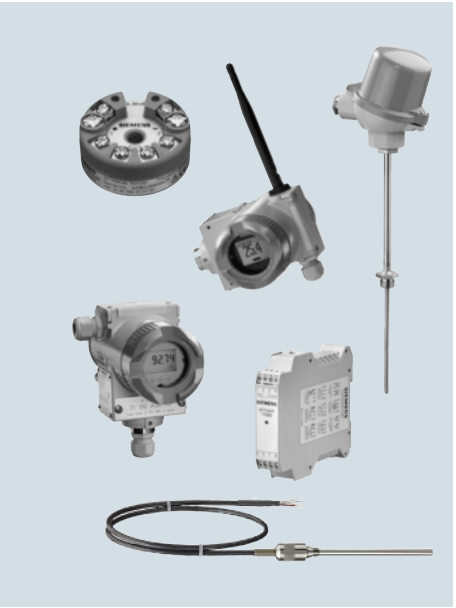
Temperature Measurement

2



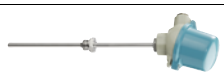
You can download all instructions, catalogs and certificates for SITRANS T free of charge at the following Internet address: www.siemens.com/sitranst

Overview

	Application	Mounting of transmitter with Ex protection		Page	Software for parameterization
		Transmitter	Sensor		
Temperature transmitter for head mounting					
	**SITRANS TH100** Transmitters for Pt100 • Two-wire system	zone 2 and zone 1	zone 2, zone 1 and zone 0	2/7	SIPROM T
	**SITRANS TH200** Transmitters for connection to resistance thermometers, resistance-based sensors, thermocouples and DC voltages up to 1.1 V • Two-wire system • Universal	zone 2 and zone 1	zone 2, zone 1 and zone 0	2/11	SIPROM T
	**SITRANS TH300** Transmitters for connection to resistance thermometers, resistance-based sensors, thermocouples and DC voltages up to 1.1 V • Two-wire system • Universal • HART	zone 2 and zone 1	zone 2, zone 1 and zone 0	2/18	SIMATIC PDM
	**SITRANS TH400** Transmitters for connection to resistance thermometers, resistance-based sensors, thermocouples and DC voltages up to 0.9 V • Fieldbus transmitters • PROFIBUS PA • FOUNDATION fieldbus	zone 2, zone 1 and zone 21	zone 2, zone 1, zone 0, zone 21, zone 20	2/25	SIMATIC PDM for TH 400 with PROFIBUS PA
Temperature transmitters for rail mounting					
	**SITRANS TR200** Transmitters for connection to resistance thermometers, resistance-based sensors, thermocouples and DC voltages up to 1.1 V • Two-wire system • Universal	zone 2, zone 1 and zone 21	zone 2, zone 1, zone 0, zone 21, zone 20	2/31	SIPROM T
	**SITRANS TR300** Transmitters for connection to resistance thermometers, resistance-based sensors, thermocouples and DC voltages up to 1.1 V • Two-wire system • Universal • HART	zone 2, zone 1 and zone 21	zone 2, zone 1, zone 0, zone 21, zone 20	2/38	SIMATIC PDM

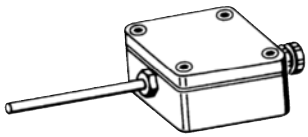
	Application	Mounting of transmitter with Ex protection		Page	Software for parameterization
		Transmitter	Sensor		
	**SITRANS TW** Transmitters for connection to resistance thermometers, resistance-based sensors, thermocouples, DC voltages and DC currents for: • Four-wire system	Safe area	zone 1, zone 0, zone 21, zone 20	2/45	SIMATIC PDM
Temperature transmitters for field mounting					
	**SITRANS TF280** Transmitter for connection to resistance-based sensor • In field enclosure for heavy industrial use • battery-operated • WirelessHART	-	-	2/57	Local operation via buttons SIMATIC PDM local with HART modem and wireless via WirelessHART
	**SITRANS TF** Transmitters for connection to resistance thermometers, resistance-based sensors, thermocouples and DC voltages up to 1.1 V • In field enclosure for heavy industrial use • HART, Universal	Zone 2 and zone 1	zone 2, zone 1 and zone 0	2/62	depending on the installed TH200/TH300 transmitter
	**SITRANS TF** Fieldbus transmitters for connection to resistance thermometers, resistance-based sensors, thermocouples and DC voltages up to 0.8 V • In field enclosure for heavy industrial use • PROFIBUS PA • FOUNDATION fieldbus	Zone 2 and zone 1	zone 2, zone 1 and zone 0	2/70	SIMATIC PDM for PROFIBUS PA
Field indicator for 4 to 20 mA signals					
	**SITRANS TF** Field indicator for 4 to 20 mA signals Display of units can be user-defined	Zone 2 and zone 1	-	2/62	--

Product overview

	Type	Description	Page	Software for parameterization
Measuring inserts for temperature sensors NEW				
	European type	• Replaceable • Mineral-insulated	2/160	-
	American type		2/162	-
Temperature sensors NEW				
	TS100	• Cable connection • Universal use • For unfavorable space conditions • Mineral-insulated	2/108	-
   	TS200	• Compact version • Universal use • Mineral-insulated • For unfavorable space conditions	2/112	-
	TS300	Resistance thermometer for food, pharmaceiticals and biotechnology • Modular design, for installation in pipelines and tanks	2/116	
		• Clamp-on design, for attachment on the pipe primarily for sterilization processes	2/120	
	TS500, Type 2	• For the process industry (piping and tanks) • Tubular thermowell for minimal to medium stress • Thermowell as per DIN 43772, Type 2 without process connection • Without extension, plug-in or use with moveable compression fittings	2/124	-
	TS500, Type 2N	• For the process industry (vessels and pipings) • Tubular thermowell for minimal to medium stress • Thermowell Type 2N similar to DIN 43772, screwed in • Without extension, connection head not adjustable	2/128	-
	TS500, Type 2G	• For the process industry (vessels and pipings) • Tubular version for minimal to medium stress • Thermowell as per DIN 43722, Type 2G, screwed in • With extension	2/132	-

	Type	Description	Page	Software for parameterization
	TS500, Type 2F	• For the process industry (vessels and pipings) • Tubular version for minimal to medium stress • Thermowell as per DIN 43722, Type 2F with flange • With extension	2/136	-
	TS500, Type 3	• For the process industry (vessels and pipings) • Tubular thermowell for minimal to medium stress • Thermowell as per DIN 43722, Type 3 without process connection, improved response time • Without extension, plug-in or use with moveable compression fittings	2/140	-
	TS500, Type 3G	• For the process industry (vessels and pipings) • Tubular version for minimal to medium stress • Thermowell as per DIN 43722, Type 3G, screwed in, improved response time • With extension	2/144	-
	TS500, Type 3F	• For the process industry (vessels and pipings) • Tubular thermowell for minimal to medium stress • Thermowell as per DIN 43722, Type 3F with flange, improved response time • With extension X	2/148	-
 	TS500, Type 4 TS500, Type 4F	• For the process industry (vessels and pipings) • Barstock thermowell for medium to highest stress • Thermowell as per DIN 43722 • Type 4 for weld-in • Type 4F with flange	2/152	-
	TS500, installation	• For the process industry (vessels and pipings) • For the installation of existing thermowells • Suitable for thermowells as per DIN 43772 as well as ASME B40.9-2001 • With European or American type extension	2/156	-

Product overview

	Measuring instrument	Largest measuring range	Page
Temperature sensors for combustion processes and damp rooms			
	Flue gas resistance thermometers	-50 ... +600 °C (-58 ... +1112 °F)	2/166
	Resistance thermometers for damp rooms	-30 ... +60 °C (-22 ... +140 °F)	2/167
	Straight thermocouples	0 ... 1250 °C (32 ... 2282 °F)	2/171

Overview

The SITRANS TH100 dispenses with electrical isolation and universal sensor connection to provide a low-cost alternative for Pt100 measurements.

For the parameterization, the SIPROM T software is used in combination with the modem for SITRANS TH100/TH200.

Its extremely compact design makes the SITRANS TH100 ideal for the retrofitting of measuring points or for the use of analog transmitters.

The transmitter is available as a non-Ex version as well as for use in potentially explosive atmospheres.

Benefits

- Two-wire transmitter
- Assembly in connection head type B (DIN 43729) or larger, or on a standard DIN rail
- Can be programmed, which means that the sensor connection, measuring range, etc. can also be programmed
- Intrinsically-safe version for use in potentially explosive areas

Application

Used in conjunction with Pt100 resistance thermometers, the SITRANS TH100 transmitters are ideal for measuring temperatures in all industries. Due to its compact size it can be installed in the connection head type B (DIN 43729) or larger.

The output signal is a direct current from 4 to 20 mA that is proportional to the temperature.

Parameterization is implemented over the PC using the parameterization software SIPROM T and the modem for SITRANS TH100/TH200. If you already have a "modem for SITRANS TK" (Article No. 7NG3190-6KB), you can continue using this to parameterize the SITRANS TH100.

Transmitters of the "intrinsically-safe" type of protection can be installed within potentially explosive atmospheres. The devices comply with the Directive 94/9/EC (ATEX), as well as FM and CSA regulations.

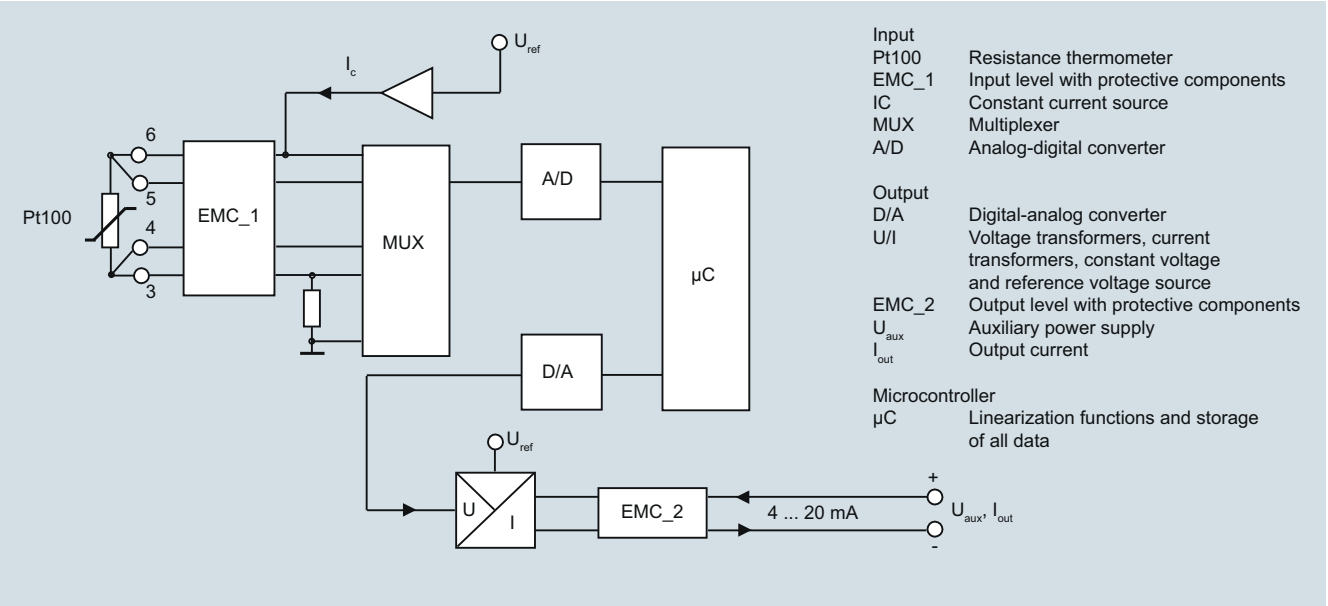
Function

Mode of operation

The measured signal supplied by a Pt100 resistance thermometer (2, 3 or 4-wire system) is amplified in the input stage. The voltage, which is proportional to the input variable, is then converted into digital signals by a multiplexer in an analog/digital converter. They are converted in the microcontroller in accordance with the sensor characteristics and further parameters (measuring range, damping, ambient temperature etc.).

The signal prepared in this way is converted in a digital/analog converter into a load-independent direct current of 4 to 20 mA.

An EMC filter protects the input and output circuits against electromagnetic interferences.



SITRANS TH100, function diagram

SITRANS TH100
two-wire system (Pt100)

Technical specifications

Input	
Resistance thermometer	
Measured variable	Temperature
Sensor type	PT100 to IEC 60751
Characteristic curve	Temperature-linear
Type of connection	2-, 3- or 4-wire circuit
Resolution	14 bit
Measuring accuracy	
• Span <250 °C (450 °F)	< 0.25 °C (0.45 °F)
• Span >250 °C (450 °F)	< 0.1 % of span
Repeatability	< 0.1 °C (0.18 °F)
Measuring current	approx. 0.4 mA
Measuring cycle	< 0.7 s
Measuring range	-200 ... +850 °C -328 ... +1562 °F)
Measuring span	25 ... 1050 °C (77 ... 1922 °F)
Unit	°C or °F
Offset	programmable: -100 ... +100 °C (-180 ... +180 °F)
Line resistance	Max. 20 Ω (total from feeder and return conductor)
Noise rejection	50 and 60 Hz
Output	
Output signal	4 ... 20 mA, two-wire
Auxiliary power	8.5 ... 36 V DC (30 V for Ex ia and ib; 32 V for Ex nL/ic; 35 V for Ex nA)
Max. load	$(U_{aux}$ - 8.5 V)/0.023 A
Overrange	3.6 ... 23 mA, infinitely adjustable (default range: 3.84 ... 20.5 mA)
Error signal (following sensor fault) (conforming to NE43)	3.6 ... 23 mA, infinitely adjustable (default range: 3.6 mA or 22.8 mA)
Damping time	0 ... 30 s (default value: 0 s)
Protection	Against reversed polarity
Resolution	12 bit
Accuracy at 23 °C (73.4 °F)	< 0.1 % of span
Temperature effect	< 0.1 %/10 °C (0.1 %/18 °F)
Effect of auxiliary power	< 0.01 % of span/V
Effect of load impedance	< 0.025 % of max. span/100 Ω
Long-term drift	• < 0.025 % of the max. span in the first month • < 0.035 % of the max. span after one year • < 0.05 % of the max. span after 5 years
Ambient conditions	
Ambient temperature range	-40 ... +85 °C (-40 ... +185 °F)
Storage temperature range	-40 ... +85 °C (-40 ... +185 °F)
Relative humidity	98 %, with condensation
Electromagnetic compatibility	According to EN 61326 and NAMUR NE21
Construction	
Weight	50 g
Dimensions	See dimensional drawing
Material	Molded plastic
Cross-section of cables	Max. 2.5 mm^2 (AWG 13)
Degree of protection to IEC 60529	
• Enclosure	IP40
• Terminals	IP00

Certificates and approvals	
Explosion protection ATEX	
EC type test certificate	PTB 05 ATEX 2049X
• "Intrinsic gas safety" type of protection	II 1 G Ex ia IIC T6/T4 II (1) 2 G Ex ib [ia Ga] IIC T6/T4 Gb II (1) 3 G Ex ic [ia Ga] IIC T6/T4 Gc II 3 G Ex ic IIC T6/T4 Gc
• "Non-sparking" type of protection	II 3 G Ex nA IIC T6/T4 Gc II 3 G Ex nA[ic] IIC T6/T4 Gc
• "Intrinsic dust safety" type of protection	II 1 D Ex ia IIIC T115 °C Da
Explosion protection FM for USA **and** Canada ($_cFM_{US}$)	
• FM approval	PID 3024169
• Degree of protection	IS Cl I, II, III, Div 1, GP ABCDEFG T4/T5/T6 Cl I, ZN 0,1 AEx ia IIC T4/T5/T6 NI Cl I, II, III, Div 2, GP ABCDFG T4/T5/T6 Cl I, ZN 2, NI IIC T4/T5/T6
Other certificates	GOST, NEPSI, PESO
Software requirements for SIPROM T	
PC operating system	Windows ME, 2000, XP and Win 7 (32 bit); can also be used in connection with RS 232 modem under Windows 95, 98 and 98SE

Selection and Ordering data

		Article No.
SITRANS TH100 temperature transmitters for Pt100 for installation in connection head, type B (DIN 43729), two-wire system, 4 ... 20 mA, programmable, without electrical isolation		
• Without explosion protection	► ⬟	**7NG3211-0NN00**
• With explosion protection "Intrinsic safety" type of protection and for zone 2		
- to ATEX	► ⬟	**7NG3211-0AN00**
- to FM ($_cFM_{US}$)	► ⬟	**7NG3211-0BN00**
Further designs		Order code
Add "**-Z**" to Article No. and specify Order code(s)		
Test report (5 measuring points)		**C11**
Customer-specific programming		
Add "**-Z**" to Article No. and specify Order code(s)		
Measuring range to be set Enter in plain text (max. 5 digits): Y01: ... to ... °C, °F		**Y01**[1]
Measuring point no. (TAG), max. 8 characters		**Y17**
Measuring point descriptor, max. 16 characters		**Y23**
Pt100 (IEC) 2-wire, R_L = 0 Ω		**U02**
Pt100 (IEC) 3-wire		**U03**
Pt100 (IEC) 4-wire		**U04**
Special differing customer-specific programming, specify in plain text		**Y09**[2]
Fail-safe value 3.6 mA (instead of 22,8 mA)		**U36**
Accessories		Article No.
Modem for SITRANS TH100, TH200 and TR200 incl. SIPROM T parameterization software With USB connection	►	**7NG3092-8KU**
CD for measuring instruments for temperature With documentation in German, English, French, Spanish, Italian, Portuguese and SIPROM T parameterization software	►	**A5E00364512**
DIN rail adapters for head transmitters (Quantity delivered: 5 units)	►	**7NG3092-8KA**
Connecting cable 4-wire, 150 mm, for sensor connections when using head transmitters in the high hinged cover (set with 5 units)		**7NG3092-8KC**

► Available ex stock.

⬟ We can offer shorter delivery times for configurations designated with the Quick Ship Symbol ⬟. For details see page 9/5 in the appendix.

1) Here, you enter the initial and final value of the desired measurement range for customer-specific programming for RTD and TC.
2) Here, you enter the initial and final value of the desired measurement range for customer-specific programming for mV, Ω.

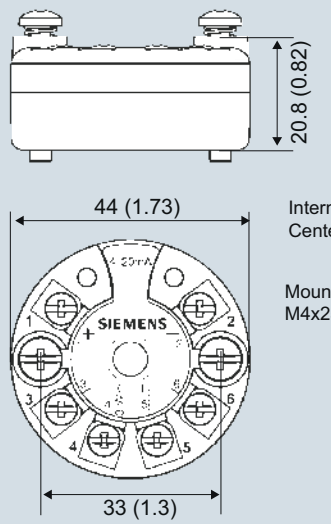
Supply units see Chapter 7 "Supplementary Components".

