Multi-functional precision thermometer
Model CTR4000

Applications

- Pharmaceutical industry
- Industry (laboratory, workshop and production)
- Temperature sensor and transmitter manufacturers
- Calibration service companies and service industry

Special features

- High accuracy
- Innovative and intuitive user interface
- Versatile applications by measuring thermocouples and resistance thermometers
- Logger and scan functions
- Up to 44 channels possible

Multi-functional precision thermometer, model CTR4000

Description

Application

The model CTR4000 precision thermometer provides a complete measurement and control interface for users wishing to make high-accuracy temperature measurements or calibrate thermometers. It supports a wide range of thermometer types, including 25 Ω SPRTs, 100 Ω PRTs, thermistors and thermocouples.
The CTR4000 is a high-accuracy measuring instrument designed for laboratory and industrial temperature measurements and calibration applications.

Functionality

The instrument will operate with all 3- and 4-wire (S)PRTs (25 Ω, 100 Ω) platinum resistance thermometers as well as most standard international thermocouple types and NTC thermistors. The following temperature measuring units are selectable: °C, °F, K. Base measuring units mV and Ω are also displayed. The temperature values will be calculated through common conversion of the base measurement.

Due to the wide range of this instrument it makes individual instruments needless and makes the calibration cost-effective.

The CTR4000 is offered in two versions: standard and advanced.
The advanced version (CTR4000-A) has selectable excitation currents and standby currents for PRT probes. The advanced version also has increased measurement accuracy for PRT probes.
The standard version (CTR4000-S) has fixed excitation current for PRT probes.

Features included:

- Excellent and high-accuracy measurement technology for the registration of different types of thermometers
- Large graphic touchscreen for temperature measurement values as well as configuration settings and statistical results
- Logger and log-data transfer to USB stick or communication interface
- Scan function with a live screen and graph
- Communication interfaces available for automated monitoring and calibration applications

Specifications
Model CTR4000

Multi-functional precision thermometer			
Input			
Input channels	4		
Channel 1 + 2	Resistance thermometers with 5-pin DIN connector		
Channel 3 + 4	Thermocouple with standard miniature 2-pin thermocouple plug		
Scanner box	Up to 4 modules		
	Max. 44 channels (in total)		
	Each module has 10 channels		
Input connections	5-pin DIN connector or bare cable ends (resistance thermometer or thermistor)		
	Standard miniature 2-pin thermocouple plug or bare cable ends (thermocouple)		
Data entry format	ITS-90 and CvD for calibrated resistance thermometers; or EN 60751 standard conversion for uncalibrated resistance thermometers		
	TC polynomial for calibrated thermocouples; or EN 60584 standard conversion for uncalibrated thermocouple		
	Steinhart and Hart for NTC thermistors		
Display update rate	500 ms		
Measuring range			
PRT/SPRT	Measuring range 0 ... 500 Ω		
	-200 … +962 °C [-328 ... +1,764 °F]		
	3- and 4-wire measurement		
Thermocouple	Measuring range -9.8 ... +76.4 mV corresponding to the range of the thermocouple E		
	-200 ... +1,820 °C [-454 ... +3,308 °F]		
	Types B, C, D, E, J, K, N, R, S, T in accordance with EN 60584		
Thermistor	0 ... 500 kΩ		
Digital display			
Display	Colour TFT display including projective capacitive touchscreen with a resolution of 800 x 480 pixels		
Resolution	0.0001 K / 0.00001 Ω / 0.00001 mV		
Display units	°C, °F, K, mV and Ω		
Functions			
Real-time clock	Integrated clock with date		
Case			
Dimensions (W x H x D)	449 x 191 x 192 mm [17.7 x 7.5 x 7.6 in]		
Weight	4.8 kg [10.5 lbs]		

