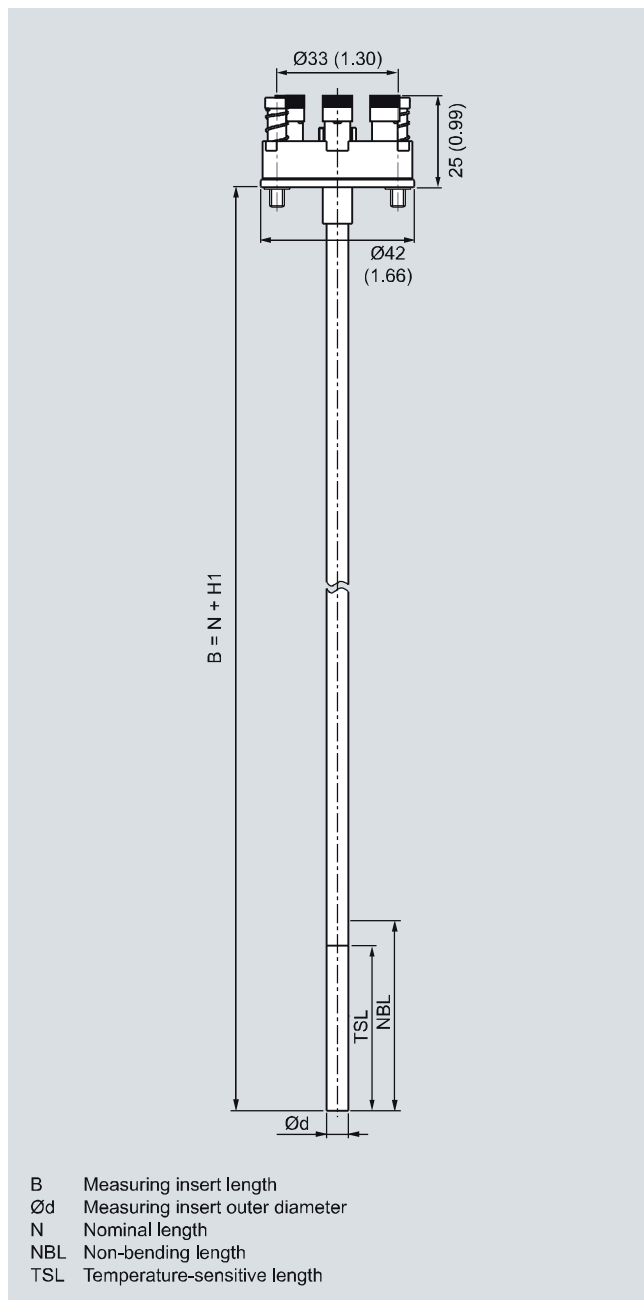


Temperature Measurement

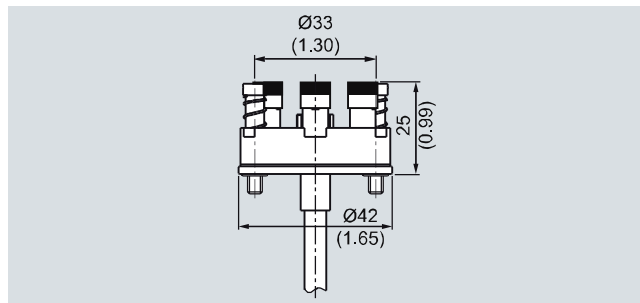
SITRANS TS

Measuring inserts for retrofits and upgrades
European type

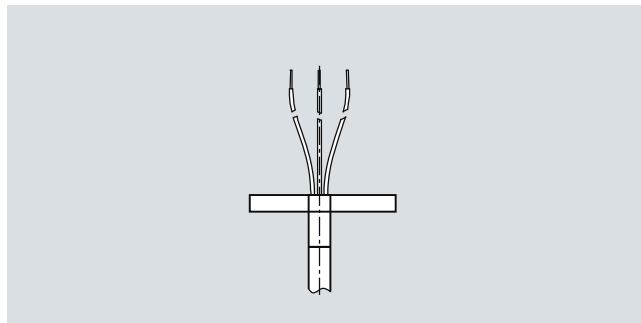
Dimensional drawings



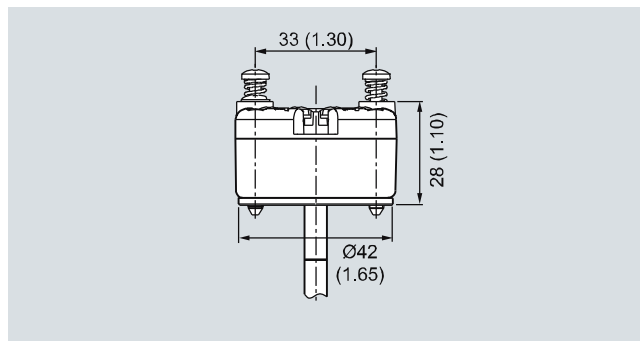
SITRANS TS, measuring inserts for temperature sensors,
replaceable, mineral-insulated design
European type (DIN ceramic base), spring load approx. 8 mm (0.31 inch)
Kaltes Ende types: see drawings on right side, dimensions in mm (inch)



Kaltes Ende type, ceramic base, dimensions in mm (inch)



Kaltes Ende type, free wire ends, dimensions in mm (inch)



Kaltes Ende type, built-on transmitter, dimensions in mm (inch)

Temperature Measurement

SITRANS TS

Measuring inserts for retrofits and upgrades
European type

Selection and Ordering data	Order No.	Ord. Code
SITRANS TS, measuring inserts for temperature sensors, replaceable, mineral-insulated design, European or American type	7MC701	
Measurement tip diameter		
• 6 mm (0.24 inch)	6	
• 8 mm (0.31 inch) (with sleeve)	8	
• 10 mm (0.39 inch) (with sleeve)	0	
Type		
• European type - DIN ceramic base	1	
• European type - DIN flying leads, absolutely necessary with built-on transmitter	2	
• American type - ANSI (nipple spring)	5	
Sensor		
• Pt100, basis, -50 ... +400 °C (-58 ... +752 °F)	A	
• Pt100, vibration-resistant, -50 ... +400 °C (-58 ... +752 °F)	B	
• Pt100, expanded range, -196 ... +600 °C (-321 ... +1112 °F)	C	
• Thermocouple Type J, -40 ... +750 °C (-40 ... 1 382 °F)	J	
• Thermocouple Type K, -40 ... +1 000 °C (-40 ... +1 832 °F)	K	
• Thermocouple Type N, -40 ... +1 000 °C (-40 ... +1 832 °F)	N	
Sensor number/Accuracy		
• Single, basic accuracy (Class 2/Class B)	A	
• Single, increased accuracy (Class 1/Class A)	B	
• Single, highest accuracy (Class AA)	C	
• Double, basic accuracy (Class 2/Class B)	D	
• Double, increased accuracy (Class 1/Class A)	E	
• Double, highest accuracy (Class AA)	F	
• Specify special version in plain text	Z A	
Measuring insert length B, standard		
• 145 mm (6.89 inch)	13	
• 205 mm (8.07 inch)	17	
• 275 mm (10.83 inch)	21	
• 315 mm (12.40 inch)	23	
• 345 mm (13.58 inch)	24	
• 375 mm (14.76 inch)	25	
• 405 mm (15.94 inch)	27	
• 435 mm (17.13 inch)	20	
• 555 mm (21.85 inch)	35	
• 585 mm (23.03 inch)	36	
Measuring insert length B, customer-specific		
• 50 ... 100 mm (1.97 ... 3.94 inch) Standard: 100 mm (3.94 inch)	11	
• 101 ... 150 mm (3.98 ... 5.91 inch) Standard: 145 mm (5.71 inch)	13	
• 151 ... 200 mm (5.95 ... 7.87 inch) Standard: 200 mm (7.87 inch)	15	
• 201 ... 250 mm (7.91 ... 9.84 inch) Standard: 205 mm (8.07 inch)	17	
• 251 ... 300 mm (9.88 ... 11.81 inch) Stan- dard: 275 mm (10.83 inch)	21	
• 301 ... 350 mm (11.85 ... 13.78 inch) Standard: 315 mm (12.40 inch)	23	
• 351 ... 400 mm (13.82 ... 15.75 inch) Standard: 375 mm (14.76 inch)	25	
• 401 ... 450 mm (15.79 ... 17.72 inch) Standard: 405 mm (15.94 inch)	27	

Selection and Ordering data	Order No.	Ord. Code
SITRANS TS, measuring inserts for temperature sensors, replaceable, mineral-insulated design, European or American type	7MC701	
• 451 ... 500 mm (17.76 ... 19.68 inch) Standard: 500 mm (19.68 inch)		31
• 501 ... 550 mm (19.72 ... 21.65 inch) Standard: 525 mm (20.67 inch)		33
• 551 ... 600 mm (21.69 ... 23.92 inch) Standard: 555 mm (21.85 inch)		35
• 601 ... 700 mm (23.66 ... 27.56 inch) Standard: 655 mm (25.79 inch)		37
• 701 ... 800 mm (27.60 ... 31.50 inch) Standard: 735 mm (28.94 inch)		41
• 801 ... 900 mm (31.54 ... 35.43 inch) Standard: 825 mm (32.48 inch)		43
• 901 ... 1 000 mm (35.47 ... 39.37 inch) Standard: 950 mm (37.40 inch)		45
• 1 001 ... 1 500 mm (39.41 ... 59.05 inch) Standard: 1 250 mm (49.21 inch)		47
Measuring insert length B, special length Special length > 1 500 mm (59.05 inch)		80

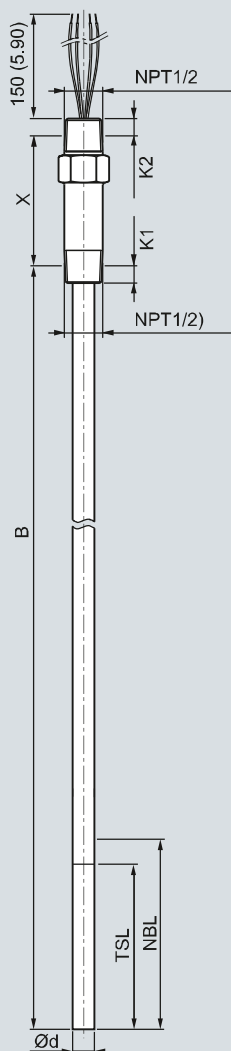
Additional configurations on page after next page!

You find ordering examples on page 33!