Ordering example

7NG3211-0NN00-Z Y01+Y23+U03
Y01: 0...100 C
Y23: TICA1234HEAT

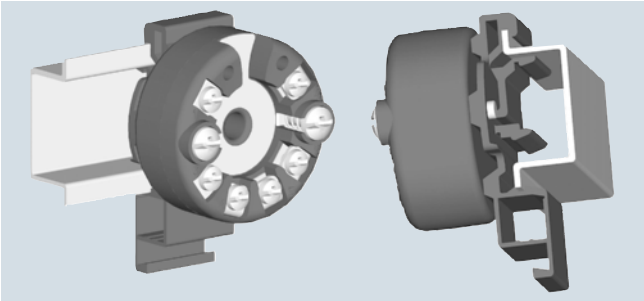
Factory setting:
- Pt100 (IEC 751) with 3-wire circuit
- Measuring range: 0 … 100 °C (32 … 212 °C)
- Error signal in the event of sensor breakage: 22.8 mA
- Sensor offset: 0 C (0 °F)
- Damping 0.0 s

Dimensional drawings

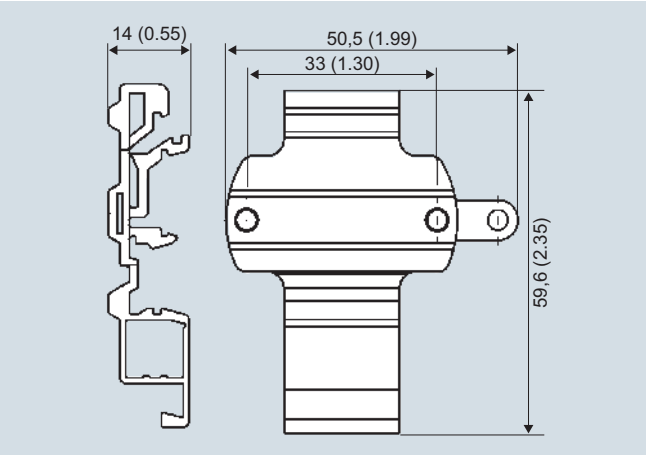


SITRANS TH100, dimensions in mm (inch)

Mounting on DIN rail



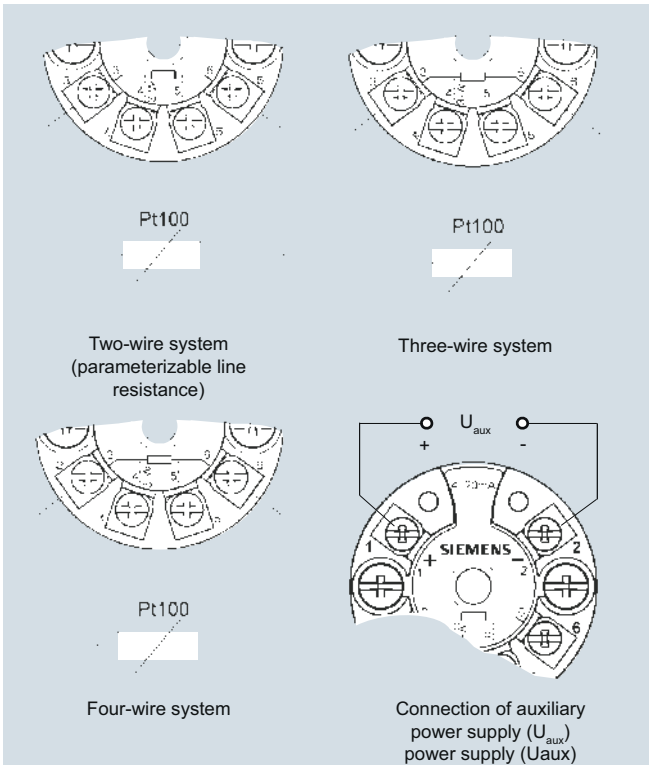
SITRANS TH100, mounting of transmitter on DIN rail



DIN rail adaptor, dimensions in mm (inch)

SITRANS TH100
two-wire system (Pt100)

Schematics



SITRANS TH100, sensor connection assignment

Overview

Ultra flexible - with the universal SITRANS TH200 transmitter

- Two-wire devices for 4 to 20 mA
- Mounting in the connection head of the temperature sensor
- Universal input for virtually any type of temperature sensor
- Configurable over PC

Benefits

- Compact design
- Flexible mounting and center hole allow you to select your preferred type of installation
- Electrically isolated
- Test sockets for multimeters
- Diagnostics LED (green/red)
- Sensor monitoring
  open circuits and short-circuits
- Self-monitoring
- Configuration status stored in EEPROM
- SIL2 (with Order Code C20), SIL2/3 (with C23)
- Expanded diagnostic functions, such as slave pointer, operating hours counter, etc.
- Special characteristic
- Electromagnetic compatibility to EN 61326 and NE21

Application

SITRANS TH200 transmitters can be used in all industrial sectors. Due to their compact size they can be installed in the connection head type B (DIN 43729) or larger. The following sensors/signal sources can be connected over their universal input module:

- Resistance thermometers (2, 3 or 4-wire system)
- Thermocouples
- Resistance-based sensors and DC voltage sources

The output signal is a direct current from 4 to 20 mA in accordance with the sensor characteristic.

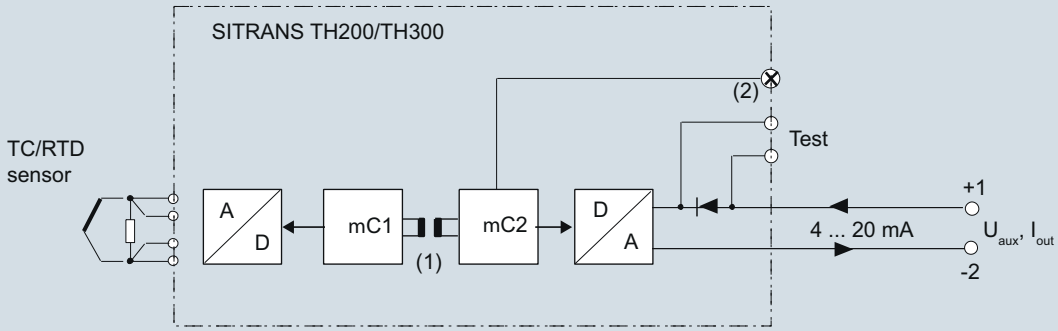
Transmitters of the "intrinsically safe" type of protection can be installed within potentially explosive atmospheres. The devices comply with the Directive 94/9/EC (ATEX), as well as FM and CSA regulations.

Function

The SITRANS TH200 is configured over a PC. A USB or RS 232 modem is linked to the output terminals for this purpose. The configuration data can now be edited using the SIPROM T software tool. The configuration data are then permanently stored in the non-volatile memory (EEPROM).

Once the sensors and power supply have been correctly connected, the transmitter outputs a temperature-linear output signal and the diagnostics LED displays a green light. In the case of a sensor short-circuit, the LED flashes red, an internal device fault is indicated by a steady red light.

The test socket can be used to connect an ammeter at any time for monitoring purposes and plausibility checks. The output current can be read without any interruption, or even without opening the current loop.



Input		Output			
A/D	Analog-digital converter	µC2	Microcontroller, primary circuit	(1)	Electrically isolated
Sensors	Resistance thermometer, thermocouple, resistance-based sensor, mV sensor	D/A	Digital-analog converter	(2)	LED
		U_{aux}	Auxiliary power supply		
µC1	Microcontroller, secondary circuit	I_{out}	Output current		

SITRANS TH200 function diagram

SITRANS TH200
two-wire system, universal

Technical specifications

Input	
Resistance thermometer	
Measured variable	Temperature
Sensor type	
• to IEC 60751	Pt25 … Pt1000
• To JIS C 1604; a = 0.00392 K^{-1}	Pt25 … Pt1000
• to IEC 60751	Ni25 … Ni1000
• Special type	over special characteristic (max. 30 points)
Sensor factor	0.25 ... 10 (adaptation of the basic type, e.g. Pt100 to version Pt25 ... 1000)
Units	°C or °F
Connection	
• Standard connection	1 resistance thermometer (RTD) in 2-wire, 3-wire or 4-wire system
• Generation of average value	2 identical resistance thermometers in 2-wire system for generation of average temperature
• Generation of difference	2 identical resistance thermometers (RTD) in 2-wire system (RTD 1 – RTD 2 or RTD 2 – RTD 1)
Interface	
• Two-wire system	Parameterizable line resistance ≤ 100 Ω (loop resistance)
• Three-wire system	No balancing required
• Four-wire system	No balancing required
Sensor current	≤ 0.45 mA
Response time	≤ 250 ms for 1 sensor with open-circuit monitoring
Open-circuit monitoring	Always active (cannot be disabled)
Short-circuit monitoring	can be switched on/off (default value: ON)
Measuring range	parameterizable (see table "Digital measuring errors")
Min. measured span	10 °C (18 °F)
Characteristic curve	Temperature-linear or special characteristic
Resistance-based sensors	
Measured variable	Actual resistance
Sensor type	Resistance-based, potentiometers
Units	Ω
Connection	
• Normal connection	1 resistance-based sensor (R) in 2-wire, 3-wire or 4-wire system
• Generation of average value	2 resistance-based sensors in 2-wire system for generation of average value
• Generation of difference	2 resistance thermometers in 2-wire system (R1 – R2 or R2 – R1)
Interface	
• Two-wire system	Parameterizable line resistance ≤ 100 Ω (loop resistance)
• Three-wire system	No balancing required
• Four-wire system	No balancing required
Sensor current	≤ 0.45 mA
Response time	≤ 250 ms for 1 sensor with open-circuit monitoring
Open-circuit monitoring	Always active (cannot be disabled)
Short-circuit monitoring	can be switched on/off (default value: OFF)
Measuring range	parameterizable max. 0 ... 2200 Ω (see table "Digital measuring errors")
Min. measured span	5 Ω ... 25 Ω (see Table "Digital measuring errors")
Characteristic curve	Resistance-linear or special characteristic
Thermocouples	
Measured variable	Temperature
Sensor type (thermocouples)	
• Type B	Pt30Rh-Pt6Rh to DIN IEC 584
• Type C	W5 %-Re acc. to ASTM 988
• Type D	W3 %-Re acc. to ASTM 988
• Type E	NiCr-CuNi to DIN IEC 584
• Type J	Fe-CuNi to DIN IEC 584
• Type K	NiCr-Ni to DIN IEC 584
• Type L	Fe-CuNi to DIN 43710
• Type N	NiCrSi-NiSi to DIN IEC 584
• Type R	Pt13Rh-Pt to DIN IEC 584
• Type S	Pt10Rh-Pt to DIN IEC 584
• Type T	Cu-CuNi to DIN IEC 584
• Type U	Cu-CuNi to DIN 43710
Units	°C or °F
Connection	
• Standard connection	1 thermocouple (TC)
• Generation of average value	2 thermocouples (TC)
• Generation of difference	2 thermocouples (TC) (TC1 – TC2 or TC2 – TC1)
Response time	≤ 250 ms for 1 sensor with open-circuit monitoring
Open-circuit monitoring	Can be switched off
Cold junction compensation	
• Internal	With integrated Pt100 resistance thermometer
• External	With external Pt100 IEC 60571 (2-wire or 3-wire connection)
• External fixed	Cold junction temperature can be set as fixed value
Measuring range	Parameterizable (see table "Digital measuring errors")
Min. measured span	Min. 40 ... 100 °C (72 ... 180 °F) (see table "Digital measuring errors")
Characteristic curve	Temperature-linear or special characteristic
mV sensor	
Measured variable	DC voltage
Sensor type	DC voltage source (DC voltage source possible over an externally connected resistor)
Units	mV
Response time	≤ 250 ms for 1 sensor with open-circuit monitoring
Open-circuit monitoring	Can be switched off
Measuring range	-10 ... +70 mV-100 … +1100 mV

Min. measured span	2 mV or 20 mV
Overload capability of the input	-1.5 ... +3.5 V DC
Input resistance	≥ 1 MΩ
Characteristic curve	Voltage-linear or special characteristic
Output	
Output signal	4 ... 20 mA, 2-wire
Auxiliary power	11 ... 35 V DC ((to 30 V for Ex ia and ib; to 32 V for Ex nA / nL / ic)
Max. load	$(U_{aux} - 11\ V)/0.023\ A$
Overrange	3.6 ... 23 mA, infinitely adjustable (default range: 3.80 mA ... 20.5 mA)
Error signal (e.g. following sensor fault) (conforming to NE43)	3.6 ... 23 mA, infinitely adjustable (default value: 22.8 mA)
Sample cycle	0.25 s nominal
Damping	Software filter 1st order 0 ... 30 s (parameterizable)
Protection	Against reversed polarity
Electrically isolated	Input against output (1 kV_{eff})
Measuring accuracy	
Digital measuring errors	See table "Digital measuring errors"
Reference conditions	
• Auxiliary power	24 V ± 1 %
• Load	500 Ω
• Ambient temperature	23 °C
• Warming-up time	> 5 min
Error in the analog output (digital/analog converter)	< 0.025 % of span
Error due to internal cold junction	< 0.5 °C (0.9 °F)
Influence of ambient temperature	
• Analog measuring error	0.02 % of span/10°C (18 °F)
• Digital measuring errors	
- with resistance thermometers	0.06 °C (0.11 °F)/10°C (18 °F)
- with thermocouples	0.6 °C (1.1 °F)/10°C (18 °F)
Auxiliary power effect	< 0.001 % of span/V
Effect of load impedance	< 0.002 % of span/100 Ω
Long-term drift	
• In the first month	• < 0.02 % of span
• After one year	• < 0.2 % of span
• After 5 years	• < 0.3 % of span
Conditions of use	
Ambient conditions	
Ambient temperature range	-40 ... +85 °C (-40 ... +185 °F)
Storage temperature range	-40 ... +85 °C (-40 ... +185 °F)
Relative humidity	< 98 %, with condensation
Electromagnetic compatibility	acc. to EN 61326 and NE21
Construction	
Material	Molded plastic
Weight	50 g (0.11 lb)
Dimensions	See "Dimensional drawings"
Cross-section of cables	Max. 2.5 mm^2 (AWG 13)
Degree of protection to IEC 60529	
• Enclosure	IP40
• Terminals	IP00

Certificates and approvals	
Explosion protection ATEX	
EC type test certificate	PTB 05 ATEX 2040X
• "Intrinsic safety" type of protection	II 1 G Ex ia IIC T6/T4 II 2 (1) G Ex ia/ib IIC T6/T4 II 3(1) G Ex ia/ic IIC T6/T4 II 1D Ex iaD 20 T115 °C
• "Operating equipment that is non-ignitable and has limited energy" type of protection	II 3 G Ex nL IIC T6/T4 II 3 G Ex nA IIC T6/T4
Explosion protection: FM for USA	
• FM approval	FM 3024169
• Degree of protection	IS / Cl I, II, III / Div 1 / GP ABCDEFG T6, T5, T4 Cl I / ZN 0 / AEx ia IIC T6, T5, T4 NI / Cl I / Div 2 / GP ABCDFG T6, T5, T4 NI / Cl I / ZN 2 / IIC T6, T5, T4
Explosion protection to FM for Canada ($_cFM_{US}$)	
• FM approval	FM 3024169C
• Degree of protection	IS / Cl I, II, III / Div 1/ GP ABCDEFG T6, T5, T4 NI / Cl I / DIV 2 / GP ABCD T6, T5, T4 NIFW / Cl I, II, III / DIV 2 / GP ABCDFG T6, T5, T4 DIP / Cl II, III / Div 2 / GP FG T6, T5, T4 Cl I / ZN 0 / Ex ia IIC T6, T5, T4 Cl I / ZN 2 / Ex nA nL IIC T6, T5, T4
Other certificates	GOST, NEPSI, PESO, IEC, EXPOLABS
Software requirements for SIPROM T	
PC operating system	Windows ME, 2000, XP and Win 7 (32 bit); can also be used in connection with RS 232 modem under Windows 95, 98 and 98SE

Factory setting:

- Pt100 (IEC 751) with 3-wire circuit
- Measuring range: 0 ... 100 °C (32 ... 212 °F)
- Fault current: 22.8 mA
- Sensor offset: 0 °C (0 °F)
- Damping 0.0 s

Digital measuring errors

Resistance thermometer

Input	Measuring range	Min. measured span		Digital accuracy	
	°C / (°F)	°C	(°F)	°C	(°F)
to IEC 60751					
Pt25	-200 ... +850 (-328 ... +1562)	10	(18)	0,3	(0.54)
Pt50	-200 ... +850 (-328 ... +1562)	10	(18)	0,15	(0.27)
Pt100 ... Pt200	-200 ... +850 (-328 ... +1562)	10	(18)	0,1	(0.18)
Pt500	-200 ... +850 (-328 ... +1562)	10	(18)	0,15	(0.27)
Pt1000	-200 ... +350 (-328 ... +662)	10	(18)	0,15	(0.27)
to JIS C1604-81					
Pt25	-200 ... +649 (-328 ... +1200)	10	(18)	0,3	(0.54)
Pt50	-200 ... +649 (-328 ... +1200)	10	(18)	0,15	(0.27)
Pt100 ... Pt200	-200 ... +649 (-328 ... +1200)	10	(18)	0,1	(0.18)
Pt500	-200 ... +649 (-328 ... +1200)	10	(18)	0,15	(0.27)
Pt1000	-200 ... +350 (-328 ... +662)	10	(18)	0,15	(0.27)
Ni 25 ... Ni1000	-60 ... +250 (-76 ... +482)	10	(18)	0,1	(0.18)

Resistance-based sensors

Input	Measuring range	Min. measured span	Digital accuracy
	Ω	Ω	Ω
Resistance	0 ... 390	5	0,05
Resistance	0 ... 2200	25	0,25

Thermocouples

Input	Measuring range	Min. measured span		Digital accuracy	
	°C/(°F)	°C	(°F)	°C	(°F)
Type B	0 ... 1820 (32 ... 3308)	100	(180)	2[1)]	(3.60)[1)]
Type C (W5)	0 ... 2300 (32 ... 4172)	100	(180)	2	(3.60)
Type D (W3)	0 ... 2300 (32 ... 4172)	100	(180)	1[2)]	(1.80)[2)]
Type E	-200 ... +1000 (-328 ... +1832)	50	(90)	1	(1.80)
Type J	-210 ... +1200 (-346 ... +2192)	50	(90)	1	(1.80)
Type K	-230 ... +1370 (-382 ... +2498)	50	(90)	1	(1.80)
Type L	-200 ... +900 (-328 ... +1652)	50	(90)	1	(1.80)
Type N	-200 ... +1300 (-328 ... +2372)	50	(90)	1	(1.80)
Type R	-50 ... +1760 (-58 ... +3200)	100	(180)	2	(3.60)
Type S	-50 ... +1760 (-58 ... +3200)	100	(180)	2	(3.60)
Type T	-200 ... +400 (-328 ... +752)	40	(72)	1	(1.80)
Type U	-200 ... +600 (-328 ... +1112)	50	(90)	2	(3.60)

[1)] The digital accuracy in the range 0 to 300 °C (32 to 572 °F) is 3 °C (5.4 °F).
[2)] The digital accuracy in the range 1750 to 2300 °C (3182 to 4172 °F) is 2 °C (3.6 °F).

mV sensor

Input	Measuring range	Min. measured span	Digital accuracy
	mV	mV	µV
mV sensor	-10 ... +70	2	40
mV sensor	-100 ... +1100	20	400

The digital accuracy is the accuracy after the analog/digital conversion including linearization and calculation of the measured value.

