

DC resistance thermometry bridge

Model CTR6000



WIKA data sheet CT 60.30

Applications

- High-performance DC resistance thermometry bridge for very accurate temperature measurements in a range of -200 ... +962 °C
- High-precision instrument designed for laboratory, commercial and industrial temperature measurement and calibration applications



Special features

- DC accuracy ± 0.8 mK at 0 °C
- Resolution 1 ppm, 0.1 mK
- Channels expandable from 1 to 60 via multiplexer
- Measures ratio, Ω , °C, °F or K
- Large multi-function display

DC resistance thermometry bridge model CTR6000

Description

The model CTR6000 resistance thermometry bridge is a high-performance DC resistance thermometry bridge. The CTR6000 provides the latest technology in DC measurement. This way of measurement has always been a hallmark of ASL instruments and the CTR6000 continues that tradition.

The CTR6000 series features a large graphic display, combining versatility with ease of use. As well as the flexible menu options on the display, the CTR6000 also includes buttons dedicated to select common functions. For multi-channel applications, the CTR6000 can be used with ASL's switch box systems CTS9000.

Data can be recorded and stored on a PC through the ULog temperature measurement and data acquisition software.

The DC version provides a switched DC sensor current to simulate the advantages of AC measurement. In addition to measuring platinum resistance thermometers (PRTs), the CTR6000 also measures NTC thermistors.

Specifications		Model CTR6000	
Input channels	2 on the main device (one platinum resistance thermometer (PRT) or thermistor + one reference resistor) 60 over multiplexer CTS9000		
Input connections	4 x BNC + shield (front panel)		
Data entry format	ITS 90 and CVD for calibrated probes; or EN 60751 for uncalibrated probes Steinhart and Hart for NTC thermistors		
Measuring ranges			
Sense current	10 μ A, 20 μ A, 100 μ A, 200 μ A, 1 mA, 2 mA, 10 mA		
Sense current multipliers	0.5 and $\sqrt{2}$		
Temperature range	-200 ... +962 $^{\circ}$ C, depending on thermometer probe		
Resistance range	0 ... 500 k Ω		
Internal resistors			
Values	25 Ω , 100 Ω , 10 k Ω , 100 k Ω		
Thermal stability	\pm 0.1 ppm/ $^{\circ}$ C		
Accuracy	\pm 0.01 % (uncalibrated)		
Accuracy			
PRT 1)	\pm 3 ppm full range (ratio) \pm 3 ppm of reading or 0.0003 Ω whichever greater (resistance) \pm 0.8 mK at 0 $^{\circ}$ C, \pm 3 mK full range (temperature)		
Thermistor	0 ... 10 k Ω \pm 10 ppm of reading or 0.01 Ω (whichever value is greater) 10 ... 50 k Ω \pm 20 ppm of reading 50 ... 100 k Ω \pm 40 ppm of reading 100 ... 500 k Ω \pm 100 ppm of reading		
Display			
Screen	large graphic VFD display screen		
Units	ratio, $^{\circ}$ C, $^{\circ}$ F, K or Ω		
Resolution	0.1 mK		
Functions			
Real-time clock	integrated clock with date		
Voltage supply			
Power supply	AC 90 ... 264 V, 47 ... 63 Hz; universal rear input on rear panel		
Power consumption	max. 95 VA		
Permissible ambient conditions			
Operating temperature	15 ... 25 $^{\circ}$ C		
Storage temperature	-20 ... +50 $^{\circ}$ C		
Communication			
Interface	USB, RS-232 or IEEE		
Case			
Dimensions	455 x 150 x 450 mm (W x H x D)		
Weight	7 kg		

1) The accuracy in K defines the deviation between the measured value and the reference value. (Only valid for indicating instruments.)