Temperature Measurement

SITRANS TS

Measuring inserts for retrofits and upgrades
American type



- B Measuring insert length
- Ød Measuring insert outer diameter
- K1 Screw depth
- K2 Screw depth
- N Nominal length
- NBL Non-bending length
- TSL Temperature-sensitive length
- X Extension

SITRANS TS, measuring inserts for temperature sensors, replaceable, mineral-insulated design
American type, spring load approx. 21 mm (0.83 inch)
Kaltes Ende types: see drawings on right side, dimensions in mm (inch)

Temperature Measurement

SITRANS TS

Measuring inserts for retrofits and upgrades
American type

Selection and Ordering data	Order code
Further designs Add "-Z" to Order No. and specify Order Code.	
Sensor number/Accuracy Enter in plain text • Specify special version in plain text	J1Y
Measuring insert length B Select range, enter desired length in plain text (No entry = standard length)	Y44
Options Add "-Z" to order number and add options, separate extensions with "+".	
Built-in head transmitter • SITRANS TH100, 4 ... 20 mA, Pt100 • SITRANS TH100 Ex i (ATEX), 4 ... 20 mA, Pt100 • SITRANS TH100 Ex i (FM), 4 ... 20 mA, Pt100 • SITRANS TH200, 4 ... 20 mA, Universal • SITRANS TH200 Ex (ATEX), 4 ... 20 mA, Universal • SITRANS TH200 Ex (FM), 4 ... 20 mA, Universal • SITRANS TH300, HART, Universal • SITRANS TH300 Ex (ATEX), HART, Universal • SITRANS TH300 Ex (FM), HART, Universal • SITRANS TH400 PA, Universal • SITRANS TH400 PA Ex, Universal • SITRANS TH400 FF, Universal • SITRANS TH400 FF Ex, Universal	T10 T11 T13 T20 T21 T23 T30 T31 T33 T40 T41 T45 T46
Explosion protection • Intrinsic safety "ia", "ic" • for SITRANS TS500 with protection type Ex d	E01 E03
Designation, calibration • Stainless steel TAG plate, enter lettering in plain text • Plant calibration per 1 point, enter temperature in plain text	Y15 Y33
Transmitter options • Transmitter, enter complete setting in plain text (Y01: +/-NNNN ... +/-NNNN C,F) • Transmitter, enter HART address (max. 8 characters) in plain text • Transmitter, enter measuring point description (max. 16 characters) in plain text • Transmitter, enter measuring point text (max. 32 characters) in plain text • Transmitter, enter bus address in plain text • Transmitter, fail-safe value 3.6 mA (instead of 22.8 mA) • Transmitter with a SIL 2 conformity • Transmitter with a SIL 2/3 conformity • Transmitter test protocol (5 points)	Y01 Y17 Y23 Y24 Y25 U36 C20 C23 C11
Option not found? Specify special version in plain text	Y99

You find ordering examples on page 33!

Temperature Measurement

Temperature transmitters for mounting in the connection head

Overview



The following temperature transmitters are available for mounting in the connection head:

SITRANS TH100

Programmable two-wire temperature transmitter (4 to 20 mA), without electrical isolation, only for Pt100 resistance thermometers.

SITRANS TH200

Programmable two-wire temperature transmitter (4 to 20 mA), electrical isolation for resistance thermometers and thermocouple elements.

SITRANS TH300

Two-wire temperature transmitter with HART communication (4 to 20 mA), electrical isolation for resistance thermometers and thermocouple elements.

SITRANS TH400

Temperature transmitter with PROFIBUS PA or FOUNDATION Fieldbus connection, electrical isolation for resistance thermometers and thermocouple elements.

Note:

- SITRANS TH100/TH200/TH300/TH400 can be fitted instead of the terminal block or in the high hinged cover. Additional fitting only possible in high hinged cover.
- If using intrinsically-safe temperature sensors any installed temperature transmitters must also be intrinsically-safe.

Selection and Ordering Data

Detailed information on the transmitters can be found for the respective products under "Transmitters for temperature".

Transmitter to be fitted	Order code
To order the sensor with a built-in temperature transmitter, add "-Z" to the Order No. of the sensor, and supplement by the following Order code:	
SITRANS TH100, only for Pt100	
• Without Ex	T10
• EEx ia IIC and EEx n for zone 2	T11
• FM	T13
SITRANS TH200	
• Without Ex	T20
• EEx ia IIC and EEx n for zone 2	T21
• FM (IS, I, NI)	T23
SITRANS TH300	
• Without Ex	T30
• EEx ia IIC und EEx n for zone 2	T31
• FM (IS, I, NI)	T33
SITRANS TH400 PA	
• Without Ex	T40
• EEx ia	T41
SITRANS TH400 FF	
• Without Ex	T45
• EEx ia	T46
Customer-specific setting of the built-in transmitter (specify settings in plain text)	Y11¹⁾
SIL2 application (only in combination with TH200 and TH300)	Y01: SIL2, C20 + Txx
¹⁾ For TH400 FF available soon	

Questionnaire for temperature sensors (resistance thermometers and thermocouples)

General information

Customer:

Address:

Contact partner:

Purchasing dept.: Tel.:

Sales dept.: Tel.:

Process dept.: Tel.:

Inquiry:

Quotation:

Place and date:

Operating conditions

2. Application:
(e.g. exhaust gas measurement)
3. Location:
(e.g. pipe bend, tank)
4. Mounting position:
(e.g. vertical, 45° against flow)
5. Temperature (measuring point):
Operating temperature:
Temperature range:
6. Medium:
7. Pressure:
Nominal pressure:
Operating pressure:
8. Flow:
9. Vibrations:
10. Miscellaneous:
(e.g. vessel or pipe materials, PTFE lining)

Ambient conditions

(e.g. seawater atmosphere, chemical plant)

Definition:

.....

.....

Special information

1. Mounting of temperature transmitter in connection head:
.....
.....
2. Packaging regulations:
.....
.....

Miscellaneous

Please additionally provide the following: rough sketch, installation diagram, section of drawing, photo

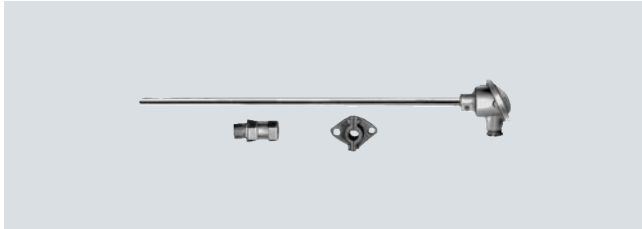
Sensor design

1. Measuring element
(type and standard) (e.g. Pt100 or TC type K)
 - 1.1. Tolerance:
 - 1.2. Design:
(e.g. Pt100 or 2, 3 or 4-wire system)
 - 1.3. Degree of protection/type of protection:
2. Protective fitting:
 - 2.1. Protective tube:
(dimensions/material)
 - 2.2. Mounting:
(dimensions/material)
 - 2.3. Neck tube:
(dimensions/material)
 - 2.4. Mounting length/nominal length:
3. Material certificates:
4. Connection:
 - 4.1. Connection head/box:
 - 4.2. Cable:
(dimensions/insulation/standard)
 - 4.3. Other:
5. Tests:
6. Accessories:
7. Supplementary requirements:

Temperature Measurement

Flue gas resistance thermometers with connection head

Overview



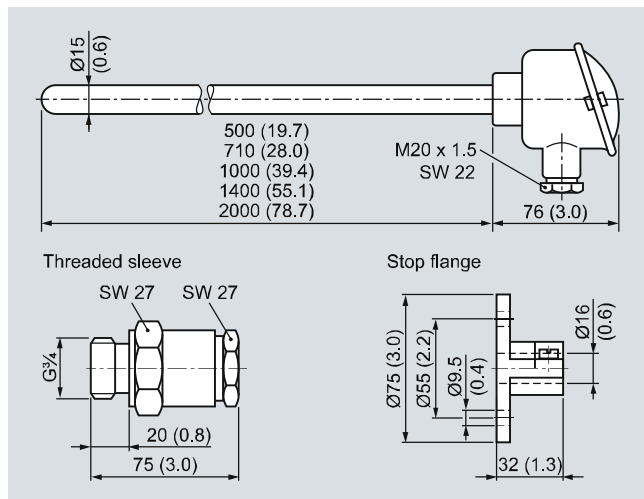
The flue gas resistance thermometer with connection head is suitable for the temperature range from -50 to +600 °C (-58 to +1112 °F) and can also be supplied with a built-in temperature transmitter.

Please order mounting flange or threaded sleeve separately.

Technical specifications

Design	According to DIN 43764: Thermometer without mount
Protective tube	
• Form	1, DIN 43772; cylindrical, 15 mm diameter (0.59 inch), wall thickness 3 mm (0.12 inch), seamless
• Material	St 35.8, mat. No. 1.0305, enamelled
• Loading capacity	1 bar (14.5 psi) above atmospheric, to DIN 43772
Measuring insert	Replaceable, with measuring insert tube (8 mm diameter (0.31 inch)) made of stainless steel; terminal block with clamping springs

Dimensional drawings



Flue gas resistance thermometer with connection head, dimensions in mm (inches)

Selection and Ordering data

Order No.

Flue gas resistance thermometer

Measuring resistor (winding) embedded in ceramic
1 Pt100 measuring resistor, three-wire circuit

Mounting length/ mm (inch):	Weight/ kg (lb):
• 500 (19.7)	0.9 (1.98)
• 710 (28.0)	1.1 (2.43)
• 1000 (39.4)	1.5 (3.31)
• 1400 (55.1)	1.9 (4.19)
• 2000 (78.7)	2.7 (5.95)

7 MC 1 0 0 0 - 1 BA 2
7 MC 1 0 0 0 - 2 BA 2
7 MC 1 0 0 0 - 3 BA 2
7 MC 1 0 0 0 - 4 BA 2
7 MC 1 0 0 0 - 5 BA 2

Connection head, form B,

made of cast light alloy, with 1 cable inlet and

- Screw cover
- Standard hinged cover
- High hinged cover

1
4
6

Further designs

Please add ***-Z*** to Order No. and specify Order code(s) and plain text.

Order code

Different design (mounting length, protective tube material etc.), specify in plain text.

Y01

TAG plate made of stainless steel specify TAG No. in plain text

Y15

Calibration carried out at one point, specify desired temperature in plain text (order equivalent number of times for several calibration points).

Y33

If optional head transmitters are integrated, please note that all calibration points are located in the set measuring range. If the points are located outside the standard measuring range, a Y11 addition is always required.

Accessories

Order No.

Mounting flange

Adjustable, to DIN 43734;
Material: GTW 35, mat. No. 0.8035, for protective tube diameter 15 mm (0.59 inch), 0.3 kg (0.66 lb)

7 MC 2 9 9 8 - 5 CA

Gas-tight threaded sleeve

Material: 9 SMnPb 28
Material No. 1.0718, for protective tube diameter 15 mm (0.59 inch), 0.4 kg (0.88 lb)

- G $\frac{3}{4}$ internal thread with gasket
- G $\frac{1}{2}$ internal thread with gasket

7 MC 2 9 9 8 - 5 DA
7 MC 2 9 9 8 - 5 DC

To order a temperature transmitter installed in the connection head and transmitters for SIL applications, see "Temperature transmitters for mounting in the connection head" (page 3/152).