Accuracies [1)]			
Resistance thermometers			
Temperature accuracy	4-wire	CTR4000-A : 3.75 mK CTR4000-S : 5 mK	
	3-wire	CTR4000-A : 0.03 K CTR4000-S : 0.03 K	
Temperature conversions	Standard EN 60751, CvD, ITS-90		
Sensor currents	CTR4000-A: 0.5 mA, 1 mA, 2 mA, √2 CTR4000-S: PT25: 2 mA, √2 PT100: 1 mA, √2		
Standby currents	R_0 < 50 Ω	0 ... 125 Ω	2 mA
	R_0 ≥ 50 Ω	0 ... 500 Ω	1 mA

Accuracies [1]		
Measuring time	3 seconds refresh rate	
Thermocouple		
Base measurement [2]	±% of reading + µV	
	±0.004 % + 2 µV	
Temperature accuracy	Type B	±0.09 °C + ±0.025 % of reading
	Type C	±0.57 °C + ±0.057 % of reading
	Type D	±0.60 °C + ±0.059 % of reading
	Type E	±0.05 °C + ±0.031 % of reading
	Type J	±0.07 °C + ±0.030 % of reading
	Type K	±0.09 °C + ±0.035 % of reading
	Type N	±0.08 °C + ±0.035 % of reading
	Type R	±0.27 °C + ±0.020 % of reading
	Type S	±0.27 °C + ±0.020 % of reading
	Type T	±0.09 °C + ±0.025 % of reading
Temperature conversions	Standard EN 60584, polynomial	
Measuring time	3 seconds refresh rate	
Cold junction compensation	Internal, external or channel Accuracy internal cold junction compensation ±0.15 K	
Thermistor		
Accuracies	0 ... 400 Ω	±0.006 Ω
	400 Ω ... 50 kΩ	±0.01 % of reading
	50 ... 500 kΩ	±0.02 % of reading
Temperature conversions	Steinhart-Hart, polynomial	
Sensor currents	0 ... 450 Ω	1 mA
	400 Ω ... 45 kΩ	10 µA
	40 ... 500 kΩ	3 µA
Measuring time	3 seconds refresh rate	

1) The accuracy in K defines the deviation between the measured value and the reference value. (Only valid for indicating instruments.)
2) In a range of -20 ... +100 mV

Specifications for thermocouples			
Types	**Working range “Temperature”**		**Working range “Voltage”**
	[°C]	**[°F]**	**[mV]**
B	250 ... 1,820	482 ... 3,308	0.291 ... 13.820
E	-200 ... +1,000	-328 ... +1,832	-8.825 ... +76.373
J	-210 ... +1,200	-346 ... +2,192	-8.095 ... +69.553
K	-200 ... +1,372	-328 ... +2,502	-5.891 ... +54.886
N	-200 ... +1,300	-328 ... +2,372	-3.990 ... +47.513
R	-50 ... +1,768	-58 ... +3,214	-0.226 ... +21.103
S	-50 ... +1,768	-58 ... +3,214	-0.235 ... +18.693
T	-200 ... +400	-328 ... +752	-5.603 ... +20.872

Communication	
Interface	■ Ethernet ■ USB

Voltage supply and performance data	
Power Supply	DC 5.9V/3A via Mensor supplied power supply model: Input: FOX30-X: AC 100-120 /200-240 V; 50/60 Hz; 0.6A

Operating conditions	
Place of use	Indoor Not for wet locations
Operating temperature	0...45 °C [32...113 °F]
	Maximum achievable accuracy within 17 ... 23 °C [63 ... 73 °F]
Storage temperature range	-20 ... +50 °C [-4 ... +122 °F]
Humidity	0 ... 70 % relative humidity (non-condensing)
Altitude	2000 Meters
Overvoltage Category	I
Pollution Degree	Degree 2
Wet Location	Not Applicable
Ingress Protection	IP20

Approvals

Approvals included in the scope of delivery

Logo	Description	Country
CE	**EU declaration of conformity**	European Union
	EMC directive EN 61326 emission (group 1, class B) and immunity (basic environments)	
	RoHS directive	

