Miniature resistance thermometer
For sanitary applications
Model TR21-B, for orbital welding

Applications

- Sanitary applications
- Food and beverage industry
- Bio and pharmaceutical industry, production of active ingredients

Special features

- Sensor can be calibrated without having to open the process
- Simple and fast connection using an M12 plug connector
- With direct sensor output (Pt100/Pt1000 in 3 or 4-wire version) or integrated transmitter with 4 ... 20 mA output signal, individually parameterisable with free-of-charge WIKAsoft-TT PC configuration software.
- Wetted parts from stainless steel 1.4435
- Self-draining and dead-space minimised, materials and surface finish qualities in accordance with standards of hygienic design

Resistance thermometer with flow-through housing, model TR21-B

Description

The model TR21-B resistance thermometer provides temperature measurement in sanitary applications and can be used for the measurement of liquid and gaseous media in the range of -50 ... +250 °C. To integrate it into the process, the patented thermowell model TW61 (patent, property right registered under No. DE 102010037994 and US 12 897.080) is directly orbitally-welded into a pipeline.

The connection ends are smooth and prepared for orbital welding. The process connections meet the stringent requirements, in terms of materials and design, of hygienic measuring points.

All electrical components are protected against moisture (IP 67 or IP 69K).

The resistance thermometer is available with direct sensor output or integrated transmitter, which can be configured individually via the PC configuration software WIKAsoft-TT.

Measuring range, damping, fault signal per NAMUR NE43 and TAG no. can be adjusted.

For easy calibration or maintenance, the sensor is removable without having to break into the process or disconnect the electrical connection. Thus hygiene risks can be minimised and downtimes can be reduced.

The spring-loading, integrated into the union nut, guarantees the contact between the sensor tip and the bottom of the thermowell and thus ensures a short response time and lasting high accuracy.

Insertion length, process connection, sensor and connection method can each be selected for the respective application within the order information. The electrical connection is made via an M12 x 1 circular connector. An adapter for electrical connection with angular connector per DIN EN 175301-803 is optionally available (patent, property right registered under No. 001370985).

Data sheets showing similar products:
Thermowells for sanitary applications; model TW22; see data sheet TW 95.22
Thermowell for sanitary applications, for orbital welding; model TW61; see data sheet TW 95.61
Resistance thermometer, with flange connection; model TR22-A; see data sheet TE 60.22
Resistance thermometer, for orbital welding; model TR22-B; see data sheet TE 60.23
Miniature resistance thermometer, with flange connection; model TR21-A; see data sheet TE 60.26

Specifications

Thermometer with direct sensor output with Pt100 or Pt1000	
Temperature range	-50 ... +150 °C (-58 ... +302 °F), -50 ... +250 °C (-58 ... +482 °F)
Measuring element	■ Pt100 (measuring current: 0.1 ... 1.0 mA) ■ Face-sensitive Pt100 (measuring current 0.1 ... 1.0 mA) 1) ■ Pt1000 (measuring current: 0.1 ... 0.3 mA) ■ Face-sensitive Pt1000 (measuring current 0.1 ... 0.3 mA) 1)
Temperature at the connector	max. 85 °C (185 °F)
Connection method	■ 3-wire With a cable length of 30 m or longer, measuring deviations can occur. ■ 4-wire The lead resistance can be ignored.
Tolerance value of the measuring element per IEC 60751 2)	■ Class AA (1/3 DIN) ■ Class A
Response time (per IEC 60751)	t_{50} < 3.2 s t_{90} < 7.3 s
Electrical connection	M12 x 1, 4-pin circular connector

For detailed specifications for Pt sensors, see Technical information IN 00.17 at www.wika.com.