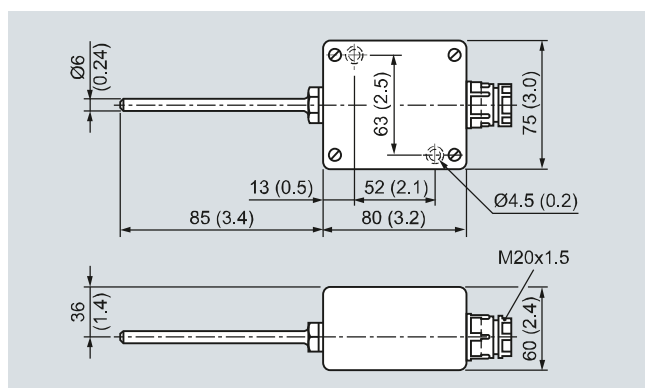
Individual parts: Measuring inserts, see "Accessories".

Flue gas resistance thermometers
with connection head**Overview**

The resistance thermometer for damp rooms is suitable for a temperature range from -30 to +60 °C (-22 to +140 °F).

Technical specifications

Protective tube	Made of stainless steel
Connection head	Made of cast light alloy, with cable bushing; made of plastic on request
Measuring insert	1 or 2 Pt measuring resistors to DIN EN 60751, connection in three-wire or two-wire system, class B
Degree of protection	IP65 acc. to DIN EN 60529

Dimensional drawings

Resistance thermometer for moist rooms, dimensions in mm (inches)

Selection and Ordering data

Order No.

Resistance thermometer for damp rooms

stainless steel protective tube

- with one Pt100 measuring resistor 0.1 kg (0.22 kg)
- with two Pt100 measuring resistors 0.1 kg (0.22 kg)

▶ **7MC1027-1AA****7MC1027-1AB****Further designs**

Please add **'-Z'** to Order No. and specify Order code(s) and plain text.

Order code

Different design (mounting length, protective tube material etc.), specify in plain text.

Y01

TAG plate made of stainless steel specify TAG No. in plain text

Y15

Calibration carried out at one point, specify desired temperature in plain text (order equivalent number of times for several calibration points).

Y33

If optional head transmitters are integrated, please note that all calibration points are located in the set measuring range. If the points are located outside the standard measuring range, a Y11 addition is always required.

- ▶ Available ex stock

To order a temperature transmitter installed in the connection head and transmitters for SIL applications, see "Temperature transmitters for mounting in the connection head" (page 3/152).

Note:

Additional fitting of head mounted transmitter of SITRANS TH series is possible.

Temperature Measurement

Accessories – Welding-type protective tubes, neck tubes and connection heads

Welding-type protective tube

Welding-type protective tube for high-pressure resistance thermometers to DIN 43 767, without neck tube, without connection head

- Tapered shank with cylindrical welding stubs
- For measuring insert tube with 6 mm (0.24 inch)
- OD female thread M18 x 1.5 (including steel screw plug)

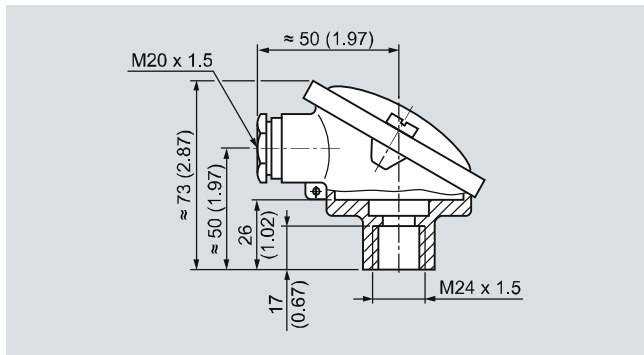
Neck tube

Neck tube for high-pressure screw-in resistance thermometer

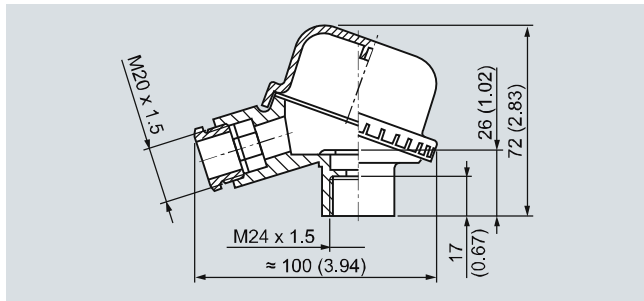
- Made of stainless steel, mat. No. 1.4571
- With threads at both ends
- For measuring insert tube with 6 mm (0.24 inch) OD

Dimensional drawings

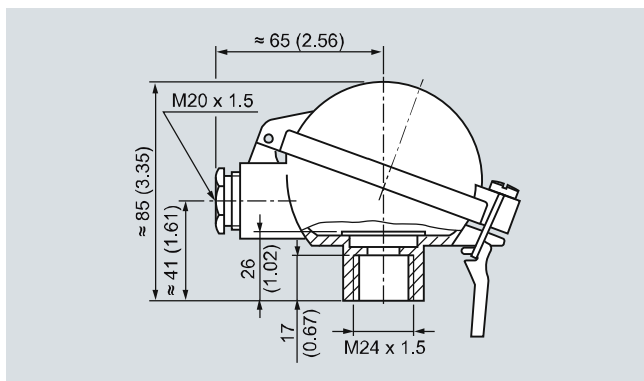
Connection heads for low and high-pressure resistance thermometers, flue gas and flange-type resistance thermometers



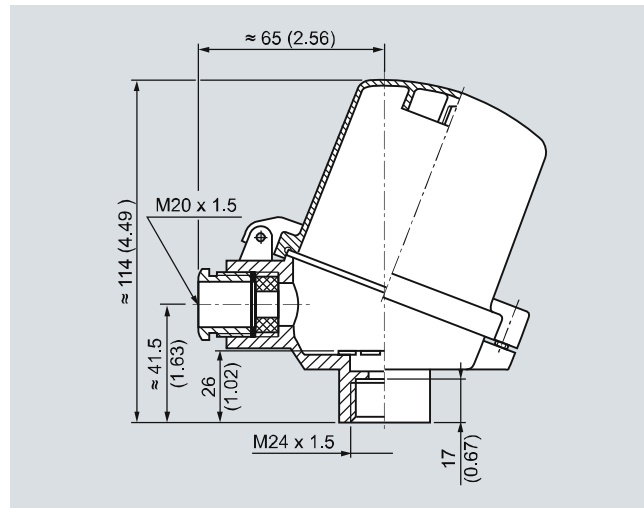
Connection head, form B, degree of protection IP54, made of cast light alloy, with screw cover, dimensions in mm (inches)



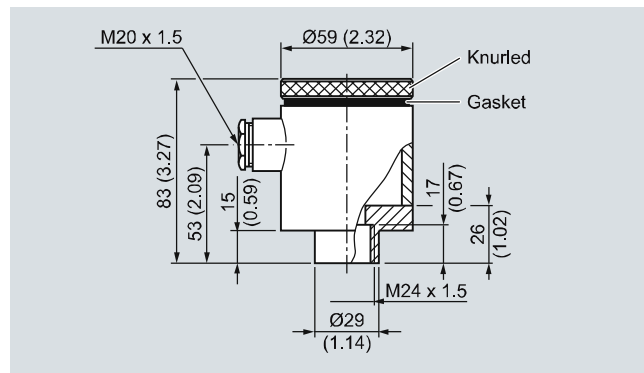
Connection head, form B, degree of protection IP54, made of plastic, with screw cover, dimensions in mm (inches)



Connection head, form B, degree of protection IP65, made of cast light alloy, with standard hinged cover, dimensions in mm (inches)



Connection head, form B, degree of protection IP65, made of cast light alloy, with high hinged cover, dimensions in mm (inches)



Connection head, form B-VA, degree of protection IP65, made of stainless steel, with screw cover, dimensions in mm (inches)

Accessories – Welding-type protective tubes, neck tubes and connection heads

Selection and Ordering data			Order No.
Welding protective tube for high-pressure resistance thermometers according to DIN 43767, without neck tube, without connection head			
tapered shank with cylindrical welding stub, for measuring insert tube with 6 mm (0.24 inch) OD; female thread M18 x 1.5 (including steel screw plug)			
Up to 540 °C (1004 °F)			
Protective tube to DIN 43772, form 4 made of 13 CrMo 44, mat. No. 1.7335			
Mounting length U mm (inch)	Protective tube length L mm (inch)	Weight mm (inch)	
• 65 (2.56)	140 (5.51)	0.3 (0.66)	7MC1905-1GA
• 65 (2.56)	200 (7.87)	0.5 (1.1)	7MC1905-2GA
• 125 (4.92)	200 (7.87)	0.5 (1.1)	7MC1905-3GA
• 125 (4.92)	260 (10.24)	0.6 (1.32)	7MC1905-4GA
Up to 550 °C (1022 °F)			
Protective tube to DIN 43772, form 4 made of 6 CrNiMoTi 17122, mat. No. 1.4571			
Mounting length U mm (inch)	Protective tube length L mm (inch)	Weight kg (lb)	
• 65 (2.56)	140 (5.51)	0.3 (0.66)	7MC1905-1DA
• 65 (2.56)	200 (7.87)	0.5 (1.1)	7MC1905-2DA
• 125 (4.92)	200 (7.87)	0.5 (1.1)	7MC1905-3DA
• 125 (4.92)	260 (10.24)	0.6 (1.32)	7MC1905-4DA
Selection and Ordering data			Order No.
Neck tube for high-pressure screw-in resistance thermometer			
made of stainless steel, mat. No. 1.4571, with thread at both ends, for measuring insert tube with 6 mm (0.24 inch) OD			
Neck tube length mm (inch)	Total length of the resistance thermometer, without connection head mm (inch)	Protective tube length mm (inch)	Weight kg (lb)
• 135 (5.31)	395 (15.55)	260 (10.24)	0.14 (0.31)
• 165 (6.50)	305/365 (12.01/14.37)	140/200 (5.51/7.87)	0.15 (0.33)
• 195 (7.68)	395 (15.55)	200 (7.87)	0.18 (0.40)
• 225 (8.86)	365 (14.37)	140 (5.51)	0.20 (0.44)
• 255 (10.04)	395 (15.55)	140 (5.51)	0.22 (0.49)
			7MC1906-1AA
			7MC1906-2AA
			7MC1906-3AA
			7MC1906-4AA
			7MC1906-5AA
Selection and Ordering data		Order No.	
Connection heads for low-pressure, high-pressure, flue gas and flange-type resistance thermometers			
Connection head, form B, degree of protection IP54			
Made of cast light alloy, with screw cover and with 1 cable bushing, weight: 0.14 kg (0.31 lb)		7MC1907-1BA	
Made of plastic, with screw cover and with 1 cable bushing, weight: 0.08 kg (0.18 lb)		7MC1907-1BK	
Connection head, form B, degree of protection IP65			
Weight: 0.3 kg (0.66 lb)			
Made of cast light alloy, with standard hinged cover and with 1 cable bushing		7MC1907-1BF	
Made of cast light alloy, with high hinged cover and with 1 cable bushing		7MC1907-1BL	
Connection head, form B-VA, degree of protection IP65			
Made of stainless steel, with screw cover and with 1 cable bushing, weight: 0.65 kg (1.43 lb)		7MC1907-1BV	
Accessories			
for connection head, form B, degree of protection IP65			
Quick-release clamp (degree of protection of connection head reduced to IP54)		7MC1907-1BS	
Weight: 0.02 kg (0.04 lb)			
Connection heads with a drilled hole of 15.5 mm diameter (0.61 inch) instead of the female thread M24 x 1.5 on request.			

