

# High-precision process calibrator Model CED7000

WIKA data sheet CT 85.51



for further approvals  
see page 6

## Applications

- Research and development laboratories
- Calibration service companies and service industry
- Industry (laboratory, workshop and production)
- Quality assurance

## Special features

- Excellent accuracy of down to 0.0025 % of reading
- Measuring and simulation of thermocouples (13), resistance thermometers (9), resistance, voltage, current and pressure
- Entry of customer-specific resistance thermometer coefficients
- Beryllium copper connections reduce thermoelectric voltages
- Insulated mA/V measuring channel for complete transmitter calibration (measuring and simulation at the same time)



High-precision process calibrator, model CED7000

## Description

### General information

The model CED7000 process calibrator combines the capabilities of a signal, temperature and pressure calibrator in a single instrument. With the efficiency of a laboratory instrument, an additional isolated measuring channel and optional external pressure modules, the CED7000 is perfect for the widest range of calibration tasks.

### Extensive application possibilities

The CED7000 has a wide range of application options. It can be used for calibration in industry (laboratory, production, workshops) and in laboratories and institutes.

### Efficiency

The signal calibration capability of the CED7000 includes current, voltage and resistance. In the thermocouple and resistance thermometer mode, the unit offers a selection between 13 different thermocouples and 9 different resistance thermometers.

For pressure measurement, an external pressure sensor is required. The best results are achieved by using the CPT6100 series. The accuracy and the resolution are dependent on the respective pressure sensor. The fully isolated measuring channel enables the calibration of transmitters. The CED7000 thus combines the two functions, measuring and simulation, in one instrument. The CED7000 is very easy to use. It supports direct entry using keyboard or cursor keys. The CED7000 can be controlled via PC using RS-232, IEEE-488 or optionally a USB connection.

### Certified accuracy

Every process calibrator CED7000 is provided with a factory calibration certificate which certifies the accuracy of the instrument. On request, we can provide a DKD/DAkKS calibration certificate for this instrument.

# Specifications

<b>Base instrument</b>	
<b>Input and output</b>	
Resistance thermometer (RTD)	Pt100 (385, 3926, 3916), Pt200, Pt500, Pt1000, Ni120, Cu10, YSI 400
Thermocouples	Types B, C, E, J, K, L, N, R, S, T, U, XK, BP
Voltage signal	DC 0 ... 100 V
Current signal	DC 0 ... 100 mA (output) DC 0 ... 50 mA (input)
Resistance	0 ... 4,000 $\Omega$
<b>Transmitter supply</b>	
Voltage supply	DC 24 V $\pm$ 10 V
Loop current	max. DC 24 mA
Resistance	HART <sup>®</sup> resistor: 250 $\Omega$ $\pm$ 3 $\Omega$ (activatable)
<b>Special features</b>	
Settling time	less than 5 seconds
Warm-up time	30 minutes
<b>Voltage supply</b>	
Power supply	AC 100 ... 240 V, 47 ... 63 Hz
Power consumption	max. 15 VA
<b>Permissible ambient conditions</b>	
Operating temperature	0 ... 50 °C
Storage temperature	-20 ... +70 °C
Calibration temperature ( $T_{cal}$ )	18 ... 28 °C
Temperature coefficient	10 % of the accuracy specification per °C outside the calibration temperature
<b>Relative humidity</b>	
Operation	< 80 % r. h. up to 30 °C < 70 % r. h. up to 40 °C < 40 % r. h. up to 50 °C
Storage	0 ... 95 % r. h. (non-condensing)
<b>Communication</b>	
Interface	RS-232, IEEE-488 (GPIB)
<b>Case</b>	
Dimensions	48.3 x 17.7 x 27.9 cm (19.0 x 7.0 x 11.0 inch)
Weight	4 kg (8.82 lb)