An additional error is generated in the output current 4 to 20 mA as a result of the digital/analog conversion of 0.025 % of the set span (digital-analog error).

The total error under reference conditions at the analog output is the sum from the digital error and the digital-analog error (poss. with the addition of cold junction errors in the case of thermocouple measurements).

Selection and Ordering data

	Article No.
Temperature transmitter SITRANS TH200	
for installation in connection head, type B (DIN 43729), two-wire system, 4 ... 20 mA, programmable, with electrical isolation	
• Without explosion protection ► ⬟	**7NG3211-1NN00**
• With explosion protection	
- to ATEX ► ⬟	**7NG3211-1AN00**
- to FM ($_cFM_{US}$) ► ⬟	**7NG3211-1BN00**
Further designs	Order code
Add "**-Z**" to Article No. and specify Order code(s)	
With test protocol (5 measuring points)	**C11**
Functional safety SIL2	**C20**
Functional safety SIL2/3	**C23**
Customer-specific programming Add "**-Z**" to Article No. and specify Order code(s)	
Measuring range to be set Enter in plain text (max. 5 digits): Y01: ... to ... °C, °F	**Y01**[1]
Measuring point no. (TAG), max. 8 characters	**Y17**
Measuring point descriptor, max. 16 characters	**Y23**
Measuring point message, max. 32 characters	**Y24**
Pt100 (IEC) 2-wire, R_L = 0 Ω	**U02**
Pt100 (IEC) 3-wire	**U03**
Pt100 (IEC) 4-wire	**U04**
Thermocouple type B	**U20**
Thermocouple type C (W5)	**U21**
Thermocouple type D (W3)	**U22**
Thermocouple type E	**U23**
Thermocouple type J	**U24**
Thermocouple type K	**U25**
Thermocouple type L	**U26**
Thermocouple type N	**U27**
Thermocouple type R	**U28**
Thermocouple type S	**U29**
Thermocouple type T	**U30**
Thermocouple type U	**U31**
With TC: CJC internal	**U40**
With TC: CJC external (Pt100, 3-wire)	**U41**
With TC: CJC external with fixed value, specify in plain text	**Y50**
Special differing customer-specific programming, specify in plain text	**Y09**[2]
Fail-safe value 3.6 mA (instead of 22,8 mA)	**U36**
Cable extension Transmitter with installed cable extension 150 mm (5.91 inch), for Pt100 in four-wire system	**W01**

Accessories		Article No.
Modem for SITRANS TH100, TH200 and TR200 incl. SIPROM T parameterization software With USB connection	►	**7NG3092-8KU**
CD for measuring instruments for temperature With documentation in German, English, French, Spanish, Italian, Portuguese and SIPROM T parameterization software	►	**A5E00364512**
DIN rail adapters for head transmitters (Quantity delivered: 5 units)	►	**7NG3092-8KA**
Connecting cable 4-wire, 150 mm, for sensor connections when using head transmitters in the high hinged cover (set with 5 units)		**7NG3092-8KC**

► Available ex stock.

⬟ We can offer shorter delivery times for configurations designated with the Quick Ship Symbol ⬟. For details see page 9/5 in the appendix.

[1] Here, you enter the initial and final value of the desired measurement range for customer-specific programming for RTD and TC.

[2] If needed, here you can mention settings, which cannot be specified with existing order codes (e.g.: programming for mV, Ω).

Supply units see Chapter 7 "Supplementary Components".

Ordering example 1:

7NG3211-1NN00-Z Y01+Y17+U03
Y01: 0...100 C
Y17: TICA123

Ordering example 2:

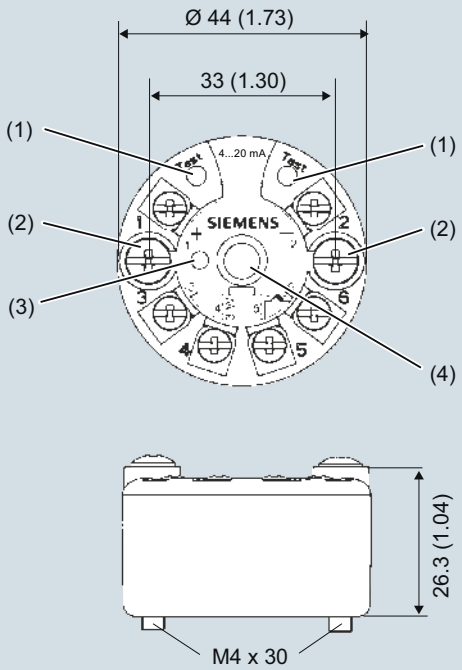
7NG3211-1NN00-Z Y01+Y23+ U25+U40
Y01: 0...100 C
Y23: TICA1234HEAT

Factory setting:

- Pt100 (IEC 751) with 3-wire circuit
- Measuring range: 0 … 100 °C (32 … 212 °F)
- Fault current: 22.8 mA
- Sensor offset: 0 °C (0 °F)
- Damping 0.0 s

SITRANS TH200
two-wire system, universal

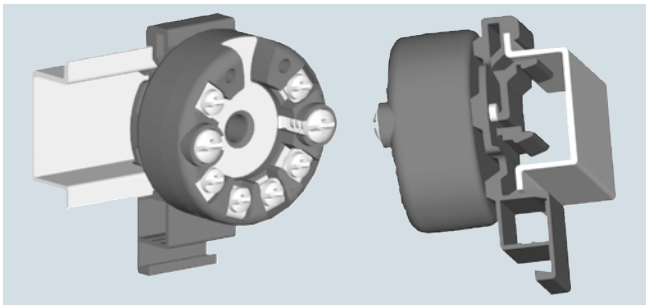
Dimensional drawings



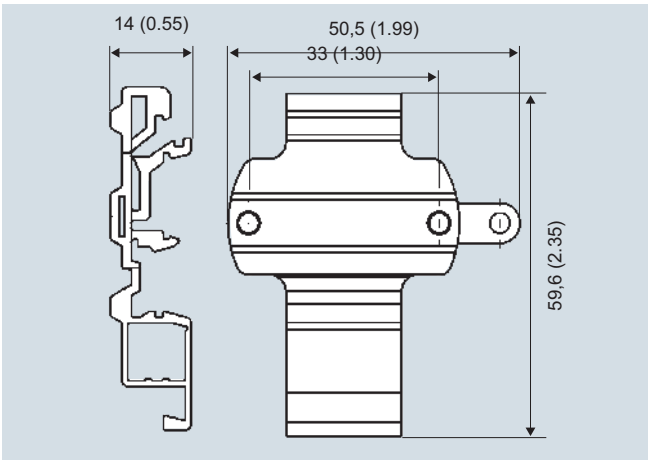
1(+) and 2(-)	Auxiliary power supply U_{aux}, output current I_{Out}
3, 4, 5 and 6	Pt100 sensor (for connections, see Sensor connection assignment)
Test (+), Test (-)	Measurement of the output current with a multimeter
(1)	Test terminal
(2)	Mounting screw M4x30
(3)	LED for operation indication
(4)	Internal diameter of center hole 6.3 (0.25)

SITRANS TH200, dimensions and pin assignment, dimensions in mm (inch)

Mounting on DIN rail



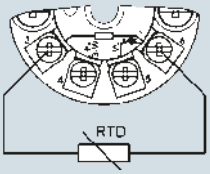
SITRANS TH200, mounting of transmitter on DIN rail



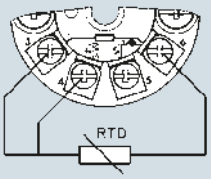
DIN rail adapter, dimensions in mm (inch)

Schematics

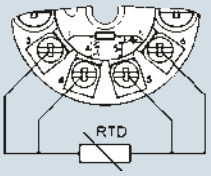
Resistance thermometer



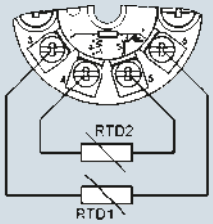
Two-wire system [1)]



Three-wire system

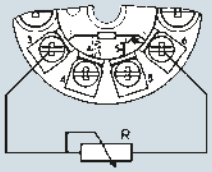


Four-wire system

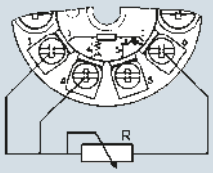


Generation of average value / difference [1)]

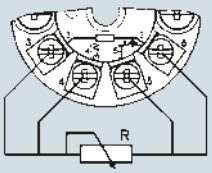
Resistance



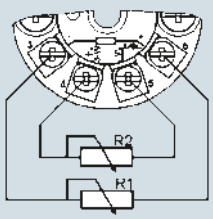
Two-wire system [1)]



Three-wire system

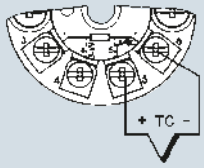


Four-wire system

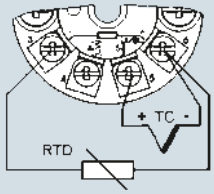


Generation of average value / difference [1)]

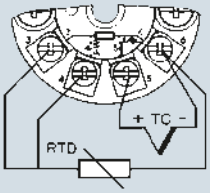
Thermocouple



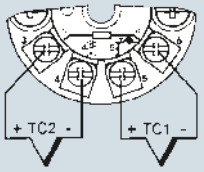
Cold junction compensation
Internal/fixed value



Cold junction compensation with external Pt100 in two-wire system [1)]



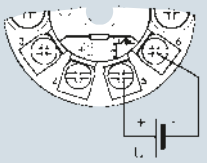
Cold junction compensation with external Pt100 in three-wire system



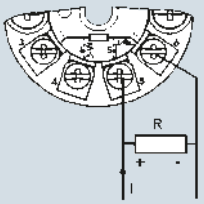
Generation of average value / difference with internal cold junction compensation

[1)] Programmable line resistance for the purpose of correction.

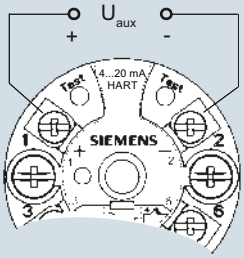
Voltage measurement



Current measurement



Connection of auxiliary power supply (U_{aux})



SITRANS TH200, sensor connection assignment

Transmitters for mounting in sensor head

SITRANS TH300
two-wire system, universal, HART

Overview

"HART" to beat - the universal SITRANS TH300 transmitter

- Two-wire devices for 4 to 20 mA, HART
- Mounting in the connection head of the temperature sensor
- Universal input for virtually any type of temperature sensor
- Configurable over HART

Benefits

- Compact design
- Flexible mounting and center hole allow you to select your preferred type of installation
- Electrically isolated
- Test sockets for multimeters
- Diagnostics LED (green/red)
- Sensor monitoring
  open circuits and short-circuits
- Self-monitoring
- Configuration status stored in EEPROM
- SIL2 (with Order Code C20), SIL2/3 (with C23)
- Expanded diagnostic functions, such as slave pointer, operating hours counter, etc.
- Special characteristic
- Electromagnetic compatibility to EN 61326 and NE21

Application

SITRANS TH300 transmitters can be used in all industrial sectors. Due to their compact size they can be installed in the connection head type B (DIN 43729) or larger. The following sensors/signal sources can be connected over their universal input module:

- Resistance thermometers (2, 3 or 4-wire system)
- Thermocouples
- Resistance-based sensors and DC voltage sources

The output signal is a direct current from 4 to 20 mA in accordance with the sensor characteristic, superimposed by the digital HART signal.

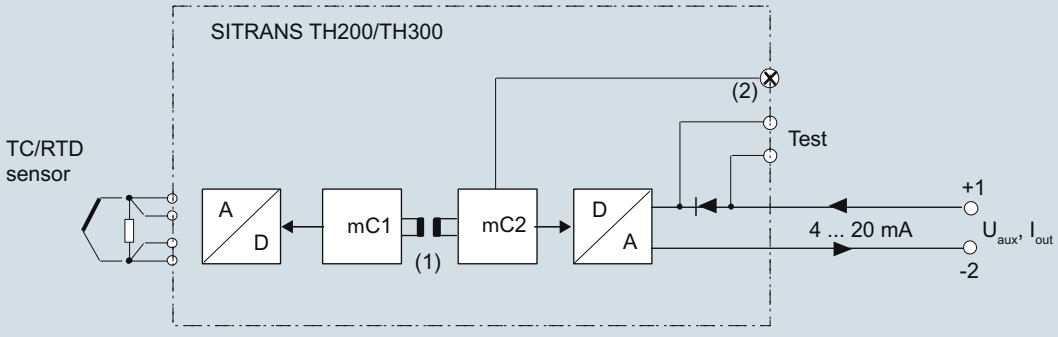
Transmitters of the "intrinsically safe" type of protection can be installed within potentially explosive atmospheres. The devices comply with the Directive 94/9/EC (ATEX), as well as FM and CSA regulations.

Function

The SITRANS TH300 is configured over HART. This can be done using a handheld communicator or even more conveniently with a HART modem and the SIMATIC PDM parameterization software. The configuration data are then permanently stored in the non-volatile memory (EEPROM).

Once the sensors and power supply have been correctly connected, the transmitter outputs a temperature-linear output signal and the diagnostics LED displays a green light. In the case of a sensor short-circuit, the LED flashes red, an internal device fault is indicated by a steady red light.

The test socket can be used to connect an ammeter at any time for monitoring purposes and plausibility checks. The output current can be read without any interruption, or even without opening the current loop.



Input		Output		(1)	Electrically isolated
A/D	Analog-digital converter	µC2	Microcontroller, primary circuit	(2)	LED
Sensors	Resistance thermometer, thermocouple, resistance-based sensor, mV sensor	D/A	Digital-analog converter		
		U_{aux}	Auxiliary power supply		
µC1	Microcontroller, secondary circuit	I_{out}	Output current		

SITRANS TH 300 function diagram

Technical specifications

Input	
Resistance thermometer	
Measured variable	Temperature
Sensor type	
• to IEC 60751	Pt25 … Pt1000
• To JIS C 1604; a = 0.00392 K^{-1}	Pt25 … Pt1000
• to IEC 60751	Ni25 … Ni1000
• Special type	over special characteristic (max. 30 points)
Sensor factor	0.25 ... 10 (adaptation of the basic type, e.g. Pt100 to version Pt25 ... 1000)
Units	°C or °F
Connection	
• Standard connection	1 resistance thermometer (RTD) in 2-wire, 3-wire or 4-wire system
• Generation of average value	2 identical resistance thermometers in 2-wire system for generation of average temperature
• Generation of difference	2 identical resistance thermometers (RTD) in 2-wire system (RTD 1 – RTD 2 or RTD 2 – RTD 1)
Interface	
• Two-wire system	Parameterizable line resistance ≤ 100 Ω (loop resistance)
• Three-wire system	No balancing required
• Four-wire system	No balancing required
Sensor current	≤ 0.45 mA
Response time	≤ 250 ms for 1 sensor with open-circuit monitoring
Open-circuit monitoring	Always active (cannot be disabled)
Short-circuit monitoring	can be switched on/off (default value: ON)
Measuring range	parameterizable (see table "Digital measuring errors")
Min. measured span	10 °C (18 °F)
Characteristic curve	Temperature-linear or special characteristic
Resistance-based sensors	
Measured variable	Actual resistance
Sensor type	Resistance-based, potentiometers
Units	Ω
Connection	
• Normal connection	1 resistance-based sensor (R) in 2-wire, 3-wire or 4-wire system
• Generation of average value	2 resistance-based sensors in 2-wire system for generation of average value
• Generation of difference	2 resistance thermometers in 2-wire system (R1 – R2 or R2 – R1)
Interface	
• Two-wire system	Parameterizable line resistance ≤ 100 Ω (loop resistance)
• Three-wire system	No balancing required
• Four-wire system	No balancing required
Sensor current	≤ 0.45 mA
Response time	≤ 250 ms for 1 sensor with open-circuit monitoring
Open-circuit monitoring	Always active (cannot be disabled)
Short-circuit monitoring	can be switched on/off (default value: OFF)
Measuring range	parameterizable max. 0 ... 2200 Ω (see table "Digital measuring errors")
Min. measured span	5 ... 25 Ω (see table "Digital measuring errors")
Characteristic curve	Resistance-linear or special characteristic
Thermocouples	
Measured variable	Temperature
Sensor type (thermocouples)	
• Type B	Pt30Rh-Pt6Rh to DIN IEC 584
• Type C	W5 %-Re acc. to ASTM 988
• Type D	W3 %-Re acc. to ASTM 988
• Type E	NiCr-CuNi to DIN IEC 584
• Type J	Fe-CuNi to DIN IEC 584
• Type K	NiCr-Ni to DIN IEC 584
• Type L	Fe-CuNi to DIN 43710
• Type N	NiCrSi-NiSi to DIN IEC 584
• Type R	Pt13Rh-Pt to DIN IEC 584
• Type S	Pt10Rh-Pt to DIN IEC 584
• Type T	Cu-CuNi to DIN IEC 584
• Type U	Cu-CuNi to DIN 43710
Units	°C or °F
Connection	
• Standard connection	1 thermocouple (TC)
• Generation of average value	2 thermocouples (TC)
• Generation of difference	2 thermocouples (TC) (TC1 – TC2 or TC2 – TC1)
Response time	≤ 250 ms for 1 sensor with open-circuit monitoring
Open-circuit monitoring	can be switched off
Cold junction compensation	
• Internal	With integrated Pt100 resistance thermometer
• External	With external Pt100 IEC 60571 (2-wire or 3-wire connection)
• External fixed	Cold junction temperature can be set as fixed value
Measuring range	parameterizable (see table "Digital measuring errors")
Min. measured span	Min. 40 ... 100 °C (72 ... 180 °F) (see table "Digital measuring errors")
Characteristic curve	Temperature-linear or special characteristic
mV sensor	
Measured variable	DC voltage
Sensor type	DC voltage source (DC voltage source possible over an externally connected resistor)
Units	mV
Response time	≤ 250 ms for 1 sensor with open-circuit monitoring
Open-circuit monitoring	Can be switched off

SITRANS TH300
two-wire system, universal, HART

Measuring range	-10 ... +70 mV -100 … +1100 mV
Min. measured span	2 mV or 20 mV
Overload capability of the input	-1.5 ... +3.5 V DC
Input resistance	≥ 1 MΩ
Characteristic curve	Voltage-linear or special characteristic
Output	
Output signal	4 ... 20 mA, 2-wire with communication acc. to HART Rev. 5.9
Auxiliary power	11 ... 35 V DC (to 30 V for Ex ia and ib; to 32 V for Ex nA/nL/ic)
Max. load	(U_{aux} –11 V)/0.023 A
Overrange	3.6 ... 23 mA, infinitely adjustable (default range: 3.80 mA ... 20.5 mA)
Error signal (e.g. following sensor fault) (conforming to NE43)	3.6 ... 23 mA, infinitely adjustable (default value: 22.8 mA)
Sample cycle	0.25 s nominal
Damping	Software filter 1st order 0 ... 30 s (parameterizable)
Protection	Against reversed polarity
Electrically isolated	Input against output (1 kV_{eff})
Measuring accuracy	
Digital measuring errors	See Table "Digital measuring errors"
Reference conditions	
• Auxiliary power	24 V ± 1 %
• Load	500 Ω
• Ambient temperature	23 °C
• Warming-up time	> 5 min
Error in the analog output (digital/analog converter)	< 0.025 % of span
Error due to internal cold junction	< 0.5 °C (0.9 °F)
Influence of ambient temperature	
• Analog measuring error	0.02 % of span/10°C (18 °F)
• Digital measuring errors	
- with resistance thermometers	0.06 °C (0.11 °F)/10°C (18 °F)
- with thermocouples	0.6 °C (1.1 °F)/10°C (18 °F)
Auxiliary power effect	< 0.001 % of span/V
Effect of load impedance	< 0.002 % of span/100 Ω
Long-term drift	
• In the first month	< 0.02 % of span
• After one year	< 0.2 % of span
• After 5 years	< 0.3 % of span
Conditions of use	
Ambient conditions	
Ambient temperature range	-40 ... +85 °C (-40 ... +185 °F)
Storage temperature range	-40 ... +85 °C (-40 ... +185 °F)
Relative humidity	< 98 %, with condensation
Electromagnetic compatibility	acc. to EN 61326 and NE21