Temperature Measurement

Thermocouples

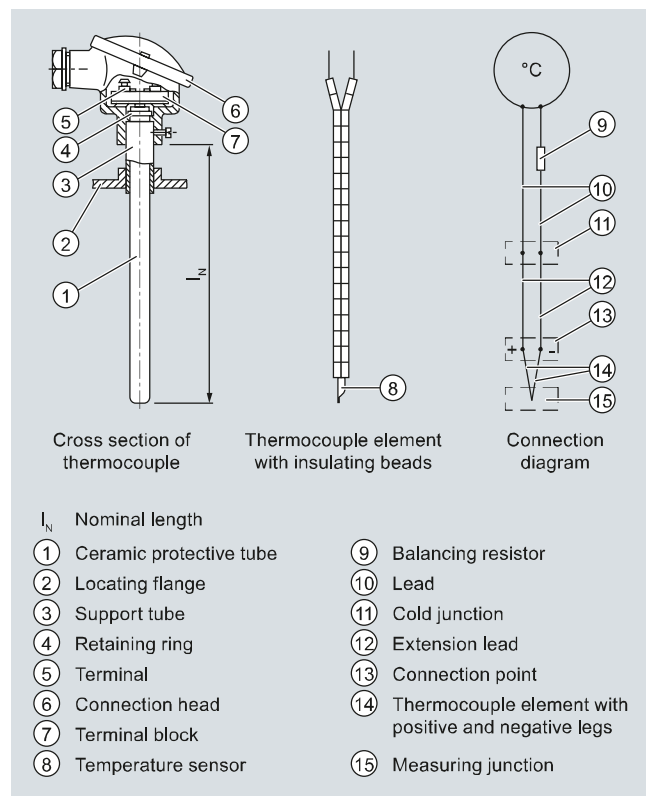
Technical description

Design

A thermocouple comprises

- The thermocouple element (sensor) and
- The mounting and connection parts required in each case.

The thermocouple element is formed by two conductors of dissimilar metals or metal alloys which are soldered or welded together at one end, the measuring junction:



Thermocouple element

Function

Measuring principle of the thermocouple element

If the measuring junction is exposed to a temperature different from that at the free ends of the thermocouple, a voltage (the thermoelectric voltage, Seebeck effect) is produced at these free ends. The magnitude of the thermoelectric voltage depends on the difference in temperature between the measuring junction and the free ends, and on the combination of materials in the thermocouple. Since a thermocouple always measures a temperature difference, the free ends of the thermocouple must be connected to a reference junction (cold junction) and held constant at a known temperature.

Calibration data for thermoelectric voltages and permissible deviations

The calibration data and the permissible deviations for commonly used thermocouples are defined (see Technical Data, Table "Calibration data for thermoelectric voltages and error limits").

The thermocouples Cu-CuNi and Fe-CuNi to DIN 43710 are used for replacement purposes. Thermocouples of class 2 are supplied as standard. For more accurate measurements, thermocouples are available with half the DIN tolerance or with a test certificate. The tolerances only apply to the condition upon delivery.

During operation at high temperatures, the tolerances of the thermocouples may change due to absorption of foreign matter, oxidation or evaporation of alloy components.

Mode of operation

The thermocouples are extended from the connection point to a point whose temperature is as constant as possible (the cold junction) by means of extension leads.

The extension leads have the same color code as the associated thermocouple elements; the positive pole is marked in red. Correct polarity must be ensured since otherwise large errors will occur. Up to 200 °C, the same calibration data and tolerances apply to the extension leads as to the corresponding thermocouples.

The influence of temperature changes at the cold junction can be balanced by means of a compensating circuit, e.g. a compensating box. The reference temperature is 0 (32 °F) or 20 °C (68 °F).

It is also possible to keep the cold junctions at a constant temperature of 50, 60 or 70 °C (122, 140 or 158 °F) using a thermostat (for several measuring junctions).

The connections from the cold junction to the measuring or process instrument are made using copper leads. With energy-consuming instruments such as indicators or multipoint recorders, the complete measuring circuit (thermocouple, extension lead and copper lead) must be balanced in the operating condition using a resistor. SITRANS T transmitters and process recorders for connection to thermocouple elements have a built-in compensating circuit for balancing the effect of the ambient temperature on the cold junction. Lead balancing is not necessary in this case because of the high input impedance.

Protection fitting/protective tubes

The thermocouple can be protected against mechanical stress and chemical attack by a ceramic or metal protective tube which may be mounted using flanges, screwed glands or by welding into the pipeline or tank. The thermocouple element terminates in the connection head.

Installation examples with specification of the recommended thermocouples and protective tube materials are listed on pages "Technical Data" and "Installation Examples".

Owing to the different operating conditions, no guarantee can be given for protective fittings. The manufacturer is responsible for damages and measuring errors caused by wrong installation in compliance with the General Terms of Delivery if the instruments have been installed by the manufacturer and if the specifications for the operating conditions furnished by the customer were correct and sufficiently detailed.

Thermocouple elements are very compatible since it is almost always possible to adapt them in shape and size to the particular problem. The temperature-responsive part is almost point-shaped. Thermocouple elements are therefore particularly suitable for measuring rapidly changing temperatures.

Temperature Measurement

Thermocouples

Straight thermocouples
to DIN 43733, with connection head

Overview

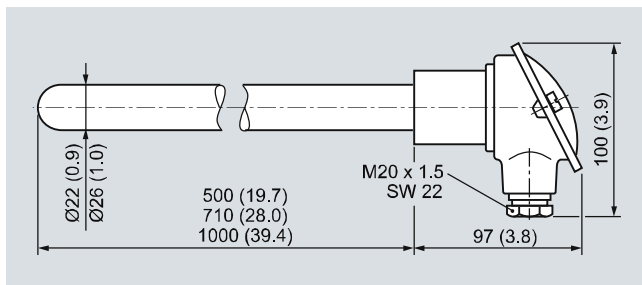


The straight thermocouple together with a metal protective tube is suitable for temperatures from 0 to 1250 °C (32 to 2282 °F) and can be supplied with a built-in temperature transmitter.

Technical specifications

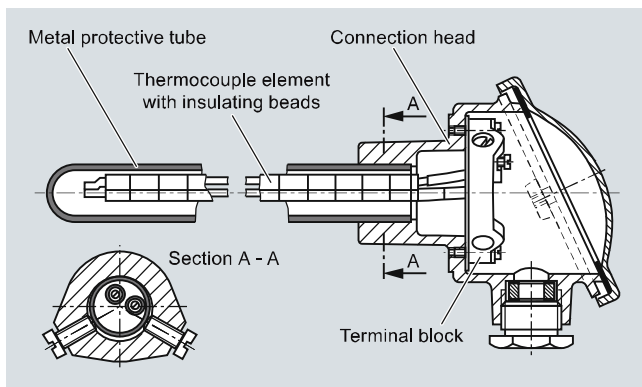
Thermocouples	Ni Cr/Ni type K
• Number	1 or 2
• Leg diameter	2 ... 3 mm (0.08 ... 0.12 inch)
• Insulation of legs	Insulating beads
Protective tube	Metal
Connection head	Form A, DIN 43729; made of cast light alloy, with one cable bushing

Dimensional drawings



Straight thermocouple, dimensions in mm (inches)

Design



Straight thermocouple with base-metal element Ni Cr/Ni with metal protective tube

Selection and Ordering data

Order No.

Straight thermocouple with Ni Cr/Ni thermocouple (type K) with metallic protective tube

to 1000 °C (1832 °F)
X 10 CrAl 24, mat. No. 1.4762
22 mm Ø x 2 mm (0.87 inch x 0.079 inch)

1 thermocouple
Leg diameter 2 mm (0.08 inch)
Weight: 1.1 ... 2.9 kg (2.4 ... 6.4 lb)
Nominal length in mm (inch):
• 500 (19.7)
• 710 (28.0)
• 1000 (39.4)

7MC2000-1DC0
7MC2000-2DC0
7MC2000-3DC0

2 thermocouples
Leg diameter 2 mm (0.08 inch)
Weight: 1.1 ... 3.2 kg (2.4 ... 7.0 lb)
Nominal length in mm (inch):
• 500 (19.7)
• 710 (28.0)
• 1000 (39.4)

7MC2000-1DD0
7MC2000-2DD0
7MC2000-3DD0

to 1100 °C (2012 °F)
X 18 CrN28, material No. 1.4749
26 mm Ø x 4 mm (1.02 inch x 0.16 inch)

1 thermocouple
Leg diameter 3 mm (0.12 inch)
Weight: 1.3 ... 2.2 kg (2.7 ... 4.8 lb)
Nominal length in mm (inch):
• 500 (19.7)
• 710 (28.0)
• 1000 (39.4)

7MC2000-1EC0
7MC2000-2EC0
7MC2000-3EC0

2 thermocouples
Leg diameter 3 mm (0.12 inch)
Weight: 1.4 ... 2.4 kg (3.1 ... 5.3 lb)
Nominal length in mm (inch):
• 500 (19.7)
• 710 (28.0)
• 1000 (39.4)

7MC2000-1ED0
7MC2000-2ED0
7MC2000-3ED0

to 1200 °C (2192 °F)
X 15 CrNi Si 24 19, material No. 1.4841
22 mm Ø x 2 mm (0.87 inch x 0.079 inch)

1 thermocouple
Leg diameter 2 mm (0.08 inch)
Weight: 1.7 ... 2.9 kg (3.7 ... 6.4 lb)
Nominal length in mm (inch):
• 500 (19.7)
• 710 (28.0)
• 1000 (39.4)

