

# Digital Temperature Transmitter

## Universally Programmable, Head Mounting

Electrical Temperature Measurement



Model T12.10

### Applications

- Machinery, plant construction
- Process industry

### Special Features

- Universal configuration via Windows-PC, simulation of the sensor not necessary
- Isolation voltage 1500 VAC between sensor and current loop
- Signalling configurable for sensor burnout and sensor short circuiting
- 100% Rh protection, moisture condensation permissible



### Description

The digital temperature transmitter T12 range is designed for universal industrial use.

Comprehensive configuration possibilities like, for example, type of sensor, measuring range and error signalling, reliable accuracy, galvanic isolation and EMI protection characterise these transmitters. The compact head mounting case fits in almost any DIN connecting head with form B.

During configuration any one of 17 types of sensors can be selected.

Measured temperatures are from  $-200^{\circ}\text{C}$  up to  $+2300^{\circ}\text{C}$ .

The following sensors can be connected:

- RTDs per DIN IEC 751, JIS C 1606, DIN 43 760 in 2-, 3- and 4-lead connection, the connection system used is configurable and ensures an optimal lead wire compensation
- thermocouples per DIN IEC 584, DIN 43 710 and ASTM E988 Cold junction compensation (CJC) is built-in, the use of an external CJC is selectable via configuration.
- resistance sensors up to  $5000\ \Omega$  in 2-, 3- and 4-lead connection, configurable compensation of the connection cable
- mV-sensors up to 800 mV

Configuration is done by means of a standard DOS PC using the Configuration Set. With the Configuration Software the required parameters are defined. Data to the T12 is downloaded using a Communication Interface (Programming Unit).

The bi-directional communication enables displaying the measured values on the PC.

Configuration sets are available as an optional extra.

The transmitters are delivered with a basic configuration (see order information). Alternatively, upon request, transmitters can be delivered with a customised configuration within the given limits.

Also available as rail mounting version: model T12.30, see data sheet TE 12.02.

