

Miniature resistance thermometer For sanitary applications Model TR21-C, with integrated sterile connection

WIKAI data sheet TE 60.28



further approvals
see page 13

Applications

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

Special features

- Compact design for space-saving fitting
- Simple and fast electrical connection via M12 x 1 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

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 (-58 ... +482 °F). For application in hazardous areas, intrinsically safe versions are available.

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.



Fig. left: without neck tube, with clamp connection
Fig. right: tapered version, G 1/2

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.

For applications requiring the sterilisation of the instrument in autoclaves, an especially temperature-resistant instrument version is available.

Specifications

Thermometer with transmitter and output signal 4 ... 20 mA (models TR21-C-xTT, TR21-C-xTB)	
Temperature range	-50 ... +150 °C (-58 ... +302 °F), -50 ... +250 °C (-58 ... +482 °F) ¹⁾
Measuring element	<div> <div></div> <div>Pt1000</div> </div> <div> <div></div> <div>Face-sensitive Pt1000 ²⁾</div> </div>
Connection method	2-wire The lead resistance is recorded as an error in the measurement.
Tolerance value of the measuring element in accordance with IEC 60751	Class A ³⁾
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	Max. 4 s (time before the first measured value)
Warming-up period	After approx. 4 minutes, the instrument will function to the specifications (accuracy) given in the data sheet.
Current signals for error signalling	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	$R_A \leq (U_B - 10 \text{ V}) / 23 \text{ mA}$ 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	±0.025 % / V (Depending on the power supply U _B)
Influence of the ambient temperature	0.1 % of span / 10 K T _a
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 circular connector (4-pin)
Autoclavability (option)	Autoclavable with mounted protection cap at connecting plug (for further information see "Ambient conditions")
Explosion protection (option)	Intrinsically safe to Ex i (ATEX) gas/dust, per directive 94/9/EC (for further information see "Further specifications for explosion-protected version")

Readings in % refer to the measuring span

1) The temperature transmitter should therefore be protected from temperatures over 85 °C (185 °F).

2) 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).
For thermowell insertion lengths of less than 50 mm, face-sensitive measuring resistors are recommended.
For thermowell insertion lengths of less than 11 mm, face-sensitive measuring resistors are generally used.

3) 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

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 transient interferences (e.g. burst, surge, ESD) take into account an increased measuring deviation of up to 2 %.

Thermometer with direct sensor output with Pt100 (model TR21-C-xPx) or Pt1000 (model TR21-C-xRx)	
Temperature range	-50 ... +150 °C (-58 ... +302 °F), -50 ... +250 °C (-58 ... +482 °F)
Measuring element	<ul style="list-style-type: none"> ■ Pt100 (measuring current 0.1 ... 1.0 mA) ■ Face-sensitive Pt100 (measuring current 0.1 ... 1.0 mA) ²⁾ ■ Pt1000 (measuring current 0.1 ... 0.3 mA) ■ Face-sensitive Pt1000 (measuring current 0.1 ... 0.3 mA) ²⁾
Temperature at the connector	Max. 85 °C (185 °F)
Connection method	<ul style="list-style-type: none"> ■ 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 in accordance with IEC 60751	<ul style="list-style-type: none"> ■ Class AA (1/3 DIN) ⁷⁾ ■ Class A ³⁾
Response time (per IEC 60751)	t ₅₀ < 3.3 s t ₉₀ < 9.7 s
Electrical connection	M12 x 1 circular connector (4-pin)
Autoclavability (option)	Autoclavable with mounted protection cap at connecting plug (for further information see "Ambient conditions")
Explosion protection (option)	Intrinsically safe to Ex i (ATEX) gas/dust, per directive 94/9/EC (for further information see "Further specifications for explosion-protected version")

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

Case	
Material	Stainless steel
Ingress protection	IP 67 and IP 69 per IEC 60529/EN 60529, IP 69K per ISO 20653 The stated ingress protection only applies when plugged in using mating connectors that have the appropriate ingress protection. IP 67 per IEC 60529/EN 60529
■ Case with connected connector	
■ Coupler connector, not connected	
Weight in kg	Approx. 0.3 ... 2.5 (depending on version)