7MC2000-1FC0
7MC2000-2FC0
7MC2000-3FC0

2 thermocouples
Leg diameter 2 mm (0.08 inch)
Weight: 1.9 ... 3.1 kg (4.2 ... 6.8 lb)
Nominal length in mm (inch):
• 500 (19.7)
• 710 (28.0)
• 1000 (39.4)

7MC2000-1FD0
7MC2000-2FD0
7MC2000-3FD0

To 1250 °C (2282 °F)
CrAl 205 (Megapyr), material No. 1.4767
22 mm Ø x 2 mm (0.87 inch x 0.079 inch)

1 thermocouple
Leg diameter 3 mm (0.12 inch)
Weight: 1 ... 2.9 kg (2.2 ... 6.4 lb)
Nominal length in mm (inch):
• 500 (19.7)
• 710 (28.0)
• 1000 (39.4)

7MC2000-1HC0
7MC2000-2HC0
7MC2000-3HC0

2 thermocouples
Leg diameter 3 mm (0.12 inch)
Weight: 1.1 ... 3.2 kg (2.4 ... 7.0 lb)
Nominal length in mm (inch):
• 500 (19.7)
• 710 (28.0)
• 1000 (39.4)

7MC2000-1HD0
7MC2000-2HD0
7MC2000-3HD0

Connection head, form A,

made of cast light alloy,
with 1 cable inlet and
• screw cover
• high hinged cover

1
6

Temperature Measurement

Thermocouples

Straight thermocouples Individual parts and accessories

Selection and Ordering data	Order No.
Straight thermocouple with Ni Cr/Ni thermocouple (type K) for temperatures to 1250 °C (2282 °F); with metallic protective tube	
Further designs Please add "-Z" to Order No. and specify Order code(s) and plain text.	Order code
Different design (mounting length, protective tube material etc.), specify in plain text.	Y01
TAG plate made of stainless steel specify TAG No. in plain text	Y15
Calibration carried out at one point, specify desired temperature in plain text (order equivalent number of times for several calibration points). If optional head transmitters are integrated, please note that all calibration points are located in the set measuring range. If the points are located outside the standard measuring range, a Y11 addition is always required.	Y33
To order a temperature transmitter installed in the connection head, see "Temperature transmitters for installation in the connection head" (page 3/177).	
Installation of a transmitter is only possible here in the versions with a high hinged cover (7MC2000-...6). Sensor type setting essential for the function. By default, the transmitter is supplied with the factory settings for configuration by the customer. The factory settings of sensor type, measuring range, etc. can be ordered using option Y11.	

Selection and Ordering data	Order No.												
Thermocouples elements for straight thermocouple according to DIN 43733													
Base-metal thermocouple with insulating beads Wire diameter 3 mm (0.12 inch) Ni Cr/Ni, to 1000 °C (maximal 1300 °C), (to 1832 °F (max. 2372 °F)) 0.55 ... 2.10 kg (1.21 ... 4.63 lb)													
<table border="0"> <tr> <td>Nominal length L1 in mm (inch):</td> <td>Thermocouple length L2 in mm (inch):</td> <td></td> </tr> <tr> <td>• 500 (19.7)</td> <td>540 (21.3)</td> <td></td> </tr> <tr> <td>• 710 (28.0)</td> <td>750 (29.5)</td> <td></td> </tr> <tr> <td>• 1000 (39.4)</td> <td>1040 (40.9)</td> <td></td> </tr> </table>	Nominal length L1 in mm (inch):	Thermocouple length L2 in mm (inch):		• 500 (19.7)	540 (21.3)		• 710 (28.0)	750 (29.5)		• 1000 (39.4)	1040 (40.9)		7MC2903-1CA 7MC2903-2CA 7MC2903-3CA
Nominal length L1 in mm (inch):	Thermocouple length L2 in mm (inch):												
• 500 (19.7)	540 (21.3)												
• 710 (28.0)	750 (29.5)												
• 1000 (39.4)	1040 (40.9)												

Selection and Ordering data	Order No.												
Metallic protective tubes for straight thermocouple elements according to DIN 43733													
X 10 CrAl 24, material No. 1.4762 Ø 22 mm x 2 mm (Ø 0.87 inch x 0.08 inch), 0.55 ... 1.10 kg (1.21 ... 2.42 lb), dished													
<table border="0"> <tr> <td>Nominal length in mm (inch):</td> <td>Protective tube length in mm (inch):</td> <td></td> </tr> <tr> <td>• 500 (19.7)</td> <td>520 (20.5)</td> <td>7MC2900-1DA</td> </tr> <tr> <td>• 710 (28.0)</td> <td>730 (28.7)</td> <td>7MC2900-2DA</td> </tr> <tr> <td>• 1000 (39.4)</td> <td>1020 (40.2)</td> <td>7MC2900-3DA</td> </tr> </table>	Nominal length in mm (inch):	Protective tube length in mm (inch):		• 500 (19.7)	520 (20.5)	7MC2900-1DA	• 710 (28.0)	730 (28.7)	7MC2900-2DA	• 1000 (39.4)	1020 (40.2)	7MC2900-3DA	
Nominal length in mm (inch):	Protective tube length in mm (inch):												
• 500 (19.7)	520 (20.5)	7MC2900-1DA											
• 710 (28.0)	730 (28.7)	7MC2900-2DA											
• 1000 (39.4)	1020 (40.2)	7MC2900-3DA											
X 10 CrAl 24, material No. 1.4749 Ø 26 mm x 4 mm (Ø 1.02 inch x 0.16 inch), 1.25 ... 2.20 kg (2.76 ... 4.85 lb), dished													
<table border="0"> <tr> <td>Nominal length in mm (inch):</td> <td>Protective tube length in mm (inch):</td> <td></td> </tr> <tr> <td>• 500 (19.7)</td> <td>520 (20.5)</td> <td>7MC2900-1EC</td> </tr> <tr> <td>• 710 (28.0)</td> <td>730 (28.7)</td> <td>7MC2900-2EC</td> </tr> <tr> <td>• 1000 (39.4)</td> <td>1020 (40.2)</td> <td>7MC2900-3EC</td> </tr> </table>	Nominal length in mm (inch):	Protective tube length in mm (inch):		• 500 (19.7)	520 (20.5)	7MC2900-1EC	• 710 (28.0)	730 (28.7)	7MC2900-2EC	• 1000 (39.4)	1020 (40.2)	7MC2900-3EC	
Nominal length in mm (inch):	Protective tube length in mm (inch):												
• 500 (19.7)	520 (20.5)	7MC2900-1EC											
• 710 (28.0)	730 (28.7)	7MC2900-2EC											
• 1000 (39.4)	1020 (40.2)	7MC2900-3EC											
X 15 CrNiSi 25 20, material No. 1.4841 Ø 22 mm x 2 mm (Ø 0.87 inch x 0.08 inch), 1.05 kg (2.31 lb), dished													
<table border="0"> <tr> <td>Nominal length in mm (inch):</td> <td>Protective tube length in mm (inch):</td> <td></td> </tr> <tr> <td>• 1000 (39.4)</td> <td>1020 (40.2)</td> <td>7MC2900-3FA</td> </tr> </table>	Nominal length in mm (inch):	Protective tube length in mm (inch):		• 1000 (39.4)	1020 (40.2)	7MC2900-3FA							
Nominal length in mm (inch):	Protective tube length in mm (inch):												
• 1000 (39.4)	1020 (40.2)	7MC2900-3FA											
CrAl 205 (Megapyr), material No. 1.4767 Ø 22 mm x 2 mm (Ø 0.87 inch x 0.05 inch), 0.55 ... 1.10 kg (1.21 ... 2.42 lb)													
<table border="0"> <tr> <td>Nominal length in mm (inch):</td> <td>Protective tube length in mm (inch):</td> <td></td> </tr> <tr> <td>• 500 (19.7)</td> <td>520 (20.5)</td> <td>7MC2900-1HA</td> </tr> <tr> <td>• 710 (28.0)</td> <td>730 (28.7)</td> <td>7MC2900-2HA</td> </tr> <tr> <td>• 1000 (39.4)</td> <td>1020 (40.2)</td> <td>7MC2900-3HA</td> </tr> </table>	Nominal length in mm (inch):	Protective tube length in mm (inch):		• 500 (19.7)	520 (20.5)	7MC2900-1HA	• 710 (28.0)	730 (28.7)	7MC2900-2HA	• 1000 (39.4)	1020 (40.2)	7MC2900-3HA	
Nominal length in mm (inch):	Protective tube length in mm (inch):												
• 500 (19.7)	520 (20.5)	7MC2900-1HA											
• 710 (28.0)	730 (28.7)	7MC2900-2HA											
• 1000 (39.4)	1020 (40.2)	7MC2900-3HA											

Temperature Measurement

Thermocouples

Straight thermocouples Individual parts and accessories

Connection heads

Connection head, form A (without terminal block and terminals) for protective tube diameter (bore = protective tube diameter +0.5 mm (0.02 inch))

Selection and Ordering data

Order No.

Connection head, form A, (without terminal block and terminals)

1 Cable inlet, degree of protection IP53,
0.35 kg (0.77 lb)

Cast light alloy

fastener, unscrewable

for protective tube diameter in mm (inch)
(bore = protective tube diam. +0.5 mm)
(0.02 inch):

- 22 (0.87)
- 26 (1.02)

7MC2905-1AA
7MC2905-1BA

Cast light alloy

high hinged cover

for protective tube diameter in mm (inch)
(bore = protective tube diam. +0.5 mm)
(0.02 inch):

- 22 (0.87)
- 26 (1.02)

7MC2905-4AA
7MC2905-4BA

Mounting accessories for connection heads

- Terminal block
- Terminal
- Set of gaskets
- Set of washers
- Mounting flange
- Threaded sleeve

Selection and Ordering data

Order No.