Input and output signals		Model CED7000							
Range	Accuracy in ± (% of reading +µV)				Resolution	Stability		Max. load	
	90 days		1 year			24 hours, ±1 °C ± (% of reading +µV)			
<b>Voltage output 1)</b>									
0 ... 100.000 mV	0.0025	3	0.003	3	1 µV	0.0005	2	10 mA	
0 ... 1.00000 V	0.0025	10	0.003	10	10 µV	0.0004	10	10 mA	
0 ... 10.0000 V	0.0025	100	0.003	100	100 µV	0.0004	100	10 mA	
0 ... 100.000 V	0.0025	1 mV	0.003	1 mV	1 mV	0.0005	1 mV	1 mA	
<b>TC output and input</b>									
-10 ... +75.000 mV	0.0025	3 µV	0.003	3 µV	1 µV	0.0005	2	10 Ω	
<b>Isolated voltage input</b>									
0 ... 10.0000 V	0.005	0.2		100 µV					
0 ... 100.000 V	0.005	2.0		1 mV					
								<b>Max. output voltage</b>	<b>Max. inductive load</b>
<b>Current output 2)</b>									
0 ... 100.000 mA	0.004	1	0.005	1	1 µA			12 V	100 mH
<b>Isolated current input 3)</b>									
0 ... 50.0000 mA	0.01	1		0.1 µA					
								<b>Nominal current</b>	
<b>Resistance output</b>									
5 ... 400.000 Ω	0.012	0.015		0.001 Ω				1 ... 3 mA	
5 ... 4.00000 kΩ	0.25	0.3		0.01 Ω				100 µA ... 1 mA	
								<b>Stimulus current</b>	
<b>Resistance input</b>									
0 ... 400.000 Ω	0.002 + 0.0035	0.002 + 0.004		0.001 Ω				1 mA	
0 ... 4.00000 kΩ	0.002 + 0.035	0.002 + 0.04		0.01 Ω				0.1 mA	
<b>Pressure measurement</b>									
Ranges	Dependent on pressure module								
Accuracy and resolution	Dependent on pressure module								
Units	psi, bar, mbar, inH <sub>2</sub> O (4 °C, 20 °C and 60 °F), cmH <sub>2</sub> O (4 °C and 20 °C), mmH <sub>2</sub> O (4 °C and 20 °C), kPa, MPa, inHg, mmHg, kg/cm <sup>2</sup>								

- 1) Output impedance: < 1 Ω; only positive output signal  
2) Only positive output signal  
3) Voltage supply DC 24 V ±10 V  
Loop current max. DC 24 mA  
Resistance HART® resistor: 250 Ω ±3 Ω (activatable)