Ambient conditions	
Ambient temperature range	
■ Standard version (model TR21-C-Zxx)	-50 ... +85 °C (-58 ... +185 °F)
■ Explosion-protected version	
- Models TR21-C-xTT, TR21-C-xTB	-40 ... +85 °C (-40 ... +185 °F)
- Models TR21-C-xPx, TR21-C-xRx	-50 ... +85 °C (-58 ... +185 °F)
Storage temperature range	-40 ... +85 °C (-40 ... +185 °F)
Climate class per IEC 60654-1	
■ Standard version (model TR21-C-Zxx)	Cx (-50 ... +85 °C or -58 ... +185 °F, 5 ... 95 % r. h.)
■ Explosion-protected version	
- Models TR21-C-xTT, TR21-C-xTB	Cx (-40 ... +85 °C or -40 ... +185 °F, 5 ... 95 % r. h.)
- Models TR21-C-xPx, TR21-C-xRx	Cx (-50 ... +85 °C or -58 ... +185 °F, 5 ... 95 % r. h.)
Maximum permissible humidity per IEC 60068-2-30 var. 2	100 % r. h., condensation allowed
Maximum permissible autoclaving conditions	max. 134 °C, 3 bar abs., 100 % r. h., duration 20 min., max. 50 cycles
Shock resistance per IEC 60068-2-27	50 g, 6 ms, 3 axis, 3 faces, 3 times for each face
Salt fog	IEC 60068-2-11

Readings in % refer to the measuring span

- 2) 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). For thermowell insertion lengths of less than 50 mm, face-sensitive measuring resistors are recommended. For thermowell insertion lengths of less than 11 mm, face-sensitive measuring resistors are generally used.
- 3) 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
- 7) Class accuracy AA (1/3 DIN) only valid in the temperature range 0 ... 150 °C (32 ... 302 °F)

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

Further specifications for explosion-protected version (optional)

■ Thermometer with transmitter and output signal 4 ... 20 mA (models TR21-C-xTT, TR21-C-xTB)

Marking:

Hazardous gas atmosphere	Temperature class	Ambient temperature range (T_a)	Maximum surface temperature (T_{max}) at the sensor or thermowell tip
II 1G Ex ia IIC T1 - T6 Ga II 1/2G Ex ia IIC T1 - T6 Ga/Gb II 2G Ex ia IIC T1 - T6 Gb	T6	-40 ... +45 °C	T_M (medium temperature) + self-heating (15 K) Pay attention to the specific conditions for safe use.
	T5	-40 ... +60 °C	
	T4	-40 ... +85 °C	
	T3	-40 ... +85 °C	
	T2	-40 ... +85 °C	
	T1	-40 ... +85 °C	

Hazardous dust atmosphere	Power P_i	Ambient temperature range (T_a)	Maximum surface temperature (T_{max}) at the sensor or thermowell tip
II 1D Ex ia IIIC T135 °C Da II 1/2D Ex ia IIIC T135 °C Da/Db II 2D Ex ia IIIC T135 °C Db	750 mW	-40 ... +40 °C	T_M (medium temperature) + self-heating (15 K) Pay attention to the specific conditions for safe use.
	650 mW	-40 ... +70 °C	
	550 mW	-40 ... +85 °C	

Safety-related maximum values for the current loop circuit (+ and - connections):

Parameters	Hazardous gas atmosphere	Hazardous dust atmosphere
Terminals	+ / -	+ / -
Voltage U_i	DC 30 V	DC 30 V
Current I_i	120 mA	120 mA
Power P_i	800 mW	750/650/550 mW
Effective internal capacitance C_i	29.7 nF	29.7 nF
Effective internal inductance L_i	Negligible	Negligible
Maximum self-heating at the sensor or thermowell tip	15 K	15 K

■ Thermometer with direct sensor output with Pt100 (model TR21-C-xPx) or Pt1000 (model TR21-C-xRx)

Marking:

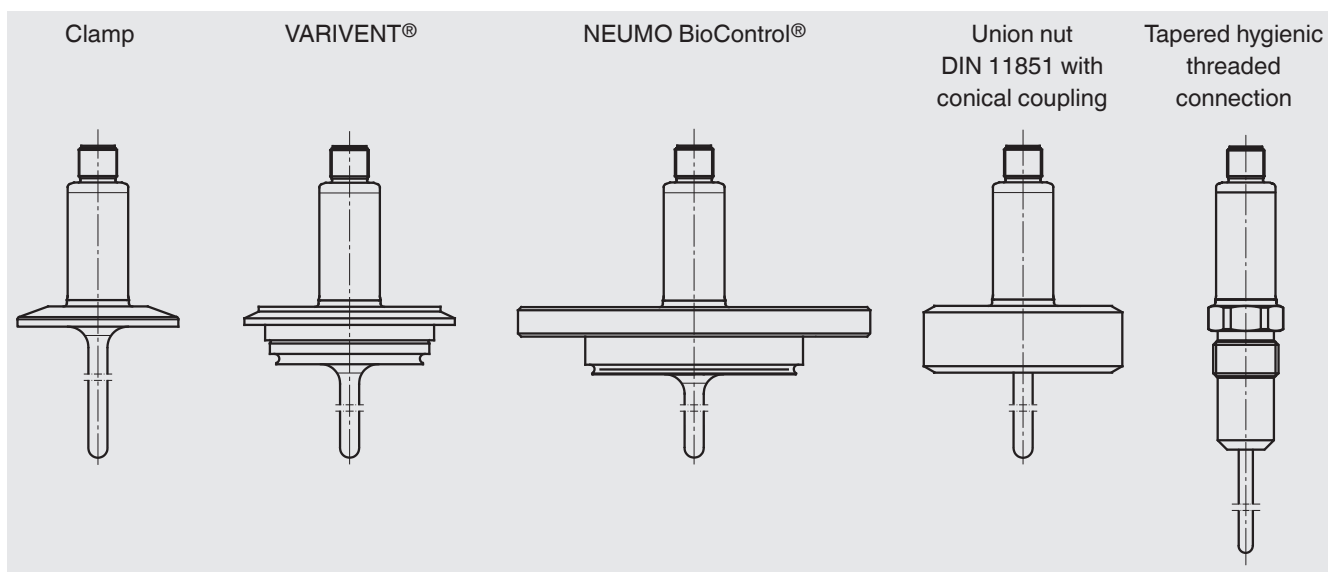
Marking	Temperature class	Ambient temperature range (T_a)	Maximum surface temperature (T_{max}) at the sensor or thermowell tip
II 1G Ex ia IIC T1 - T6 Ga II 1/2G Ex ia IIC T1 - T6 Ga/Gb II 2G Ex ia IIC T1 - T6 Gb	T6	-50 ... +80 °C	T_M (medium temperature) + self-heating Pay attention to the specific conditions for safe use.
	T5	-50 ... +85 °C	
	T4	-50 ... +85 °C	
	T3	-50 ... +85 °C	
	T2	-50 ... +85 °C	
	T1	-50 ... +85 °C	

Marking	Power P_i	Ambient temperature range (T_a)	Maximum surface temperature (T_{max}) at the sensor or thermowell tip
II 1D Ex ia IIIC T135 °C Da II 1/2D Ex ia IIIC T135 °C Da/Db II 2D Ex ia IIIC T135 °C Db	750 mW	-50 ... +40 °C	T_M (medium temperature) + self-heating Pay attention to the specific conditions for safe use.
	650 mW	-50 ... +70 °C	
	550 mW	-50 ... +85 °C	

Safety-related maximum values for the current loop circuit (connections in accordance with pin assignment 1 - 4):

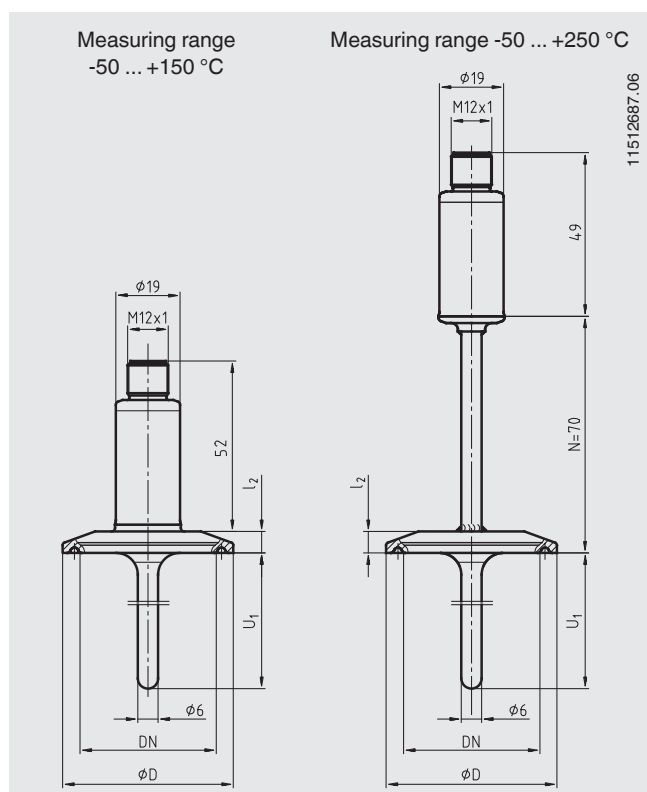
Parameters	Gas applications	Dust applications
Terminals	1 - 4	1 - 4
Voltage U_i	DC 30 V	DC 30 V
Current I_i	550 mA	250 mA
Power P_i	1.500 mW	750/650/550 mW
Effective internal capacitance C_i	Negligible	Negligible
Effective internal inductance L_i	Negligible	Negligible
Maximum self-heating at the sensor or thermowell tip	$(R_{th}) = 335 \text{ K/W}$	$(R_{th}) = 335 \text{ K/W}$

