Precision Thermometer KELVIMAT®

Model 4323

4323 EN

- **Pt25, Pt100 / thermocouples**
- **Tolerance ± 0.01 °C**
- **Resolution 0.001 °C (1 mK)**
- **Measurement range - 210 °C ... + 2315 °C**
- **Measurement sensor parameter can be entered**
- **Measures absolute temperatures and temperature differences (A, B, A-B)**
- **Data logging up to 4000 values**
- **Scanning up to 10 channels**
- **Battery operation possible**

Application

The KELVIMAT® 4323 is a high-precision yet easy-to-use thermometer that is specially suited to connecting Pt100 and 10 thermocouple types. The resistance sensors have a 4-wire connection and draw a low test current of 1 mA. It´s low error limit of 10 mK and outstanding long-term stability mean that the device is ideal for exact temperature measurements in many application areas:

Biological and medical researchers value its low error margin, low measurement current, the choice between 1- and 2-channel measurement and the differential temperature display. Even changes of temperature with just a mK resolution are displayed.

Reliability, long-term stability and high resolution make the device a solid choice for industrial applications. It allows early detection of rapid temperature changes. The RS232 interface, which is fitted as standard, is indispensable for many applications. It allows measurement data to be sent to higher-level computer systems for evaluation.
The instrument can also be attached to a USB interface using an adapter.

Description

The two measurement channels can be operated individually. Differential mode allows the temperature difference between channels A and B to be measured.

Changing sensors and the resultant recalibration is usually an expensive process because it takes so much time. With the KELVIMAT® model 4323, on the other hand, once calibration data has been obtained is easily entered via the keypad, as a result of which the system is immediately calibrated for the new sensor.

The combination of proven technology and advanced microprocessor circuitry gives you a reliable, easy-to-operate precision thermometer.

Technical Data

Number of channels:
Front panel: 2 each for TC resp. RTD
Rear panel: 1x4 channels resp. 2x4 channels Scanner card (n) (version specific)

Interfaces:
RS232 or IEEE 488

Protocol: RS232//ANSI/EIATIA/-232-E-1991
IEEE//ANSI IEEE 488.1-1987

Operating temperature range for full error limit: 0 ... 40 °C
rel. humidity max. 80 %
no condensation

Power supply: 100, 120, 220, 240 V
47 - 63 Hz
+ 10 % - 13 %
max. 40 VA

Integrated batteries (accus): 1 x lead gel accu 6 V, 2.8 Ah
1 x lead gel accu 6 V, 1.2 Ah
1 x lithium battery

Working hours uninterrupted service (accu): 8-14 h

Resolution: RTD 0.001 °C
TC 0.01 °C

Display: LCD, with 240 x 64 points and backlight

Data logging: up to 4000 values

Reference junction: intern or external (with TC)

Functions: mathematical functions, max./min., standard deviation, digital filter

Units: °C, °F, K, Ω and mV

Dimensions (W x D x H): 219 x 315 x 110 [mm]

Weight: approx. 5.5 kg

Sensor: Pt100, Alpha 0.00385, 0.003916 and selectable

Connection front panel: RTD TC: LEMO 1B 6-pin, 3 or 4 wire 4 mm sockets in a copper connection block with 19 mm distance (4323-V500 and 600)

Connection rear panel: RTD TC: LEMO 1 B 6-pin miniature plug connection

Analog output (Monitor port; option): BNC on rear panel connector, scale 1 mV/°C (12 bit), resolution 0.5 °C
output refers to displayed value

Measurement period: channel A or B 1.8 second
channel A - B 3.6 second
average factor 2

Mathematical function: shows max/min values (peak to peak) standard deviation

Storage temperature: - 20 ... + 50 °C

Operation temperature: 0 ... + 45 °C
rel. humidity max. 80 %
no condensation

Calibration: digital, secured by a code

Thermocouples (4323-V500 -V600)

Model	Measuring Range from [C°]	to [C°]	Error Limit/Year 20 °C ± % Rdg.	± 5° + % F.S.
B	+ 250	1820	0.025	0.006
C	0	2315	0.075	0.005
D	0	2315	0.075	0.005
E	- 200	1000	0.026	0.004
J	- 210	1200	0.03	0.005
K	- 200	1372	0.035	0.006
N	- 200	1300	0.035	0.005
R	- 50	1768	0.02	0.015
S	- 50	1768	0.02	0.015
T	- 200	400	0.025	0.015

The table above relates to values with the reference junction switched off. If the device is operated in automatic mode, the measurement uncertainty is ≤ 0.1 °C at + 20 °C with a deviation of ≤ 0.01 °C/°C in a temperature range of 0 °C to + 40 °C.