Mounting accessories

Terminal block without terminals

for base-metal thermocouples;
0.06 kg (0.13 lb)

7MC2998-1AA

Terminal

for base-metal thermocouples;
0.01 kg (0.02 lb)

7MC2998-1BA

Set of gaskets (100 off)

for the connection head cover;
0.01 kg (0.02 lb)

7MC2998-1CA

Set of washers (100 off)

for the terminal block; 0.01 kg (0.02 lb)

7MC2998-1CB

Mounting flange, adjustable; made of GTW

- for protective tube outer diameters
22 mm (0.87 inch); 0.35 kg (0.77 lb)
- for protective tube outer diameters
26 mm (1.02 inch); 0.32 kg (0.71 lb)

7MC2998-2CB

7MC2998-2CC

Threaded sleeve

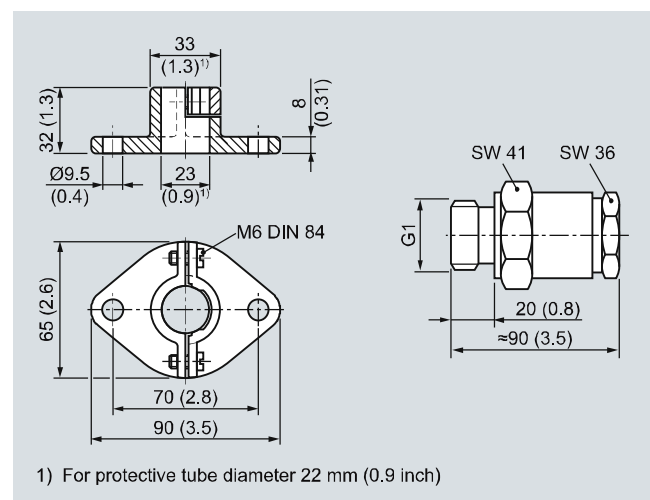
Gas-tight up to 1 bar (14.5 psi), adjustable,
material No. 1.0718, with gasket;
0.40 kg (0.88 lb)

- for protective tube outer diameters
22 mm (0.87 inch), **G1**
- for protective tube outer diameters
26 mm (1.02 inch), **G1**

7MC2998-2DB

7MC2998-2DC

Dimensional drawings



Mounting flange to DIN 43734 (left) and threaded sleeve (right) for installing straight thermocouples, dimensions in mm (inches)

Temperature Measurement

Resistance thermometers for food, pharmaceuticals and biotechnology

Resistance thermometers for installation in pipelines and tanks

Overview



The resistance thermometer is designed for installation in tanks and pipelines as well as for the measurement of temperature with hygiene requirements. The usual process connections are available. The rugged design means that it is suitable for a wide range of process applications in the food, pharmaceutical and biotechnology industries. The resistance thermometer is also available with a built-in transmitter. A versatile range of head transmitters is available for this application.

Design

- Pt100 measuring resistor
- Stainless steel measuring insert
- Replaceable measuring insert
- Process connections for food/pharmaceuticals/biotechnology
- Hygiene version, design corresponds to EHEDG recommendations
- Fast response available with reduced tip
- Transmitter can be integrated (4 to 20 mA or PROFIBUS PA)

The resistance thermometer has a replaceable measuring insert. The measuring insert contains either one or two Pt100 measuring resistors which are connected to the base in the connection head with a two-wire, three-wire or four-wire system. The change in resistance dependent on the measured temperature can be recorded by a transmitter and converted into a standardized signal.

Technical specifications

Design	Replaceable measuring insert with connection head and protection fitting
Connection head	Either: <ul style="list-style-type: none"> • Form B standard, screw cover, stainless steel 1.4301, IP67 • Form B, cover with 2 slotted screws, aluminium, IP54, standard • Form B, screw cover, plastic, IP54 (BK) • Form B, hinged cover with slotted screws, aluminium, IP65 (BUZ) • Form B, hinged cover with quick-release, aluminium, IP65 (BUS) • Form B, high hinged cover with slotted screw, aluminium, IP65 (BUZH)
Protective tube	Stainless steel 1.4404/316L 6 or 9 mm (0.24 or 0.35 inch) diam., optionally with tapered tip, see Selection and Ordering data for mounting length U1
Measuring insert	Stainless steel, replaceable Pt100 measuring resistor to DIN 43762 Rigid design or as jacket element (mineral-insulated, flexible, increased vibration resistance)
Accuracy of measuring resistor	Class A according to DIN EN 60751
Integration of transmitter	Suitable Pt100 transmitters for head mounting can be fitted in the connection head, see Selection and Ordering data
Process connections	<ul style="list-style-type: none"> • DIN 11851 with slotted union nut • Clamp connection to DIN 32676 • Clamp connection to ISO 2852 • Tri-clamp • Varivent • Sanitary nozzle • Neumo BioControl • Spherical welding-type sleeve cyl./sph. 30 x 40 mm (1.18 x 1.57 inch) • Aseptic connections The gasket is not included in the standard scope of delivery! Further process connections on request. Process connection material: Stainless steel 1.4404/316L
Surface properties	<ul style="list-style-type: none"> • Standard Surface roughness Ra < 1.5 µm (5.9 x 10⁻⁵ inch) • Hygiene Surface roughness Ra < 0.8 µm (3.1 x 10⁻⁵ inch) • Welded seam < 1.5 µm (5.9 x 10⁻⁵ inch)

Temperature Measurement

Resistance thermometers for food, pharmaceuticals and biotechnology

Resistance thermometers
for installation in pipelines and tanks

Selection and Ordering data		Order No.	Order code
Pt100 resistance thermometer for food, pharmaceuticals and biotechnology		7 MC 8 0 0 5 -	
Connection head			
Form B, cast light alloy, screw cover, IP54, cable gland	1		
Form B, plastic, screw cover, IP54, cable gland	2		
Form BUZ, cast light alloy, screw cover, IP65, cable gland	3		
Form BUZH, cast light alloy, high hinged cover, IP 65, cable gland	4		
Form B, stainless steel, standard, IP67, cable gland	5		
Special version: (add Order code and plain text)	9		H 1 Y
Process connection, material 1.4404/316L			
Milk pipe union to DIN 11851 with slotted union nut and nominal diameter/pressure			
• DN 25 / PN 40	AA		
• DN 32 / PN 40	AB		
• DN 40 / PN 40	AC		
• DN 50 / PN 25	AD		
Clamp connection:			
ISO 2852	DIN	Tri-Clamp	Outer diameter D
	32676		
–	–	1/2" / 3/4"	25.0 mm
DN 25/33.7/38	DN 25/32/40	1", 1 1/2"	50.5 mm
DN 40/51	DN 50	2"	64.0 mm
DN 63.5	–	2 1/2"	77.5 mm
DN 88.9	DN 80	–	106.0 mm
			CA
			CB
			CC
			CD
			CE
Varivent connection (Tuchenhagen)			
• D = 50 mm (1.97 inch), for Varivent housing DN 25 and DN 1"	KU		
• D = 68 mm (2.68 inch), for Varivent housing DN 40 ... 125 and 1 1/2" ... 6"	KV		
NEUMO/BioControl			
• Size 25	BA		
• Size 50	BB		
• Size 65	BC		
Ingold flange			
• DN 25 with hexagon union nut G 1 1/4", mounting length 40 mm (1.57"), diameter 24.8 mm (0.98") incl. O-ring	JA		
Welding piece (sphere diameter 30 x 40 mm (1.2 x 1.6 inch) long)			
	LA		
Special version: Type of screwed gland and nominal diameter (add Order code and plain text)			
	ZA		J 1 Y
Protective tube			
Ø F1=6 mm (0.24 inch)		Ø 3/3.2 mm, (0.12/0.13 inch) miner. insul.	1
Ø F1=9 mm (0.35 inch)		Ø 6 mm (0.24 inch)	2
Ø F1=9 mm (0.35 inch)		Ø 6 mm (0.24 inch) miner. insul.	3
Ø F1=9 mm (0.35 inch)		Ø 3/3.2 mm, (0.12/0.12 inch) miner. insul.	4
tapered tip F3=5 Ø x 20 mm (0.2 x 0.79 inch)			
Special version: (add Order code and plain text)	9		L 1 Y

Selection and Ordering data		Order No.	Order code
Pt100 resistance thermometer for food, pharmaceuticals and biotechnology		7 MC 8 0 0 5 -	
Neck tube length M			
80 mm (3.15 inch)	1		
145 mm (5.71 inch)	2		
Special version: (add Order code and plain text)	9		N 1 Y
Mounting length U1			
15 mm (0.59 inch)			B
35 mm (1.38 inch)			C
50 mm (1.97 inch)			D
100 mm (3.94 inch)			E
160 mm (6.30 inch)			F
250 mm (9.84 inch)			G
400 mm (15.75 inch)			H
4 inch			J
6 inch			K
9 inch			L
Special version: (add Order code and plain text)			Z
			P 1 Y
Sensor			
Thin-film technology: measuring range -50 ... +400 °C (-58 ... +752 °F)			
1 x Pt100, class A, three-wire			F
2 x Pt100, class A, three-wire			G
1 x Pt100, class A, four-wire			H
Special version: (add Order code and plain text)			Z
			Q 1 Y
Further designs			Order code
Add "-Z" to Order No. and add Order code.			
Process connection completely electropolished			P01
Hygiene version ($R_a < 0.8 \mu\text{m}$ (3.1×10^{-5} inch))			H01
Certificates			
• Roughness depth measurement R_a certified by factory certificate to EN 10204-3.1B			C18
• Material certificate to EN 10204-3.1			C19
Specify special version in plain text			Y01
TAG plate made of stainless steel specify TAG No. in plain text			Y15
Test report (at 0, 50 and 100%) specify measuring range in plain text			Y33
If optional head transmitters are integrated, please note that all calibration points are located in the set measuring range. If the points are located outside the standard measuring range, a Y11 addition is always required.			
To order a temperature transmitter installed in the connection head, see "Temperature transmitters for mounting in the connection head" (page 3/152).			