Overview of the process connections

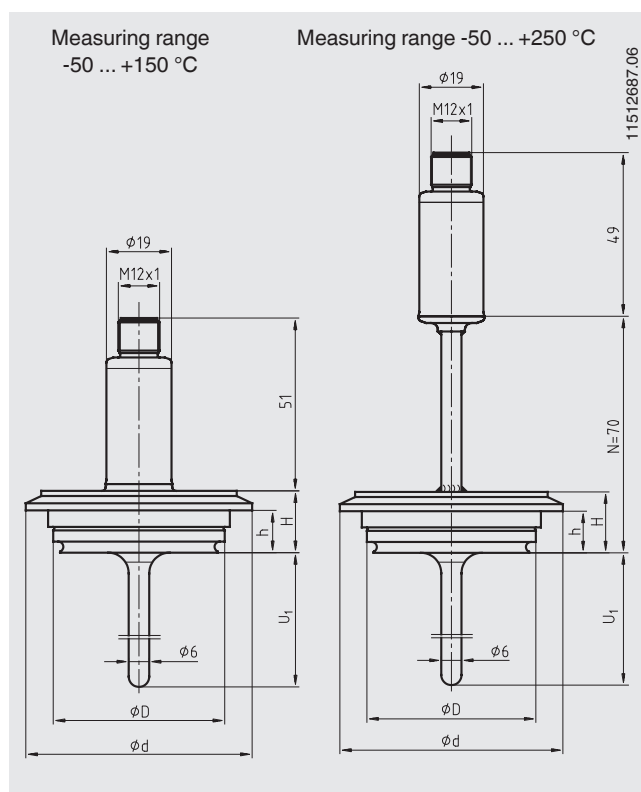


Dimensions in mm

Clamp process connection



VARIVENT® process connection



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

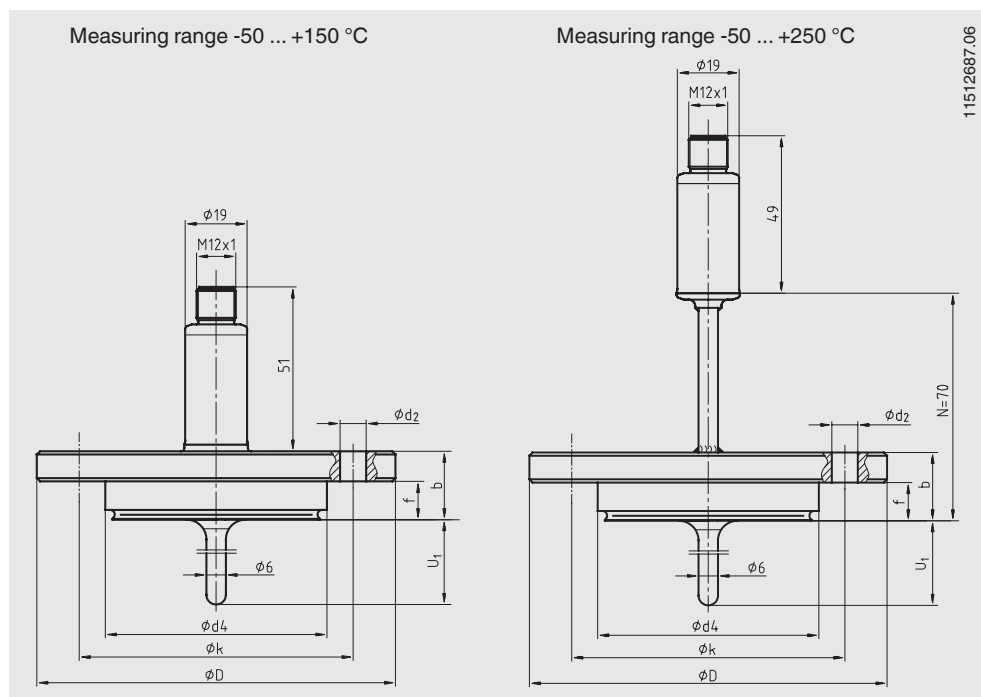
Dimensions for clamp process connection

Process connection	Nominal width in mm/inch	PN in bar	Dimensions in mm		Weight in kg
			Ø D	l ₂	
DIN 32676 for pipes per DIN 11866 row 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 row 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 row C	½" ... ¾"	16	25.0	4.75	0.2
	1" ... 1 ½"	16	50.5	6.35	0.3
	2"	16	64.0	6.35	0.4
Tri-clamp	½" ... ¾"	16	25.0	4.75	0.2
	1" ... 1 ½"	16	50.5	6.35	0.3
	2"	16	64.0	6.35	0.4
	2 ½"	16	77.5	6.35	0.5
	3"	16	91.0	6.35	0.6
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				Weight in kg
			Ø D	Ø d	H	h	
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