Construction	
Material	Molded plastic
Weight	50 g (0.11 lb)
Dimensions	See "Dimensional drawings"
Cross-section of cables	Max. 2.5 mm^2 (AWG 13)
Degree of protection to IEC 60529	
• Enclosure	IP40
• Terminals	IP00
Certificates and approvals	
Explosion protection ATEX	
EC type test certificate	PTB 05 ATEX 2040X
• "Intrinsic safety" type of protection	II 1 G Ex ia IIC T6/T4 II 2 (1) G Ex ia/ib IIC T6/T4 II 3(1) G Ex ia/ic IIC T6/T4 II 1D Ex iaD 20 T115 °C
• "Operating equipment that is non-ignitable and has limited energy" type of protection	II 3 G Ex nL IIC T6/T4 II 3 G Ex nA IIC T6/T4
Explosion protection: FM for USA	
• FM approval	FM 3024169
• Degree of protection	IS / Cl I, II, III / Div 1 / GP ABCDEFG T6, T5, T4 Cl I / ZN 0 / AEx ia IIC T6, T5, T4 NI / Cl I / Div 2 / GP ABCDFG T6, T5, T4 NI / Cl I / ZN 2 / IIC T6, T5, T4
Explosion protection to FM for Canada ($_cFM_{US}$)	
• FM approval	FM 3024169C
• Degree of protection	IS / Cl I, II, III / Div 1/ GP ABCDEFG T6, T5, T4 NI / Cl I / DIV 2 / GP ABCD T6, T5, T4 NIFW / Cl I, II, III / DIV 2 / GP ABCDFG T6, T5, T4 DIP / Cl II, III / Div 2 / GP FG T6, T5, T4 Cl I / ZN 0 / Ex ia IIC T6, T5, T4 Cl I / ZN 2 / Ex nA nL IIC T6, T5, T4
Other certificates	GOST, NEPSI, PESO, IEC, EXPOLABS

Factory setting:

- Pt100 (IEC 751) with 3-wire circuit
- Measuring range: 0 ... 100 °C (32 ... 212 °F)
- Fault current: 22.8 mA
- Sensor offset: 0 °C (0 °F)
- Damping 0.0 s

Digital measuring errors

Resistance thermometer

Input	Measuring range	Min. measured span		Digital accuracy	
	°C/(°F)	°C	(°F)	°C	(°F)
to IEC 60751					
Pt25	-200 ... +850 (-328 ... +1562)	10	(18)	0,3	(0.54)
Pt50	-200 ... +850 (-328 ... +1562)	10	(18)	0,15	(0.27)
Pt100 ... Pt200	-200 ... +850 (-328 ... +1562)	10	(18)	0,1	(0.18)
Pt500	-200 ... +850 (-328 ... +1562)	10	(18)	0,15	(0.27)
Pt1000	-200 ... +350 (-328 ... +662)	10	(18)	0,15	(0.27)
to JIS C1604-81					
Pt25	-200 ... +649 (-328 ... +1200)	10	(18)	0,3	(0.54)
Pt50	-200 ... +649 (-328 ... +1200)	10	(18)	0,15	(0.27)
Pt100 ... Pt200	-200 ... +649 (-328 ... +1200)	10	(18)	0,1	(0.18)
Pt500	-200 ... +649 (-328 ... +1200)	10	(18)	0,15	(0.27)
Pt1000	-200 ... +350 (-328 ... +662)	10	(18)	0,15	(0.27)
Ni 25 to Ni1000	-60 ... +250 (-76 ... +482)	10	(18)	0,1	(0.18)

Resistance-based sensors

Input	Measuring range	Min. measured span	Digital accuracy
	Ω	Ω	Ω
Resistance	0 ... 390	5	0,05
Resistance	0 ... 2200	25	0,25

Thermocouples

Input	Measuring range	Min. measured span		Digital accuracy	
	°C/(°F)	°C	(°F)	°C	(°F)
Type B	0 ... 1820 (32 ... 3308)	100	(180)	2[1)]	(3.60)[1)]
Type C (W5)	0 ... 2300 (32 ... 4172)	100	(180)	2	(3.60)
Type D (W3)	0 ... 2300 (32 ... 4172)	100	(180)	1[2)]	(1.80)[2)]
Type E	-200 ... +1000 (-328 ... +1832)	50	(90)	1	(1.80)
Type J	-210 ... +1200 (-346 ... +2192)	50	(90)	1	(1.80)
Type K	-230 ... +1370 (-382 ... +2498)	50	(90)	1	(1.80)
Type L	-200 ... +900 (-328 ... +1652)	50	(90)	1	(1.80)
Type N	-200 ... +1300 (-328 ... +2372)	50	(90)	1	(1.80)
Type R	-50 ... +1760 (-58 ... +3200)	100	(180)	2	(3.60)
Type S	-50 ... +1760 (-58 ... +3200)	100	(180)	2	(3.60)
Type T	-200 ... +400 (-328 ... +752)	40	(72)	1	(1.80)
Type U	-200 ... +600 (-328 ... +1112)	50	(90)	2	(3.60)

[1)] The digital accuracy in the range 0 to 300 °C (32 to 572 °F) is 3 °C (5.4 °F).
[2)] The digital accuracy in the range 1750 to 2300 (3182 to 4172 °F) is 2 °C (3.6 °F).

mV sensor

Input	Measuring range	Min. measured span	Digital accuracy
	mV	mV	µV
mV sensor	-10 ... +70	2	40
mV sensor	-100 ... +1100	20	400

The digital accuracy is the accuracy after the analog/digital conversion including linearization and calculation of the measured value.

An additional error is generated in the output current 4 to 20 mA as a result of the digital/analog conversion of 0.025 % of the set span (digital-analog error).

The total error under reference conditions at the analog output is the sum from the digital error and the digital-analog error (poss. with the addition of cold junction errors in the case of thermocouple measurements).

Transmitters for mounting in sensor head

SITRANS TH300
two-wire system, universal, HART

Selection and Ordering data

	Article No.
Temperature transmitter SITRANS TH300	
for installation in connection head, type B (DIN 43729), two-wire system 4 ... 20 mA, communication capable to HART, with galvanic isolation	
• Without explosion protection ► ⬟	**7NG3212-0NN00**
• With explosion protection	
- to ATEX ► ⬟	**7NG3212-0AN00**
- to FM ($_{C}FM_{US}$) ► ⬟	**7NG3212-0BN00**
Further designs	Order code
Add "**-Z**" to Article No. and specify Order code(s)	
with test protocol (5 measuring points)	**C11**
Functional safety SIL2	**C20**
Functional safety SIL2/3	**C23**
Customer-specific programming	
Add "**-Z**" to Article No. and specify Order code(s)	
Measuring range to be set Enter in plain text (max. 5 digits): Y01: ... to ... °C, °F	**Y01**[1]
Measuring point no. (TAG), max. 8 characters	**Y17**
Measuring point descriptor, max. 16 characters	**Y23**
Measuring point message, max. 32 characters	**Y24**
Pt100 (IEC) 2-wire, R_L = 0 Ω	**U02**
Pt100 (IEC) 3-wire	**U03**
Pt100 (IEC) 4-wire	**U04**
Thermocouple type B	**U20**
Thermocouple type C (W5)	**U21**
Thermocouple type D (W3)	**U22**
Thermocouple type E	**U23**
Thermocouple type J	**U24**
Thermocouple type K	**U25**
Thermocouple type L	**U26**
Thermocouple type N	**U27**
Thermocouple type R	**U28**
Thermocouple type S	**U29**
Thermocouple type T	**U30**
Thermocouple type U	**U31**
With TC: CJC internal	**U40**
With TC: CJC external (Pt100, 3-wire)	**U41**
With TC: CJC external with fixed value, specify in plain text	**Y50**
Special differing customer-specific programming, specify in plain text	**Y09**[2]
Fail-safe value 3.6 mA (instead of 22,8 mA)	**U36**
Cable extension Transmitter with installed cable extension 150 mm (5.91 inch), for Pt100 in four-wire system	**W01**

Accessories	Article No.
CD for measuring instruments for temperature ►	**A5E00364512**
With documentation in German, English, French, Spanish, Italian, Portuguese and SIPROM T parameterization software	
HART modem	
• With RS 232 connection ►	**7MF4997-1DA**
• With USB connection ►	**7MF4997-1DB**
SIMATIC PDM operating software	**See Section 9**
DIN rail adapters for head transmitters	**7NG3092-8KA**
Connecting cable	**7NG3092-8KC**
4-wire, 150 mm, for sensor connections when using head transmitters in the high hinged cover (set with 5 units)	

► Available ex stock.

⬟ We can offer shorter delivery times for configurations designated with the Quick Ship Symbol ⬟. For details see page 9/5 in the appendix.

[1] Here, you enter the initial and final value of the desired measurement range for customer-specific programming for mV, Ω.

[2] If needed, here you can mention settings, which cannot be specified with existing order codes (e.g.: programming for mV, Ω).

Supply units see Chapter 7 "Supplementary Components".

Ordering example 1:

7NG3212-0NN00-Z Y01+Y17+U03
Y01: -10 ... +100 °C
Y17: TICA123

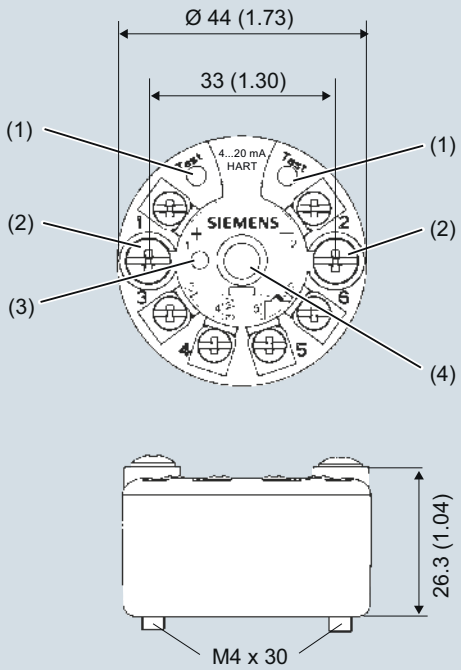
Ordering example 2:

7NG3212-0NN00-Z Y01+Y23+ U25+U40
Y01: -10 ... +100 °C
Y23: TICA1234HEAT

Factory setting:

- Pt100 (IEC 751) with 3-wire circuit
- Measuring range: 0 ... 100 °C (32 ... 212 °F)
- Fault current: 22.8 mA
- Sensor offset: 0 °C (0 °F)
- Damping 0.0 s

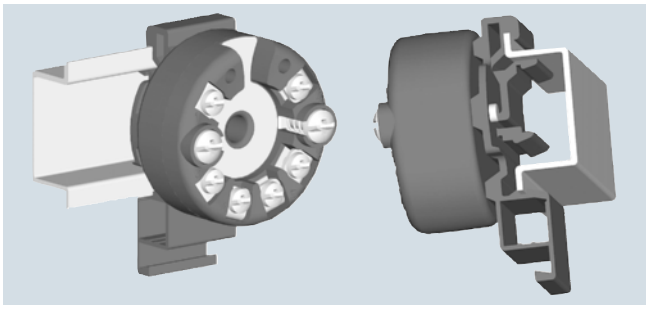
Dimensional drawings



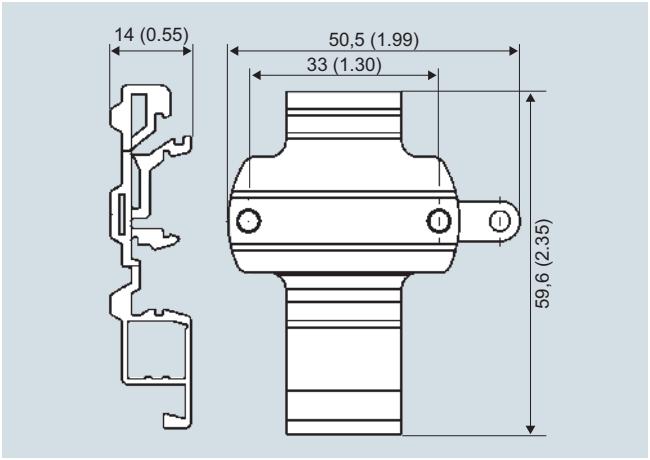
1(+) and 2(-)	Auxiliary power supply U_{aux}, output current I_{Out}
3, 4, 5 and 6	Pt100 sensor (for connections, see Sensor connection assignment)
Test (+), Test (-)	Measurement of the output current with a multimeter
(1)	Test terminal
(2)	Mounting screw M4x30
(3)	LED for operation indication
(4)	Internal diameter of center hole 6.3 (0.25)

SITRANS TH300, dimensions and pin assignment, dimensions in mm (inch)

Mounting on DIN rail



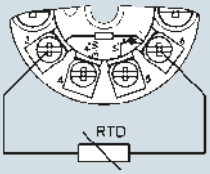
SITRANS TH300, mounting of transmitter on DIN rail



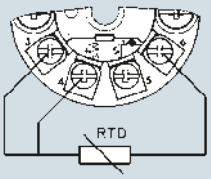
DIN rail adapter, dimensions in mm (inch)

Schematics

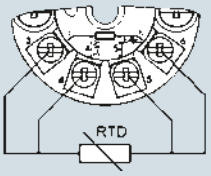
Resistance thermometer



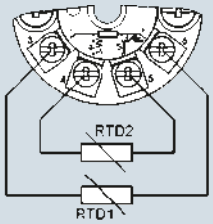
Two-wire system [1)]



Three-wire system

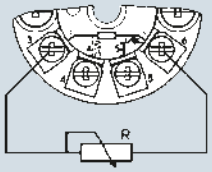


Four-wire system

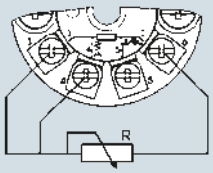


Generation of average value / difference [1)]

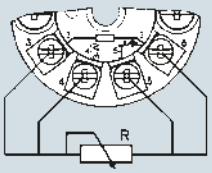
Resistance



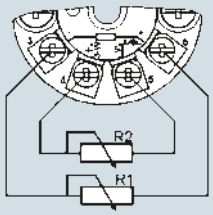
Two-wire system [1)]



Three-wire system

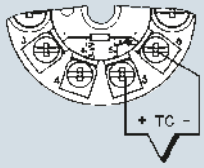


Four-wire system

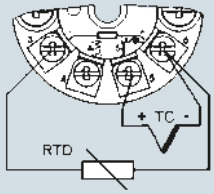


Generation of average value / difference [1)]

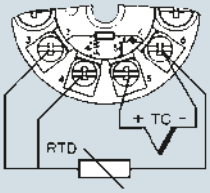
Thermocouple



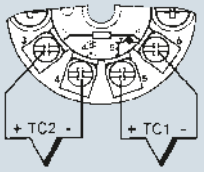
Cold junction compensation
Internal/fixed value



Cold junction compensation with external Pt100 in two-wire system [1)]



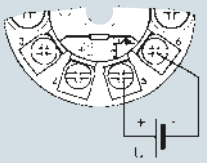
Cold junction compensation with external Pt100 in three-wire system



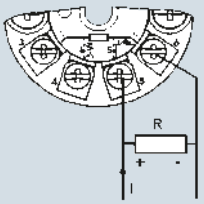
Generation of average value / difference with internal cold junction compensation

[1)] Programmable line resistance for the purpose of correction.

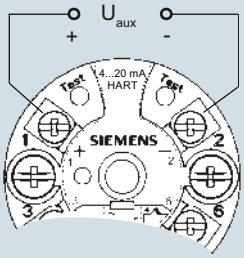
Voltage measurement



Current measurement



Connection of auxiliary power supply (U_{aux})



SITRANS TH300, sensor connection assignment

Overview

SITRANS TH400 fieldbus transmitters

Versions:

- For FOUNDATION fieldbus
- For PROFIBUS PA

The SITRANS TH400 temperature transmitter is a small field bus transmitter for mounting in the connection head of form B. Extensive functionality enables the temperature transmitter to be precisely adapted to the plant's requirements. Operation is very simple in spite of the numerous setting options. Thanks to its universal concept it can be used in all industries and is easy to integrate in the context of Totally Integrated Automation applications.

Transmitters of the "intrinsically safe" type of protection can be installed within potentially explosive atmospheres. The devices comply with the Directive 94/9/EC (ATEX), as well as FM and CSA regulations.

Installing SITRANS TH400 in temperature sensors turns them into complete, bus-capable measuring points; compact - and in a single device.