Output and input	Measuring range	Accuracy in $\pm^{\circ}\text{C}$ 4) 5)	
		$T_{\text{cal}} \pm 5^{\circ}\text{C}$	
Thermocouples		90 days	1 year
Type B	600 ... 800 $^{\circ}\text{C}$	0.35	0.35
	800 ... 1,550 $^{\circ}\text{C}$	0.28	0.28
	1,550 ... 1,820 $^{\circ}\text{C}$	0.21	0.22
Type C	0 ... 1,000 $^{\circ}\text{C}$	0.15	0.16
	1,000 ... 1,800 $^{\circ}\text{C}$	0.22	0.23
	1,000 ... 2,000 $^{\circ}\text{C}$	0.24	0.26
	1,800 ... 2,316 $^{\circ}\text{C}$	0.32	0.35
Type E	-250 ... -200 $^{\circ}\text{C}$	0.24	0.25
	-200 ... -100 $^{\circ}\text{C}$	0.10	0.12
	-100 ... 0 $^{\circ}\text{C}$	0.07	0.09
	0 ... 600 $^{\circ}\text{C}$	0.06	0.08
	600 ... 1,000 $^{\circ}\text{C}$	0.08	0.10
Type J	-210 ... -100 $^{\circ}\text{C}$	0.13	0.14
	-100 ... 800 $^{\circ}\text{C}$	0.07	0.09
	800 ... 1,200 $^{\circ}\text{C}$	0.08	0.10
Type K	-250 ... -200 $^{\circ}\text{C}$	0.45	0.46
	-200 ... -100 $^{\circ}\text{C}$	0.15	0.16
	-100 ... +500 $^{\circ}\text{C}$	0.08	0.10
	500 ... 800 $^{\circ}\text{C}$	0.09	0.10
	800 ... 1,372 $^{\circ}\text{C}$	0.11	0.13
Type L	-200 ... -100 $^{\circ}\text{C}$	0.08	0.10
	-100 ... +900 $^{\circ}\text{C}$	0.07	0.09
Type N	-250 ... -200 $^{\circ}\text{C}$	0.72	0.73
	-200 ... -100 $^{\circ}\text{C}$	0.22	0.23
	-100 ... 0 $^{\circ}\text{C}$	0.11	0.12
	0 ... 100 $^{\circ}\text{C}$	0.09	0.11
	100 ... 800 $^{\circ}\text{C}$	0.08	0.10
	800 ... 1,300 $^{\circ}\text{C}$	0.10	0.12
Type R	-50 ... -25 $^{\circ}\text{C}$	0.54	0.55
	-25 ... 0 $^{\circ}\text{C}$	0.44	0.45
	0 ... 100 $^{\circ}\text{C}$	0.38	0.39
	100 ... 400 $^{\circ}\text{C}$	0.27	0.28
	400 ... 600 $^{\circ}\text{C}$	0.21	0.22
	600 ... 1,000 $^{\circ}\text{C}$	0.19	0.21
	1,000 ... 1,600 $^{\circ}\text{C}$	0.18	0.19
	1,600 ... 1,767 $^{\circ}\text{C}$	0.21	0.23
Type S	-50 ... -25 $^{\circ}\text{C}$	0.51	0.51
	-25 ... 0 $^{\circ}\text{C}$	0.43	0.43
	0 ... 100 $^{\circ}\text{C}$	0.37	0.38
	100 ... 400 $^{\circ}\text{C}$	0.28	0.29
	400 ... 600 $^{\circ}\text{C}$	0.22	0.23
	600 ... 1,000 $^{\circ}\text{C}$	0.21	0.22
	1,000 ... 1,600 $^{\circ}\text{C}$	0.20	0.22
1,600 ... 1,767 $^{\circ}\text{C}$	0.24	0.26	
Type T	-250 ... -200 $^{\circ}\text{C}$	0.34	0.35
	-200 ... -100 $^{\circ}\text{C}$	0.14	0.16
	-100 ... 0 $^{\circ}\text{C}$	0.09	0.11
	0 ... 200 $^{\circ}\text{C}$	0.07	0.09
	200 ... 400 $^{\circ}\text{C}$	0.06	0.09
Type U	-200 ... 0 $^{\circ}\text{C}$	0.15	0.16
	0 ... 200 $^{\circ}\text{C}$	0.08	0.10
	200 ... 600 $^{\circ}\text{C}$	0.07	0.10
Type XK	-200 ... -100 $^{\circ}\text{C}$	0.10	0.11
	-100 ... 0 $^{\circ}\text{C}$	0.07	0.09
	0 ... 600 $^{\circ}\text{C}$	0.06	0.08
	600 ... 800 $^{\circ}\text{C}$	0.07	0.09
Type BP	0 ... 200 $^{\circ}\text{C}$	0.17	0.18
	200 ... 600 $^{\circ}\text{C}$	0.14	0.16
	600 ... 800 $^{\circ}\text{C}$	0.15	0.17
	800 ... 1,600 $^{\circ}\text{C}$	0.22	0.23
	1,600 ... 2,000 $^{\circ}\text{C}$	0.26	0.28
	2,000 ... 2,500 $^{\circ}\text{C}$	0.38	0.40

4) The accuracy does not include the error of the thermocouple.

5) The accuracy includes the error of cold junction compensation. It is not specified separately.

