Miniature resistance thermometer
For sanitary applications
Model TR21-C, with welded flange connection

Applications

- Sanitary applications
- Food and beverage industry
- Pharmaceutical industry, production of active ingredients
- Biotechnology and Life-Science-Engineering

Special features

- Compact design for space-saving fitting
- 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
- Materials and surface finish quality in accordance with standards of hygienic design

Resistance thermometer without neck tube with clamp connection, model TR21-C

Description

The model TR21-C 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. These thermometers are fitted with process connections that 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.

The welded junction between the thermowell and the flange makes the use of a sealing as additional material in those areas redundant which are in contact with the product.

Through the compact design, this resistance thermometer is designed specifically for operation in applications with limited mounting space.

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 with an M12 x 1 circular connector. An adapter for electrical connection with angular connector per DIN EN 175301-803 form A 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
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
Miniature resistance thermometer, for orbital welding; model TR21-B; see data sheet TE 60.27

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} < 3.3 s t_{90} < 9.7 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 Tamb
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} < 3.3 s t_{90} < 9.7 s
Electrical connection	M12 x 1, 4-pin circular connector

Readings in % refer to the measuring span

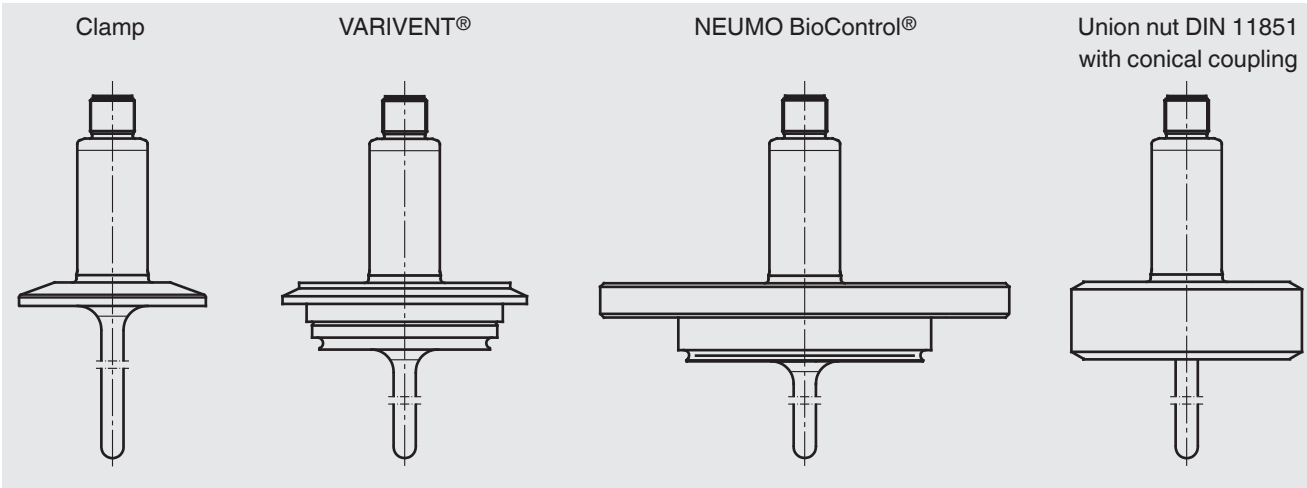
1) Through their small design, face-sensitive measuring resistors serve to reduce the heat dissipation with short insertion lengths.
Available for the temperature range up to 150 °C (302 °F) in classes A and B.
For thermowell insertion lengths of less than 11 mm, face-sensitive measuring resistors are 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