**Specification**
**Model T12.10**

Input	configurable: type of sensor and measuring range	max. measuring range	minimum measuring span <sup>1)</sup>
RTDs	Pt100 ( $\alpha = 0,00385$ )	DIN EN 60 751	-200 ... + 850 °C
	JPt100 ( $\alpha = 0,003916$ )	JIS C 1606 (1989)	-200 ... + 500 °C
	Ni100	DIN 43 760 (1987-09)	-60 ... + 250 °C
thermocouple	type T, Cu-CuNi	DIN EN 60 584	-200 ... + 400 °C
	type E, NiCr-CuNi	DIN EN 60 584	-100 ... +1000 °C
	type J, Fe-CuNi	DIN EN 60 584	-100 ... +1200 °C
	type L, Fe-CuNi	DIN 43 710 (1985-12)	-100 ... + 900 °C
	type K, NiCr-Ni	DIN EN 60 584	-180 ... +1372 °C
	type N, NiCrSi-NiSi	DIN EN 60 584	-180 ... +1300 °C
	type U, Cu-CuNi	DIN 43 710 (1985-12)	-200 ... + 600 °C
	type R, PtRh-Pt	DIN EN 60 584	-50 ... +1760 °C
	type S, PtRh-Pt	DIN EN 60 584	-50 ... +1760 °C
	type B, PtRh-PtRh	DIN EN 60 584	0 ... + 1820 °C <sup>2)</sup>
	type W3, W3Re/W25Re	ASTM E988	0 ... + 2300 °C
	type W5, W5Re/W26Re	ASTM E988	0 ... + 2300 °C
	resistance sensor		0 ... 5000 $\Omega$
mV-sensor		-10 ... 800 mV	5 mV
<b>RTDs / resistance sensor</b>			
measuring deviation per	DIN EN 60 770, 23 °C $\pm$ 5 K		
	RTDs	$\pm 0.2$ K or <sup>3)</sup> $\pm (0.025 \% \text{ FS} + 0.1) \text{ K}$	
	resistance sensor	$\pm 0.07 \Omega$ or <sup>3)</sup> $\pm 0.03 \% \text{ FS in } \Omega$	
sensor current		approx. 0.2 mA	
temperature coefficient $T_C$	RTDs	$\pm (0.025 \% \text{ FS} + 0.09) \text{ K} / 10 \text{ K}_{T_{\text{amb}}}$	
	resistance sensor	$\pm (0.025 \% \text{ FS} + 0.01) \Omega / 10 \text{ K}_{T_{\text{amb}}}$	
lead wire connection		configurable: 2-lead, 3-lead, 4-lead	
connection leads	effect	$\pm 0.02 \Omega / 10 \Omega$	
	max. permissible resistance	30 $\Omega$ each wire, 3-lead symmetric	
signalling of sensor error		configurable	
<b>thermocouples</b>			
measuring deviation <sup>4)</sup> per	DIN EN 60 770, 23 °C $\pm$ 5 K	$\pm 0.5$ K or <sup>3)</sup> $\pm 0.05 \% \text{ FS}$ or <sup>3)</sup> $\pm 10 \mu\text{V}$	
cold junction compensation		$\pm 1.0$ K	
temperature coefficient $T_C$	type T, E, J, L, K, N, U	$\pm (0.05 \% \text{ FS} + 0.1) \text{ K} / 10 \text{ K}_{T_{\text{amb}}}$ or <sup>3)</sup> $\pm 0.5 \text{ K} / 10 \text{ K}_{T_{\text{amb}}}$	
	type R, S, B, W3, W5	$\pm 2 \text{ K} / 10 \text{ K}_{T_{\text{amb}}}$	
connection leads	effect	$\pm 0.5 \mu\text{V} / 10 \Omega$	
	max. permissible resistance	250 $\Omega$	
signalling of sensor error		configurable	
<b>mV-sensor</b>			
measuring deviation per	DIN EN 60 770, 23 °C $\pm$ 5 K	$\pm 10 \mu\text{V}$ or <sup>3)</sup> $\pm 0.05 \% \text{ FS in mV}$	
temperature coefficient $T_C$		$\pm (0.05 \% \text{ FS} + 0.02) \text{ mV} / 10 \text{ K}_{T_{\text{amb}}}$	
connection leads	effect	$\pm 0.5 \mu\text{V} / 10 \Omega$	
	max. permissible resistance	250 $\Omega$	
<b>Analogue output for measuring range</b>		configurable: 4 ... 20 mA or 20 ... 4 mA, 2 wire design	
with type of sensor	RTDs	linear to temperature per DIN EN 60 751 / JIS C 1606 / DIN 43 760:1987-09	
with type of sensor	thermocouple	linear to temperature per DIN EN 60 584 / DIN 43 710:1985-12 / ASTM E988	
by simulation mode		independent from input signal, simulation value configurable from 3.5 mA up to 23 mA	
output limits configurable			
application specification	NAMUR NE 43	configurable from 3.6 mA up to 23 mA	
	not active	lower limit: 3.8 mA upper limit: 20.5 mA	
load $R_A$		lower limit: 3.6 mA upper limit: 23 mA	
load effect		$R_A \leq (U_B - 9 \text{ V}) / 0.023 \text{ A}$ with $R_A$ in $\Omega$ and $U_B$ in V	
measuring deviation per	DIN IEC 770, 23 °C $\pm$ 5 K	$\pm 0.01 \%$ of measuring span / 100 $\Omega$	
temperature coefficient $T_C$		$\pm 0.05 \%$ of measuring span	
damping		$\pm 0.1 \%$ of measuring span / 10 $\text{K}_{T_{\text{amb}}}$	
measured value update		configurable: minimal 0.5 s, 1 s up to 60 s	
power supply effect		approx. 2 / s	
<b>Total measuring deviation</b>		sum of input + output per DIN EN 60 770, 23 °C $\pm$ 5 K	
<b>Signalling at analogue output</b>		with sensor error and internal malfunction	
NAMUR NE 43	up scale	$> 21.0$ mA	
	down scale	$< 3.6$ mA	
substitute value		configurable from 3.5 mA up to 23.0 mA	

1) beginning of measuring range maximum 50 % of end of measuring range

2) technical data valid only for configured measuring range  $\geq 400$  °C

3) whichever is greater

4) valid only for configured measuring range with beginning  $\geq -150$  °C

FS full scale value of configured measuring range


$R_A$  load

$T_{\text{amb}}$  ambient temperature

$T_C$  temperature coefficient

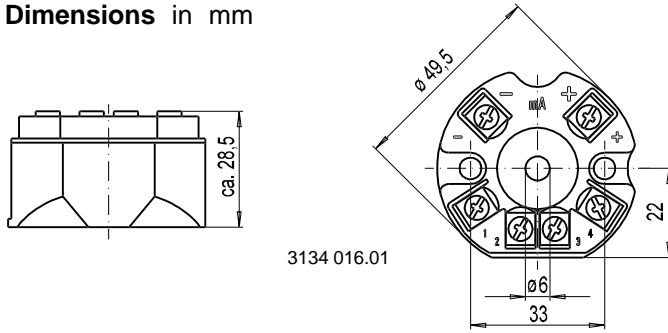
$U_B$  loop power supply voltage, see power supply