Thermometer with transmitter and output signal 4 ... 20 mA	
Temperature range	-50 ... +150 °C (-58 ... +302 °F), -50 ... +250 °C (-58 ... +482 °F) 3)
Measuring element	■ Pt1000 ■ Face-sensitive Pt1000 1)
Connection method	2-wire
Tolerance value of the measuring element per IEC 60751 2)	Class A
Measuring span	minimum 20 K, maximum 300 K
Measuring deviation of the transmitter per IEC 60770	±0.25 K
Total measuring deviation in accordance with IEC 60770	Measuring deviation of the measuring element + the transmitter
Basic configuration	Measuring range 0 ... 150 °C (32 ... 302 °F), other measuring ranges are adjustable
Analogue output	4 ... 20 mA, 2-wire
Linearisation	Linear to temperature per IEC 60751
Linearisation error	±0.1 % 4)
Switch-on delay, electrical (time before the first measured value)	max. 4 s
Warming-up period	After approx. 4 minutes, the instrument will function to the specifications (accuracy) given in the data sheet.
Current signals for fault signal	configurable in accordance with NAMUR NE43 downscale ≤ 3.6 mA upscale ≥ 21.0 mA
Sensor short-circuit	not configurable, in accordance with NAMUR NE43 downscale ≤ 3.6 mA
Sensor current	< 0.3 mA (self-heating can be ignored)
Load R_A	$R_A \leq (U_B - 10\ V) / 23\ mA$ with R_A in Ω and U_B in V
Effect of load	±0.05 % / 100 Ω
Power supply U_B	DC 10 ... 30 V
Max. permissible residual ripple	10 % generated by U_B < 3 % ripple of the output current
Power supply input	protected against reverse polarity
Power supply effect (depending on the power supply U_B)	±0.025 % / V
Influence of the ambient temperature	0.1 % of span / 10 K T_{amb}
Electromagnetic compatibility (EMC) 6)	2004/108/EC, EN 61326 emission (group 1, class B) and interference immunity (industrial application) 5), configuration at 20 % of the full measuring range
Temperature units	configurable °C, °F, K
Info data	TAG No., description and user message can be stored in transmitter
Configuration and calibration data	permanently stored
Response time (per IEC 60751)	t_{50} < 3.2 s t_{90} < 7.3 s
Electrical connection	M12 x 1, 4-pin circular connector

Readings in % refer to the measuring span

1) Through their small design, face-sensitive measuring resistors serve to reduce the heat dissipation with short insertion lengths.
Available for the temperature range up to 150 °C (302 °F) in classes A and B.
For thermowell insertion lengths of less than 11 mm, face-sensitive measuring resistors are generally used.
2) Class accuracy AA (1/3 DIN) only valid in the temperature range 0 ...150 °C (32 ... 302 °F)
Class accuracy A only valid in the temperature range -30 ...+150 °C (-22 ... +302 °F) or -30 ...+250 °C (-22 ... +482 °F), otherwise class B
3) The temperature transmitter should therefore be protected from temperatures over 85 °C (185 °F).
4) ±0.2 % for measuring ranges with a lower limit less than 0 °C (32 °F)
5) Use resistance thermometers with shielded cable, and ground the shield on at least one end of the lead, if the lines are longer than 30 m or leave the building. The instrument must be operated grounded.
6) During interference consider an increased measuring deviation of up to 2 %.

Case

Material	Stainless steel
Ingress protection	
■ Case with connected connector	IP 67 and IP 69K per IEC 60529/EN 60529 The stated ingress protection only applies when plugged in using mating connectors that have the appropriate ingress protection.
■ Coupler connector, not connected	IP 67 per IEC 60529/EN 60529
Weight in kg	approx. 0.3 ... 2.5 (depending on version)

Ambient conditions

Ambient temperature range	-50 ... +85 °C (-58 ... +185 °F)
Storage temperature range	-40 ... +85 °C (-40 ... +185 °F)
Climate class per IEC 60654-1	Cx (-50 ... +85 °C or -58 ... +185 °F, 5 ... 95 % relative humidity)
Maximum permissible humidity per IEC 60068-2-30 var. 2	100 % r. h., condensation allowed
Shock	IEC 60068-2-27
Salt fog	IEC 60068-2-11
Accuracy 7)	-1 Kelvin