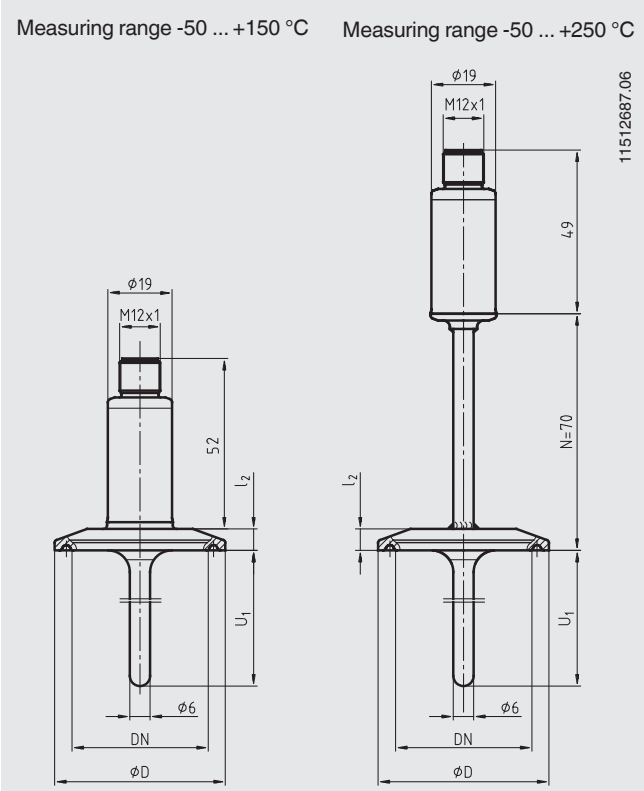
Process connection	
Surface roughness	Standard: $R_a \leq 0.76$ µm (SF3 per ASME BPE) Optional: $R_a \leq 0.38$ µm (SF4 per ASME BPE) $R_a \leq 0.38$ µm electropolished (SF4 per ASME BPE)
Materials (wetted)	Stainless steel 1.4435 (316L)
Connection to thermometer	Welded
Thermowell diameter	6 mm, optional: probe tip reduced to 4.5 mm (from $U_1 > 25$ mm)
Pressure ratings	cf. tables of dimensions

Overview of the process connections

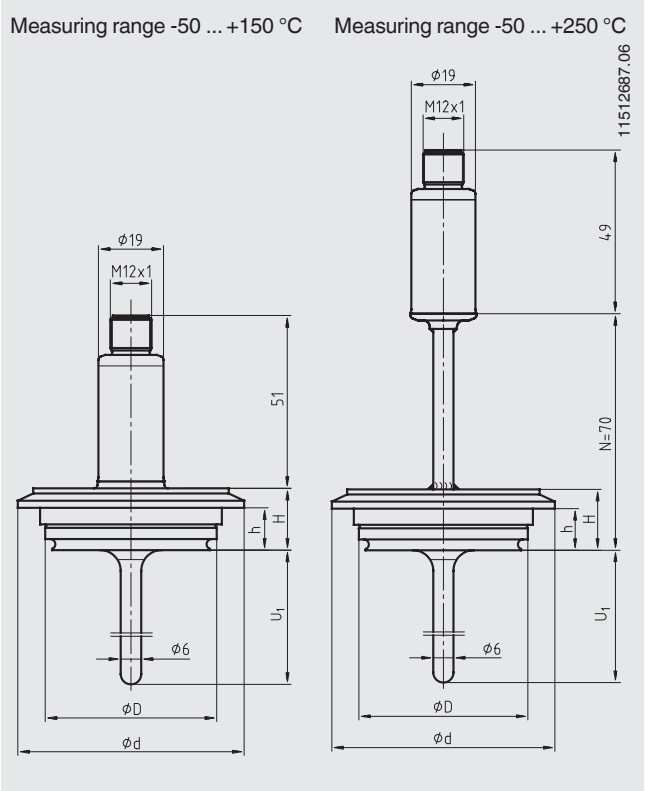


Dimensions in mm

Clamp process connection



VARIVENT® process connection



VARIVENT® is a registered trademark of the company GEA Tuchenhagen.