CE conformity

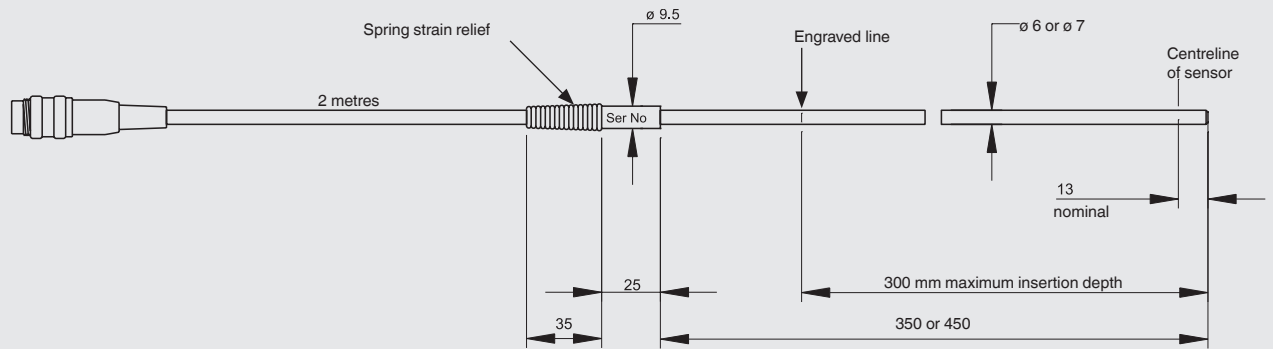
CE conformity

EMC directive	2004/108/EC, EN 61326 emission (group 1, class B) and interference immunity (portable test and measuring equipment)
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Approvals and certificates, see website

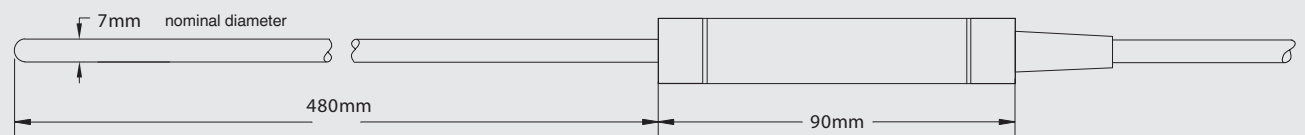
Recommended temperature probes

Resistance thermometer



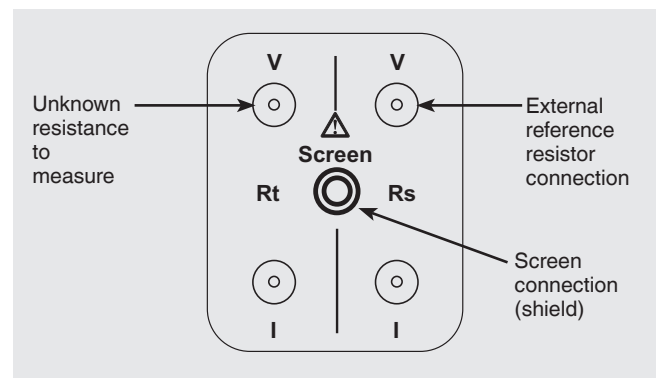
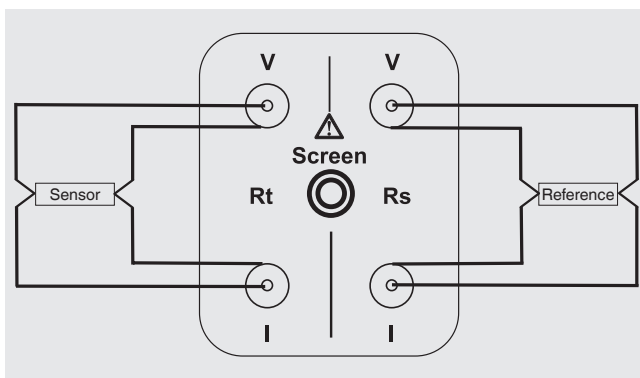
Model	Dimensions	Temperature range	Detector length
CTP5000-652	Pt100, d = 6 mm, l = 450 mm (without spring strain relief, 100 mm handle)	-70 ... +650 °C	30 mm
CTP5000-651	Pt100, d = 7.5 mm, l = 450 mm (125 mm handle)	-189 ... +650 °C	50 mm