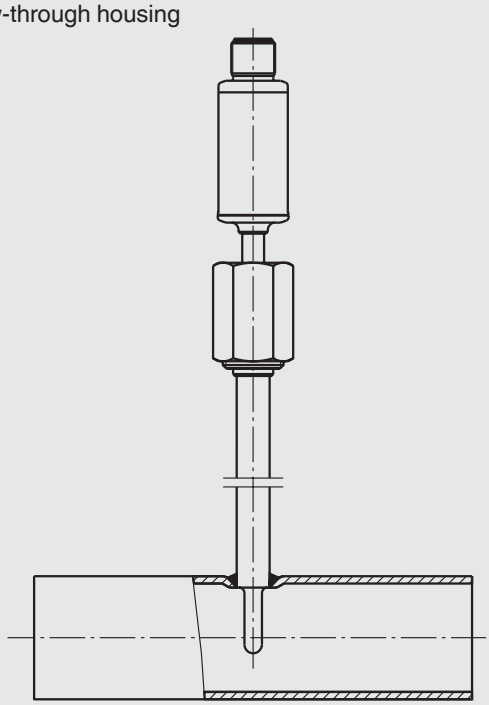
Thermowell model TW61

Designs	■ Flow-through housing ■ Angular housing
Nominal widths of pipe	cf. tables of dimensions
Surface roughness	per DIN 11866 series A, B: Standard: Ra < 0.8 µm Option: Ra < 0.4 µm electropolished per DIN 11866 series C, ASME-BPE: Standard: Ra < 0.76 µm Option: R_a < 0.38 µm electropolished others on request
Materials	per DIN 11866 series A, B: Stainless steel 1.4435 per DIN 11866 series C, ASME-BPE: Stainless steel 316L
Connection to thermometer	G 3/8"
Thermowell diameter	cf. tables of dimensions
Neck tube length M	The neck tube length M is adjusted to the length A of 60 mm. further lengths to customer specifications
Pressure ratings	cf. tables of dimensions
Pipe lengths TL and L_1, thermowell insertion length U_1	cf. tables of dimensions

7) Measured at 100 °C

Overview of the process connections

Flow-through housing



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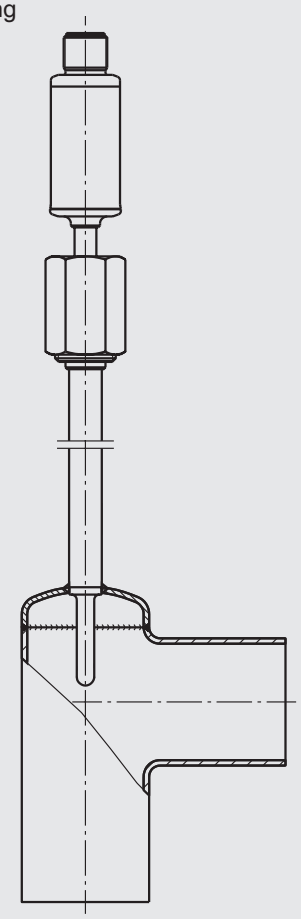
Angular housing



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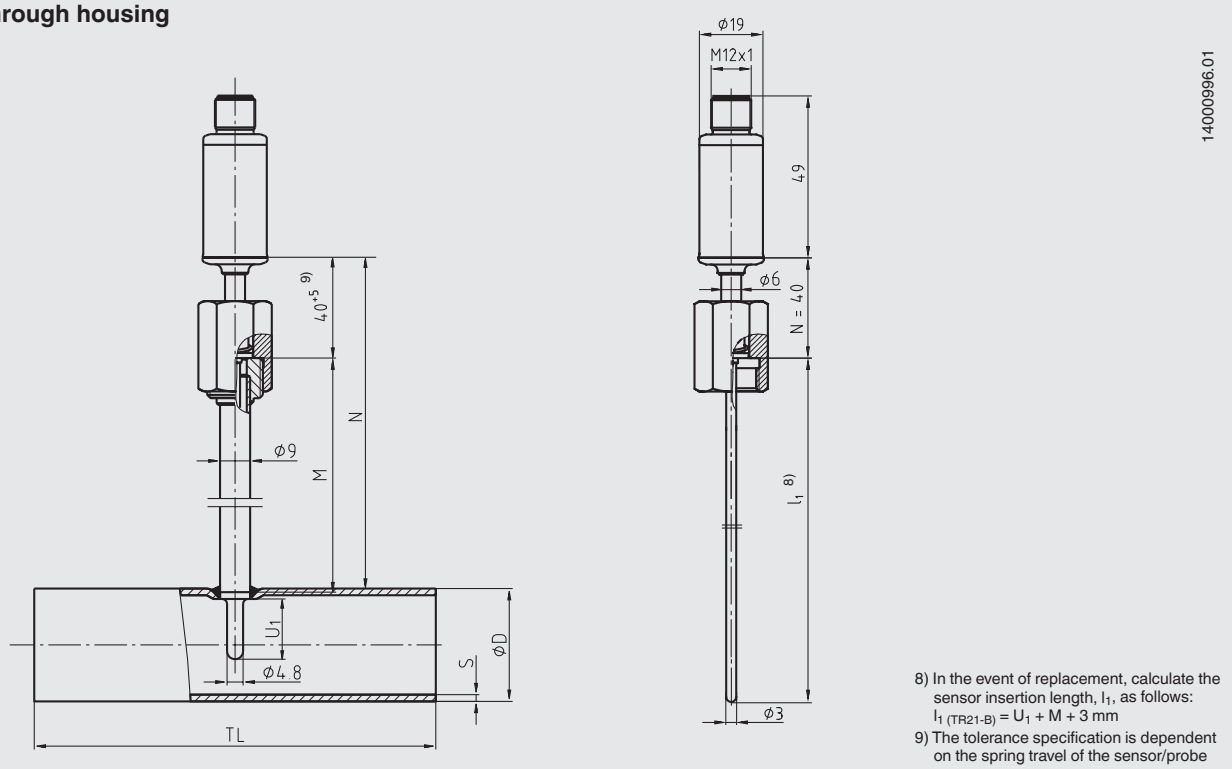
Dimensions of the process connections in mm (model TW61 thermowells)