Certificates

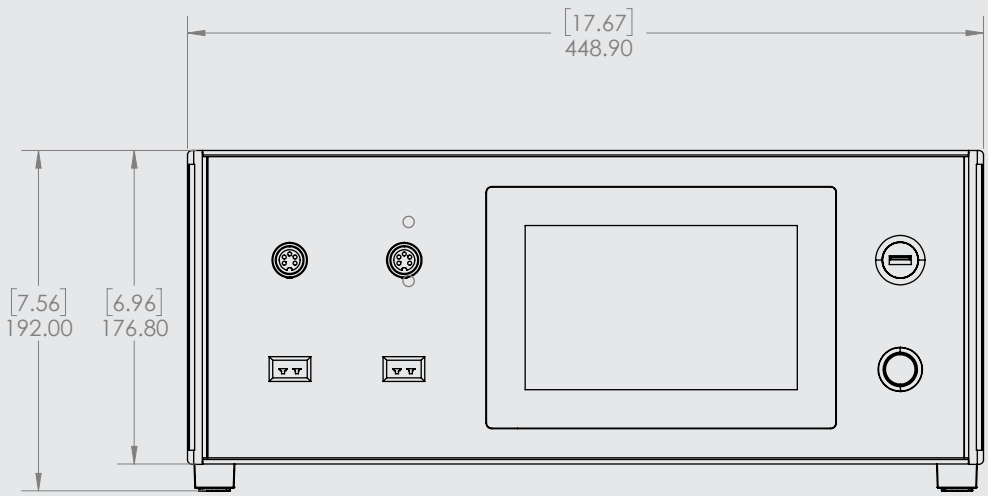
Certificate	
Calibration	■ Test report for electrical inputs ■ 3.1 calibration certificate per DIN EN 10204 (system calibration) [1)] ■ DKD/DAkkS calibration certificate for electrical inputs ■ DKD/DAkkS calibration certificate (system calibration) [1)]
Recommended recalibration interval	1 year (dependent on conditions of use)

1) System calibration means the calibration of a thermometer as a measuring chain with the CTR4000

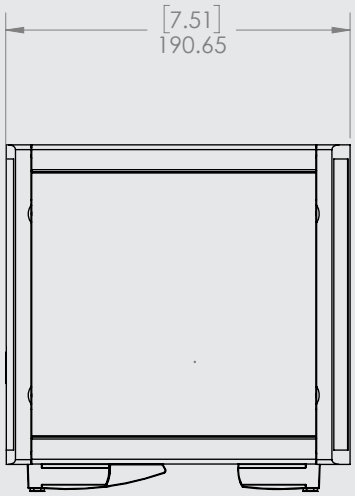
Approvals and certificates, see website

Dimensions in mm [in]

Front view

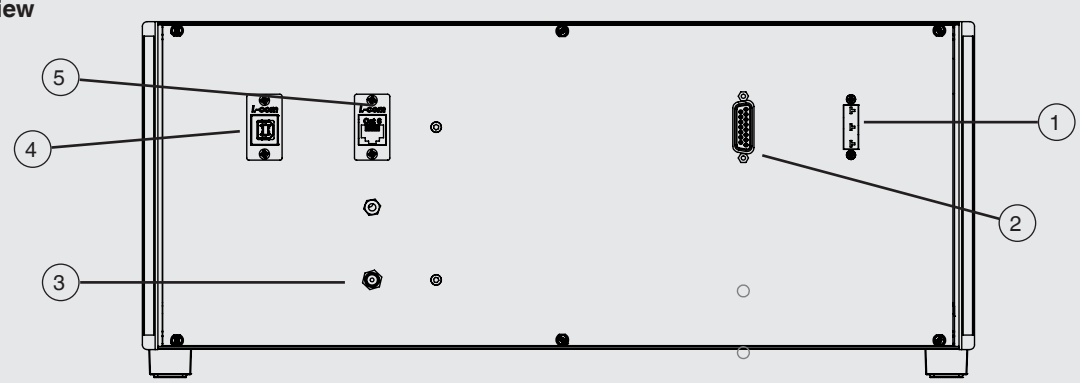


Side view (left)



Dimensions in mm [in]

Rear view



① **TC expansion**
Input TC expansion, refer to “Input channel expansion port (CTS expansion, TC expansion)" in product manual.