<b>Power supply <math>U_B</math></b>		
model T12.10.000 (without Ex-protection)		DC 9 ... 36 V
model T12.10.002 (with Ex, intrinsically safe ia)		DC 9 ... 30 V
model T12.10.006 (with Ex-protection per CSA)		DC 9 ... 30 V
model T12.10.008 (with Ex-protection per FM)		DC 9 ... 30 V
model T12.10.009 (with Ex, energy-limited and non sparking)		DC 9 ... 36 V
input power supply protection		reverse polarity
<b>Ex-protection per Directive 94/9/EC ATEX intrinsically safe per EN 50 020</b>		EC Type Examination Certificate DMT 98 ATEX E 008 X
model T12.10.002		II 1G EEx ia IIB / IIC T4 / T5 / T6
permissible ambient temperature		-40 °C ... +85 °C with T4 -40 °C ... +75 °C with T5 -40 °C ... +60 °C with T6
maximum values for connection of the current loop circuit (connections + and -)	$U_i = DC 30 V$ $C_i = 25 nF$	$I_i = 100 mA$ $L_i = 0.65 mH$ $P_i = 705 mW$
maximum values for connection of the sensor circuit (connections 1 up to 4)	$U_o = DC 11.5 V$ Group IIB: Group IIC:	$I_o = 31 mA$ $C_o = 11 \mu F$ $C_o = 1.5 \mu F$ $P_o = 87 mW$ $L_o = 8.6 mH$ $L_o = 8.6 mH$
<b>Ex-protection, Intrinsic Safety per CSA</b>		CSA LR 105000-5
model T12.10.006		Intrinsically Safe: Class I, Division 1, Group A, B, C and D
max. permissible ambient temperature		85 °C, 75 °C, 60 °C for T-Code T4, T5, T6 respectively
maximum values for connection Entity Parameters	current loop circuit	$V_{max} = 30 Vdc$ $I_{max} = 100 mA$ $P_{max} = 705 mW$
	Input Terminals (+, -)	$C_i = 25 nF$ $L_i = 0.65 mH$
	sensor circuit	$V_{oc} = 11.5 Vdc$ $I_{sc} = 31 mA$ $P_{max} = 87 mW$
	Output Terminals (1, 2, 3, 4)	$C_a = 0.4 \mu F$ $L_a = 8.6 mH$
<b>Ex-protection, Intrinsic Safety per FM</b>		Installation Drawing No. 3184731
model T12.10.008		Intrinsically Safe: Class I, Division 1, Group A, B, C and D
permissible ambient temperature		temperature code T4 -40 °C ... +85 °C temperature code T5 -40 °C ... +75 °C temperature code T6 -40 °C ... +60 °C
maximum values for connection Entity Parameters	current loop circuit	$V_{max} = 30 Vdc$ $I_{max} = 100 mA$ $P_{max} = 705 mW$
	Power Loop (Terminals + and -)	$C_i = 25 nF$ $L_i = 0.65 \mu H$
	sensor circuit	$V_{oc} = 11.5 Vdc$ $I_{sc} = 31 mA$ $P_{max} = 87 mW$
	Sensor Circuit (Terminals 1 to 4)	$C_a = 1.5 \mu F$ $L_a = 8.6 mH$
<b>Special features</b>		
isolation voltage (input versus analogue output)		1500 VAC, 60 s
ambient and storage temperature		
standard range		-40 ... +85 °C
option <sup>1)</sup> : increased range		min. -50 °C    max. +105 °C
climate class		Cx (-40 ... +85 °C, 5 % up to 95 % relative humidity) DIN EN 60 654-1
humidity		100 % relative humidity (unlimited with isolated sensor connection wires), moisture condensation permissible DIN IEC 68-2-30 Var. 2
vibration		10 ... 2000 Hz    5 g    DIN IEC 68-2-6
shock		DIN IEC 68-2-27 $g_N = 30$
salt fog		DIN IEC 68-2-11
configuration and calibration data		permanently stored in EEPROM
testing current to monitor sensor		nom. 33 $\mu A$ during testing cycle, otherwise 0 $\mu A$
self-monitoring		automatic execution of initial test after connection to power supply, thereafter monitoring for internal malfunction
warm-up time		approx. 5 Min. <sup>2)</sup>
power consumption with $U_B$ 24 V		max. 552 mW
communication interface		Programming Unit PU348 (see accessories)
<b>Case</b>		for head mounting
material		plastic
ingress protection	case	IP 66 / IP 67    IEC 529 / DIN EN 60 529
	terminal connections	IP 00    IEC 529 / DIN EN 60 529
cross section of terminal connections		max. 2.5 mm <sup>2</sup> , screws captive
weight		approx. 67 g
dimensions		see drawings