Flow-through housing

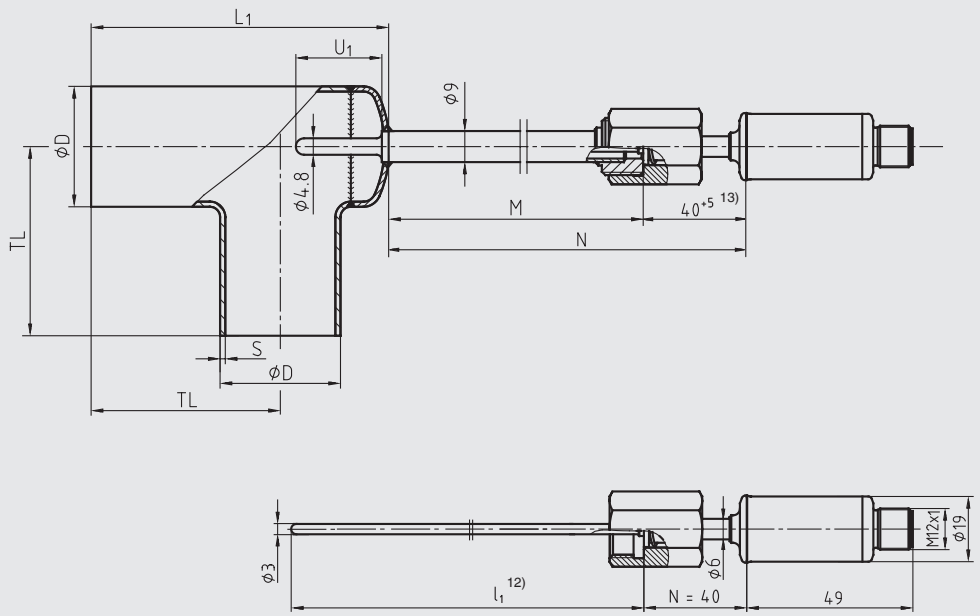


8) In the event of replacement, calculate the sensor insertion length, l_1, as follows: $l_{1\ (TR21\text{-}B)} = U_1 + M + 3$ mm
9) The tolerance specification is dependent on the spring travel of the sensor/probe

Nominal width of pipe DN / OD	Nominal pressure in bar PN 10) 11)	Outer diameter of pipe Ø D	Pipe schedule s	Pipe length T_L	Thermowell insertion length U_1	Neck tube length M
DIN 11866 series A or metric						
10	25	13	1.5	70	6	51
15	25	19	1.5	70	9	48
20	25	23	1.5	80	11	46
25	25	29	1.5	100	18	39
32	25	35	1.5	110	18	39
40	25	41	1.5	120	18	39
50	25	53	1.5	160	30	27
65	16	70	2.0	210	30	27
80	16	85	2.0	260	45	32
100	12.5	104	2.0	310	45	32
DIN 11866 series B or ISO						
13.5	25	13.5	1.6	64	6	51
17.2	25	17.2	1.6	68	9	48
21.3	25	21.3	1.6	72	11	46
26.9	25	26.9	1.6	110	11	46
33.7	25	33.7	2.0	120	18	39
42.4	25	42.4	2.0	130	18	39
48.3	25	48.3	2.0	130	18	39
60.3	25	60.3	2.0	180	30	27
76.1	16	76.1	2.0	220	30	27
88.9	16	88.9	2.3	260	45	32
DIN 11866 series C or ASME BPE						
1/2"	13.8	12.7	1.65	95.2	6	51
3/4"	13.8	19.05	1.65	101.6	9	48
1"	13.8	25.4	1.65	108.0	11	46
1 1/2"	13.8	38.1	1.65	120.6	18	39
2"	13.8	50.8	1.65	146.0	18	39
2 1/2"	13.8	63.5	1.65	158.8	30	27
3"	13.8	76.2	1.65	171.4	30	27
4"	13.8	101.6	2.11	209.6	45	32