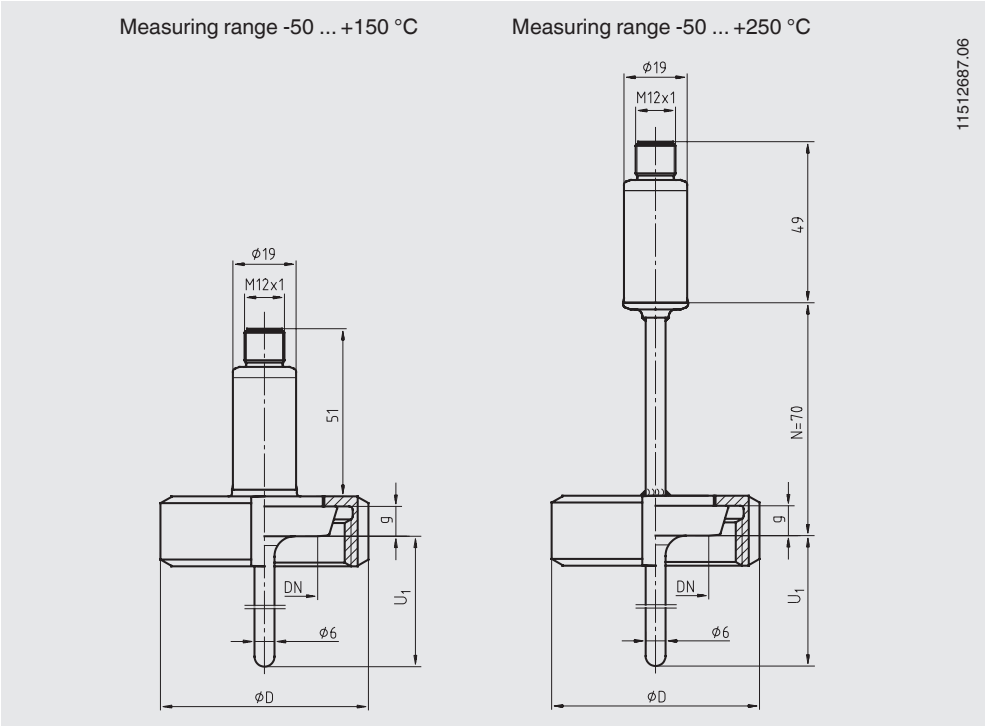
BioControl® is a registered trademark of the company NEUMO.

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							Weight in kg
			U ₁ ¹⁾	Ø d ₄	Ø D	f	b	Ø k	Ø d ₂	
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

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

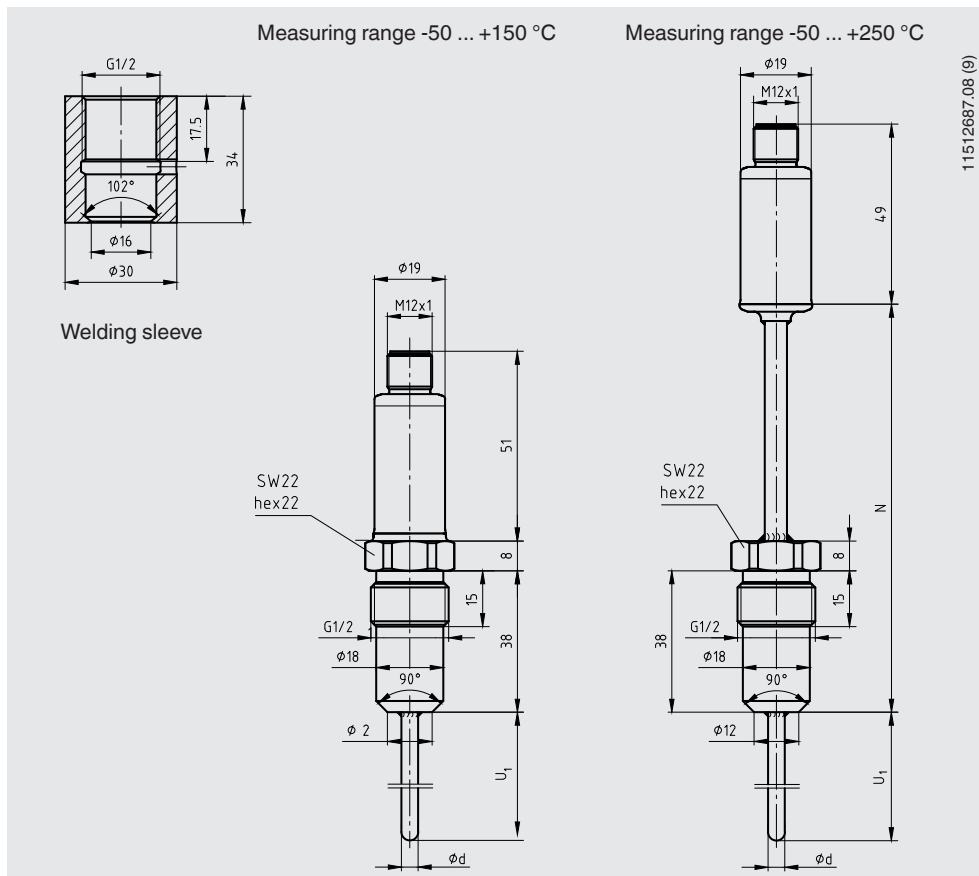
Union nut process connection DIN 11851 with conical coupling (milk thread fitting)



