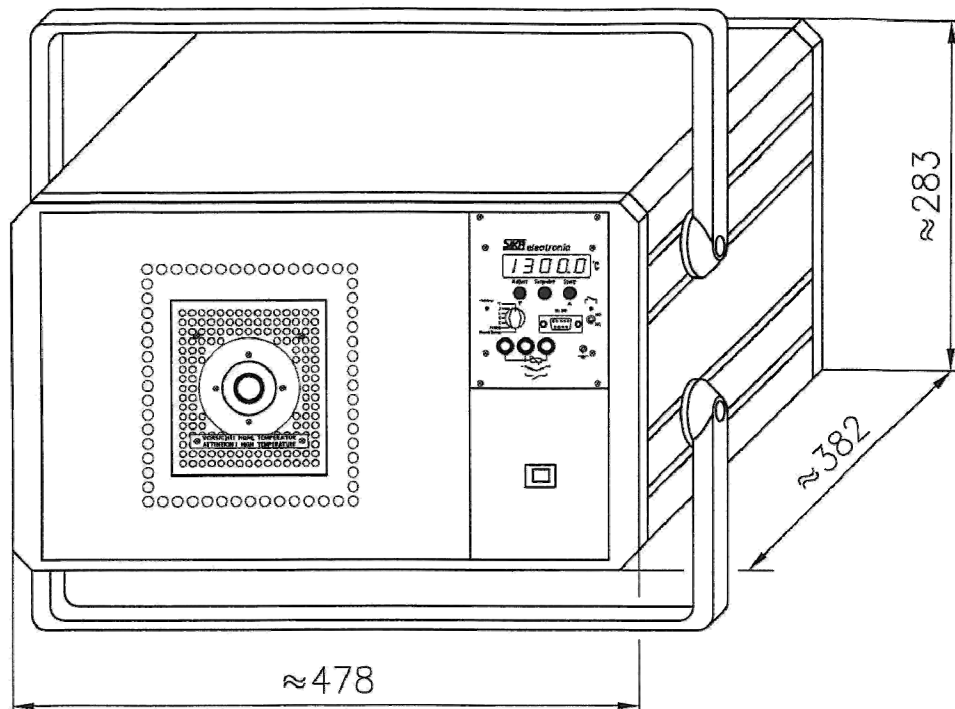
Connector: D-Sub DB09

RS232C, transmitting scheme:

9600 baud, 8 data bit, 1 stop bit, odd parity

Dimensions and weight:

Dimensions	TP281300/28/200
length, total / of instrumen	520/480 mm
total width	280 mm
total height, incl. handle and cable hairness	480/410 mm
weight	ca. 30 kg



Appendix

Guideline DKD-R 5-4: Calibration of temperature block calibrators – Appendix B details of the DKD technical committee's "Temperature and Humidity" for the operation of temperature block calibrators.

Having a calibrator certificate from a DKD calibrator laboratory confirms that the temperature block calibrator meets the high demands of the calibrating ability of such a device, which are outlined in the guidelines DKD-R 5-4. Nevertheless, the following points should be noted regarding the use of the calibrator:

The calibration of the temperature block calibrator predominantly relates to the temperature of the solid body block. The temperature of the thermometer in the block to be calibrated can differ from this temperature. If a thermometer of the same model, under the same test conditions as were used in the calibration is used, it can be assumed that the measurement difference in the calibration of ideal thermometers are not larger than the measurement inaccuracy which is stated in the calibrator certificate. If it is the case that nothing else is specified on the calibrator certificate, it must be ensured that

- the measuring element is located in the homogeneous temperature zone.
- The inner diameter of the bore hole used in the calibrator (possibly the casing) in the temperature range of -80 °C to 660 °C is a maximum of 0.5mm bigger than the outer diameter of the calibrated thermometer, and in the temperature range of 660 °C to 1300 °C is a maximum of 1.0mm bigger
- The immersion depth of the thermometer to be calibrated amounts to at least 15 times the outer diameter of the thermometer to be calibrated
- The thermometer to be calibrated has an outer diameter of $d < 6\text{ mm}$.

Please take particular care if a heat transfer medium was used during the calibration of the temperature block calibrator. If this is the case the calibration is only effective if the calibrator was used with a corresponding heat transfer medium.

With the calibration of thermometers with an outer diameter $d > 6\text{ mm}$ allow for an additional error of measurement due to heat conduction. In the case that such measurements are required, the additional heat conduction can be determined by the thermometer model and ascertained from your DKD calibrator laboratory. A good test of the possible temperature variations caused by heat conduction consists of testing whether the display of the calibrated thermometer changes when it is lifted 20mm. Contributions to measurement inaccuracy that are conditional on the thermometer to be calibrated (e.g. inhomogeneities from thermal elements), are likewise not covered in the measurement inaccuracy of the calibrator.

In the case that the calibrator is used in load conditions that do not comply with the load condition from the calibration, the influence of the load condition can be determined through replacement or addition of other thermometers on site.

The details on the calibration certificate are important for the calibration, not the manufacturers' instructions. Before the calibration please make sure you agree upon the operation and calibration conditions with your DKD calibration laboratory.

If there is nothing else specified on the calibrator certificate, (independent from the manufacturers' instructions) it must be ensured that

- the calibrator is used in a vertical position
- no additional thermal isolation is in use
- the environmental temperature is $(23 + 5)\text{ °C}$.

In order to check the calibration of the temperature block calibrator it is recommended to take regular measurements with a calibrated thermometer. If control measurements with a calibrated thermometer are not taken annually, recalibration of the temperature block calibrator is strongly recommended.

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