Application

- Linearized temperature measurement with resistance thermometers or thermal elements
- Differential, mean-value or redundant temperature measurement with resistance thermometers or thermal elements
- Linear resistance and bipolar millivolt measurements
- Differential, mean-value or redundant resistance and bipolar millivolt measurements

Function

Features

- Mounting in connection head, type B, to DIN 43729, or larger
- Polarity-neutral bus connection
- 24-bit analog-digital converter for high resolution
- Electrically isolated
- Intrinsically-safe version for use in potentially explosive areas
- Special characteristic
- Sensor redundance

With PROFIBUS PA communication

- Function blocks: 2 x analog

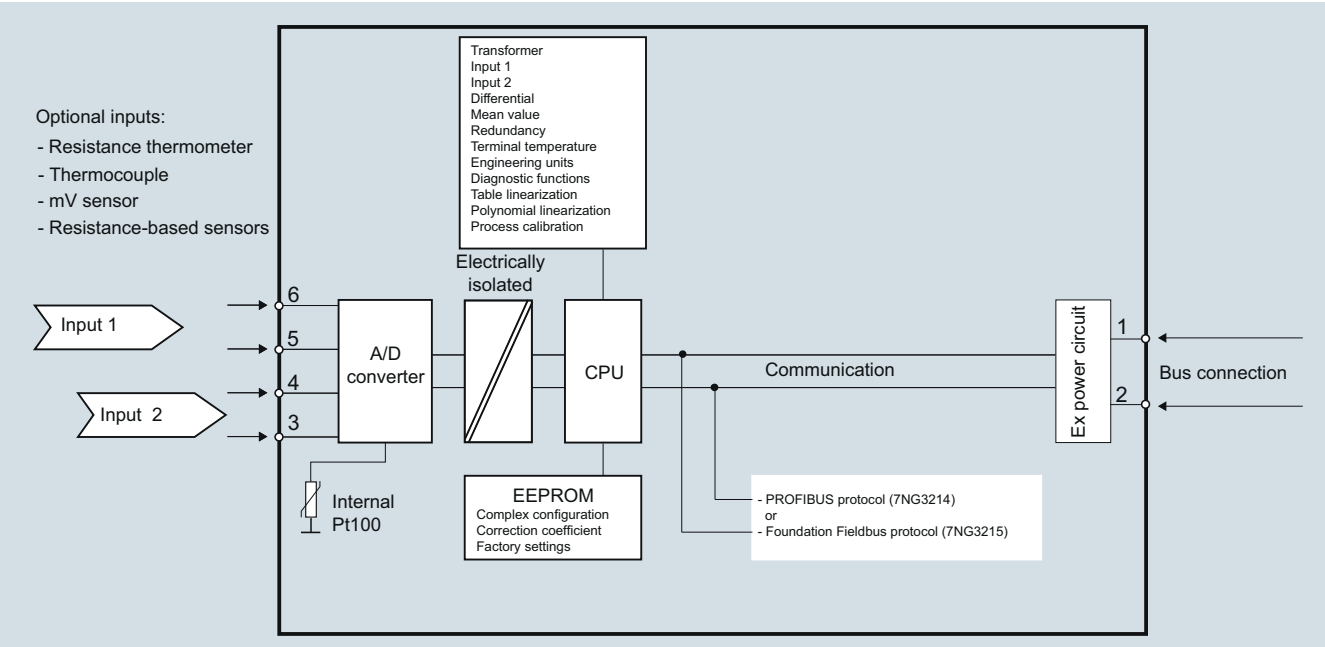
With FOUNDATION fieldbus communication

- Function blocks: 2 x analog and 1 x PID
- Functionality: Basic or LAS

Mode of operation

The following function diagram explains the mode of operation of the transmitter.

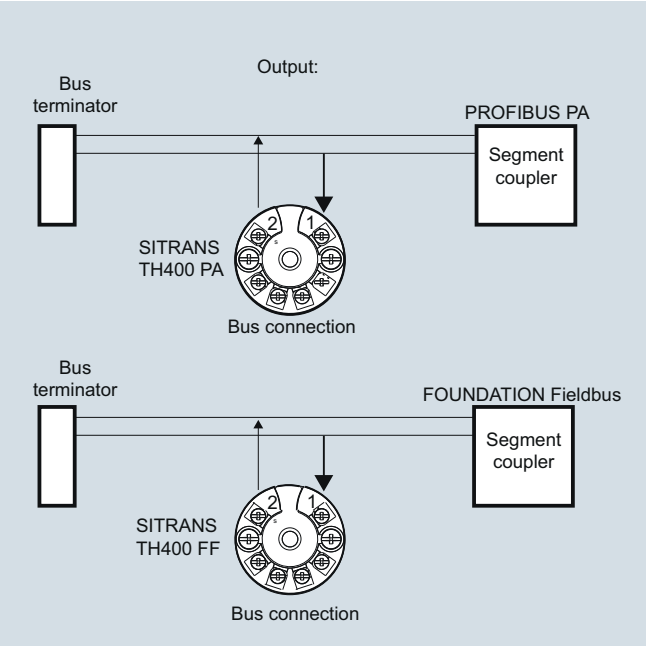
The only difference between the two versions of the SITRANS TH400 (7NG3214-... and 7NG3215-...) is the type of fieldbus protocol used (PROFIBUS PA or FOUNDATION fieldbus).



SITRANS TH400, function diagram

SITRANS TH400 fieldbus transmitter

System communication



SITRANS TH400, communication interface

Technical specifications

Input	
Analog-to-digital conversion	
• Measurement rate	< 50 ms
• Resolution	24-bit
Resistance thermometer	
Pt25 ... Pt1000 to IEC 60751/JIS C 1604	
• Measuring range	-200 ... +850 °C (-328 ... +1562 °F)
Ni25 ... Ni1000 to DIN 43760	
• Measuring range	-60 ... +250 °C (-76 ... +482 °F)
Cu10 ... Cu1000, α = 0.00427	
• Measuring range	-50 ... +200 °C (-58 ... +392 °F)
Line resistance per sensor cable	Max. 50 Ω
Sensor current	Nominal 0.2 mA
Sensor fault detection	
• Sensor break detection	Yes
• Sensor short-circuit detection	Yes, < 15 Ω
Resistance-based sensors	
Measuring range	0 Ω ... 10 kΩ
Line resistance per sensor cable	Max. 50 Ω
Sensor current	Nominal 0.2 mA
Sensor fault detection	
• Sensor break detection	Yes
• Sensor short-circuit detection	Yes, < 15 Ω

Thermocouple	
to IEC 584	Measuring range
• Type B	400 .. +1820 °C (752 ... 3308 °F)
• Type E	-100 ... +1000 °C (-148 ... +1832 °F)
• Type J	-100 ... +1000 °C (-148 ... +1832 °F)
• Type K	-100 ... +1200 °C (-148 ... +2192 °F)
• Type N	-180 ... +1300 °C (-292 ... +2372 °F)
• Type R	-50 ... +1760 °C (-58 ... +3200 °F)
• Type S	-50 ... +1760 °C (-58 ... +3200 °F)
• Type T	-200 ... +400 °C (-328 ... +752 °F)
to DIN 43710	
• Type L	-200 ... +900 °C (-328 ... +1652 °F)
• Type U	-200 ... +600 °C (-328 ... +1112 °F)
to ASTM E988-90	
• Type W3	0 ... 2300 °C (32 ... +4172 °F)
• Type W5	0 ... 2300 °C (32 ... +4172 °F)
External cold junction compensation	-40 ... +135 °C (-40 ... +275 °F)
Sensor fault detection	
• Sensor break detection	Yes
• Sensor short-circuit detection	Yes, < 3 mV
• Sensor current in the event of open-circuit monitoring	4 µA
mV sensor - voltage input	
Measuring range	-800 ... +800 mV
Input resistance	10 MΩ
Output	
Filter time (programmable)	0 ... 60 s
Update time	< 400 ms
Measuring accuracy	
Accuracy is defined as the higher value of general values and basic values.	

General values

Type of input	Absolute accuracy	Temperature coefficient
All	≤ ± 0.05 % of the measured value	≤ ± 0.002 % of the measured value/°C

Basic values

Type of input	Basic accuracy	Temperature coefficient
Pt100 and Pt1000	≤ ± 0.1 °C	≤ ± 0.002 °C/°C
Ni100	≤ ± 0.15 °C	≤ ± 0.002 °C/°C
Cu10	≤ ± 1.3 °C	≤ ± 0.02 °C/°C
Resistance-based sensors	≤ ± 0.05 Ω	≤ ± 0.002 Ω/°C
Voltage source	≤ ± 10 µV	≤ ± 0.2 % µV/°C
Thermocouple, type: E, J, K, L, N, T, U	≤ ± 0.5 °C	≤ ± 0.01 °C/°C
Thermocouple, type: B, R, S, W3, W5	≤ ± 1 °C	≤ ± 0.025 °C/°C
Cold junction compensation	≤ ± 0.5 °C	

Reference conditions	
Warming-up time	30 s
Signal-to-noise ratio	Min. 60 dB
Calibration condition	20 ... 28 °C (68 ... 82 °F)

Conditions of use	
Ambient conditions	
Permissible ambient temperature	-40 ... +85 °C (-40 ... +185 °F)
Permissible storage temperature	-40 ... +85 °C (-40 ... +185 °F)
Relative humidity	≤ 98 %, with condensation
Insulation resistance	
• Test voltage	500 V AC for 60 s
Mechanical testing	
• Vibrations (DIN class B) to	IEC 60068-2-6 and IEC 60068-2-64 4 g/2 ... 100 Hz
Electromagnetic compatibility	
EMC noise voltage influence	< ± 0.1 % of span
Extended EMC noise immunity: NAMUR NE 21, criterion A, Burst	< ± 1 % of span
EMC 2004/108/EC Emission and Noise Immunity to	EN 61326
Construction	
Material	Molded plastic
Weight	55 g (0.12 lb)
Dimensions	See Dimensional drawings
Cross-section of cables	Max. 2.5 mm^2 (AWG 13)
Degree of protection	
• Transmitter enclosure	IP40
• Terminal	IP00
Auxiliary power	
Power supply	
• Standard, Ex "nA", Ex "nL", NI	9.0 ... 32 V DC
• ATEX, FM, UL and CSA	9.0 ... 30 V DC
• In FISCO/FNICO installations	9.0 ... 17.5 V DC
Power consumption	< 11 mA
Max. increase in power consumption in the event of a fault	< 7 mA

Certificates and approvals	
Explosion protection ATEX	
EC type test certificate	KEMA 06 ATEX 0264
• "Intrinsic safety" type of protection	II 1 G Ex ia IIC T4...T6 II 2(1) G Ex ib[ia] IIC T4...T6 II 1 D Ex iaD
EC type test certificate	KEMA 06 ATEX 0263 X
• Type of protection for "equipment is non-arcing"	II 3 GD Ex nA[nL] IIC T4...T6 II 3 GD Ex nL IIC T4...T6 II 3 GD Ex nA[ic] IIC T4...T6 II 3 GD Ex ic IIC T4...T6
Explosion protection: FM for USA	
• FM approval	FM 3027985
• Degree of protection	• IS Class I, Div 1, Groups A, B, C, D T4/T5/T6, FISCO • IS Class I, Zone 0, AEx ia, IIC T4/T5/T6, FISCO • NI Class I, Div 2, Groups A, B, C, D T4/T5/T6, FNICO
Explosion protection CSA for Canada	
• CSA approval	CSA 1861385
• Degree of protection	• IS Class I, Div 1, Groups A, B, C, D T4/T5/T6 • Ex ia IIC T4/T5/T6 and Ex ib [ia] IIC T4/T5/T6 • NI Class I, Div 2, Groups A, B, C, D T4/T5/T6 • Ex nA II T4/T5/T6
Other certificates	GOST, PESO
Communication	
Parameterization interface	
• PROFIBUS PA connection	
- Protocol	Profile 3.0
- Address (for delivery)	126
• FOUNDATION fieldbus connection	
- Protocol	FF protocol
- Functionality	Basic or LAS
- Version	ITK 4.6
- Function blocks	2 x analog and 1 x PID
Factory setting	
only for SITRANS TH400 PA	
Sensor	Pt100 (IEC)
Type of connection	3-wire circuit
Unit	°C
Failure mode	Last valid value
Filter time	0 s
PA address	126
PROFIBUS Ident No.	Manufacturer-specific
only for SITRANS TH400 FF	
Sensor	Pt100 (IEC)
Type of connection	3-wire circuit
Unit	°C
Failure mode	Last valid value
Filter time	0 s
Node address	22

SITRANS TH400
fieldbus transmitter

Selection and Ordering data

	Article No.
Temperature transmitter SITRANS TH400	
for installation in connection head, with electrical isolation, order instruction manual separately.	
• Bus-compatible to PROFIBUS PA	
- No explosion protection or Zone 2/Div 2 to ATEX/FM/CSA ► ⬟	**7NG3214-0NN00**
- With explosion protection "Intrinsically safe to ATEX/FM/CSA" ► ⬟	**7NG3214-0AN00**
• Bus-compatible to FOUNDATION Fieldbus	
- No explosion protection or Zone 2/Div 2 to ATEX/FM/CSA ► ⬟	**7NG3215-0NN00**
- With explosion protection "Intrinsically safe to ATEX/FM/CSA" ► ⬟	**7NG3215-0AN00**
Further designs	Order code
Please add "**-Z**" to Article No. and specify Order code(s) and plain text.	
With test protocol (5 measuring points)	**C11**
Customer-specific programming	
Add "**-Z**" to Article No. and specify Order code(s)	
Measuring range to be set Enter in plain text	**Y01**[1]
Measuring point no. (TAG), max. 32 characters	**Y17**
Measuring point descriptor, max. 32 characters	**Y23**
Measuring point message, max. 32 characters	**Y24**
Bus address, specify in plain text	**Y25**
Pt100 (IEC) 2-wire, R_L = 0 Ω	**U02**
Pt100 (IEC) 3-wire	**U03**
Pt100 (IEC) 4-wire	**U04**
Thermocouple type B	**U20**
Thermocouple type C (W5)	**U21**
Thermocouple type D (W3)	**U22**
Thermocouple type E	**U23**
Thermocouple type J	**U24**
Thermocouple type K	**U25**
Thermocouple type L	**U26**
Thermocouple type N	**U27**
Thermocouple type R	**U28**
Thermocouple type S	**U29**
Thermocouple type T	**U30**
Thermocouple type U	**U31**
With TC: CJC internal	**U40**
With TC: CJC external (Pt100, 3-wire)	**U41**
With TC: CJC external with fixed value, specify in plain text	**Y50**
Special differing customer-specific programming, specify in plain text	**Y09**[2]

Accessories	Article No.
CD for measuring instruments for temperature ►	**A5E00364512**
With documentation in German, English, French, Spanish, Italian, Portuguese and SIPROM T parameterization software	
SIMATIC PDM operating software	**See Chapter 9**
DIN rail adapters for head transmitters	**7NG3092-8KA**
(Quantity delivered: 5 units)	
Connecting cable	**7NG3092-8KC**
4-wire, 150 mm, for sensor connections when using head transmitters in the high hinged cover (set with 5 units)	
for additional PA components,	**See Catalog IK PI**

► Available ex stock.

⬟ We can offer shorter delivery times for configurations designated with the Quick Ship Symbol ⬟. For details see page 9/5 in the appendix.

[1] Here, you enter the initial and final value of the desired measurement range for customer-specific programming for mV, Ω.

[2] If needed, here you can mention settings, which cannot be specified with existing order codes (e.g.: programming for mV, Ω).

Ordering example 1:

7NG3214-0NN00-Z Y01+Y17+U03
Y01: 0...100 C
Y17: TICA1234HEAT

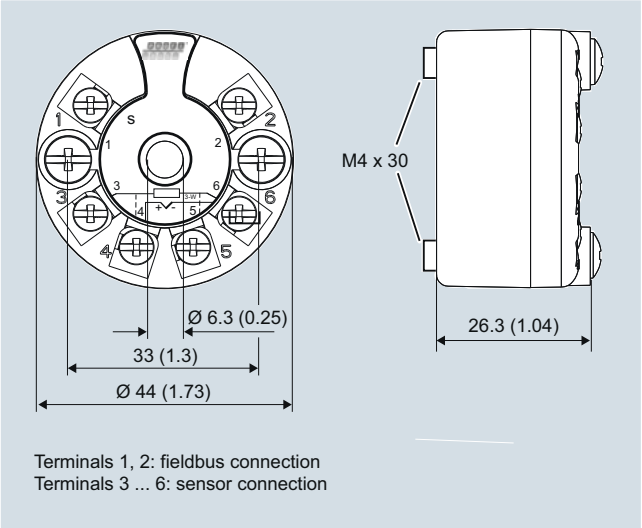
Ordering example 2:

7NG3214-0NN00-Z Y01+Y17+Y25+U25+U40
Y01: 0...500 C
Y17: TICA5678HEAT
Y25: 33

Factory setting:

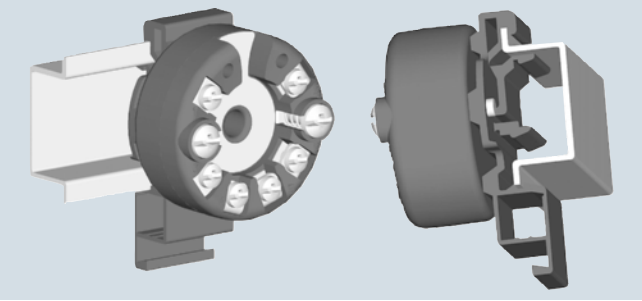
- For SITRANS TH400 PA:
  - Pt100 (IEC 751) with 3-wire circuit
  - Unit: °C
  - Failure mode: Last valid value
  - Filter time: 0 s
  - PA address: 126
  - PROFIBUS Ident No.: Manufacturer-specific
- For SITRANS TH400 FF:
  - Pt100 (IEC 751) with 3-wire circuit
  - Unit: °C
  - Failure mode: Last valid value
  - Filter time: 0 s

Dimensional drawings

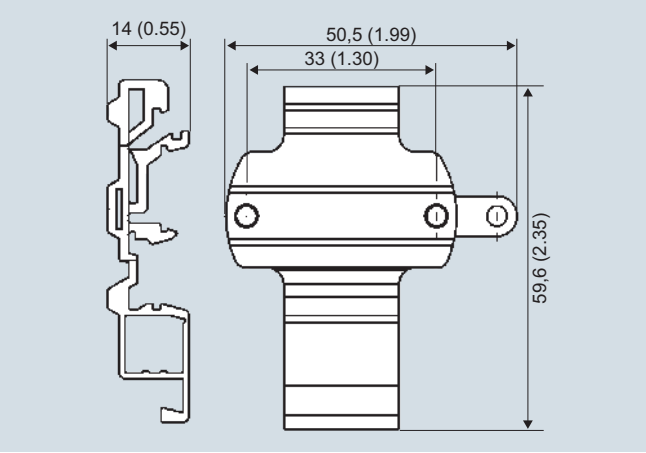


SITRANS TH400 dimensions in mm (inches) and connections

Mounting on DIN rail



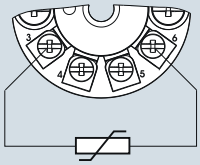
SITRANS TH400, mounting of transmitter on DIN rail



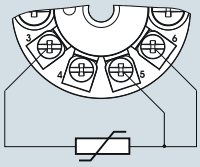
DIN rail adaptor, dimensions in mm (inch)

Schematics

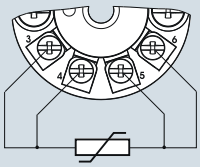
Resistance thermometer



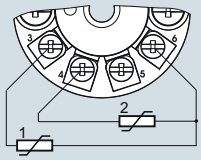
Two-wire system [1)]



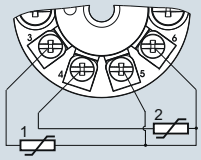
Three-wire system



Four-wire system

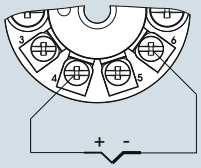


Mean-value/differential or redundancy generation
2 x two-wire system [1)]

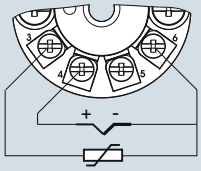


Mean-value/differential or redundancy generation
1 sensor in two-wire system [1)]
1 sensor in three-wire system

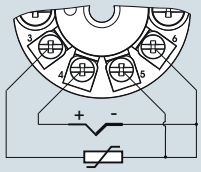
Thermocouple



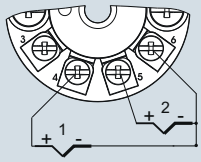
Internal
cold junction compensation



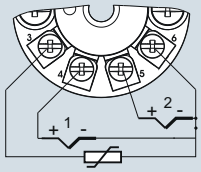
Cold junction compensation
with external Pt100 in two-wire system [1)]



Cold junction compensation
with external Pt100 in three-wire system

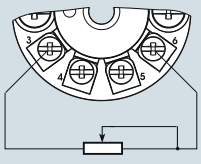


Mean value, differential or redundancy generation with internal cold junction compensation

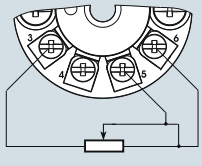


Mean value, differential or redundancy generation and cold junction compensation with internal Pt100 in two-wire system [1)]

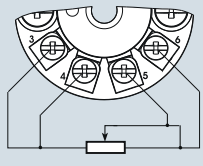
Resistance



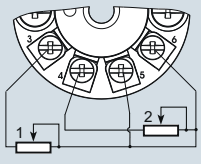
Two-wire system [1)]



Three-wire system

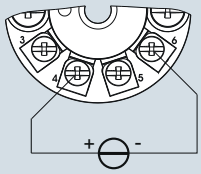


Four-wire system

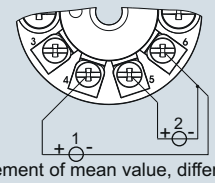


Mean value, differential or redundancy generation
1 resistor in two-wire system [1)]
1 resistor in three-wire system

Voltage measurement



One voltage source



Measurement of mean value, differential and redundancy with 2 voltage sources

[1)] Programmable line resistance for the purpose of correction.