Temperature Measurement

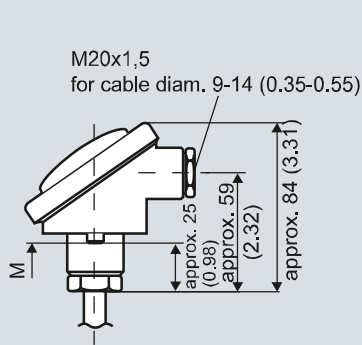
Resistance thermometers for food, pharmaceuticals and biotechnology

Resistance thermometers for installation in pipelines and tanks

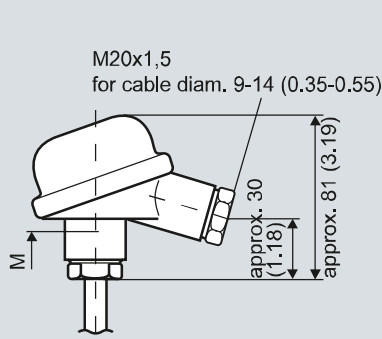
Dimensional drawings

Connection heads

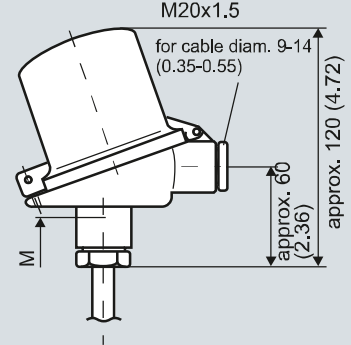
Form B, cover with 2 slotted screws, Mat. Aluminium, IP 54



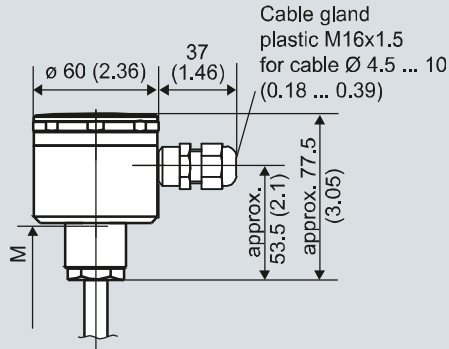
Form B, screw cover plastic, IP 54 (BK)



Form B, high hinged cover with slotted screw, aluminium, IP 65 (BUZH)



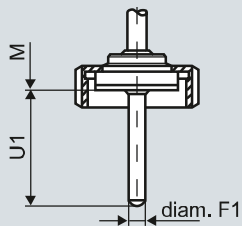
Form B, standard, screw cover, stainless steel, IP 67



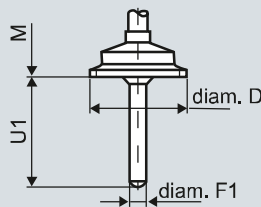
Neck tube length M up to sealing face

Process connections

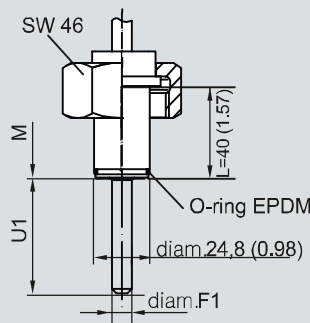
Tapered nipple with slotted nut DIN 11 851 or aseptic to DIN 11 864 DN 25 to 50 (1" to 2 1/2")



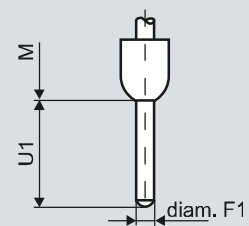
Clamp connection to DIN 32 676 or ISO 2852, TRI-clamp DN 8 to 80 (1" to 3")



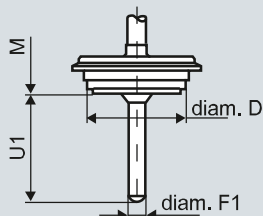
Sanitary nozzle DN25 with hexagon union nut



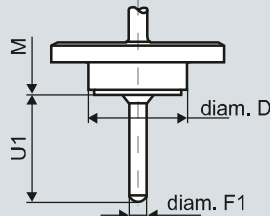
Spherical welding-type sleeve Sphere 30 x 40 mm (1.18 x 1.57 in)



Varivent connection D 50 for Varivent housing DN 25 and 1" D 68 for Varivent housing DN 40 to DN 125 and 1 1/2" to 6"



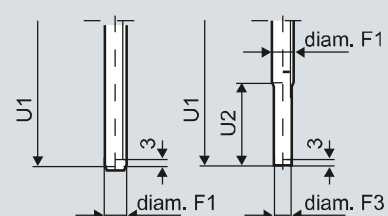
Neuma BioControl Size 25 D-30.5 diam. Size 50 D-50 diam. Size 65 D-68 diam.



Protective tube based on DIN 43 772

Form 2

Similar to form 3 tapered tip



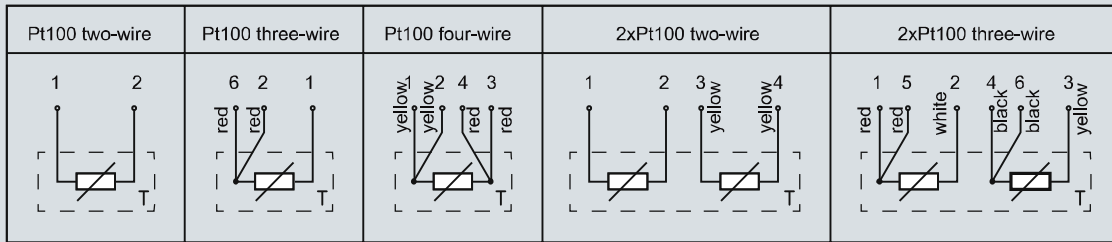
Connection heads and process connections, dimensions in mm (inches)

Temperature Measurement

Resistance thermometers for food, pharmaceuticals and biotechnology

Resistance thermometers
for installation in pipelines and tanks

Schematics



Connection diagram

Temperature Measurement

Resistance thermometers for food, pharmaceuticals and biotechnology

Resistance thermometers with clamp-on system

Overview



The innovative and improved clamp-on temperature measurement system offers measuring features that were previously only achievable using inline techniques.

- For pipe diameters of 4 to 57 mm (0.16 to 2.24 inch), optionally up to 200 mm (7.9 inch)
- Replaceable measuring insert
- All common output signals
- Intrinsically safe Ex versions
- Hygienic design acc. to EHEDG

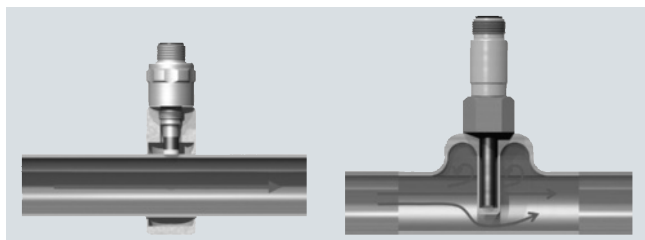
Benefits

- Fast response times and high-precision
- Temperature measurements with no dead-leg, turbulence-free
- Decoupling of ambient temperature influences, errors in measurement approx. 0.2 %/10K
- Can be recalibrated
- Cost savings during installation and operation. No welding in, easy to dismantle for recalibration

Application

The innovative clamp-on temperature measuring system is primarily used for temperature monitoring and process control in the food and pharmaceutical industries, particularly for sterilization processes.

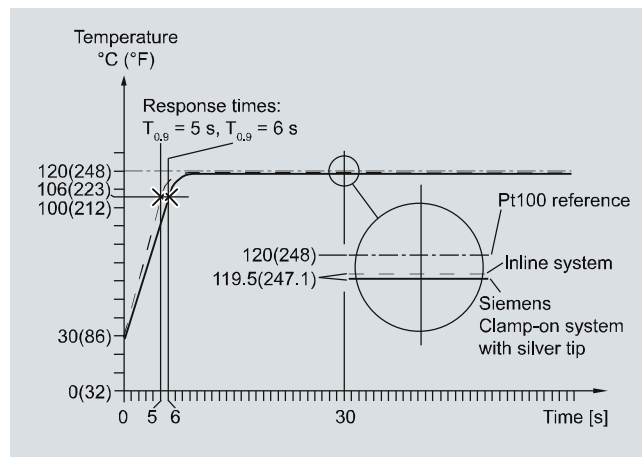
It completely replaces the commonly used inline measurement system, without having any of the inherent disadvantages: opening of pipelines during assembly, high costs for assembly and qualification of welded connections, flow and hygienic problems.



Siemens clamp-on

Conventional inline measurement

Measurement technology is comparable with inline measurements.



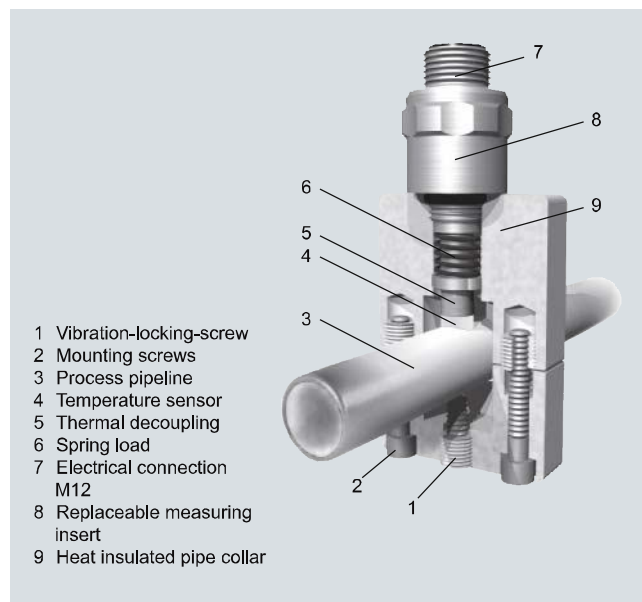
Sample application showing pipeline 13 x 1.5 mm (0.51 x 0.06 inch) made of stainless steel using heat-conductive-compound.

Design

Temperature measurement is carried out over a modified and quick-response Pt100 measuring element, which is positioned and insulated over a pipe collar made of heat-resistant plastic.

The measuring insert contains a special temperature sensor tip made of silver, which is pressed evenly onto the pipeline by means of a spring.

The compulsory guide of the replaceable measuring insert ensures even pressure contact on the pipeline, which ensures a reproducible measuring result.



Integration

The device either provides the Pt100 sensor signal direct or, in the version with connection head for the standard signals 4 to 20 mA as well, HART, PROFIBUS PA and FOUNDATION Fieldbus. This ensures easy integration in an existing device concept.

Temperature Measurement

Resistance thermometers for food, pharmaceuticals and biotechnology

Resistance thermometers with clamp-on system

Configuration

In order to ensure selection of the right device, it is necessary to know the pipe diameter of the process tube. For special sizes, first select the correct collar size and specify the required size in plain text. Space-saving versions for narrow installation conditions (e.g. pipe bundles) are also available (latch-fastening version).

The required output signal can be selected, as described under "Integration". The cable gland for the stainless steel enclosure may vary from the standard version. There are a range of intrinsically safe versions available for explosion protection acc. to ATEX, both for gases and for dust. For the correct assignment after recalibration, both the collar and the measuring insert are marked with the serial number and pipe diameter. These data can also be engraved if required. Furthermore, customers can select the setting for the transmitter, a TAG marking and the option of 4-wire circuit.

We recommend using heat-conductive-compound.

Programming

PROFIBUS PA versions are connected to the bus and configured using the SIMATIC PDM operating software.

FOUNDATION Fieldbus devices are configured over AMS. The HART version can be configured over a handheld or over a HART modem in conjunction with SIMATIC PDM or AMS.

For 4 to 20 mA devices without HART protocol, a special modem and the SIPROM T operating software is required. We recommend using the USB version of the modem. The USB interface also provides the power supply.