1) only possible for model T12.10.000, i.e. without  -protection

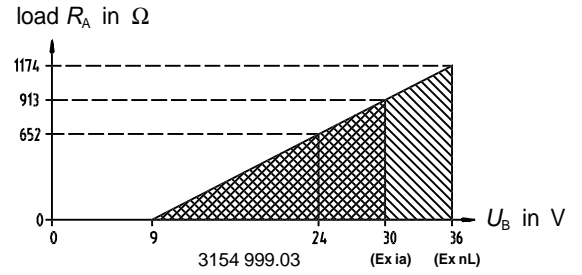
2) Time, after turn on, until the instrument will function within specified repeatability

**Dimensions in mm**

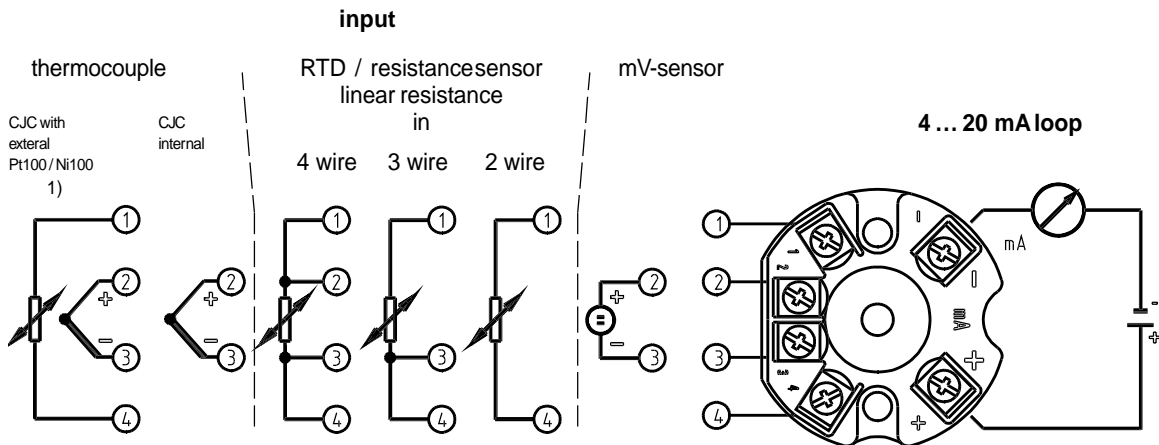


**Load diagram**

The permissible load is dependent upon the loop power supply voltage.