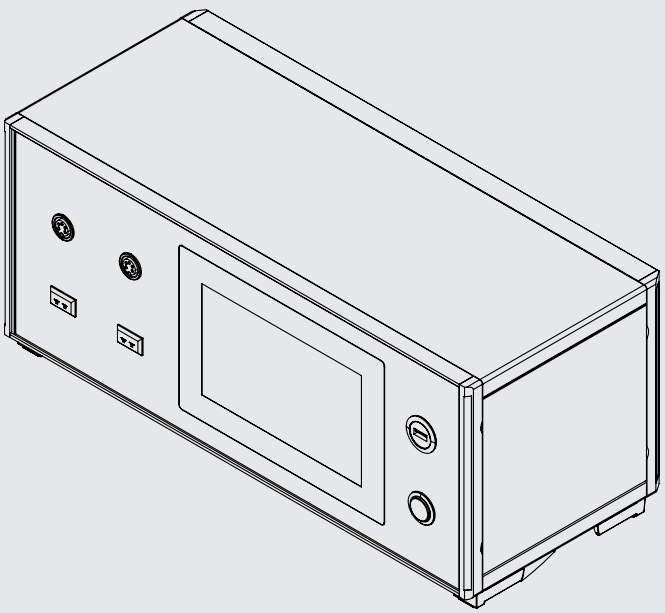
② **CTS Expansion**
Input CTS expansion, refer to “Input channel expansion port (CTS expansion, TC expansion)" in product manual.

③ **Power Input**
Connection of the power supply over power supply unit, refer to “Voltage supply” in product manual.

④ **USB Device**
USB interface (standard), refer to “USB interface (standard)” in product manual.

⑤ **Ethernet**
Ethernet interface (standard), refer to “Ethernet interface” in product manual.

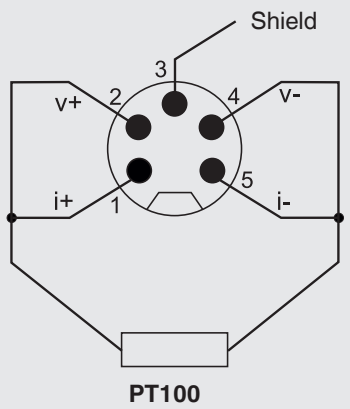
Isometric view



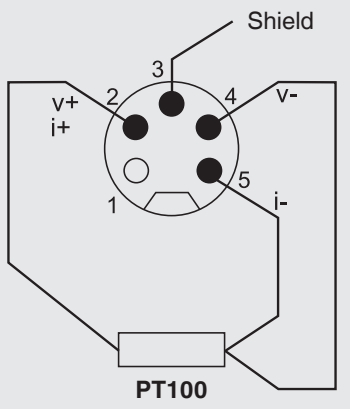
Resistance thermometer connection (5-pin DIN connector)
Channel 1 and 2 (PRT1, PRT2)