SITRANS TH400, sensor connection assignment

Overview

Ultra flexible - with the universal SITRANS TR200 transmitter

- Two-wire devices for 4 to 20 mA
- Enclosure for rail mounting
- Universal input for virtually any type of temperature sensor
- Configurable over PC

Benefits

- Compact design
- Electrically isolated
- Test sockets for multimeters
- Diagnostics LED (green/red)
- Sensor monitoring
  open circuits and short-circuits
- Self-monitoring
- Configuration status stored in EEPROM
- Expanded diagnostic functions, such as slave pointer, operating hours counter, etc.
- Special characteristic
- Electromagnetic compatibility to EN 61326 and NE21
- SIL2 (with Order Code C20), SIL2/3 (with C23)

Application

SITRANS TR200 transmitters can be used in all industrial sectors. Their compact design enables simple mounting on standard DIN rails on-site in protective boxes or in control cabinets. The following sensors/signal sources can be connected over their universal input module:

- Resistance thermometers (2, 3 or 4-wire system)
- Thermocouples
- Resistance-based sensors and DC voltage sources

The output signal is a direct current from 4 to 20 mA in accordance with the sensor characteristic.

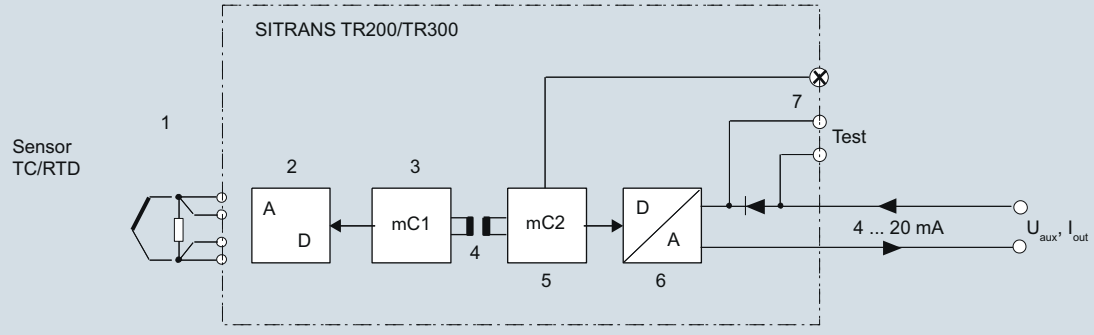
Transmitters of the "intrinsically safe" type of protection can be installed within potentially explosive atmospheres. The devices comply with the Directive 94/9/EC (ATEX).

Function

The SITRANS TR200 is configured over a PC. A USB or RS 232 modem is linked to the output terminals for this purpose. The configuration data can now be edited using the SIPROM T software tool. The configuration data are then permanently stored in the non-volatile memory (EEPROM).

Once the sensors and power supply have been correctly connected, the transmitter outputs a temperature-linear output signal and the diagnostics LED displays a green light. In the case of a sensor short-circuit, the LED flashes red, an internal device fault is indicated by a steady red light.

The test socket can be used to connect an ammeter at any time for monitoring purposes and plausibility checks. The output current can be read without any interruption, or even without opening the current loop.



1 Sensor such as resistance thermometer, thermocouple, resistance-based, sensor, mV sensor
2 Analog-digital converter
3 Microcontroller, secondary circuit
4 Electrical isolation
5 Microcontroller, primary circuit
6 Digital-analog converter
7 LED

U_{aux} Auxiliary power supply
I_{out} Output current
Test Test terminals for temporary connection of an amperemeter

SITRANS TR200 function diagram

SITRANS TR200
two-wire system, universal

Technical specifications

Input	
Resistance thermometer	
Measured variable	Temperature
Sensor type	
• to IEC 60751	Pt25 … 1000
• to JIS C 1604; a=0.00392 K^{-1}	Pt25 … 1000
• to IEC 60751	Ni25 … 1000
• Special type	over special characteristic (max. 30 points)
Sensor factor	0.25 ... 10 (adaptation of the basic type, e.g. Pt100 to version Pt25 ... 1000)
Units	°C or °F
Connection	
• Standard connection	1 resistance thermometer (RTD) in 2-wire, 3-wire or 4-wire system
• Generation of average value	2 resistance thermometers in 2-wire system for generation of average temperature
• Generation of difference	2 resistance thermometers (RTD) in 2-wire system (RTD 1 – RTD 2 or RTD 2 – RTD 1)
Interface	
• Two-wire system	Parameterizable line resistance ≤ 100 Ω (loop resistance)
• Three-wire system	No balancing required
• Four-wire system	No balancing required
Sensor current	≤ 0.45 mA
Response time T_{63}	≤ 250 ms for 1 sensor with open-circuit monitoring
Open-circuit monitoring	Always active (cannot be disabled)
Short-circuit monitoring	can be switched on/off (default value: ON)
Measuring range	parameterizable (see table "Digital measuring errors")
Min. measured span	10 °C (18 °F)
Characteristic curve	Temperature-linear or special characteristic
Resistance-based sensors	
Measured variable	Actual resistance
Sensor type	Resistance-based, potentiometers
Units	Ω
Connection	
• Normal connection	1 resistance-based sensor (R) in 2-wire, 3-wire or 4-wire system
• Generation of average value	2 resistance-based sensors in 2-wire system for generation of average value
• Generation of difference	2 resistance thermometers in 2-wire system (R1 – R2 or R2 – R1)
Interface	
• Two-wire system	Parameterizable line resistance ≤ 100 Ω (loop resistance)
• Three-wire system	No balancing required
• Four-wire system	No balancing required
Sensor current	≤ 0.45 mA
Response time T_{63}	≤ 250 ms for 1 sensor with open-circuit monitoring
Open-circuit monitoring	Always active (cannot be disabled)
Short-circuit monitoring	can be switched on/off (default value: OFF)
Measuring range	parameterizable max. 0 ... 2200 Ω (see table "Digital measuring errors")
Min. measured span	5 ... 25 Ω (see table "Digital measuring errors")
Characteristic curve	Resistance-linear or special characteristic
Thermocouples	
Measured variable	Temperature
Sensor type (thermocouples)	
• Type B	Pt30Rh-Pt6Rh to DIN IEC 584
• Type C	W5 %-Re acc. to ASTM 988
• Type D	W3 %-Re acc. to ASTM 988
• Type E	NiCr-CuNi to DIN IEC 584
• Type J	Fe-CuNi to DIN IEC 584
• Type K	NiCr-Ni to DIN IEC 584
• Type L	Fe-CuNi to DIN 43710
• Type N	NiCrSi-NiSi to DIN IEC 584
• Type R	Pt13Rh-Pt to DIN IEC 584
• Type S	Pt10Rh-Pt to DIN IEC 584
• Type T	Cu-CuNi to DIN IEC 584
• Type U	Cu-CuNi to DIN 43710
Units	°C or °F
Connection	
• Standard connection	1 thermocouple (TC)
• Generation of average value	2 thermocouples (TC)
• Generation of difference	2 thermocouples (TC) (TC1 – TC2 or TC2 – TC1)
Response time T_{63}	≤ 250 ms for 1 sensor with open-circuit monitoring
Open-circuit monitoring	Can be switched off
Cold junction compensation	
• Internal	With integrated Pt100 resistance thermometer
• External	With external Pt100 IEC 60571 (2-wire or 3-wire connection)
• External fixed	Cold junction temperature can be set as fixed value
Measuring range	parameterizable (see table "Digital measuring errors")
Min. measured span	Min. 40 ... 100 °C (72 ... 180 °F) (see table "Digital measuring errors")
Characteristic curve	Temperature-linear or special characteristic
mV sensor	
Measured variable	DC voltage
Sensor type	DC voltage source (DC voltage source possible over an externally connected resistor)
Units	mV
Response time T_{63}	≤ 250 ms for 1 sensor with open-circuit monitoring
Open-circuit monitoring	Can be switched off
Measuring range	parameterizable max. -100 … 1100 mV
Min. measured span	2 mV or 20 mV
Overload capability of the input	-1.5 ... +3.5 V DC
Input resistance	≥ 1 MΩ
Characteristic curve	Voltage-linear or special characteristic

Output	
Output signal	4 ... 20 mA, 2-wire
Auxiliary power	11 ... 35 V DC (to 30 V for Ex i/ic; to 32 V for Ex nA)
Max. load	$(U_{aux} - 11\ V)/0.023\ A$
Overrange	3.6 ... 23 mA, infinitely adjustable (default range: 3.84 mA ... 20.5 mA)
Error signal (e.g. following sensor fault) (conforming to NE43)	3.6 ... 23 mA, infinitely adjustable (default value: 22.8 mA)
Sample cycle	0.25 s nominal
Damping	Software filter 1st order 0 ... 30 s (parameterizable)
Protection	Against reversed polarity
Electrically isolated	Input against output 2.12 kV DC (1.5 kV_{eff} AC)
Measuring accuracy	
Digital measuring errors	See Table "Digital measuring errors"
Reference conditions	
• Auxiliary power	24 V ± 1 %
• Load	500 Ω
• Ambient temperature	23 °C
• Warming-up time	> 5 min
Error in the analog output (digital/analog converter)	< 0.025 % of span
Error due to internal cold junction	< 0.5 °C (0.9 °F)
Influence of ambient temperature	
• Analog measuring error	0.02 % of span/10 °C (18 °F)
• Digital measuring errors	
- With resistance thermometer	0.06 °C (0.11 °F)/10 °C (18 °F)
- with thermocouples	0.6 °C (1.1 °F)/10 °C (18 °F)
Auxiliary power effect	< 0.001 % of span/V
Effect of load impedance	< 0.002 % of span/100 Ω
Long-term drift	
• In the first month	< 0.02 % of span in the first month
• After one year	< 0.2 % of span after one year
• After 5 years	< 0.3 % of span after 5 years
Conditions of use	
Ambient conditions	
Ambient temperature range	-40 ... +85 °C (-40 ... +185 °F)
Storage temperature range	-40 ... +85 °C (-40 ... +185 °F)
Relative humidity	< 98 %, with condensation
Electromagnetic compatibility	acc. to EN 61326 and NE21
Construction	
Material	Plastic, electronic module potted
Weight	122 g
Dimensions	See "Dimensional drawings"
Cross-section of cables	Max. 2.5 mm^2 (AWG 13)
Degree of protection to IEC 60529	
• Enclosure	IP20

Certificates and approvals	
Explosion protection ATEX	
EC type test certificate	PTB 07 ATEX 2032X
• "Intrinsic safety" type of protection	II 2(1) G Ex ia/ib IIC T6/T4 II 3(1) G Ex ia/ic IIC T6/T4 II 3 G Ex ic IIC T6/T4 II 2(1) D Ex iaD/ibD 20/21 T115 °C
• Type of protection, "equipment is non-arcing"	II 3 G Ex nA IIC T6/T4
Other certificates	NEPSI
Software requirements for SIPROM T	
PC operating system	Windows ME, 2000, XP and Win 7 (32 bit); can also be used in connection with RS 232 modem under Windows 95, 98 and 98SE

Factory setting:

- Pt100 (IEC 751) with 3-wire circuit
- Measuring range: 0 ... 100 °C (32 ... 212 °F)
- Error signal in the event of sensor breakage: 22.8 mA
- Sensor offset: 0 °C (0 °F)
- Damping 0.0 s

Digital measuring errors

Resistance thermometer

Input	Measuring range	Min. measured span		Digital accuracy	
	°C/(°F)	°C	(°F)	°C	(°F)
to IEC 60751					
Pt25	-200 ... +850 (-328 ... +1562)	10	(18)	0.3	(0.54)
Pt50	-200 ... +850 (-328 ... +1562)	10	(18)	0.15	(0.27)
Pt100 ... Pt200	-200 ... +850 (-328 ... +1562)	10	(18)	0.1	(0.18)
Pt500	-200 ... +850 (-328 ... +1562)	10	(18)	0.15	(0.27)
Pt1000	-200 ... +350 (-328 ... +662)	10	(18)	0.15	(0.27)
to JIS C1604-81					
Pt25	-200 ... +649 (-328 ... +1200)	10	(18)	0.3	(0.54)
Pt50	-200 ... +649 (-328 ... +1200)	10	(18)	0.15	(0.27)
Pt100 ... Pt200	-200 ... +649 (-328 ... +1200)	10	(18)	0.1	(0.18)
Pt500	-200 ... +649 (-328 ... +1200)	10	(18)	0.15	(0.27)
Pt1000	-200 ... +350 (-328 ... +662)	10	(18)	0.15	(0.27)
Ni 25 to Ni1000	-60 ... +250 (-76 ... +482)	10	(18)	0.1	(0.18)

SITRANS TR200
two-wire system, universal

Resistance-based sensors

Input	Measuring range	Min. measured span	Digital accuracy
	Ω	Ω	Ω
Resistance	0 ... 390	5	0.05
Resistance	0 ... 2200	25	0.25

Thermocouples

Input	Measuring range	Min. measured span		Digital accuracy	
	°C/(°F)	°C	(°F)	°C	(°F)
Type B	0 ... 1820 (32 ... 3308)	100	(180)	2[1]	(3.6)[1]
Type C (W5)	0 ... 2300 (32 ... 4172)	100	(180)	2	(3.6)
Type D (W3)	0 ... 2300 (32 ... 4172)	100	(180)	1[2]	(1.8)[2]
Type E	-200 ... +1000 (-328 ... +1832)	50	(90)	1	(1.8)
Type J	-210 ... +1200 (-346 ... +2192)	50	(90)	1	(1.8)
Type K	-230 ... +1370 (-382 ... +2498)	50	(90)	1	(1.8)
Type L	-200 ... +900 (-328 ... +1652)	50	(90)	1	(1.8)
Type N	-200 ... +1300 (-328 ... +2372)	50	(90)	1	(1.8)
Type R	-50 ... +1760 (-58 ... +3200)	100	(180)	2	(3.6)
Type S	-50 ... +1760 (-58 ... +3200)	100	(180)	2	(3.6)
Type T	-200 ... +400 (-328 ... +752)	40	(72)	1	(1.8)
Type U	-200 ... +600 (-328 ... +1112)	50	(90)	2	(3.6)

1) The digital accuracy in the range 0 to 300 °C (32 to 572 °F) is 3 °C (5.4 °F).
2) The digital accuracy in the range 1750 to 2300 °C (3182 to 4172 °F) is 2 °C (3.6 °F).

mV sensor

Input	Measuring range	Min. measured span	Digital accuracy
	mV	mV	µV
mV sensor	-10 ... +70	2	40
mV sensor	-100 ... +1100	20	400

The digital accuracy is the accuracy after the analog/digital conversion including linearization and calculation of the measured value.

An additional error is generated in the output current 4 to 20 mA as a result of the digital/analog conversion of 0.025 % of the set span (digital-analog error).

The total error under reference conditions at the analog output is the sum from the digital error and the digital-analog error (poss. with the addition of cold junction errors in the case of thermocouple measurements).

Selection and Ordering data		Article No.
Temperature transmitter SITRANS TR200		
For mounting on a standard DIN rail, two-wire system, 4 to 20 mA, programmable, with electrical isolation, with documentation on CD		
• Without explosion protection	▶ ⬟	**7NG3032-0JN00**
• With explosion protection to ATEX	▶ ⬟	**7NG3032-1JN00**
Further designs		Order code
Please add "**-Z**" to Article No. with and specify Order codes(s).		
With test protocol (5 measuring points)		**C11**
Functional safety SIL2		**C20**
Functional safety SIL2/3		**C23**
Customer-specific programming		
Add "**-Z**" to Article No. and specify Order code(s)		
Measuring range to be set Enter in plain text (max. 5 digits): Y01: ... to ... °C, °F		**Y01**[1]
Measuring point no. (TAG), max. 8 characters		**Y17**
Measuring point descriptor, max. 16 characters		**Y23**
Measuring point message, max. 32 characters		**Y24**
Text on front label, max. 16 characters		**Y29**[2]
Pt100 (IEC) 2-wire, R_L = 0 Ω		**U02**
Pt100 (IEC) 3-wire		**U03**
Pt100 (IEC) 4-wire		**U04**
Thermocouple type B		**U20**
Thermocouple type C (W5)		**U21**
Thermocouple type D (W3)		**U22**
Thermocouple type E		**U23**
Thermocouple type J		**U24**
Thermocouple type K		**U25**
Thermocouple type L		**U26**
Thermocouple type N		**U27**
Thermocouple type R		**U28**
Thermocouple type S		**U29**
Thermocouple type T		**U30**
Thermocouple type U		**U31**
With TC: CJC internal		**U40**
With TC: CJC external (Pt100, 3-wire)		**U41**
With TC: CJC external with fixed value, specify in plain text		**Y50**
Special differing customer-specific programming, specify in plain text		**Y09**
Fail-safe value 3.6 mA (instead of 22.8 mA)		**U36**

Accessories		Article No.
Modem for SITRANS TH100, TH200 and TR200 incl. SIPROM T parameterization software With USB connection	▶	**7NG3092-8KU**
CD for measuring instruments for temperature With documentation in German, English, French, Spanish, Italian, Portuguese and SIPROM T parameterization software	▶	**A5E00364512**

▶ Available ex stock.

⬟ We can offer shorter delivery times for configurations designated with the Quick Ship Symbol ⬟. For details see page 9/5 in the appendix.

1) Here, you enter the initial and final value of the desired measurement range for customer-specific programming for RTD and TC.
2) Text on front label not stored inside transmitter.

Supply units see Chapter 7 "Supplementary Components".