Input	Measuring range	Accuracy in $\pm^{\circ}\text{C}$ <sup>6) 7)</sup>	
		$T_{\text{cal}} \pm 5^{\circ}\text{C}$	
Resistance thermometer and thermistor		90 days	1 year
<b>Pt385, 100 <math>\Omega</math></b>	-200 ... -80 $^{\circ}\text{C}$	0.012	0.013
	-80 ... +100 $^{\circ}\text{C}$	0.018	0.020
	100 ... 300 $^{\circ}\text{C}$	0.022	0.024
	300 ... 400 $^{\circ}\text{C}$	0.025	0.026
	400 ... 630 $^{\circ}\text{C}$	0.031	0.033
	630 ... 800 $^{\circ}\text{C}$	0.037	0.038
<b>Pt3926, 100 <math>\Omega</math></b>	-200 ... -80 $^{\circ}\text{C}$	0.012	0.013
	-80 ... 0 $^{\circ}\text{C}$	0.014	0.015
	0 ... 100 $^{\circ}\text{C}$	0.016	0.017
	100 ... 300 $^{\circ}\text{C}$	0.026	0.022
	300 ... 400 $^{\circ}\text{C}$	0.021	0.026
	400 ... 630 $^{\circ}\text{C}$	0.024	0.032
<b>Pt3916, 100 <math>\Omega</math></b>	-200 ... -190 $^{\circ}\text{C}$	0.009	0.010
	-190 ... -80 $^{\circ}\text{C}$	0.012	0.013
	-80 ... 0 $^{\circ}\text{C}$	0.014	0.015
	0 ... 100 $^{\circ}\text{C}$	0.016	0.017
	100 ... 300 $^{\circ}\text{C}$	0.021	0.022
	300 ... 400 $^{\circ}\text{C}$	0.024	0.026
	400 ... 600 $^{\circ}\text{C}$	0.030	0.031
	600 ... 630 $^{\circ}\text{C}$	0.031	0.033
<b>Pt385, 200 <math>\Omega</math></b>	-200 ... -80 $^{\circ}\text{C}$	0.047	0.053
	-80 ... 0 $^{\circ}\text{C}$	0.050	0.056
	0 ... 100 $^{\circ}\text{C}$	0.053	0.060
	100 ... 260 $^{\circ}\text{C}$	0.054	0.060
	260 ... 300 $^{\circ}\text{C}$	0.062	0.069
	300 ... 400 $^{\circ}\text{C}$	0.064	0.071
	400 ... 630 $^{\circ}\text{C}$	0.079	0.088
	<b>Pt385, 500 <math>\Omega</math></b>	-200 ... 0 $^{\circ}\text{C}$	0.023
0 ... 100 $^{\circ}\text{C}$		0.026	0.028
100 ... 300 $^{\circ}\text{C}$		0.031	0.034
300 ... 400 $^{\circ}\text{C}$		0.035	0.038
400 ... 630 $^{\circ}\text{C}$		0.041	0.045
<b>Pt385, 1,000 <math>\Omega</math></b>	-200 ... 0 $^{\circ}\text{C}$	0.014	0.015
	0 ... 100 $^{\circ}\text{C}$	0.017	0.018
	100 ... 300 $^{\circ}\text{C}$	0.022	0.024
	300 ... 400 $^{\circ}\text{C}$	0.024	0.026
	400 ... 630 $^{\circ}\text{C}$	0.031	0.033
<b>Ni120, 120 <math>\Omega</math></b>	-80 ... +260 $^{\circ}\text{C}$	0.008	0.009
<b>Cu427, 10 <math>\Omega</math></b>	-100 ... +260 $^{\circ}\text{C}$	0.097	0.110
<b>YSI 400</b>	15 ... 50 $^{\circ}\text{C}$	0.005	0.007
<b>SPRT</b>	-200 ... +660 $^{\circ}\text{C}$	0.05	0.06





6) 4-wire input

7) The accuracy does not include the error of the probe.