View towards front panel connector

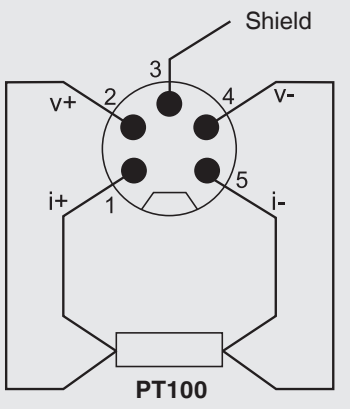
2-wire PRT connection



3-wire PRT connection

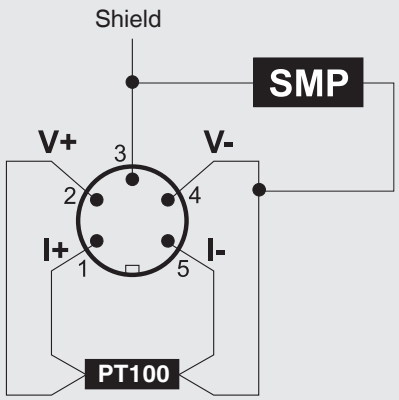


4-wire PRT connection



Options

View from top panel

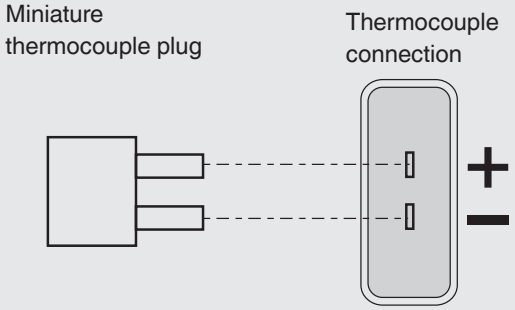


With DIN connector or SMART connector

With ASL's SMART connector on the probes, storing the data is needed only once - in the connector! It can even be used on another instrument without any further action.

The SMART connector saves time and reduces error.
If there are existing calibrated or uncalibrated probes, no problem, CTR4000 automatically registers if a probe is SMART or normal.

Thermocouple connection (miniature connector), channel 3 and 4 (TC3, TC4)



Touchscreen and intuitive user interface

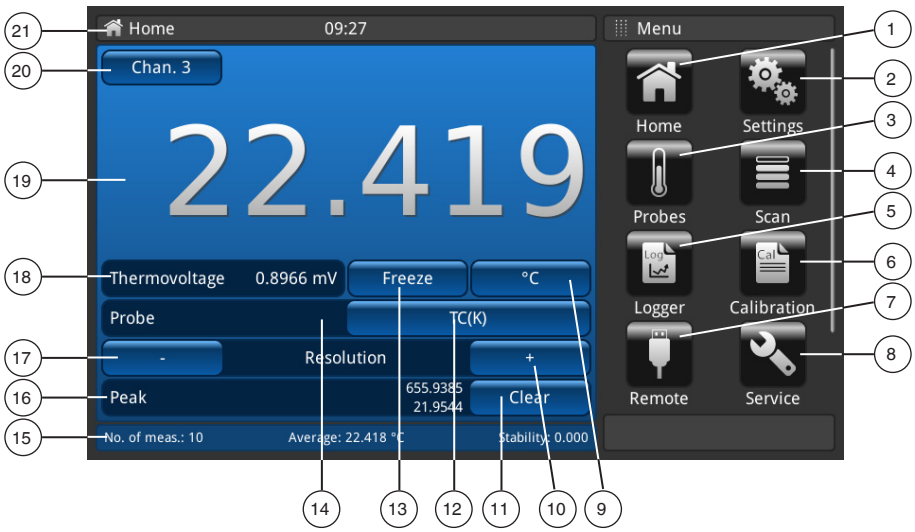
Switching on the instrument, the main screen appears. From here the user can make several settings and can see in this case the measurement in °C of a 4-wire PT25 connected to channel 1.

On the right side the user can select the menus to select inputs or settings.

On the main screen are the function buttons that enable the user to quickly select settings. This is like a shortcut to the menu or an immediate setting.

A click on these guides to a menu which opens on the right side or causes a change on the display.

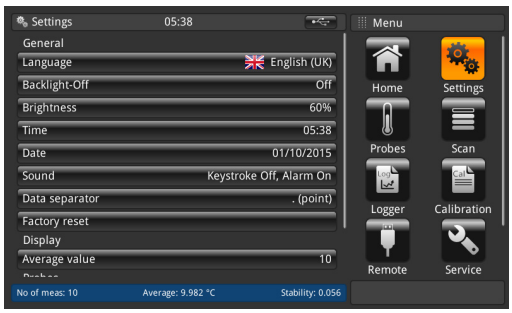
Standard desktop/main screen



1. Home application
2. General settings
3. Probe settings
4. Scan settings
5. Logger settings
6. Calibration settings
7. Remote settings
8. Service settings
9. Unit; shortcut
10. Plus decimal place
11. Clear the peak values (maximum value, minimum value since starting the instrument)
12. Selected probe (standard or custom); shortcut
13. Freeze the display; function button
14. Root 2 for sensor current PRT; function button
15. Current displaying of average, stability and number of measurements
16. Peak displaying
17. Minus decimal place
18. Measured value in the base unit according to probe, e.g. Ω for Pt100 and mV for TC
19. Current measured value
20. Selected channel; shortcut
21. Current application name