Technical specifications

Input

Measured variable	Temperature
Measuring range	-40 ... +150 °C (-40 ... +302 °F)
Measuring resistor	1 x Pt100 acc. EN 60751, Class A in 3-wire version

Output

• Sensor signal	Pt100
• Current signal	4 ... 20 mA
HART	4 ... 20 mA, digitally superimposed HART signal
PROFIBUS PA and FOUNDATION Fieldbus	Digital bus signal

Measuring accuracy

Response time/accuracy (see sample application under "Applications")	$T_{0,9} = 6 \text{ s}$ / approx. 0.5 °C (0.9°F), standard version
Reference conditions	
• Pipeline	13 x 1.5 mm (0.51 x 0.06 inch) made of stainless steel using heat-conductive-compound.
• Ambient temperature	20 °C (68 °F)
• Medium	water, 120 °C (248 °F)
• Flow rate	3 m/s (9.84 ft/s)

Conditions of use

Nominal pipe diameters	Suitable for all common nominal pipe diameters 4 ... 57 mm (0.16 ... 2.24 inch). Special versions up to 200 mm (7.87 inch) possible (tension band version)
Degree of protection	IP65 acc. to EN 60529 (IP65 for pipe collar and IP67 for electrical connection)

Design

Electrical connection	<ul style="list-style-type: none"> • Connector M12 x 1.5 for direct sensor signal • Connection head made of stainless steel Mat. No. 1.4305 with polyamide cable gland for cable diameter 3 ... 6.5 mm (0.12 ... 0.26 inch)
Weight	
• Versions with round connector M12	
- Pipe diameter 4 ... 17.2 mm (0.16 ... 0.7 inch)	Approx. 100 g (0.22 lb)
- Pipe diameter 18 ... 38 mm (0.7 ... 1.5 inch)	Approx. 200 g (0.44 lb)
- Pipe diameter 38 ... 57 mm (1.5 ... 2.24 inch)	Approx. 250 g (0.55 lb)
• Versions with stainless steel connection head	
- Pipe diameter 13.5 ... 17.2 mm (0.53 ... 0.7 inch)	Approx. 300 g (0.66 lb)
- Pipe diameter 18 ... 38 mm (0.7 ... 1.5 inch)	Approx. 400 g (0.88 lb)
- Pipe diameter 38 ... 57 mm (1.5 ... 2.24 inch)	Approx. 450 g (0.99 lb)

Measuring insert

- Special measuring insert made of stainless steel; hygienic design
- Measuring element made of silver, thermal decoupling through plastic insert
- Measuring insert screwed into collar with spring load. Use heat-conductive-compound (see accessories) prior to mounting the device.

Pipe collar

- Material: Temperature resistant high-performance plastic with integrated insulating system in the hygienic design
- Ambient temperature influence: Approx. 0.2 %/10 K

Certificates and approvals (available soon)

Explosion protection ATEX

EC type test certificate

Type of protection "intrinsic safety i"

- II 1 G Ex ia IIC T6/T5/T4
- II 2 G Ex ib IIC T6/T5/T4
- II 1 D Ex iaD 20 T89°C
- II 2 D Ex ibD 21 T121°C

Interface

$U_i \leq 30 \text{ V}$, $P_i \leq 200 \text{ mW}$
 C_i and L_i are negligibly small.

Temperature Measurement

Resistance thermometers for food, pharmaceuticals and biotechnology

Resistance thermometers with clamp-on system

Selection and Ordering data	Order no.	Order code
Pipe collar Pt100 thermometer	7MC 8 0 1 6 - 0	0
Type of connection		A B
Connector M12 x 1 Connection head form B, stainless steel		
Mounting with pipe collar		
Outer pipe diam; Collar size; mm (inch)		
4 (0.16)		A1
6 (0.24)		B1
6,35 (0.25)		C1
8 (0.31)		D1
9,35 (0.37)		E1
10 (0.39)		F1
10,2 (F)		G1
10,3 (0.41)		H1
12 (0.47)	50 x 35 x 20 (1.97 x 1.38 x 0.79)	J1
12,7 (0.50)		K1
13 (0.51)		L1
13,5 (0.53)		M1
13,7 (0.54)		N1
14 (0.55)		P1
15,88 (0.62)		Q1
16 (0.63)		R1
17,2 (0.68)		S1
18,0 (0.71)		A2
19,0 (0.74)		B2
19,05 (0.75)		C2
20,0 (0.79)		D2
21,3 (0.84)		E2
22,0 (0.87)		F2
23,0 (0.90)		G2
24,0 (0.94)		H2
25,0 (0.98)		J2
25,4 (1.00)		K2
26,7 (1.05)		L2
26,9 (1.06)	70 x 70 x 20 (2.76 x 2.76 x 0.79)	M2
28,0 (1.10)		N2
29,0 (1.14)		P2
30,0 (1.18)		Q2
31,8 (1.25)		R2
32,0 (1.26)		S2
33,4 (1.31)		T2
33,7 (1.33)		U2
34,0 (1.34)		V2
35,0 (1.38)		W2
36,0 (1.42)		X2
38,0 (1.49)		Y2
38,1 (1.50)		A3
41,0 (1.61)		B3
42,4 (1.67)		C3
44,5 (1.75)		D3
48,3 (1.90)	90 x 85 x 20 (3.54 x 3.35 x 0.79)	E3
50,8 (2.00)		F3
53,0 (2.09)		G3
54,0 (2.13)		H3
57,0 (2.24)		J3
Special size ¹⁾		Z0
		K1 Y

Selection and Ordering data	Order no.	Order code
Pipe collar Pt100 thermometer	7MC 8 0 1 6 - 0	0
Mounting with strap		
Outer pipe diam. mm (inch)	Strap size mm (inch)	
50 ... 60 (1.97 ... 2.36)	50/70 (1.97/2.76)	A7
60 ... 75 (2.36 ... 2.95)	60/80 (2.76/3.15)	B7
75 ... 85 (2.95 ... 3.35)	70/90 (1.97/3.54)	C7
85 ... 105 (3.35 ... 4.13)	90/110 (3.54/4.33)	D7
105 ... 125 (4.13 ... 4.92)	110/130 (4.33/5.12)	E7
125 ... 155 (4.92 ... 6.10)	125/160 (4.92/6.30)	F7
155 ... 200 (6.10 ... 7.87)	155/200 (6.10/7.87)	G7
Without strap		H7

Selection and Ordering data	Ord. code
Further designs	
Add "-Z" to Order No. and specify Order Code.	
Transmitter (only connection type available: connection head)	
TH100	T10
TH100 Ex	T11
TH200	T20
TH200 Ex	T21
TH300	T30
TH300 Ex	T31
TH400 PA	T40
TH400 PA Ex	T41
TH400 FF	T45
TH400 FF Ex	T46
Customer-specific setting of the built-in transmitter (specify settings in plain text) (for technical specifications of the transmitter, see chapter "SITRANS T measuring instruments for temperature")	Y11
Other cable gland (only for connection head)	
Polyamide for cable diameter 4,5 ... 10 mm (0.18 ... 0.39 inch)	K02
Stainless steel for cable diameter 3 ... 6,5 mm (0.12 ... 0.25 inch)	K03
Round connector M12 x 1	K11
With explosion protection "Intrinsic safety" (available soon)	
II 1GD Ex ia IIC T6/T4	E01
Deviating pipe; mm (inches)	Collar size; mm (inch)
4 ... 17,9 (0.16 ... 0.70)	50 x 35 (1.97 x 1.38)
18 ... 38 (0.71 ... 1.49)	70 x 70 (2.76 x 2.76)
38,1 ... 57 (1.5 ... 2.24)	90 x 85 (3.54 x 3.35)
Larger nominal diameters on request	S19
Space-saving mounting (latch fastening)	
Outer pipe; mm (inch):	
6 ... 17,2 (0.24 ... 0.68)	S21
18 ... 35 (0.71 ... 1.38)	S22
38 ... 50,8 (1.45 ... 2.00)	S23

Temperature Measurement

Resistance thermometers for food, pharmaceuticals and biotechnology

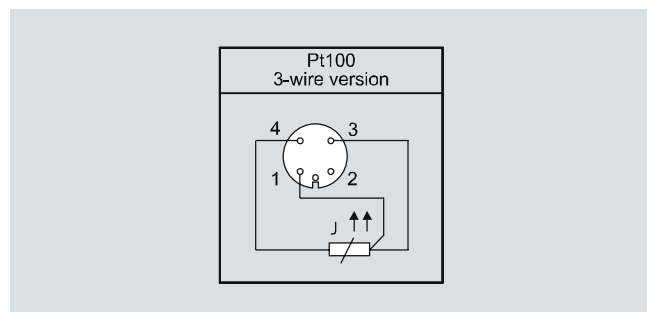
Resistance thermometers
with clamp-on system

Selection and Ordering data	Ord. code
Further Options	
Assignment marking, engraving instead of adhesive label (Serial number and pipe diameter on plug and plastic block)	L11
Sensor 4-wire connection	L14
Heat-conductive-compound, silicone-free, syringe 3 g	L15
Suffixes	
Please add "-Z" to Order No. and specify Order code(s) and plain text.	
Transmitter, specify complete setting in plain text	Y01
TAG plate made of stainless steel (specify TAG No. in plain text)	Y15
Test report at 50 % and 100 % (specify the measuring range in plain text)	Y33
If optional head transmitters are integrated, please note that all calibration points are located in the set measuring range. If the points are located outside the standard measuring range, a Y11 addition is always required.	
Special version, specify in plain text	Y99
1) Special sizes for pipe outer diameters: In order to process "Z0" special sizes, the following two additional items of information are essential: - the required diameter specified in plain text under "K1Y" - Selection of the corresponding pipe collar or latch fastener size (Order codes "S11" to "S23")	

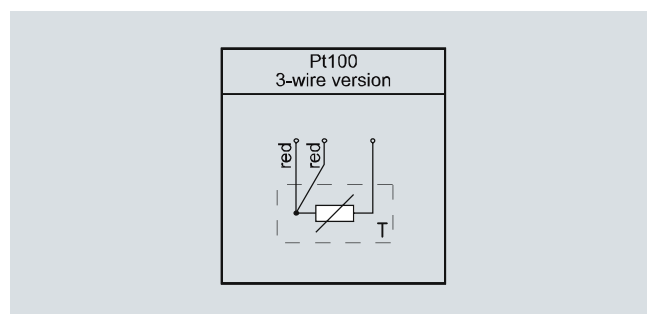
Selection and Ordering data	Order No.
Accessories	
Modem for SITRANS TH100 and TH200 incl. parameterization software SIPROM T	
With USB connection	7NG3092-8KU
With RS 232 connection	7NG3092-8KM
HART modem	
With RS 232 connection	7MF4997-1DA
With USB connection	7MF4997-1DB
SIMATIC PDM operating software, see "Communication and Software"	
CD for measuring instruments for temperature	A5E00364512
with documentation in German, English, French, Spanisch, Italian, Portuguese and SIPROM T parameterization software	

Power supply units see "SITRANS I supply units and isolation amplifiers".

Schematics



Connection diagram for round connector M12 x 1, 4-pole



Connection diagram for connection head or cable gland