Resistance thermometer



Model	Dimensions	Temperature range	Detector length
CTP5000-T25	Pt25, d = 6.5 ... 7.5 mm, l = 480 mm	-189 ... +660 °C	45 mm

Input connections



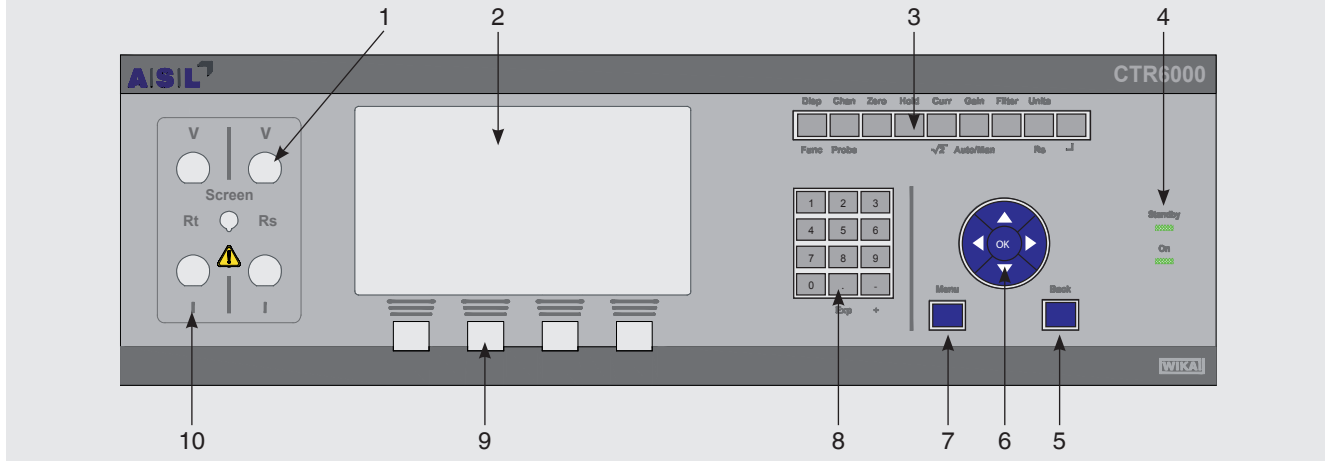
The BNC input connectors are located to the left of the display. The central connector is used when a screen connection is required. The two right-hand connections are only used when an external reference resistor is selected;

they are not required when one of the internal reference resistors is used. The unknown resistance or probe is connected to the left-hand BNCs.

Features of the precision thermometer

- Easy to use
- Large graphic VFD display screen
- 4-wire measurement
- 2 channels as standard with optional up to 60 channels over multiplexer CTS9000