Ordering example 1:

7NG3032-0JN00-Z Y01+Y17+Y29+U03
Y01: 0...100 C
Y17: TICA123
Y29: TICA123

Ordering example 2:

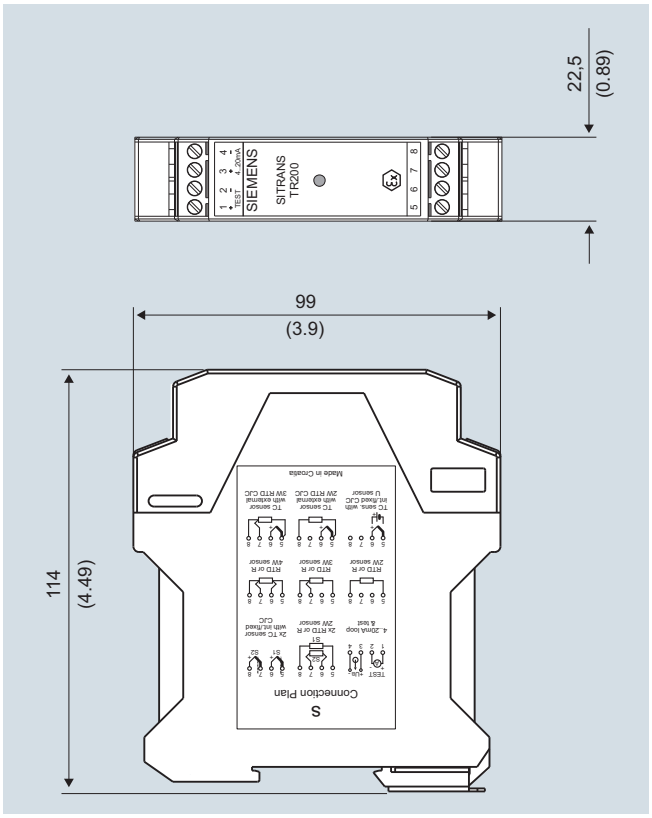
7NG3032-0JN00-Z Y01+Y17+Y23+Y29+U25+U40
Y01: 0...600 C
Y17: TICA123
Y23: TICA123HEAT
Y29: TICA123HEAT

Factory setting:

- Pt100 (IEC 751) with 3-wire circuit
- Measuring range: 0 … 100 °C (32 … 212 °F)
- Fault current: 22.8 mA
- Sensor offset: 0 °C (0 °F)
- Damping 0.0 s

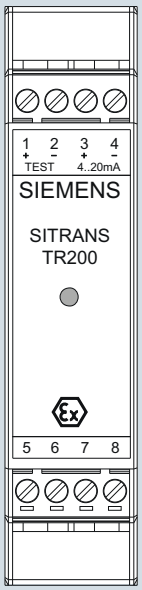
SITRANS TR200
two-wire system, universal

Dimensional drawings



SITRANS TR200, dimensions in mm (inch)

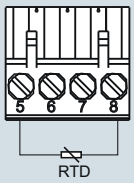
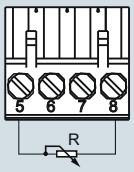
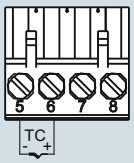
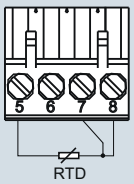
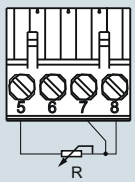
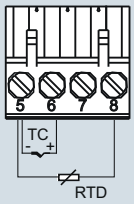
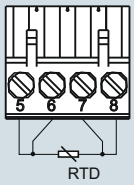
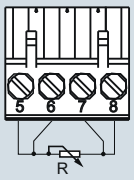
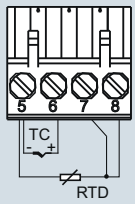
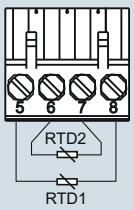
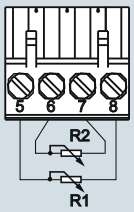
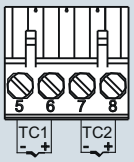
Schematics



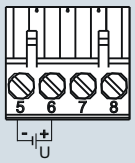
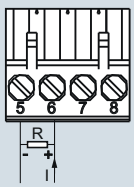
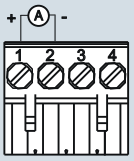
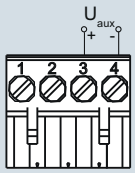
Asssignments

1 (+) and 2 (-)	Test terminals (test) for measurement of the output current with a multimeter
3 (+) and 4 (-)	Power supply U_{aux}, output current I_{out}
5, 6, 7 and 8	Sensor assignment, see schematics

SITRANS TR200, pin assignment

Resistance thermometer	Resistance	Thermocouple
 Two-wire system [1]	 Two-wire system [1]	 Cold junction compensation internal/fixed value
 Three-wire system	 Three-wire system	 Cold junction compensation with external Pt100 in two-wire system [1]
 Four-wire system	 Four-wire system	 Cold junction compensation with external Pt100 in three-wire system
 Generation of average value/difference [1]	 Generation of average value/difference [1]	 Generation of average value / difference with internal cold junction compensation

[1] Programmable line resistance for the purpose of correction.

Voltage measurement	Current measurement	Test terminals	Power supply/ 4 ... 20 mA (U_{aux})
			

SITRANS TR200, sensor connection assignment

SITRANS TR300
two-wire system, universal, HART

Overview

"HART" to beat - the universal SITRANS TR300 transmitter

- Two-wire devices for 4 to 20 mA, HART
- Device for rail mounting
- Universal input for virtually any type of temperature sensor
- Configurable over HART

Benefits

- Compact design
- Electrically isolated
- Test sockets for multimeters
- Diagnostics LED (green/red)
- Sensor monitoring
  open circuits and short-circuits
- Self-monitoring
- Configuration status stored in EEPROM
- Expanded diagnostic functions, such as slave pointer, operating hours counter, etc.
- Special characteristic
- Electromagnetic compatibility to EN 61326 and NE21
- SIL2 (with Order Code C20), SIL2/3 (with C23)

Application

SITRANS TR300 transmitters can be used in all industrial sectors. Their compact design enables simple mounting on standard DIN rails on-site in protective boxes or in control cabinets. The following sensors/signal sources can be connected over their universal input module:

- Resistance thermometers (2, 3 or 4-wire system)
- Thermocouples
- Resistance-based sensors and DC voltage sources

The output signal is a direct current from 4 to 20 mA in accordance with the sensor characteristic, superimposed by the digital HART signal.

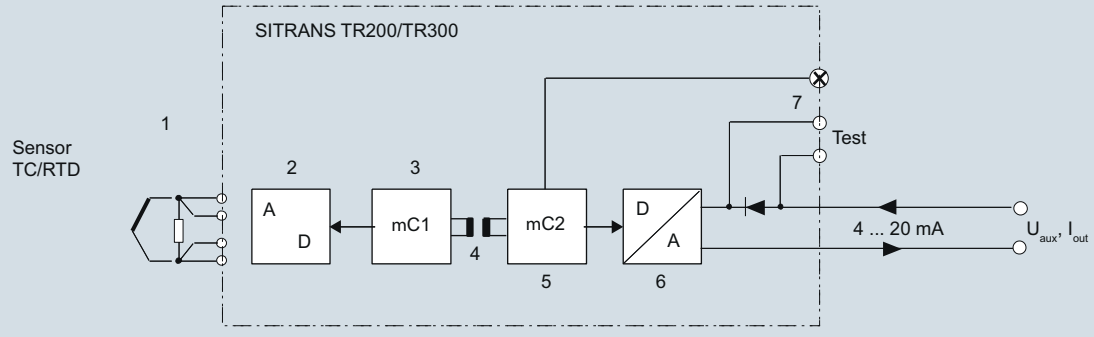
Transmitters of the "intrinsically safe" type of protection can be installed within potentially explosive atmospheres. The devices comply with the Directive 94/9/EC (ATEX).

Function

The SITRANS TR300 is configured over HART. This can be done using a handheld communicator or even more conveniently with a HART modem and the SIMATIC PDM parameterization software. The configuration data are then permanently stored in the non-volatile memory (EEPROM).

Once the sensors and power supply have been correctly connected, the transmitter outputs a temperature-linear output signal and the diagnostics LED displays a green light. In the case of a sensor short-circuit, the LED flashes red, an internal device fault is indicated by a steady red light.

The test socket can be used to connect an ammeter at any time for monitoring purposes and plausibility checks. The output current can be read without any interruption, or even without opening the current loop.



1 Sensor such as resistance thermometer, thermocouple, resistance-based, sensor, mV sensor
2 Analog-digital converter
3 Microcontroller, secondary circuit
4 Electrical isolation
5 Microcontroller, primary circuit
6 Digital-analog converter
7 LED

U_{aux} Auxiliary power supply
I_{out} Output current
Test Test terminals for temporary connection of an amperemeter

SITRANS TR300 function diagram

Technical specifications

Input	
Resistance thermometer	
Measured variable	Temperature
Sensor type	
• to IEC 60751	Pt25 … Pt1000
• to JIS C 1604; a=0.00392 K^{-1}	Pt25 … Pt1000
• to IEC 60751	Ni25 … Pt1000
• Special type	over special characteristic (max. 30 points)
Sensor factor	0.25 ... 10 (adaptation of the basic type, e.g. Pt100 to version Pt25 ... 1000)
Units	°C or °F
Connection	
• Standard connection	1 resistance thermometer (RTD) in 2-wire, 3-wire or 4-wire system
• Generation of average value	2 identical resistance thermometers in 2-wire system for generation of average temperature
• Generation of difference	2 identical resistance thermometers (RTD) in 2-wire system (RTD 1 – RTD 2 or RTD 2 – RTD 1)
Interface	
• Two-wire system	Parameterizable line resistance ≤ 100 Ω (loop resistance)
• Three-wire system	No balancing required
• Four-wire system	No balancing required
Sensor current	≤ 0.45 mA
Response time T_{63}	≤ 250 ms for 1 sensor with open-circuit monitoring
Open-circuit monitoring	Always active (cannot be isabled)
Short-circuit monitoring	can be switched on/off (default value: ON)
Measuring range	parameterizable (see table "Digital measuring errors")
Min. measured span	10 °C (18 °F)
Characteristic curve	Temperature-linear or special characteristic
Resistance-based sensors	
Measured variable	Actual resistance
Sensor type	Resistance-based, potentiometers
Units	Ω
Connection	
• Normal connection	1 resistance-based sensor (R) in 2-wire, 3-wire or 4-wire system
• Generation of average value	2 resistance-based sensors in 2-wire system for generation of average value
• Generation of difference	2 resistance thermometers in 2-wire system (R1 – R2 or R2 – R1)
Interface	
• Two-wire system	Parameterizable line resistance ≤ 100 Ω (loop resistance)
• Three-wire system	No balancing required
• Four-wire system	No balancing required
Sensor current	≤ 0.45 mA
Response time T_{63}	≤ 250 ms for 1 sensor with open-circuit monitoring
Open-circuit monitoring	Always active (cannot be disabled)
Short-circuit monitoring	can be switched on/off (default value: OFF)
Measuring range	parameterizable max. 0 ... 2200 Ω (see table "Digital measuring errors")
Min. measured span	5 ... 25 Ω (see table "Digital measuring errors")
Characteristic curve	Resistance-linear or special characteristic
Thermocouples	
Measured variable	Temperature
Sensor type (thermocouples)	
• Type B	Pt30Rh-Pt6Rh to DIN IEC 584
• Type C	W5 %-Re acc. to ASTM 988
• Type D	W3 %-Re acc. to ASTM 988
• Type E	NiCr-CuNi to DIN IEC 584
• Type J	Fe-CuNi to DIN IEC 584
• Type K	NiCr-Ni to DIN IEC 584
• Type L	Fe-CuNi to DIN 43710
• Type N	NiCrSi-NiSi to DIN IEC 584
• Type R	Pt13Rh-Pt to DIN IEC 584
• Type S	Pt10Rh-Pt to DIN IEC 584
• Type T	Cu-CuNi to DIN IEC 584
• Type U	Cu-CuNi to DIN 43710
Units	°C or °F
Connection	
• Standard connection	1 thermocouple (TC)
• Generation of average value	2 thermocouples (TC)
• Generation of difference	2 thermocouples (TC) (TC1 – TC2 or TC2 – TC1)
Response time T_{63}	≤ 250 ms for 1 sensor with open-circuit monitoring
Open-circuit monitoring	Can be switched off
Cold junction compensation	
• Internal	With integrated Pt100 resistance thermometer
• External	With external Pt100 IEC 60571 (2-wire or 3-wire connection)
• External fixed	Cold junction temperature can be set as fixed value
Measuring range	parameterizable (see table "Digital measuring errors")
Min. measured span	Min. 40 ... 100 °C (72 ... 180 °F) (see table "Digital measuring errors")
Characteristic curve	Temperature-linear or special characteristic
mV sensor	
Measured variable	DC voltage
Sensor type	DC voltage source (DC voltage source possible over an externally connected resistor)
Units	mV
Response time T_{63}	≤ 250 ms for 1 sensor with open-circuit monitoring
Open-circuit monitoring	Can be switched off

SITRANS TR300
two-wire system, universal, HART

Measuring range	parameterizable max. -100 … 1100 mV
Min. measured span	2 mV or 20 mV
Overload capability of the input	-1.5 ... +3.5 V DC
Input resistance	≥ 1 MΩ
Characteristic curve	Voltage-linear or special characteristic
Output	
Output signal	4 ... 20 mA, 2-wire with communication acc. to HART Rev. 5.9
Auxiliary power	11 ... 35 V DC (to 30 V for Ex i/ic; to 32 V for Ex nA)
Max. load	(U_{aux} –11 V)/0.023 A
Overrange	3.6 ... 23 mA, infinitely adjustable (default range: 3.84 ... 20.5 mA)
Error signal (e.g. following sensor fault) (conforming to NE43)	3.6 ... 23 mA, infinitely adjustable (default value: 22.8 mA)
Sample cycle	0.25 s nominal
Damping	Software filter 1st order 0 ... 30 s (parameterizable)
Protection	Against reversed polarity
Electrical isolation	Input against output (1 kV_{eff})
Measuring accuracy	
Digital measuring errors	see table "Digital measuring errors"
Reference conditions	
• Auxiliary power	24 V ± 1 %
• Load	500 Ω
• Ambient temperature	23 °C
• Warming-up time	> 5 min
Error in the analog output (digital/analog converter)	< 0.025 % of span
Error due to internal cold junction	< 0.5 °C (0.9 °F)
Ambient temperature effect	
• Analog measuring errors of span	< 0.2 % of max. span/10 °C (18 °F)
• Digital measuring errors - at resistance thermometers - at thermocouples	 0.06 °C (0.11 °F)/10 °C (18 °F) 0.6 °C (1.1 °F)/10 °C (18 °F)
Auxiliary power effect	< 0.001 % of span/V
Effect of load impedance	< 0.002 % of span/100 Ω
Long-term drift	
• In the first month	< 0.02 % of span in the first month
• After one year	< 0.2 % of span after one year
• After 5 years	< 0.3 % of span after 5 years
Conditions of use	
Ambient conditions	
Ambient temperature range	-40 ... +85 °C (-40 ... +185 °F)
Storage temperature range	-40 ... +85 °C (-40 ... +185 °F)
Relative humidity	< 98 %, with condensation
Electromagnetic compatibility	acc. to EN 61326 and NE21
Design	
Material	Plastic, electronic module potted
Weight	122 g
Dimensions	See "Dimensional drawings"
Cross-section of cables	Max. 2.5 mm^2 (AWG 13)
Degree of protection to IEC 60529	
• Enclosure	IP20

Certificates and approvals	
Explosion protection ATEX	
EC type test certificate	PTB 07 ATEX 2032X
• "Intrinsic safety" type of protection	II 2(1) G Ex ia/ib IIC T6/T4 II 3(1) G Ex ia/ic IIC T6/T4 II 3 G Ex ic IIC T6/T4 II 2(1) D Ex iaD/ibD 20/21 T115 °C
• Type of protection, "equipment is non-arcing"	II 3 G Ex nA IIC T6/T4
Other certificates	NEPSI

Factory setting:

- Pt100 (IEC 751) with 3-wire circuit
- Measuring range: 0 ... 100 °C (32 ... 212 °F)
- Error signal in the event of sensor breakage: 22.8 mA
- Sensor offset: 0 °C (0 °F)
- Damping 0.0 s

Digital measuring errors

Resistance thermometer

Input	Measuring range	Min. measured span		Digital accuracy	
	°C / (°F)	°C	(°F)	°C	(°F)
to IEC 60751					
Pt25	-200 ... +850 (-328 ... +1562)	10	(18)	0.3	(0.54)
Pt50	-200 ... +850 (-328 ... +1562)	10	(18)	0.15	(0.27)
Pt100 ... Pt200	-200 ... +850 (-328 ... +1562)	10	(18)	0.1	(0.18)
Pt500	-200 ... +850 (-328 ... +1562)	10	(18)	0.15	(0.27)
Pt1000	-200 ... +350 (-328 ... +662)	10	(18)	0.15	(0.27)
to JIS C1604-81					
Pt25	-200 ... +649 (-328 ... +1200)	10	(18)	0.3	(0.54)
Pt50	-200 ... +649 (-328 ... +1200)	10	(18)	0.15	(0.27)
Pt100 ... Pt200	-200 ... +649 (-328 ... +1200)	10	(18)	0.1	(0.18)
Pt500	-200 ... +649 (-328 ... +1200)	10	(18)	0.15	(0.27)
Pt1000	-200 ... +350 (-328 ... +662)	10	(18)	0.15	(0.27)
Ni 25 to Ni1000	-60 ... +250 (-76 ... +482)	10	(18)	0.1	(0.18)

Resistance-based sensors

Input	Measuring range	Min. measured span	Digital accuracy
	Ω	Ω	Ω
Resistance	0 ... 390	5	0.05
Resistance	0 ... 2200	25	0.25

Thermocouples

Input	Measuring range	Min. measured span		Digital accuracy	
	°C / (°F)	°C	(°F)	°C	(°F)
Type B	0 ... 1820 (32 ... 3308)	100	(180)	2[1]	(3.6)[1]
Type C (W5)	0 ... 2300 (32 ... 4172)	100	(180)	2	(3.6)
Type D (W3)	0 ... 2300 (32 ... 4172)	100	(180)	1[2]	(1.8)[2]
Type E	-200 ... +1000 (-328 ... +1832)	50	(90)	1	(1.8)
Type J	-210 ... +1200 (-346 ... +2192)	50	(90)	1	(1.8)
Type K	-230 ... +1370 (-382 ... +2498)	50	(90)	1	(1.8)
Type L	-200 ... +900 (-328 ... +1652)	50	(90)	1	(1.8)
Type N	-200 ... +1300 (-328 ... +2372)	50	(90)	1	(1.8)
Type R	-50 ... +1760 (-58 ... +3200)	100	(180)	2	(3.6)
Type S	-50 ... +1760 (-58 ... +3200)	100	(180)	2	(3.6)
Type T	-200 ... +400 (-328 ... +752)	40	(72)	1	(1.8)
Type U	-200 ... +600 (-328 ... +1112)	50	(90)	2	(3.6)

1) The digital accuracy in the range 0 to 300 °C (32 to 572 °F) is 3 °C (5.4 °F).
2) The digital accuracy in the range 1750 to 2300 °C (3182 to 4172 °F) is 2 °C (3.6 °F).

mV sensor

Input	Measuring range	Min. measured span	Digital accuracy
	mV	mV	µV
mV sensor	-10 ... +70	2	40
mV sensor	-100 ... +1100	20	400

The digital accuracy is the accuracy after the analog/digital conversion including linearization and calculation of the measured value.