**Designation of terminal connectors**

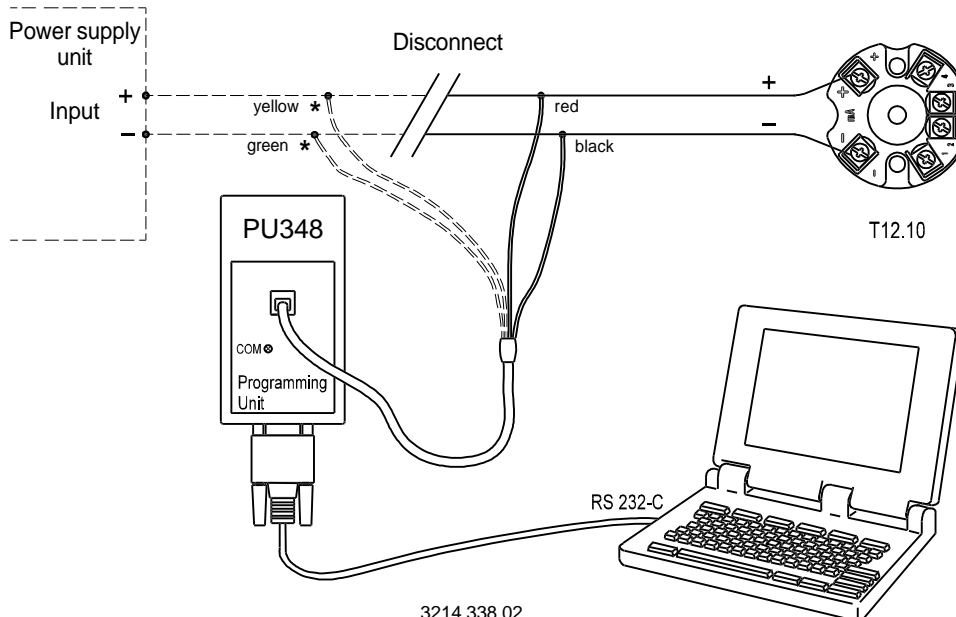


1) Connect sensor (Pt100 / Ni100) for external cold junction compensation between terminal 1 and 4.

3134 032.02

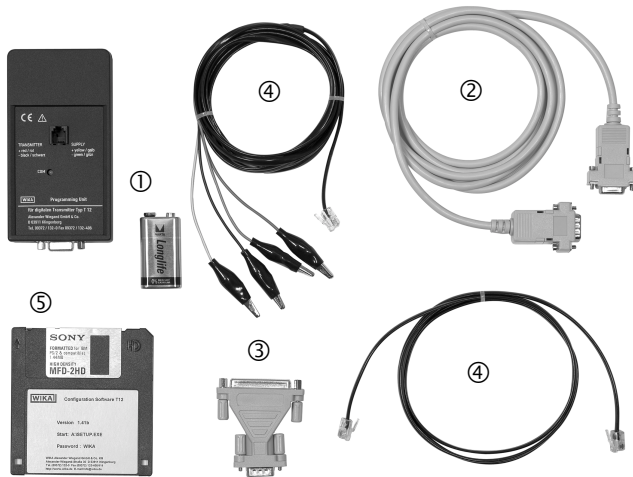
**Connection of Programming Unit PU348**

\* Yellow and green are connected only if configuration of the T12.10 is to be made when the transmitter is on-line. When configuring in the workshop, an external power supply is not required as the Programming Unit provides the power.



## Accessories

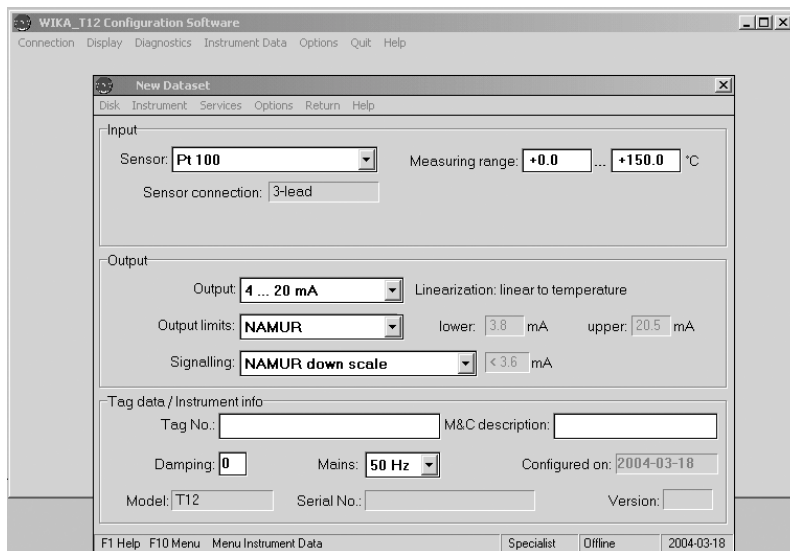
### Configuration Set



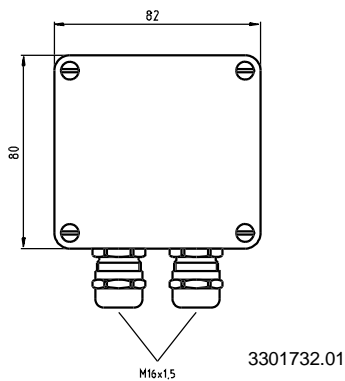
The Configuration Set contains:

- ① Programming Unit (Communication Interface) incl. 9V battery
- ② Connection cable, RS 232-C (9-pin sub-D-plug)
- ③ Plug adapter (25-pin to 9-pin sub-D-plug)
- ④ Two connection cables Programming Unit ↔ T12
- ⑤ Configuration Software (multi-lingual, Online Help) (free of charge download from the WIKA Homepage [www.wika.de](http://www.wika.de))

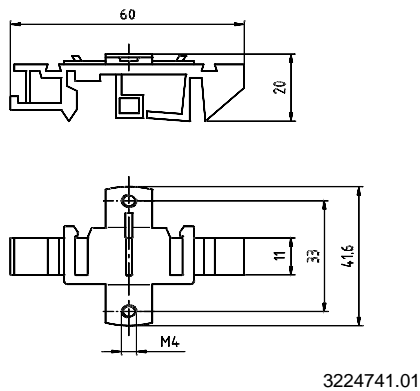
### Screenshot Configuration Software



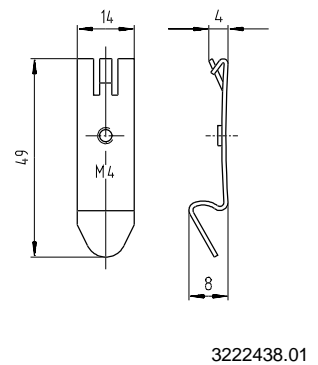
### Field case



### Adapter, plastic



### Adapter, steel tin galvanised



## Ordering informationen for temperature transmitter Model T12.10

Field No.	Code	Features
		<b>Model</b>
1	<input type="text"/> <b>T12.10</b>	T12.10, head mounting
		<b>Explosion protection</b>
	<input type="text"/> <b>0</b>	without
	<input type="text"/> <b>2</b>	II 1G EEx ia IIC T4/T5/T6 acc. to directive 94/9/EC (ATEX)
	<input type="text"/> <b>6</b>	CSA Class I, Division 1, Group A, B, C and D
	<input type="text"/> <b>8</b>	FM Class I, Division 1, Group A, B, C and D
2	<input type="text"/> <b>9</b>	II 3G EEx nL/nA IIC T4/T5/T6
		<b>Measuring range</b>
	<input type="text"/> <b>GK</b>	basic configuration 1)
3	<input type="text"/> <b>KK</b>	customer's specification 2) <i>please state as additional text</i>
		<b>Ambient temperature</b>
	<input type="text"/> <b>S</b>	Standard -40 °C ... +85 °C
	<input type="text"/> <b>N</b>	extended range: -50 °C ... +85 °C <i>only without explosion protection</i>
4	<input type="text"/> <b>H</b>	extended range: -40 °C ... +105 °C <i>only without explosion protection</i>
		<b>Additional order info</b>
	<input type="text"/> <b>YES</b>	<input type="text"/> <b>NO</b>
5	<input type="text"/> <b>T</b>	<input type="text"/> <b>Z</b> additional text <i>Please state as clearly understandable text!</i>

### Order code:

1	2	3	4	5
<input type="text"/>	- 00	<input type="text"/>	- <input type="text"/>	- <input type="text"/>

### Additional text:

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Accessories for model T12 <i>(please order separately)</i>	Order No.
Configuration Software T12 on 3.5" disk 3)	36 60141
Configuration-Set for T12 3)	36 34842
Field case, plastic (ABS), IP 65, for mounting of a head mounting transmitter, permissible ambient temperature: -40 °C ... +80 °C, 82x80x55 mm (WxLxH), with two cable glands M16x1.5	33 01732
Adapter for mounting on a DIN rail, plastic	35 93789
Adapter for mounting on a DIN rail, steel tin galvanised	36 19851

- 1) Input signal: Pt 100 in 3 wire connection, Measuring range: 0 ... 150 °C,  
Output signal: 4 ... 20 mA, Output limits: NAMUR (lower limit: 3.8 mA upper limit: 20.5 mA),  
Signalling of sensor error: NAMUR down scale (3.5 mA), Damping: off
- 2) Please pay attention to the limits of measuring ranges on page 2.
- 3) Free of charge download from the [WIKAI](http://www.wika.de) Homepage [www.wika.de](http://www.wika.de)

Specifications and dimensions given in this leaflet represent the state of engineering at the time of printing.  
Modifications may take place and materials specified may be replaced by others without prior notice.



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