Internal reference junction
The thermocouple is connected using the thermocouple plug model 4489-x. The thermocouple has open ends.

External reference junction
The thermocouple is connected via the external reference junction model 4485-V001. The built-in Pt100 sensor measures the temperature at the junction of the thermo wire/plug to the socket in the external reference junction. The thermocouple is plugged into the reference junction using a miniature plug.

Resistance sensor

Model	Measuring Range [C°]	Measurement Current mA	Typical Accuracy 20 °C ± 5 °C
Pt25	- 200 to - 100	1	0.02 °C
Pt25	- 100 to 500	1	0.01 °C
Pt25	500 to 670	1	0.02 °C
Pt100	- 200 to - 100	1	0.02 °C
Pt100	- 100 to 500	1	0.01 °C
Pt100	500 to 800	1	0.02 °C

α = 0.00385 or 0.003916

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Rear scanner option
Depending on the version of the KELVIMAT® 4323, up to 2 scanner cards can be installed in the back of the unit. The following scanner cards are available:

- ► 4 channels Pt 100
- ► 4 channels thermocouple

The scanner cards can be combined.

Pt 100 scanner
The error tolerances of the scanner card inputs on the back of the unit are the same as those for the inputs on the front panel. As with the front inputs, standards can be selected and coefficients can be entered. 6-pin LEMO 1B plug connectors are used.

Thermocouple scanner
10 thermocouple types are stored for the thermocouple inputs and can be selected via the menu. Thermocouples are connected via a miniature socket. As on the front panel, an internal or external reference junction is available for the connections on the rear of the unit, although the 4485-V001 external reference junction can only be connected at the front panel.
With 2 inputs on the front panel and 2 scanner cards, up to 10 thermocouple sensors can be connected.

1 x Pt100 and 1 x TC scanner card

Reference junction
In automatic mode, the measurement uncertainty of the reference junction is better than 0.1 °C at 20 °C with a TC of 0.01 °C/°C in the range of 0 °C ... 40 °C.

Input:	Copper connection block that only accepts thermo wire.
Channel switching:	Via front panel keypad or RS-232 / IEEE488 interface
Channel identification:	A0 ... A4 and B0 ... B4 (A0 and B0 are on the front panel)

Scanner sequence
The following scanner sequences can be set via the front panel:

- ► Continuous scanning of all channels
- ► X-interval scanning of all channels
- ► Measurement rate per channel can be set from 00:00:00 to 99:99:99 seconds
- ► Switching from channel to channel in a time of 00:00:00 to 99:99:99 seconds

Up to four scanner lists can be stored with sequence settings and the scanned channels.