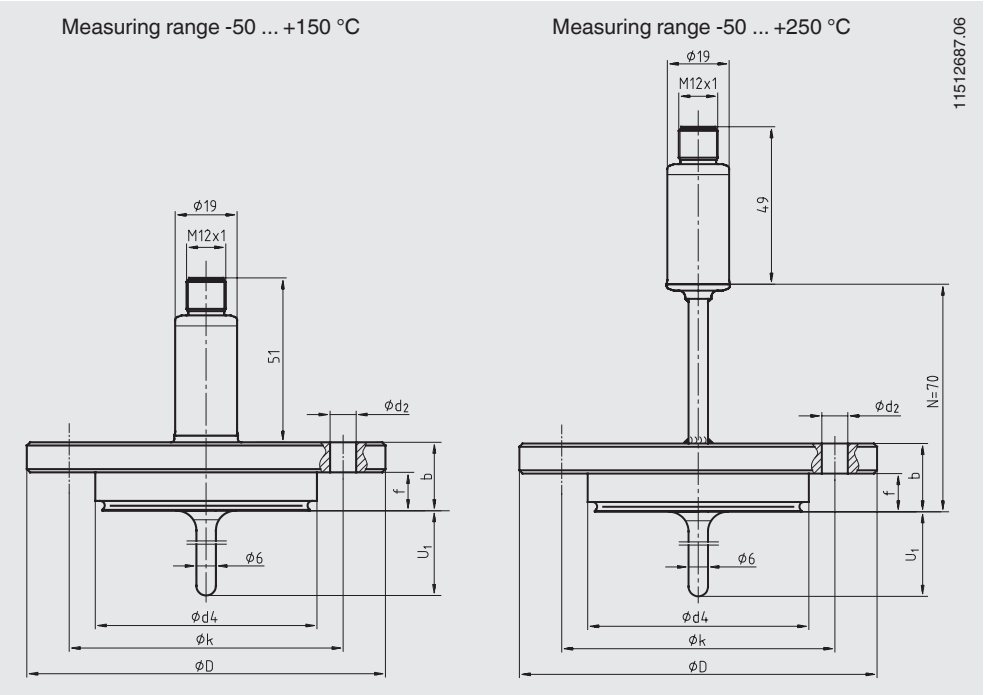
Dimensions for clamp process connection

Process connection	Nominal width in mm/inch	PN in bar	Dimensions in mm Ø D	l_2	Weight in kg
DIN 32676 for pipes per DIN 11866 series A	DN 10 ... 20	16	34.0	6.35	0.2
	DN 25 ... 40	16	50.5	6.35	0.3
	DN 50	16	64.0	6.35	0.4
DIN 32676 for pipes per DIN 11866 series B	13.5 ... 17.2	16	25.0	4.75	0.2
	21.3 ... 33.7	16	50.5	6.35	0.3
	42.4 ... 48.3	16	64.0	6.35	0.3
DIN 32676 for pipes per DIN 11866 series C or Tri-Clamp	½"	16	25.0	4.75	0.2
	¾"	16	25.0	4.75	0.2
	1"	16	50.5	6.35	0.3
	1 ½"	16	50.5	6.35	0.3
	2"	16	64.0	6.35	0.4
ISO 2852	DN 12 ... 21.3	16	34.0	6.35	0.2
	DN 25 ... 38	16	50.5	6.35	0.3
	DN 40 ... 51	16	64.0	6.35	0.4

Dimensions for VARIVENT® process connection

Process connection	Nominal width in mm	PN in bar	Dimensions in mm Ø D	Ø d	H	h	Weight in kg
Form B	DN 10, DN 15	25	31	52.7	20	13.65	0.3
Form F	DN 25, DN 32	25	50	66.0	18	12.30	0.4
Form N	DN 40, DN 50	16	68	84.0	18	12.30	0.6