Output	Measuring range	Accuracy in $\pm$ °C 8)	
		$T_{cal} \pm 5$ °C	
Resistance thermometer and thermistor		90 days	1 year
Pt385, 100 $\Omega$	-200 ... +800 °C	0.04	0.05
Pt3926, 100 $\Omega$	-200 ... +630 °C	0.04	0.05
Pt3916, 100 $\Omega$	-200 ... +630 °C	0.04	0.05
Pt385, 200 $\Omega$	-200 ... +400 °C 400 ... 630 °C	0.35 0.42	0.40 0.50
Pt385, 500 $\Omega$	-200 ... +630 °C	0.15	0.17
Pt385, 1,000 $\Omega$	-200 ... +630 °C	0.07	0.09
Ni120, 120 $\Omega$	-80 ... +260 °C	0.02	0.02
Cu427, 10 $\Omega$	-100 ... +260 °C	0.30	0.38
YSI 400	15 ... 50 °C	0.005	0.007

8) 2-wire output

## Approvals

Logo	Description	Country
	<b>EU declaration of conformity</b> <ul style="list-style-type: none"> <li>■ EMC directive EN 61326-1 emission (group 1, class B) and immunity (controlled electromagnetic environment)</li> <li>■ Low voltage directive EN 61010-1 and EN 61010-2-030 safety requirements for electrical equipment for measurement, control and laboratory use</li> <li>■ RoHS directive</li> </ul>	European Union
	<b>EAC</b> <ul style="list-style-type: none"> <li>■ EMC directive</li> <li>■ Low voltage directive</li> </ul>	Eurasian Economic Community
	<b>GOST</b> Metrology, measurement technology	Russia
	<b>BelGIM</b> Metrology, measurement technology	Belarus

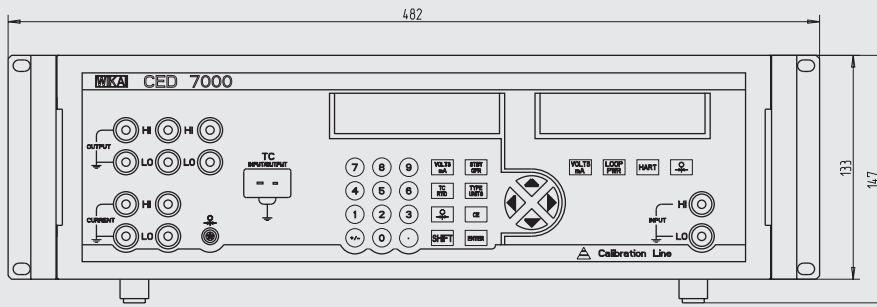
## Certificates

Certificate	
<b>Calibration</b>	Standard: 3.1 calibration certificate per EN 10204 Option: DKD/DAkkS calibration certificate
<b>Recommended recalibration interval</b>	1 year (dependent on conditions of use)