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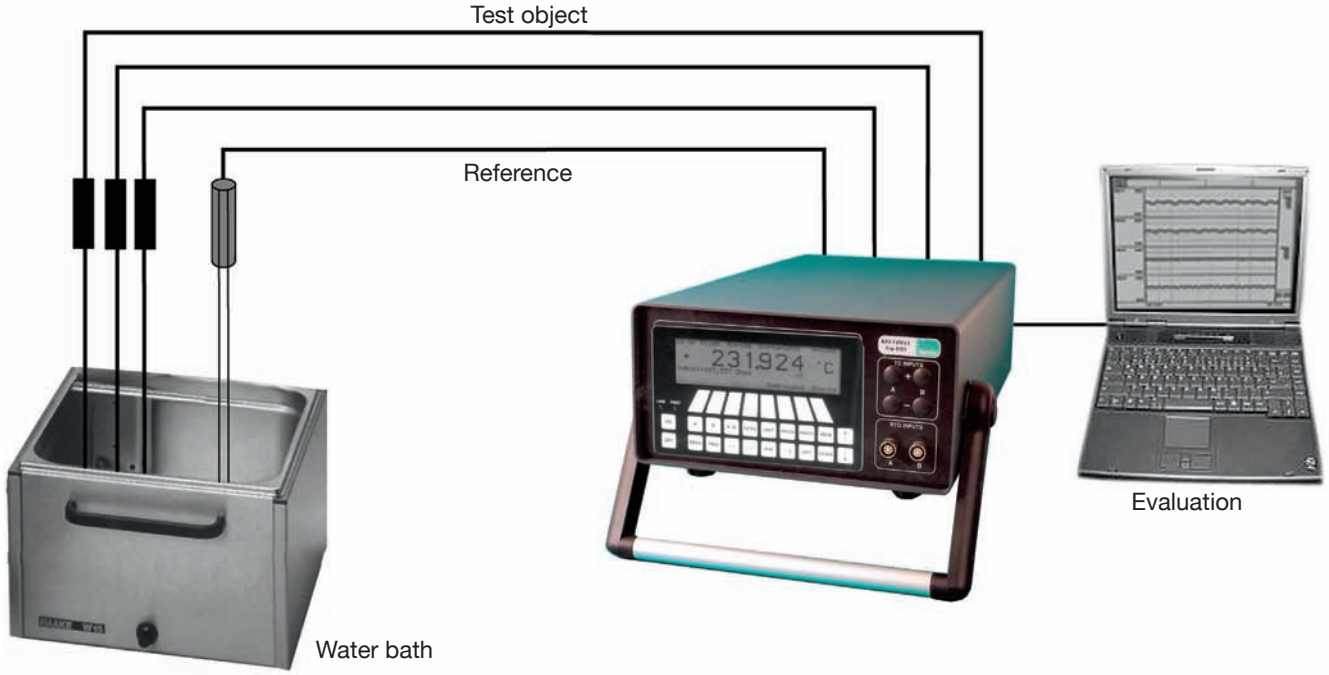
Application

A Pt 100 measurement sensor that is calibrated on the KELVIMAT® 4323 precisely measures the temperature in the water bath. The platinum or thermocouple measurement sensors that are being calibrated are connected via the internal scanner and compared to the reference and evaluated via the second measurement channel. For easier handling or higher temperatures, the use of our metal block calibrators, such as type 43425, is recommended.



Order Information

KELVIMAT® **Model 4323 -V**

Basic device	with RS232 and 2x Pt100 inputs	1	0	0
Basic device	with IEEE488 and 2x Pt100 inputs	3	0	0
Basic device	with IEEE488, Pt100, thermocouples B, E, J, K, N, R, S, T, C, D	5	0	0
Basic device	with RS232, Pt100, thermocouples B, E, J, K, N, R, S, T, C, D	6	0	0
Option	analog output		0	1
Option	scanner 8 x Pt100 and	A1 ... A4, B1 ... B4	2	0
Option	scanner 8 x TC and	A1 ... A4, B1 ... B4 only -V 500 -V 600	3	0
Option	scanner 4 x Pt100, 4 x TC	A1 ... A4, B1 ... B4 only -V 500 -V 600	4	0
Option	scanner 4 x Pt100,	A1 ... A4,	5	0
Option	scanner 4 x TC,	A1 ... A4, only -V 500 -V 600	6	0

Accessories

Connector plug
Device connecting plug for test probe **Model 4291-0 LEMO 1B**

Data cable RS232 **Model 9900-K323**
USB/RS232 converter **Model 9900-K351**

Thermocouple plug **Model 4489-x**
External reference junction **Model 4485-V001**

DKD Calibration Certificate

DKD calibration of an entire measurement chain by comparing measurements with a resistance thermometer connected to the PTB national standard at the following test points: 0 °C, T_1, T_2, T_3.

Please tell us the temperature points T that you require.