NEUMO BioControl® process connection



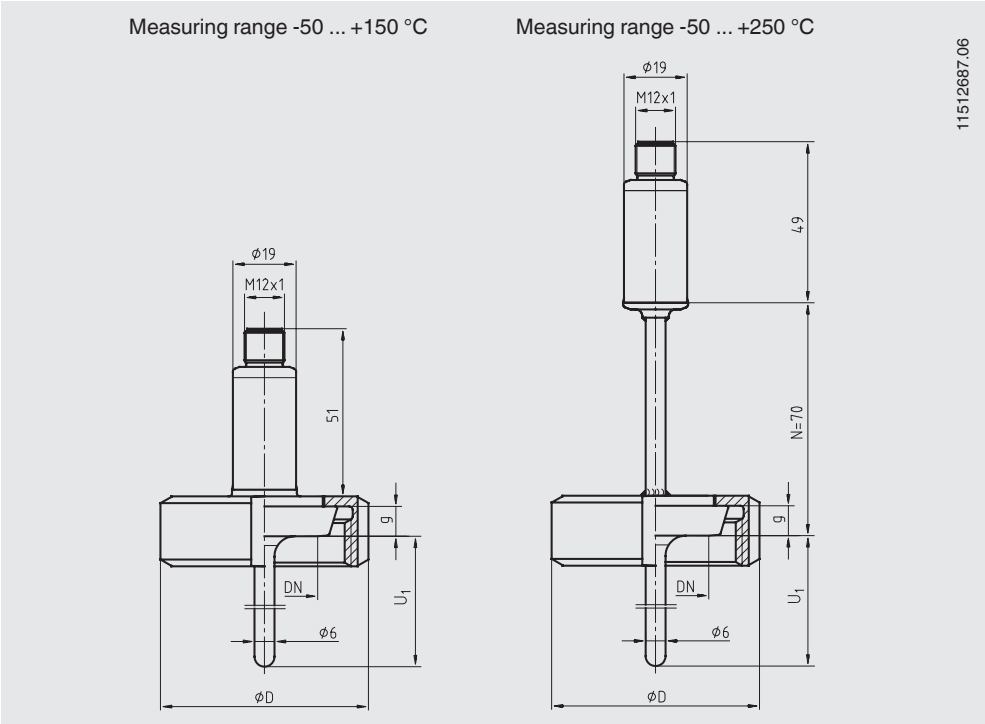
BioControl® is a registered trademark of the company NEUMO.

For a detailed description of the BioControl® cases, see data sheet AC 09.14.

Case size	Nominal width in mm	PN in bar	Dimensions in mm U_1 [7)]	Ø d_4	Ø D	f	b	Ø k	Ø d_2	Weight in kg
Size 25	DN 8	16	5	30.5	64	11	20	50	4 x Ø 7	0.4
	DN 10	16	6	30.5	64	11	20	50	4 x Ø 7	0.4
	DN 15	16	9	30.5	64	11	20	50	4 x Ø 7	0.4
	DN 20	16	11	30.5	64	11	20	50	4 x Ø 7	0.4
Size 50	DN 25	16	15	50.0	90	17	27	70	4 x Ø 9	0.8
	DN 40	16	20	50.0	90	17	27	70	4 x Ø 9	0.8
	DN 50	16	25	50.0	90	17	27	70	4 x Ø 9	0.8
	DN 65	16	35	50.0	90	17	27	70	4 x Ø 9	0.8
	DN 80	16	45	50.0	90	17	27	70	4 x Ø 9	0.8
	DN 100	16	55	50.0	90	17	27	70	4 x Ø 9	0.8
Size 65	DN 40	16	20	68.0	120	17	27	95	4 x Ø 11	1.4
	DN 50	16	25	68.0	120	17	27	95	4 x Ø 11	1.4
	DN 65	16	35	68.0	120	17	27	95	4 x Ø 11	1.4
	DN 80	16	45	68.0	120	17	27	95	4 x Ø 11	1.4
	DN 100	16	55	68.0	120	17	27	95	4 x Ø 11	1.4

7) Recommended insertion length for installation in BioControl® flow-through housing; other insertion lengths are possible.