10) Maximum operating temperature 150 °C
11) All thermowells of this series that are internally pressurised, with a nominal diameter (DN) > 25 mm, are manufactured and tested to Module H of the Pressure Equipment Directive, 97/23/EC.

Angular housing



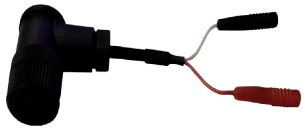
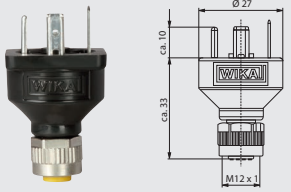
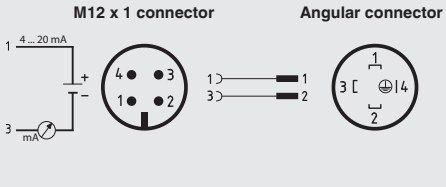
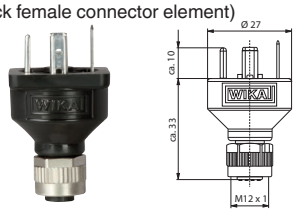
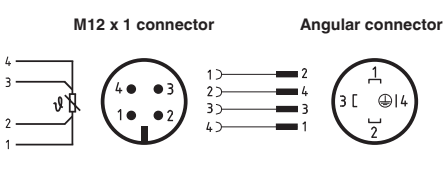
12) In the event of replacement, calculate the sensor insertion length, l_1, as follows:
$l_{1\ (TR21\text{-}B)} = U_1 + M + 3$ mm
13) The tolerance specification is dependent on the spring travel of the sensor/probe

Nominal width of pipe DN / OD	Nominal pressure in bar PN 14) 15)	Outer diameter of pipe Ø D	Pipe schedule s	Pipe length T_L	Pipe length L_1	Thermowell insertion length U_1	Neck tube length M
DIN 11866 series A or metric							
10	25	13	1.5	35	55	14	43
15	25	19	1.5	35	55	18	39
20	25	23	1.5	40	63	18	39
25	25	29	1.5	50	77	30	27
32	25	35	1.5	55	87	30	27
40	25	41	1.5	60	97	30	27
50	25	53	1.5	80	126	30	27
65	16	70	2.0	105	165	45	32
80	16	85	2.0	130	201	45	32
100	12.5	104	2.0	155	241	45	32
DIN 11866 series B or ISO							
13.5	25	13.5	1.6	32	55	14	43
17.2	25	17.2	1.6	34	55	16	41
21.3	25	21.3	1.6	36	58	18	39
26.9	25	26.9	1.6	55	81	30	27
33.7	25	33.7	2.0	60	91	30	27
42.4	25	42.4	2.0	65	102	30	27
48.3	25	48.3	2.0	65	108	30	27
60.3	25	60.3	2.0	90	145	45	32
76.1	16	76.1	2.0	110	173	45	32
88.9	16	88.9	2.3	130	203	45	32
DIN 11866 series C or ASME BPE							
1/2"	13.8	12.7	1.65	47.6	71	14	43
3/4"	13.8	19.05	1.65	50.8	71	18	39
1"	13.8	25.4	1.65	54.0	79	18	39
1 1/2"	13.8	38.1	1.65	60.3	94	30	27
2"	13.8	50.8	1.65	73.0	118	30	27
2 1/2"	13.8	63.5	1.65	79.4	134	45	32
3"	13.8	76.2	1.65	85.7	150	45	32
4"	13.8	101.6	2.11	104.8	190	45	32