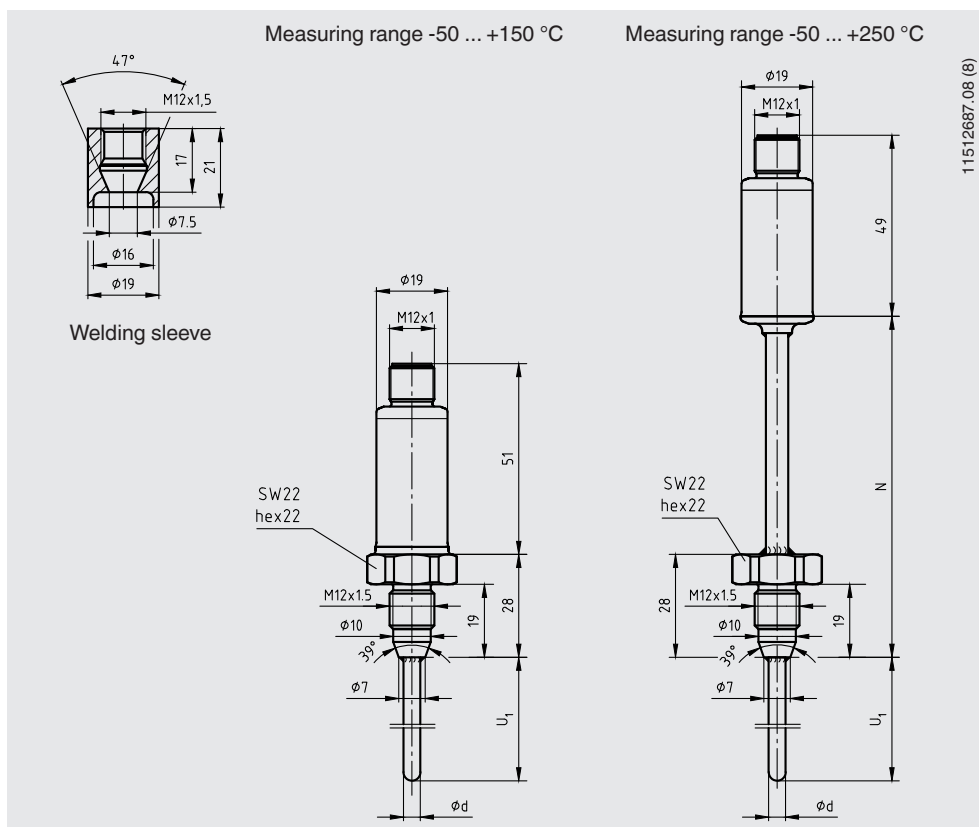
Nominal width in mm	PN in bar	Dimensions in mm				Weight in kg
		Ø d ₆	G	Ø D	g	
DN 20	40	36.5	RD 44 x 1/6	54	8	0.4
DN 25	40	44.0	RD 52 x 1/6	63	10	0.5
DN 32	40	50.0	RD 58 x 1/6	70	10	0.6
DN 40	40	56.0	RD 65 x 1/6	78	10	0.8
DN 50	25	68.5	RD 78 x 1/6	92	11	0.9

Tapered hygienic threaded connection process connection

■ Process connection G 1/2



■ Process connection M12 x 1.5

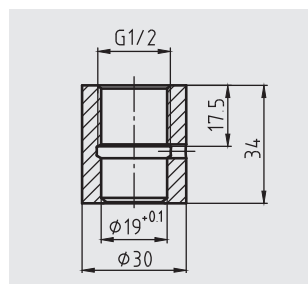


Other process connections and nominal widths available on request.