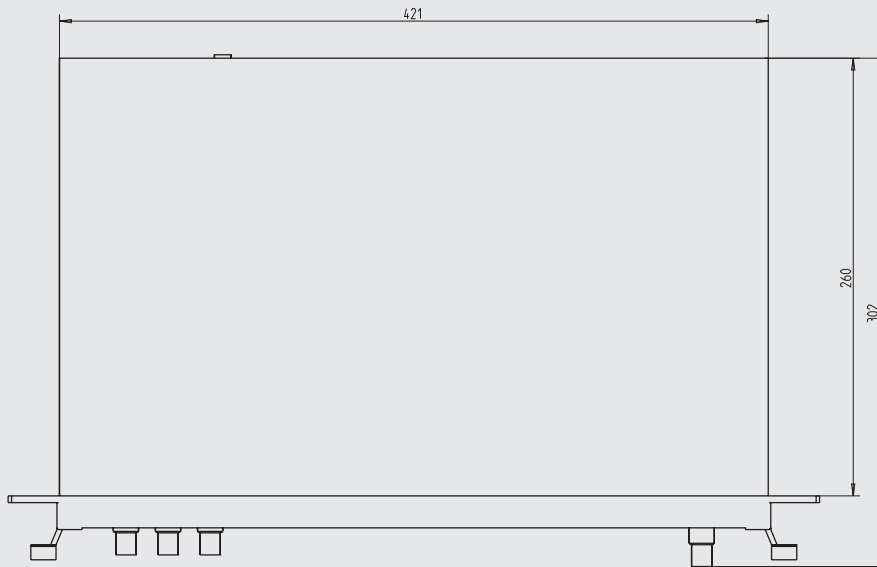
Approvals and certificates, see website

# Dimensions in mm

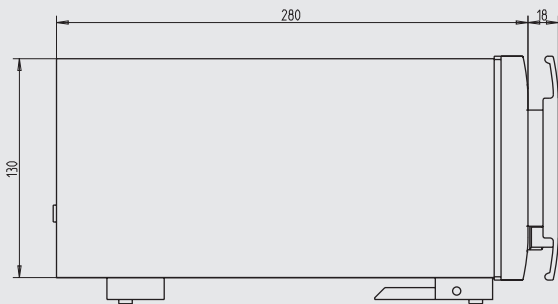
Front view



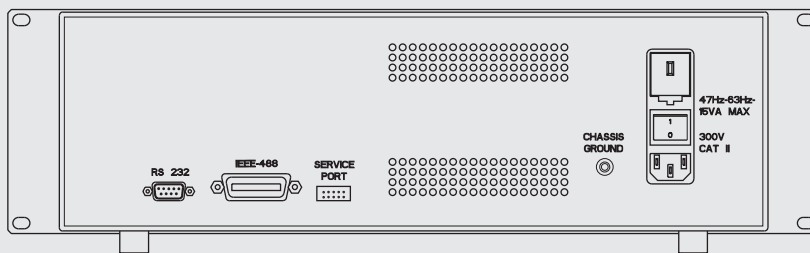
Plan view



Side view



Rear view



## Handling

The CED7000 process calibrator is very simple and user-friendly in operation.

The values can be entered both directly and via the cursor keys. When entering the values directly, the actual value is entered using the numerical keys, the cursor keys are used to change individual digits.

In the voltage mode, the CED7000 automatically sets the appropriate range for the value entered in order to always achieve the highest accuracy.

## Voltage mode

The process calibrator offers four precision voltage simulation ranges (100 mV, 1 V, 10 V, 100 V) with an accuracy of 0.003 % of reading (30 ppm). These ranges are ideal for the calibration of a wide range of different DC voltage instruments.

All voltage simulations are set in less than 20 ms to their full specification. It makes the CED7000 ideal for automatic calibration systems.

An automatic operate/standby function guarantees that a voltage of more than DC 30 V must be acknowledged by the operator before the voltage is made available at the terminals. This provides the optimal protection for the instruments to be calibrated against overvoltage.

## Current mode

The CED7000 has a very precise current simulation range (100 mA) with an accuracy of 0.005 % of reading (50 ppm). This provides ideal conditions for the calibration of process instruments, particularly 4 ... 20 mA instruments.

With a maximum output voltage of DC 12 V at 100 mA, a wide range of different DC current measuring instruments can be calibrated. As the voltage mode, this mode provides a fast reaction time and an operate/standby function.

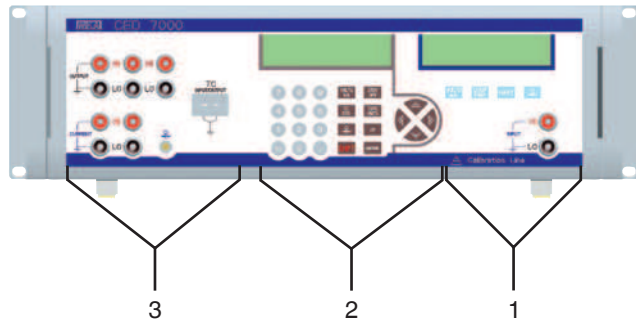
## Thermocouple mode

The CED7000 can display and simulate 13 different thermocouple types. Its thermocouple input and output are cold-junction compensated using an extremely stable Pt1000 sensor.