Front panel

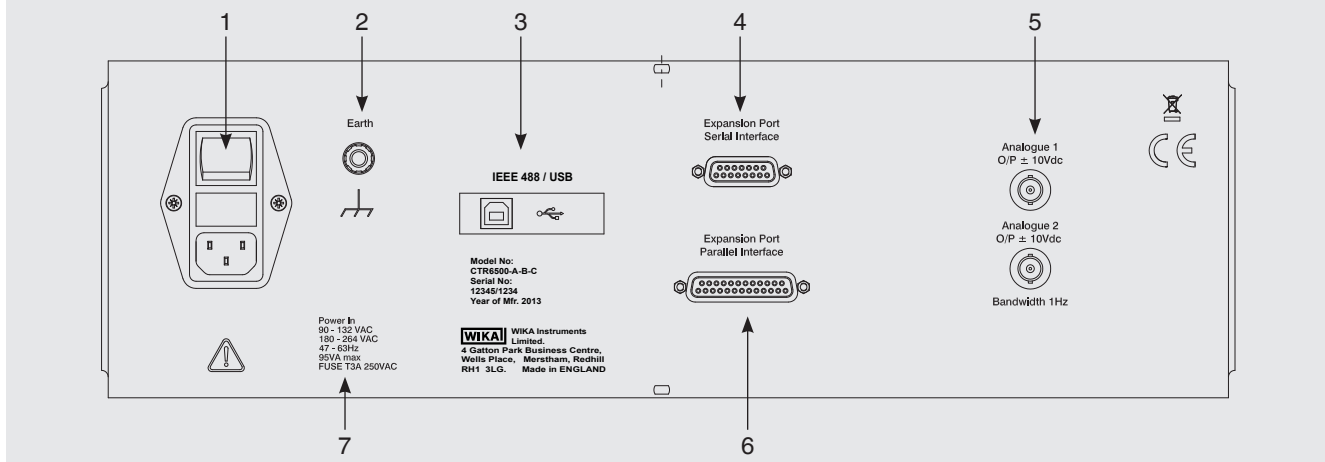


- | | |
|------------------------|---------------------|
| 1 Reference channel Rs | 6 Navigation keys |
| 2 VFD display screen | 7 Menu key |
| 3 Function keys | 8 Numeric keypad |
| 4 Status LED | 9 Four soft keys |
| 5 Back key | 10 Input channel Rt |

The two status LEDs to the right are used to indicate that electrical power is applied and to indicate that the bridge is in standby mode (graphical display in low power mode). The four keys under the display are **soft keys** so their function varies with the instrument operating mode

(whenever these keys can be used, their current function is displayed above each key).

Rear panel



- | | |
|--------------------------------------|---------------------|
| 1 Mains plug, ON/OFF switch and fuse | 5 Analogue output |
| 2 Earth connector | 6 Expansion port 2 |
| 3 USB or IEEE connector | 7 Electrical rating |
| 4 Expansion port 1 | |

Operation

The instrument's keys are grouped by type and consist of nine function keys, a twelve-key numerical keypad, navigation keys and an OK key, four soft keys and separate menu and back keys. The combination of function and soft keys is used to access data and/or functions within the instrument.

The keys are used to select the various menu options and to control the instrument. Generally, no more than one

menu level is required for commonly used settings. A few (infrequently used options) require two or three menu levels.

The functions under the keys are accessed by pressing the right-hand shift key and then the required key (e.g. to access the probe menu press shift and then the chan key).

Function keys

Key	Description	Function
Function keys		
Disp	Select display type	Alternates numerical, graphical, standby display
Chan	Select input channel	Opens and closes the R _s channel select menu
Zero	Zero display measurement	Opens and closes the display zero (null) menu
Hold	Hold display measurement	Starts and stops display (measurement continues)
Curr	Select operating current	Opens and closes the sensor-current menu
Gain	Select instrument gain	Opens and closes the instrument-gain menu
Filter	Select filter value	Opens and closes measurement-bandwidth menu
Units	Select display units	Opens and closes the display-units menu
Shift key	Shift key	Selects lower function keys (and, Exp or +)
Function shift keys		
Func	Select function menu	Selects function menu
Probe	Select probe menu	Opens and closes probe menu
√2	Set current	Sets root 2 current
Auto/Man	Reserved turns	Automatic gain selection ON/OFF
Rs	Select reference resistor	Opens the reference resistor menu
Menu function keys		
Back	Clear data entry/return	Clears any data entry errors or returns from a menu
Menu	Menu selection	Displays other submenus
▲▼◀▶	Navigation keys	Used to navigate through the menus
OK	Save entry	Saves data entry and returns to previous menu

The numeric keypad is used to enter numerical values (and may also be used to select submenu options when these are shown on the screen).