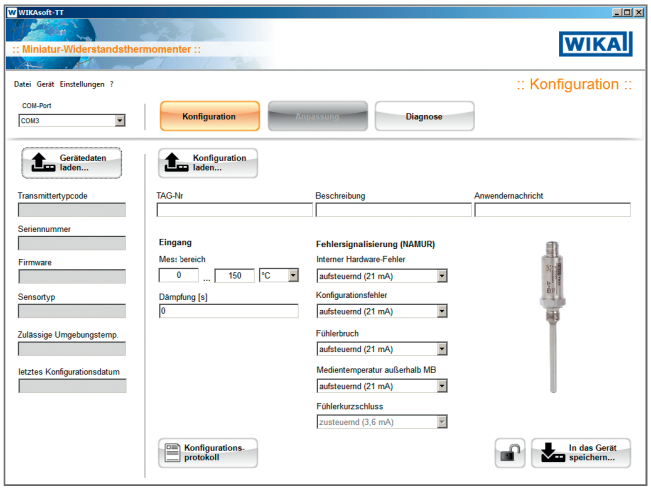
14) Maximum operating temperature 150 °C
15) All thermowells of this series that are internally pressurised, with a nominal diameter (DN) > 25 mm, are manufactured and tested to Module H of the Pressure Equipment Directive, 97/23/EC.

Accessories

Configuration set

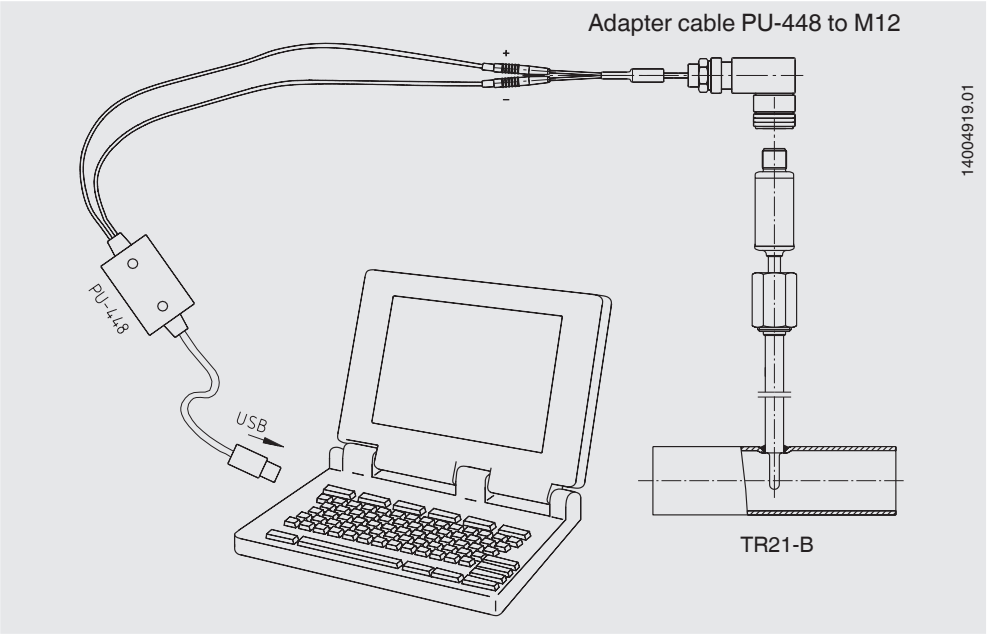
Model	Special features	Order no.
Programming unit Model PU-448 	■ Easy to use ■ LED status/diagnostic displays ■ Compact design ■ No further voltage supply is needed for either the programming unit or for the transmitter	11606304
Adapter cable M12 to PU-448 	Adapter cable for the connection of a model TR21-B resistance thermometer to the PU-448 programming unit	14003193
M12 x 1 transmitter adapter to angular connector DIN EN 175301-803 (yellow female connector element)  	Adapter for the connection of a resistance thermometer with a DIN EN 175301-803 form A angular connector with a 4 ... 20 mA output signal (data sheet AC 80.17) **Case:** PA **Ambient temperature:** -40 ... +115 °C **Union nut:** zinc diecast **Contacts:** copper-zinc alloy, tin-plated **Dielectric strength:** 500 V **Ingress protection:** IP 65	14069503
M12 x 1 Pt adapter to angular connector DIN EN 175301-803 (black female connector element)  	Adapter for the connection of the resistance thermometer with a DIN EN 175301-803 form A angular connector with direct resistance output signal (data sheet AC 80.17) **Case:** PA **Ambient temperature:** -40 ... +115 °C **Union nut:** zinc diecast **Contacts:** copper-zinc alloy, tin-plated **Dielectric strength:** 500 V **Ingress protection:** IP 65	14061115