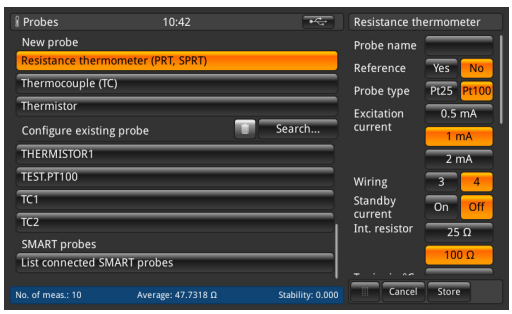
Simple instrument configurations

General instrument settings



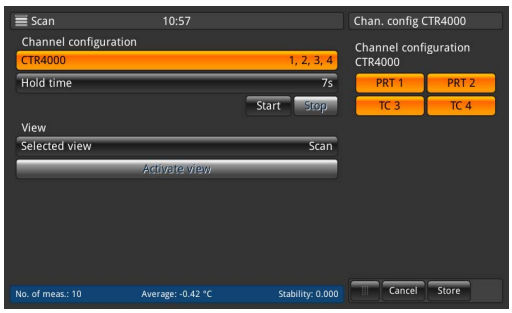
If selecting the menu on the right side, the settings appear on the left side. If, for example, the **[Language]** button is pressed, then all available languages will be displayed on the right hand side and these can easily be selected.
In the menu setting all things concerning the instrument can be handled.

Probe settings



In this menu the probe settings can be selected and the reference thermometers can be stored under a unique name.

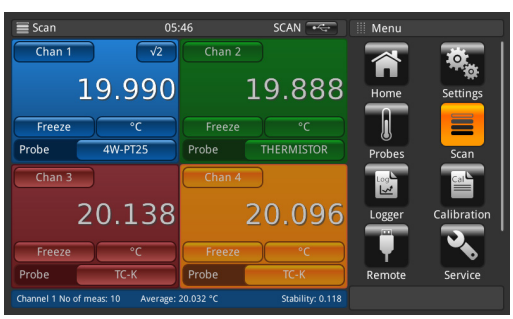
Scan settings



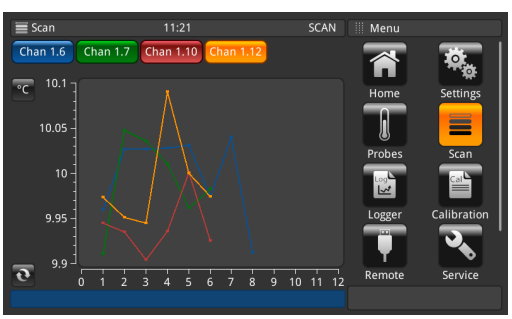
In the scan menu, the user can define a scan by selecting the channels and the hold time.
The scan is activated using the start button.

Two views can be selected: Scan and Graph
Due to the wide range of this instrument, no individual instruments are needed which makes the calibration cost-effective. Logger and scan function with a live screen and graph makes calibration life easy.

Scan view



Graphical scan view



Automated thermometer calibration for model CTR4000 with model CTx9x00

The calibration of temperature probes usually requires considerable effort. This test procedure can be significantly simplified by linking an automated reference thermometer with a temperature source. Such an arrangement allows the creation of individual calibration routines which can be called at any time – calibration just by pushing one button.

The model CTR4000 precision thermometer has four input channels: one for the reference sensor and three for test items.
The stable temperature environment required for the calibration is provided, depending on the test item, in a dry-well calibrator or a micro calibration bath.

One calibration process, two stations – this usually means separate preparation and parameterisation of both instruments. With CTR4000, this preliminary stage can be omitted. The precision thermometer can be linked with a corresponding temperature source from the CTx9x00 series via the respective communication interface using a special feature.

This combination creates a hardware unit for individual and reproducible calibration routines where all measured values of the connected thermometers are recorded and the test temperature is provided automatically. The touchscreen user interface of the calibration instrument makes it easier for the operator to enter information.