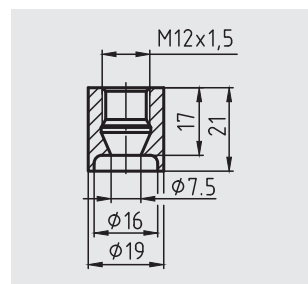
Accessories

Model	Special features	Order no.
Programming unit Model PU-448 	<ul style="list-style-type: none"> ■ 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 sealing cap with mounted PTFE sealing	Sealing cap for protecting the resistance thermometer during sterilisation in autoclaves	14113588
M12 connection cable	Cable socket straight, 4-pin, ingress protection IP 67 ■ Temperature range -20 ... +80 °C ■ Suitable for hazardous areas	Cable length 2 m 14086880 Cable length 5 m 14086883
	Cable socket straight, 4-pin, ingress protection IP 69K, Hygienic Design ■ Temperature range -40 ... +80 °C ■ Not for hazardous areas	Cable length 3 m 14137167 Cable length 5 m 14137168
	Angled socket, 4-pin, ingress protection IP 67 ■ Temperature range -20 ... +80 °C ■ Suitable for hazardous areas	Cable length 2 m 14086889 Cable length 5 m 14086891
	Angled socket, 4-pin, ingress protection IP 69K, Hygienic Design ■ Temperature range -40 ... +80 °C ■ Not for hazardous areas	Cable length 3 m 14137169 Cable length 5 m 14137170
	Welding sleeves With tapered hygienic threaded connection G 1/2 Material: stainless steel 1.4435 (316L)	11422599
	With tapered hygienic threaded connection M12 Material: stainless steel 1.4435 (316L)	11426721
	Weld-in help 	Weld-in mandrel for tapered hygienic threaded connection G 1/2 Material: CuZn alloy (brass) 11477742
		Weld-in mandrel for tapered hygienic threaded connection M12 Material: CuZn alloy (brass) 11476894