## Resistance thermometer mode

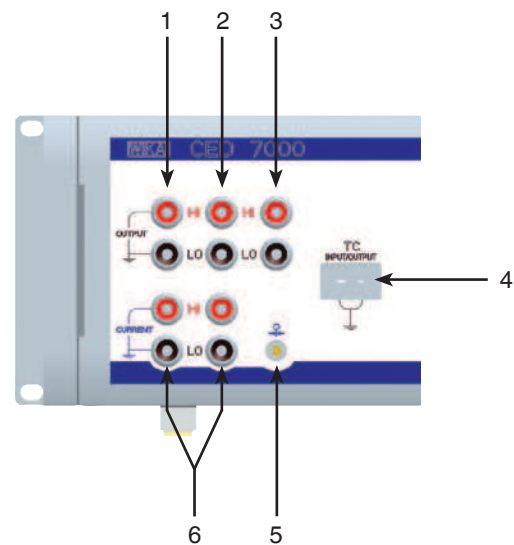
Nine different resistance thermometer types as well as YSI 400 and resistances for non-standard curves can be read and simulated. The coefficients A, B, C and R0 can be entered directly. The instrument can save up to five customer-specific resistance thermometers. The performance of the CED7000 can be compared with other resistance measuring instruments, however, the display is always active with a resolution of 0.001.

## Front view



- (1) Isolated measuring channel
- (2) Primary input/output display and controls
- (3) Primary input/output connections

## Primary input and output connections



- (1) Voltage output
- (2) Current output
- (3) Resistance thermometer and resistance output
- (4) Thermocouple input/output
- (5) Connection for external pressure sensor
- (6) Resistance thermometer and resistance input



### Pressure mode

With the CED7000, pressure can be displayed in many units with an accuracy of down to 0.01 % of span. The isolated measuring channel makes it possible to display pressure simultaneously in different units. All precision pressure sensors of the CPT6100 series can be connected.

### Remote control

All operating functions can be activated and read via RS-232, IEEE-488 or USB interfaces. For this, Windows® HyperTerminal or a different ASCII code-based software can be used. The use of customer-specific programmes is also possible if they are written using programming software similar to C++.

### Set-point control

Up to nine set points can be defined for each output mode. Set points can be very easily checked using three keys. Any number of specified set points can be automatically called up with complete control of the dwell time. This function allows fast performing and repetition of the tests.

### Perfect accuracy/stability

The stability and accuracy of the CED7000 is fully traceable to DKD-/DAkkS standards. The accuracy is specified for 90 days and for a year interval. Manual zero calibration can be carried out for the thermocouple input, resistance input and pressure function in order to avoid offsets.

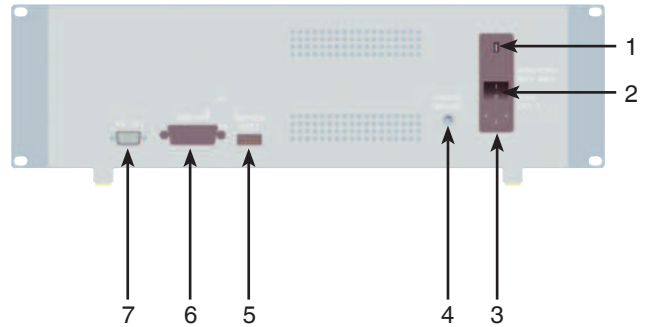
### Flexible output

Five-way screw and plug-in connections provide a wide range of connection options. A multi-LEMO connector is used for the connection of an external pressure sensor, a miniature connector input is provided for thermocouples.