Each created routine is saved in the precision thermometer and can be called later on. Since the entire calibration process is automatic, the user only needs to press the Start button. The user does not need to be present until the end of the process which may take several hours in some cases. Nevertheless, the user can monitor the test process on the screen of CTR4000, if required. All calibration phases are logged by a data logger and all data is saved. Subsequently, this information can be downloaded to a USB stick, exported to the XML and CSV format and processed.
All calibration routines can be reproduced for subsequent test processes.

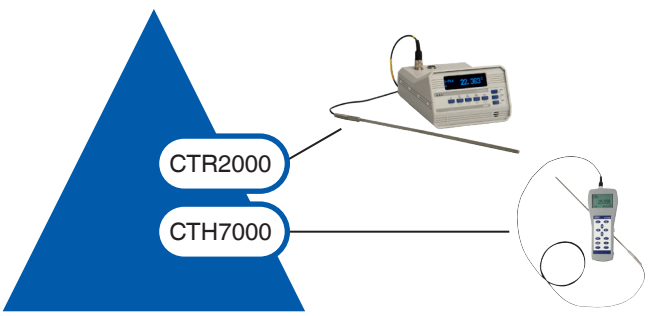
Further details

We are expanding our product range of precision thermometers to a versatile thermometer for the industrial market with the model CTR4000 multi-functional precision thermometer. The ability to measure up to 44 resistance thermometers, thermocouples and thermistors simultaneously makes the instrument versatile in application.

The CTR4000 is new in its class. This instrument closes the gap between the hand-held series CTH6x00 which can handle thermocouples and the desktop instrument like model CTR2000 which can only handle resistance thermometers.

It is a precision instrument, designed for use in a laboratory or light industrial environment. The instrument can be extended by using multiplexers to gain additional channels.

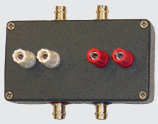
The instrument model CTR4000 is compatible with the existing model CTS3000 multiplexer for resistance thermometers and thermocouples. In addition, the user interface is easy to handle like other WIKA calibration technology products.



RTD measurement

TC and PRT measurements

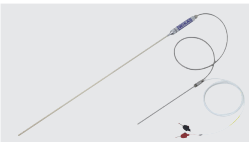
Accessories and spare parts

Description		Order code
		CTX-A-A1
	**Case** Transport case, robust	-T1-
	**Multiplexer model CTS3000** 10-channel multiplexer as desktop case For resistance thermometers and thermocouples (maximum of 4 multiplexers per CTR4000)	-CD-
	**Multiplexer model CTS3000** 10-channel multiplexer with built-in case for 19" rack For resistance thermometers and thermocouples (maximum of 4 multiplexers per CTR4000)	-CR-
	**Adapter** To connect a thermometer with bare cable ends	-AD-
	**Adapter cable CTS3000** 5 x 4 mm banana plug to 5-pin DIN socket	A3
	**Adapter cable CTR4000** 5 x 4 mm banana socket to 5-pin DIN connector	AE
	**15-pin interface cable** For resistance thermometers Length: 0.75 m [2.5 ft]	I5
	**TC interface cable** For thermocouples Length: 0.75 m [2.5 ft]	I6

Ordering information for your enquiry:		
	1. Order code: CTX-A-A1 **2. Option:**	⇓ [ ]

Description		Order code
	**Temperature probe model CTP5000** Immersion probe	CTP5000
	**Reference Thermometer model CTP6000** high-accuracy temperature measurement	CTP6000

Accessories and spare parts

Description	Order code
 **Thermocouple model CTP9000** Immersion probe type S With or without cold junction	CTP9000

Scope of delivery

- Model CTR4000 multi-functional precision thermometer incl. AC adapter
- Test report for electrical inputs
- Calibration certificate (system calibration only if ordered together with a probe)
- Operating instructions

1) System calibration means the calibration of a thermometer as a measuring chain with the CTR4000

Ordering information
CTR4000 / Interface / Number of multiplexers / Number of resistance thermometers / Number of thermocouples CTP9000 / Calibration / Transport case / Further approvals / Additional ordering information

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