Union nut process connection DIN 11851 with conical coupling (milk thread fitting)

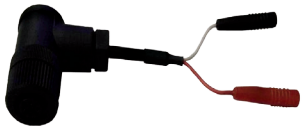
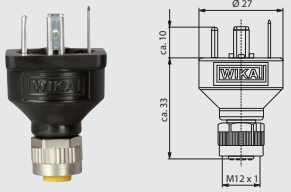
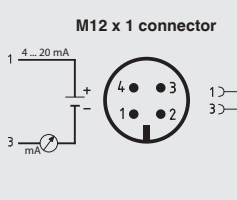
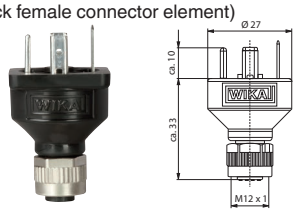
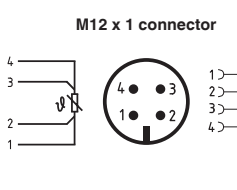


Nominal width in mm	PN in bar	Dimensions in mm				Weight in kg
		Ø d_6	G	Ø D	g	
DN 20	40	36.5	RD 44 x 1/6	54	8	0.4
DN 25	40	44.0	RD 52 x 1/6	63	10	0.5
DN 32	40	50.0	RD 58 x 1/6	70	10	0.6
DN 40	40	56.0	RD 65 x 1/6	78	10	0.8
DN 50	25	68.5	RD 78 x 1/6	92	11	0.9

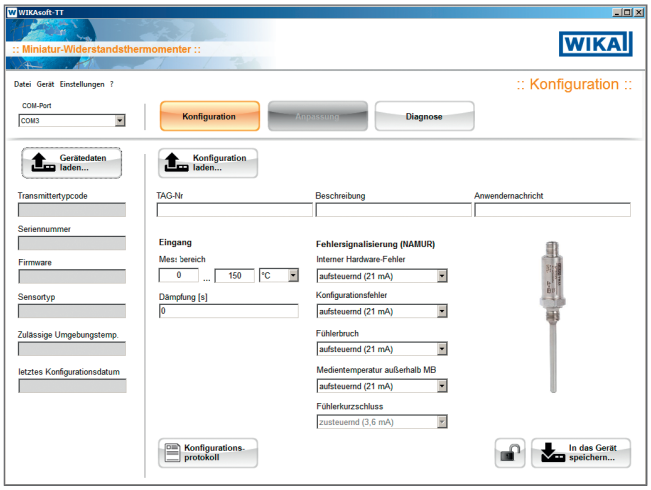
Other process connections and nominal widths available on request.

Accessories

Configuration set

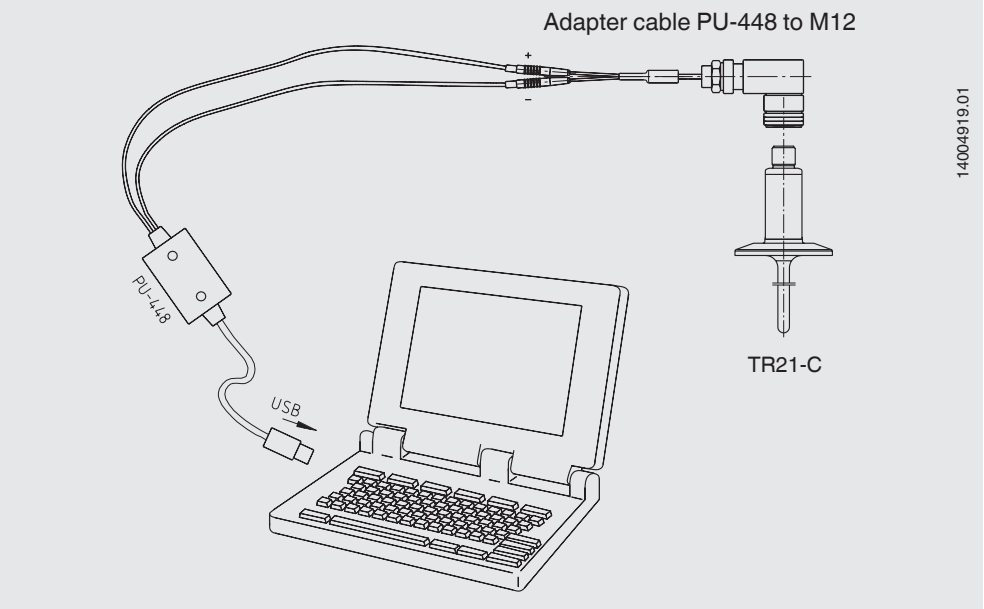
Model	Special features	Order no.
Programming unit Model PU-448 	■ Easy to use ■ LED status/diagnostic displays ■ Compact design ■ No further voltage supply is needed for either the programming unit or for the transmitter	11606304
Adapter cable M12 to PU-448 	Adapter cable for the connection of a model TR21-C resistance thermometer to the model 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) **M12 x 1 connector** **Angular connector** **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) **M12 x 1 connector** **Angular connector** **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