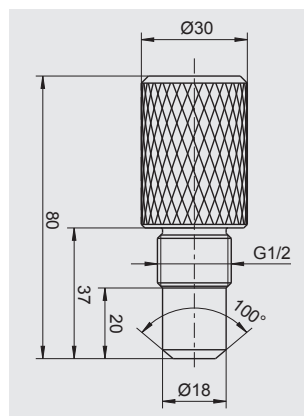
Welding sleeves G 1/2



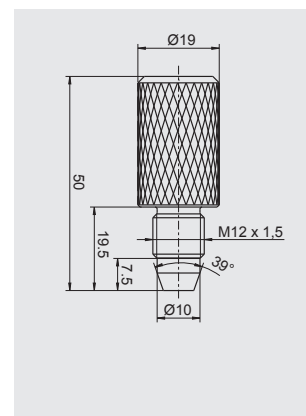
Welding sleeves M12



Weld-in mandrel G 1/2



Weld-in mandrel M12

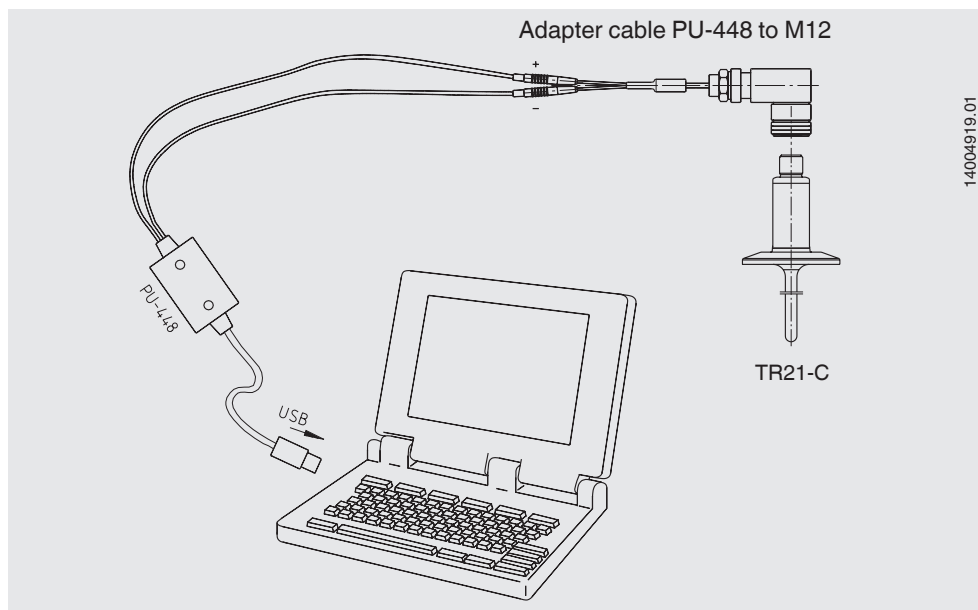


Configuration software WIKAsoft-TT

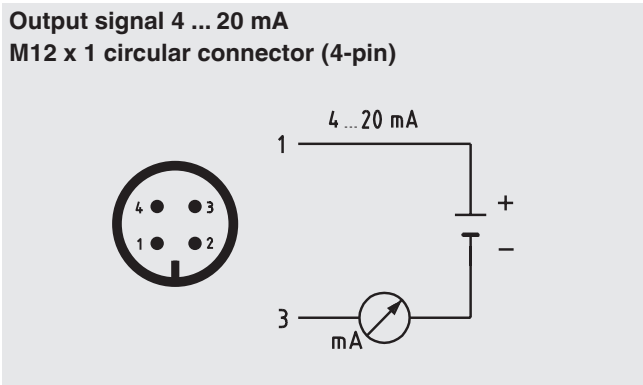


Configuration software (multilingual) as a download from www.wika.com

Connecting PU-448 programming unit



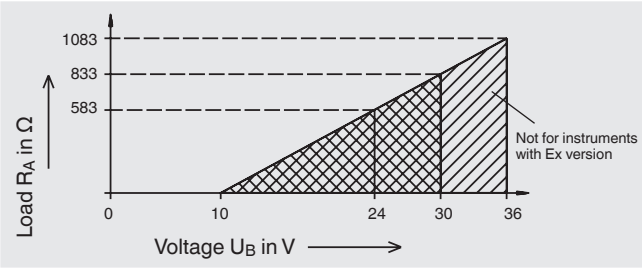
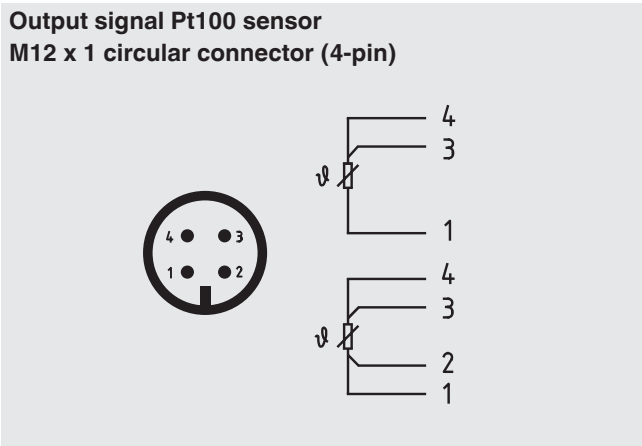
Electrical connection














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

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.



Approvals

Logo	Description	Country
 	EC declaration of conformity ■ EMC directive 2004/108/EC ¹⁾ EN 61326 emission (group 1, class B) and interference immunity (industrial application) ■ ATEX directive 94/9/EC (option) II 1G Ex ia IIC T1 - T6 Ga II 1/2G Ex ia IIC T1 - T6 Ga/Gb II 2G Ex ia IIC T1 - T6 Gb II 1D Ex ia IIIC T135 °C Da II 1/2D Ex ia IIIC T135 °C Da/Db II 2D Ex ia IIIC T135 °C Db	European Community
	IECEx (option) Hazardous areas	IECEx member states
	CSA ■ Safety (e.g. electr. safety, overpressure, ...) ■ Hazardous areas	USA and Canada
	EAC (option) Electromagnetic compatibility ¹⁾	Eurasian Economic Community
	GOST (option) Metrology, measurement technology	Russia
	KazInMetr (option) Metrology, measurement technology	Kazakhstan
-	MTSCHS (option) Permission for commissioning	Kazakhstan
	BelGIM (option) Metrology, measurement technology	Belarus
	Uzstandard (option) Metrology, measurement technology	Uzbekistan
	3-A Sanitary Standard	USA
	EHEDG Hygienic Equipment Design	European Community

1) Only for built-in transmitter

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 ³⁾
VARIVENT®	yes	yes
BioConnect®	yes	no
DIN 11851	yes ²⁾	yes ³⁾

2) 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

3) 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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