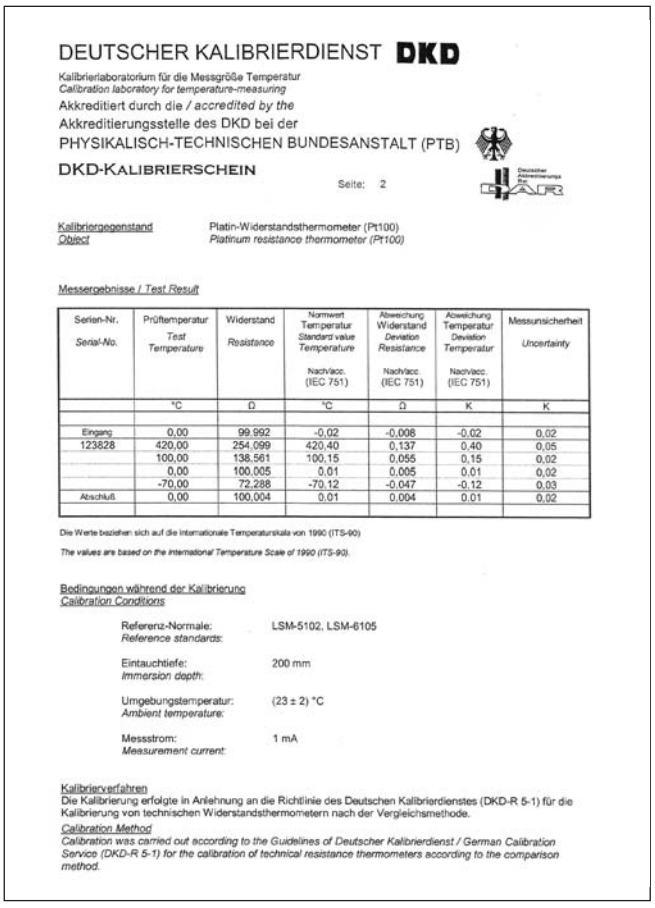
Order code: **42 DKD-M**

Calibrating a measuring chain: **43 ABG**

Calibrated high precision Pt 100 temperature sensor

Temperature range: - 70 ... + 420 °C
Protective steel shell 6 mm ø, 350 mm long,
Calibration certificate from an independent DKD laboratory (see copy below).

Order code: **4323-Z002**



DEUTSCHER KALIBRIERDIENST **DKD**

Kalibrierlaboratorium für die Messgröße Temperatur
Calibration laboratory for temperature-measuring
Akkreditiert durch die / *accredited by the*
Akkreditierungsstelle des DKD bei der
PHYSIKALISCH-TECHNISCHEN BUNDESANSTALT (PTB)

DKD-KALIBRIERSCHEIN Seite: 2

Kalibriergegenstand / *Object*: Platin-Widerstandsthermometer (Pt100) / *Platinum resistance thermometer (Pt100)*

Messergebnisse / *Test Result*

Serien-Nr. *Serial-No.*	Prüftemperatur *Test Temperature*	Widerstand *Resistance*	Normwert Temperatur *Standard value Temperature* Nachkc. (IEC 751)	Abweichung Widerstand *Deviation Resistance* Nachkc. (IEC 751)	Abweichung Temperatur *Deviation Temperatur* Nachkc. (IEC 751)	Messunsicherheit *Uncertainty*
	°C	Ω	°C	Ω	K	K
Eingang	0,00	99,992	-0,02	-0,008	-0,02	0,02
123828	420,00	254,099	420,40	0,137	0,40	0,05
	100,00	138,561	100,15	0,055	0,15	0,02
	0,00	100,005	0,01	0,005	0,01	0,02
	-70,00	72,288	-70,12	-0,047	-0,12	0,03
Abschluß	0,00	100,004	0,01	0,004	0,01	0,02

Die Werte beziehen sich auf die Internationale Temperaturskala von 1990 (ITS-90)
The values are based on the International Temperature Scale of 1990 (ITS-90).

Bedingungen während der Kalibrierung / *Calibration Conditions*

Referenz-Normale / *Reference standards*: LSM-5102, LSM-6105
Eintauchtiefe / *Immersion depth*: 200 mm
Umgebungstemperatur / *Ambient temperature*: (23 ± 2) °C
Messstrom / *Measurement current*: 1 mA

Kalibrierverfahren
Die Kalibrierung erfolgte in Anlehnung an die Richtlinie des Deutschen Kalibrierdienstes (DKD-R 5-1) für die Kalibrierung von technischen Widerstandsthermometern nach der Vergleichsmethode.
Calibration Method
Calibration was carried out according to the Guidelines of Deutscher Kalibrierdienst / German Calibration Service (DKD-R 5-1) for the calibration of technical resistance thermometers according to the comparison method.

The constants A, B, C and R_0 are found using the data pairs, temperature and resistance value and entered in the device. The device is then linearized for the respective channel.