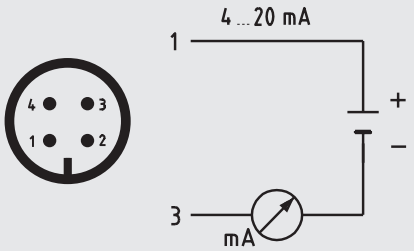
Configuration software (multilingual) as a download from www.wika.com

Connecting PU-448 programming unit



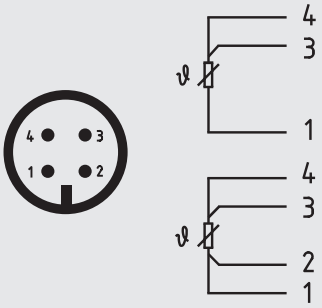
Electrical connection

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

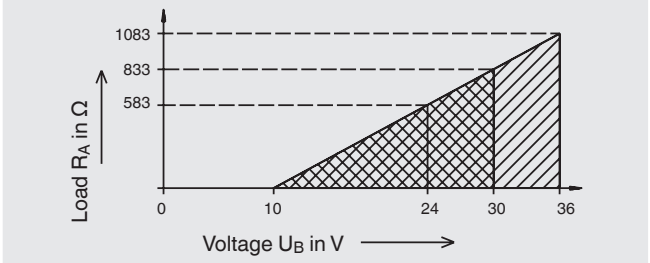


Pin	Signal	Description
1	L+	10 ... 30 V
2	VQ	not connected
3	L-	0 V
4	C	not connected

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



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.



CE conformity

EMC directive [8)]
2004/108/EC, EN 61326 emission (group 1, class B) and interference immunity (industrial application)

8) Only for built-in transmitter

Patents, property rights

M12 x 1 adapter to angular connector DIN EN 175301-803, registered under No. 001370985

Approvals (option)

- **3-A**, food, USA
- **EHEDG**, food, Germany

Certificates (option)

- 2.2 test report
- 3.1 inspection certificate
- Manufacturer's declaration regarding Regulation (EC) 1935/2004
- Hygiene certificates

Approval	3-A	EHEDG
Clamp	yes	yes [10)]
VARIVENT®	yes	yes
BioConnect®	yes	no
DIN 11851	yes [9)]	yes [9)]

9) In combination with
- ASEPTO-STAR k-flex upgrade gaskets from Kieselmann GmbH, Germany or
- SKS gasket set DIN 11851 EHEDG from Siersema Komponenten Service (S.K.S.) B.V., Netherlands

10) In combination with
- Kalrez/Stainless steel gasket from Dupont de Nemours, Switzerland or
- T-ring seals from Combifit International B. V., Netherlands

Approvals and certificates, see website

Ordering information
Model / Approval / Sensor or transmitter output / Sensor specification or transmitter configuration / Process temperature / Process connection / Thermowell diameter / Material wetted parts / Insertion length U_1 / Neck length / Electrical accessories / Certificates / Options

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