Configuration software WIKAsoft-TT



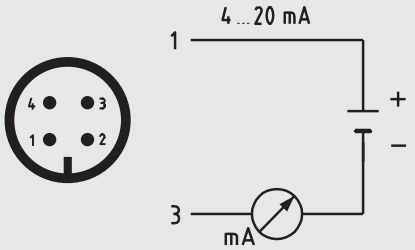
Configuration software (multilingual) as a download from www.wika.com

Connecting PU-448 programming unit



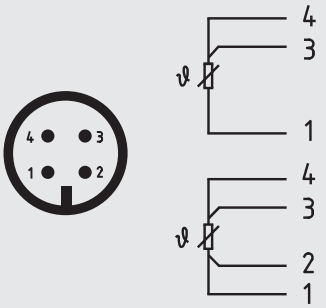
Electrical connection

Output signal 4 ... 20 mA
Circular connector M12 x 1, 4-pin

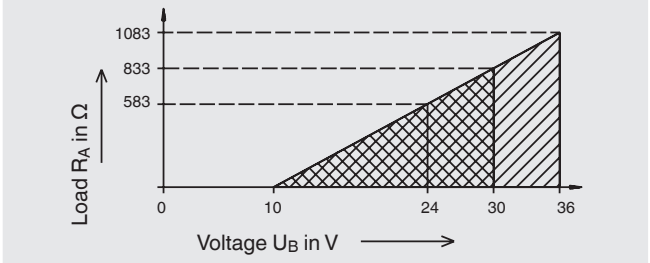


Pin	Signal	Description
1	L+	10 ... 30 V
2	VQ	not connected
3	L-	0 V
4	C	not connected

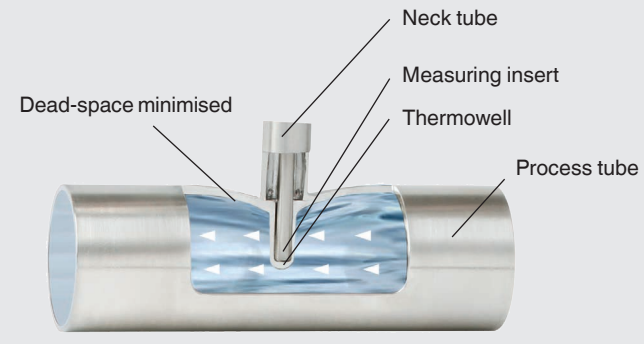
Output signal - Pt100 sensor
Circular connector M12 x 1, 4-pin



Load diagram
The permissible load depends on the loop supply voltage. For communication with the instrument with programming unit PU-448, a max. load of 350 Ω is admissible.



Hygienic design



The patented hygienic design of the TW61 flow-through housing enables dead-space minimised, invasive temperature measurement and a flexible mounting position through self-draining.

CE conformity

Pressure equipment directive
97/23/EC, PS > 200 bar, module H, pressure accessory

For thermowells > DN 25 (1") and for the associated marking on the measuring instrument or thermowell, WIKA confirms conformity with the 97/23/EC Pressure Equipment Directive in accordance with the conformity assessment procedure, module H.

For thermowells with nominal widths of ≤ DN 25 (1"), an EC conformity evaluation in accordance with the Pressure Equipment Directive (PED) is not permitted. Those are designed and manufactured without CE marking in line with the applicable sound engineering practice (PED article 3, chapter 3).

EMC directive [16)]
2004/108/EC, EN 61326 emission (group 1, class B) and interference immunity (industrial application)

16) Only for built-in transmitter

Approvals (option)

- **3-A**, food, USA

Certificates (option)

- 2.2 test report
- 3.1 inspection certificate
- DKD/DAkkS certificate
- Hygiene certificate

Certificate	Flow-through housing	Angular housing
3-A	yes, for all dimensions	yes, from DIN 11866 series A: DN 32 DIN 11866 series B: DN 33.7 DIN 11866 series C: DN 1 ½"

Patents, property rights

- M12 x 1 adapter to angular connector DIN EN 175301-803, registered under No. 001370985
- Dead-space free welding nipple for thermowell model TW61, registered under No. DE 102010037994 and US 12 897.080

Approvals and certificates, see website

Ordering information
Model / Approval / Sensor or transmitter output / Sensor specification or transmitter configuration / Process temperature / Thermowell / Process connection / Material wetted parts / Insertion length U1 / Electrical accessories / Certificates / Options

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