Numeric keypad function

Key	Description	Function
Numeric keys		
0 ... 9	Numerical data entry	Enters a numerical digit or selects a numeric menu
-	Minus key	Used during numerical data entry
.	Decimal point	Used during numerical data entry
Numeric shift keys		
Exp	Exponent key	Used for numerical data entry (with the shift key)
+	Plus key	Used for numerical data entry (with the shift key)

Model CTS9000 multi-channel systems for thermometry bridges

ASL's thermometry bridges can be used with up to six 10-channel multiplexers. The multiplexers, available as stand-alone units or as part of a fully integrated system as shown, can be operated manually or under remote control via the driver. The RS-232-C or IEEE interfaces are optional.

The CTR6000 can be used with either one model CTS9000 multiplexer without a driver or with a driver for multi-channel calibration of up to 60 channels.

The model CTS9000 is a 10-channel multiplexer which provides full 4-wire plus ground switching using high-performance reed relays and has two unique features:



Model CTS9000 multi-channel systems for thermometry bridges

■ Multiplexer standby current

When in use the temperature of a platinum resistance thermometer (PRT) is increased slightly by the "self-heating effect" of the constant current. This effect may vary by PRT and is therefore determined during calibration. The problem arises if you wish to take a measurement as soon as you select a PRT as probes can take a minute, sometimes more to stabilise once selected.

The solution is to keep the probes always selected with an identical current, standby current, from its own power source. When the PRT is selected for the bridge it is already at "operating temperature" and a precise measurement can be made immediately! Any value up to 10 mA may be factory set, individually for each channel.

■ Optimised bridge performance

To optimise bridge performance when using PRT's of different R_0 values, for example 25 Ω and 100 Ω , measurements are made against a reference fixed resistor of matching values.

Up to four channels of the first CTS9000 scanner can be configured to switch reference resistors (R_s) rather than platinum resistance thermometers so that as thermometers are selected, the correct value of R_s can also be automatically selected.

Usual configurations ($R_t:R_s$) are 10:0 (10 platinum resistance thermometers, 0 reference fixed resistors), 8:2, 7:3 and 6:4.

Scope of delivery

- Model CTR6000 DC resistance thermometry bridge incl. power cord and USB cable
- Choice of model CTP5000 temperature probes
- Choice of model CTS9000 multiplexer
- Choice of model CER6000 resistances

Option

- Model CTS9000, 10-channel automatic/remote scanner, current source for unselected PRTs
- Precision resistor module FR4 (standard values = 1, 10, 25 and 100 Ω , oven controlled)

Accessories

- 100 Ω , test resistor, 0.1 %, 3 ppm/ $^{\circ}\text{C}$
- BNC to BNC cable (3 m) - connection bridge to adapter box FA3
- BNC to open end (3 m) - connection bridge to reference resistors
- PRT adapter box (4 terminals to BNC)
- BNC to 2 x 4 mm banana terminals (2 per pack)
- BNC to 2 x 4 mm banana plugs (2 per pack)
- Adapter BNC to 5-pin DIN plug (1 m)

Software

- ULog



Precision resistor module, model FR4

Specifications	Precision resistor module, model FR4
Value	1, 10, 25 and 100 Ω
Accuracy	1 ... 10 Ω ± 0.005 % (50 ppm) > 10 ... 100 Ω ± 0.0025 % (25 ppm) > 100 ... 1,000 Ω ± 0.001 % (10 ppm)
Stability	< 2 ppm per year
Temperature coefficient	< 0.6 ppm/ $^{\circ}\text{C}$

Ordering information

CTR6000 / Interface / Numbers of multiplexer CTS9000 / Standby current / Definition standby current / Interface driver module / Housing / Precision resistor module / Resistor value 1 / Resistor value 2 / Resistor value 3 / Resistor value 4 / Additional order information

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