### Isolated measuring channel

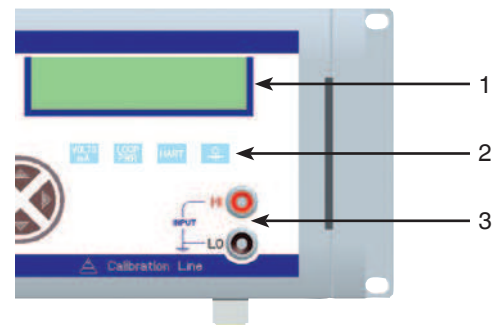
The CED7000 features a completely isolated measuring channel which allows the user to calibrate transmitters. This channel has a DC 24 V voltage supply for supplying 2-wire transmitters and an activatable HART® resistor.

### Interfaces on the rear side



- (1) Fuse compartment
- (2) Power switch
- (3) AC connection per standard IEC
- (4) Grounding (case)
- (5) Service connection
- (6) IEEE-488
- (7) RS-232 (USB with adapter)

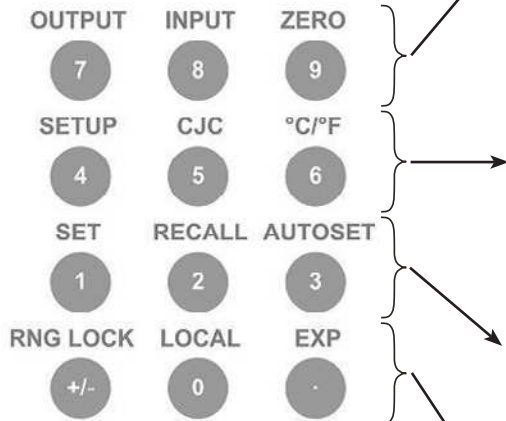
### Isolated measuring channel



- (1) Display
- (2) Function keys
- (3) Input for current and voltage

# Keyboard

## Primary control keys



OUTPUT	SHIFT	7	Switching between input and output mode
INPUT	SHIFT	8	
ZERO	SHIFT	9	
SETUP	SHIFT	4	Settings
CJC	SHIFT	5	Selection of internal or external cold junction compensation
°C / °F	SHIFT	6	Selection of Celsius or Fahrenheit
SET	SHIFT	1	Entering set points
RECALL	SHIFT	2	Recalling set points
AUTOSET	SHIFT	3	Automatic stepping of selected set points
RNG LOCK	SHIFT	+/-	Selection of auto range or range lock
LOCAL	SHIFT	0	Finishing remote control
EXP	SHIFT	·	Selection of the exponent during the entry of customer-specific resistance thermometer coefficients

	Switching between voltage and current
	Switching between TC and RTD
	Selection of the input mode for pressure
	Switching between individual TCs or RTDs
	Switching from standby to operating mode
	Enter key
	Clears the input in the display
	Selection of secondary functions via the numeric keys



## Control keys for the isolated measuring channel



	Switching between voltage and current
	Activation of the DC 24 V supply voltage
	Connection of a 250 Ω HART® resistor
	Selection of the input mode for pressure

## Scope of delivery

- High-precision process calibrator, model CED7000
- Operating instructions
- 3.1 calibration certificate per DIN EN 10204
- Power cord

## Option

### Certificates

- DKD/DAkkS certified accuracy

## Accessories

### Test cables

- Thermocouple wire kit J, K, T, E with plugs
- Thermocouple wire kit R/S, N, B with plugs
- Beryllium copper cable with low thermoelectric voltage (red)
- Beryllium copper cable with low thermoelectric voltage (black)

### Interface

- Null-modem cable
- USB serial adapter

## Ordering information

Model / Mains voltage / Calibration / Additional ordering information

© 04/2008 WIKA Alexander Wiegand SE & Co. KG, all rights reserved.  
The specifications given in this document represent the state of engineering at the time of publishing.  
We reserve the right to make modifications to the specifications and materials.