An additional error is generated in the output current 4 to 20 mA as a result of the digital/analog conversion of 0,025 % of the set span (digital-analog error).

The total error under reference conditions at the analog output is the sum from the digital error and the digital-analog error (poss. with the addition of cold junction errors in the case of thermocouple measurements).

Transmitters for rail mounting

SITRANS TR300
two-wire system, universal, HART

Selection and Ordering data		Article No.
Temperature transmitter SITRANS TR300		
For mounting on a standard DIN rail, two-wire system, 4 … 20 mA, HART, with electrical isolation, with documentation on CD		
• Without explosion protection	► ⬟	**7NG3033-0JN00**
• With explosion protection to ATEX	► ⬟	**7NG3033-1JN00**
Further designs		Order code
Please add "**-Z**" to Article No. with and specify Order codes(s).		
With test protocol (5 measuring points)		**C11**
Functional safety SIL2		**C20**
Functional safety SIL2/3		**C23**
Customer-specific programming		
Add "**-Z**" to Article No. and specify Order code(s)		
Measuring range to be set Enter in plain text (max. 5 digits): Y01: ... to ... °C, °F		**Y01**[1]
Measuring point no. (TAG), max. 8 characters		**Y17**
Measuring point descriptor, max. 16 characters		**Y23**
Measuring point message, max. 32 characters		**Y24**
Text on front label, max. 16 characters		**Y29**[2]
Pt100 (IEC) 2-wire, R_L = 0 Ω		**U02**
Pt100 (IEC) 3-wire		**U03**
Pt100 (IEC) 4-wire		**U04**
Thermocouple type B		**U20**
Thermocouple type C (W5)		**U21**
Thermocouple type D (W3)		**U22**
Thermocouple type E		**U23**
Thermocouple type J		**U24**
Thermocouple type K		**U25**
Thermocouple type L		**U26**
Thermocouple type N		**U27**
Thermocouple type R		**U28**
Thermocouple type S		**U29**
Thermocouple type T		**U30**
Thermocouple type U		**U31**
With TC: CJC internal		**U40**
With TC: CJC external (Pt100, 3-wire)		**U41**
With TC: CJC external with fixed value, specify in plain text		**Y50**
Special differing customer-specific programming, specify in plain text		**Y09**[3]
Fail-safe value 3.6 mA (instead of 22.8 mA)		**U36**

Accessories		Article No.
CD for measuring instruments for temperature	►	**A5E00364512**
With documentation in German, English, French, Spanish, Italian, Portuguese and SIPROM T parameterization software		
HART modem		
• With RS 232 connection	►	**7MF4997-1DA**
• With USB connection	►	**7MF4997-1DB**
Simatic PDM operating software		**See Section 9**

► Available ex stock.

⬟ We can offer shorter delivery times for configurations designated with the Quick Ship Symbol ⬟. For details see page 9/5 in the appendix.

1) Here, you enter the initial and final value of the desired measurement range for customer-specific programming for RTD and TC.
2) Text on front label not stored inside transmitter.
3) Here, you enter the initial and final value of the desired measurement range for customer-specific programming for mV, Ω.

Supply units see Chapter 7 "Supplementary Components".

Ordering example 1:

7NG3033-0JN00-Z Y01+Y17+Y29+U03
Y01: 0...100 C
Y17: TICA123
Y29: TICA123

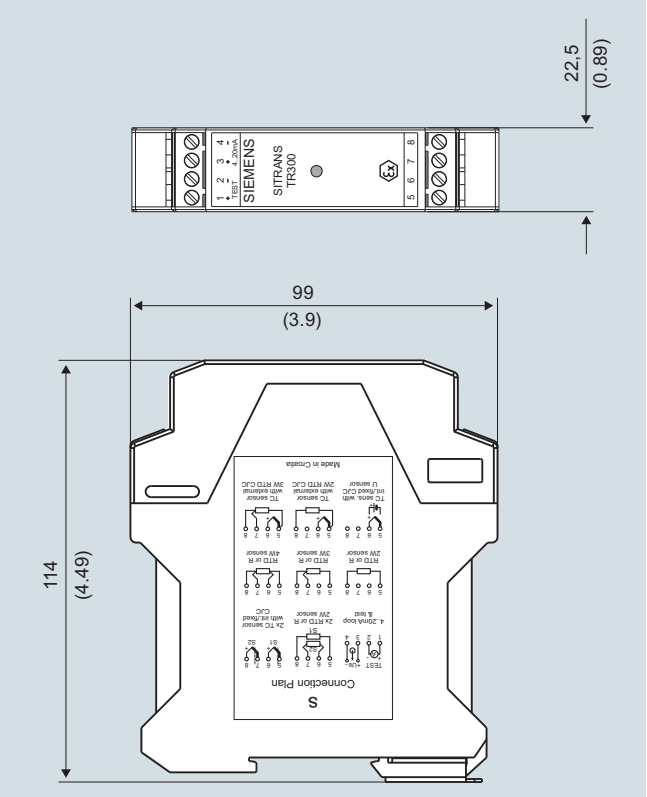
Ordering example 2:

7NG3033-0JN00-Z Y01+Y17+Y23+Y29+U25+U40
Y01: 0...600 C
Y17: TICA123
Y23: TICA123HEAT
Y29: TICA123HEAT

Factory setting:

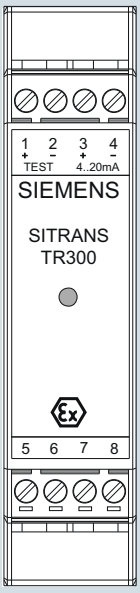
- Pt100 (IEC 751) with 3-wire circuit
- Measuring range: 0 ... 100 °C (32 ... 212 °F)
- Error signal in the event of sensor breakage: 22.8 mA
- Sensor offset: 0 °C (0 °F)
- Damping 0.0 s

Dimensional drawings



SITRANS TR300, dimensions in mm (inch)

Schematics

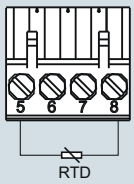
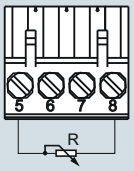
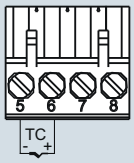
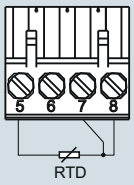
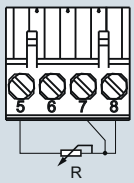
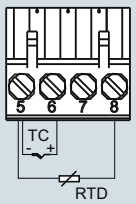
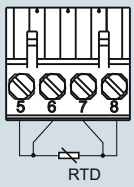
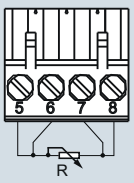
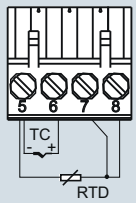
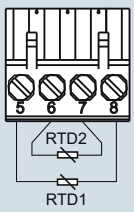
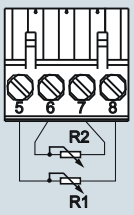
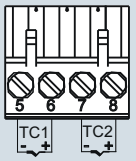


Assignments

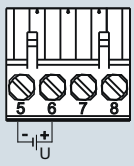
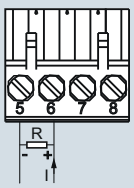
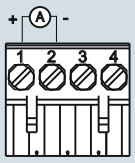
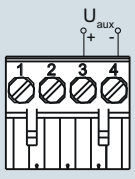
1 (+) and 2 (-)	Test terminals (Test) for measurement of the output current with a multimeter
3 (+) and 4 (-)	Power supply U_{aux}, Output current I_{out}
5, 6, 7 and 8	Sensor assignment, see schematics

SITRANS TR300, pin assignment

SITRANS TR300
two-wire system, universal, HART

Resistance thermometer	Resistance	Thermocouple
 Two-wire system [1]	 Two-wire system [1]	 Cold junction compensation internal/fixed value
 Three-wire system	 Three-wire system	 Cold junction compensation with external Pt100 in two-wire system [1]
 Four-wire system	 Four-wire system	 Cold junction compensation with external Pt100 in three-wire system
 Generation of average value/difference [1]	 Generation of average value/difference [1]	 Generation of average value / difference with internal cold junction compensation

[1] Programmable line resistance for the purpose of correction.

Voltage measurement	Current measurement	Test terminals	Power supply/ 4 ... 20 mA (U_{aux})
			

SITRANS TR300, sensor connection assignment

SITRANS TW
four-wire system, universal, HART

Overview

The user-friendly transmitters for the control room

The SITRANS TW universal transmitter is a further development of the service-proven SITRANS T for the 4-wire system in a mounting rail housing. With numerous new functions it sets new standards for temperature transmitters.

With its diagnostics and simulation functions the SITRANS TW provides the necessary insight during commissioning and operation. And using its HART interface the SITRANS TW can be conveniently adapted with SIMATIC PDM to every measurement task.

All SITRANS TW control room devices are available in a non-intrinsically safe version as well as in an intrinsically safe version for use with the most stringent requirements.

Application

The SITRANS TW transmitter is a four-wire rail-mounted device with a universal input circuit for connection to the following sensors and signal sources:

- Resistance thermometer
- Thermocouples
- Resistance-based sensors/potentiometers
- mV sensors
- As special version:
  - V sources
  - Current sources

The 4-wire rail-mounted SITRANS TW transmitter wire is designed for control room installation. It must not be mounted in potentially explosive atmospheres.

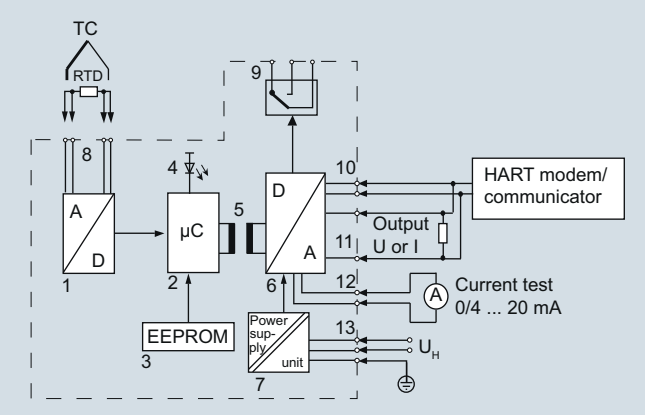
All SITRANS TW control room devices are available in a non-intrinsically safe version as well as in an intrinsically safe version for use with the most stringent requirements.

Function

Features

- Transmitter in four-wire system with HART interface
- Housing can be mounted on 35 mm rail or 32 mm G rail
- Screw plug connector
- All circuits electrically isolated
- Output signal: 0/4 to 20 mA or 0/2 to 10 V
- Power supplies: 115/230 V AC/DC or 24 V AC/DC
- Explosion protection [EEx ia] or [EEx ib] for measurements with sensors in the hazardous area
- Temperature-linear characteristic for all temperature sensors
- Temperature-linear characteristic can be selected for all temperature sensors
- Automatic correction of zero and span
- Monitoring of sensor and cable for open-circuit and short- circuit
- Sensor fault and/or limit can be output via an optional sensor fault/limit monitor
- Hardware write protection for HART communication
- Diagnostic functions
- Slave pointer functions
- SIL1

Mode of operation



The signal output by a resistance-based sensor (two-wire, three-wire, four-wire system), voltage source, current source or thermocouple is converted by the analog-to-digital converter (1, function diagram) into a digital signal. This is evaluated in the microcontroller (2), corrected according to the sensor characteristic, and converted by the digital-to-analog converter (6) into an output current (0/4 to 20 mA) or output voltage (0/2 to 10 V). The sensor characteristics as well as the electronics data and the data for the transmitter parameters are stored in the non-volatile memory (3).

AC or DC voltages can be used as the power supply (13). Any terminal connections are possible for the power supply as a result of the bridge rectifier in the power supply unit. The PE conductor is required for safety reasons.

A HART modem or a HART communicator permit parameterization of the transmitter using a protocol according to the HART specification. The transmitter can be directly parameterized at the point of measurement via the HART output terminals (10).

The operation indicator (4) identifies a fault-free or faulty operating state of the transmitter. The limit monitor (9) enables the signaling of sensor faults and/or limit violations. In the case of a current output, the current can be checked on a meter connected to test socket (12).

Diagnosis and simulation functions

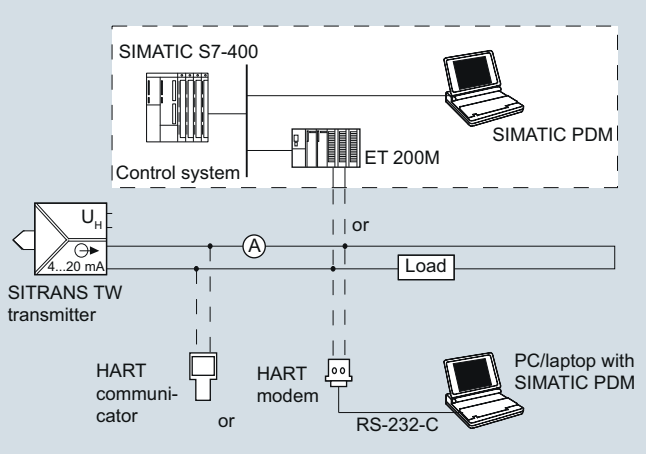
The SITRANS TW comes with extensive diagnosis and simulation functions.

Physical values can be defined with the simulation function. It is thus possible to check the complete signal path from the sensor input to inside the control system without additional equipment. The slave pointer functions are used to record the minimum and maximum of the plant's process variable.

SITRANS TW
four-wire system, universal, HART

Integration

System configuration



Possible system configurations

The SITRANS TW transmitter as a four-wire rail-mounted device can be used in a number of system configurations: as a stand-alone version or as part of a complex system environment, e.g. with SIMATIC S7. All device functions are available via HART communication.

Communication options through the HART interface:

- HART communicator
- HART modem connected to PC/laptop on which the appropriate software is available, e.g. SIMATIC PDM
- HART-compatible control system (e.g. SIMATIC S7-400 with ET 200M)

Technical specifications

Input	
Selectable filters to suppress the line frequency	50 Hz, 60 Hz, also 10 Hz for special applications (line frequency filter is similar with measuring frequency)
Resistance thermometer	
Measured variable	Temperature
Measuring range	Parameterizable
Measuring span	min. 25 °C (45 °F) x 1/scaling factor
Sensor type	
• Acc. to IEC 751	Pt100 (IEC 751)
• Acc. to JIS C 1604-81	Pt100 (JIS C1604-81)
• to DIN 43760	Ni100 (DIN 43760)
• Special type ($R_{RTD} \leq 500\ \Omega$)	Multiples or parts of the defined characteristic values can be parameterized (e.g. Pt500, Ni120)
Characteristic curve	Temperature-linear, resistance-linear or customer-specific
Type of connection	• Normal connection • Sum or parallel connection • Mean-value or differential connection
Interface	2, 3 or 4-wire circuit
Measuring range limits	Depending on type of connected thermometer (defined range of resistance thermometer)
Sensor breakage monitoring	Monitoring of all connections for open-circuit (function can be switched off)
Sensor short-circuit monitoring	Parameterizable response threshold (function can be switched off)
Resistance-based sensor, potentiometer	
Measured variable	Actual resistance
Measuring range	Parameterizable
Measuring span	min. 10 Ω
Characteristic curve	Resistance-linear or customer-specific
Type of connection	• Normal connection • Differential connection • Mean-value connection
Interface	2, 3 or 4-wire circuit
Input range	0 ... 6000 Ω; with mean-value and difference circuits: 0 ... 3000 Ω
Sensor breakage monitoring	Monitoring of all connections for open-circuit (function can be switched off)
Sensor short-circuit monitoring	Parameterizable response threshold (function can be switched off)

Thermocouples	
Measured variable	Temperature
Measuring range	Parameterizable
Measuring span	min. 50 °C (90 °F) x 1/scaling factor
Measuring range limits	Depend. on type of thermocouple element
Thermocouple element	Type B: Pt30 %Rh/Pt6 %Rh (DIN IEC 584)
	Type C: W5 %-Re (ASTM 988)
	Type D: W3 %-Re (ASTM 988)
	Type E: NiCr/CuNi (DIN IEC 584)
	Type J: Fe/CuNi (DIN IEC 584)
	Type K: NiCr/Ni (DIN IEC 584)
	Type L: Fe-CuNi (DIN 43710)
	Type N: NiCrSi-NiSi (DIN IEC 584)
	Type R: Pt13 %Rh/Pt (DIN IEC 584)
	Type S: Pt10 %Rh/Pt (DIN IEC 584)
	Type T: Cu/CuNi (DIN IEC 584)
	Type U: Cu/CuNi (DIN 43710)
	Special type (-10 mV ≤ UTC ≤ 100 mV)
Characteristic curve	Temperature-linear, voltage-linear or customer-specific
Type of connection	• Normal connection
	• Averaging connection
	• Mean-value connection
	• Differential connection
Cold junction compensation	None, internal measurement, external measurement or predefined fixed value
Sensor breakage monitoring	Function can be switched off
mV sensors	
Measured variable	DC voltage
Measuring range	Parameterizable
Measuring span	min. 4 mV
Input range	-120 ... +1000mV
Characteristic curve	Voltage-linear or customer-specific
Overload capacity of inputs	max. ± 3.5 V
Input resistance	≥ 1 MΩ
Sensor current	Approx. 180 µA
Sensor breakage monitoring	Function can be switched off
V sources	
Measured variable	DC voltage
Measuring range	Parameterizable
Characteristic curve	Voltage-linear or customer-specific
Input range/min. span	
• Devices with 7NG3242-xxxx**1** or 7NG3242-xxxx**0** with U/I plug	-1.2 ... + 10 V/0.04 V
• Devices with 7NG3242-xxxx**2**	-12 ... +100 V/0.4 V
• Devices with 7NG3242-xxxx**3**	-120 ... +140 V/4.0 V
Sensor breakage monitoring	Not possible

µA-, mA sources	
Measured variable	DC voltage
Measuring range	Parameterizable
Characteristic curve	Current-linear or customer- specific
Input range/min. span	
• Devices with 7NG3242-xxxx**4**	-12 ... +100 µA/0.4 µA
• Devices with 7NG3242-xxxx**5**	-120 ... +1000 µA/4 µA
• Devices with 7NG3242-xxxx**6**	-1.2 ... +10 mA/0.04 mA
• Devices with 7NG3242-xxxx**7** or 7NG3242-xxxx**0** with U/I plug	-12 ... +100 mA/0.4 mA
• Devices with 7NG3242-xxxx**8**	-120 ... +1000 mA/4 mA
Sensor breakage monitoring	Not possible
Output	
Output signal	Load-independent direct current 0/4 ... 20 mA, can be switched to load-independent DC voltage 0/2 ... 10 V using plug-in jumpers
Current 0/4 ... 20 mA	
• Overrange	-0.5 ... +23.0 mA, continuously adjustable
• Output range following sensor fault (conforming to NE43)	-0.5 ... +23.0 mA, continuously adjustable
• Load	≤ 650 Ω
• No-load voltage	≤ 30 V
Voltage 0/2 ... 10 V	
• Overrange	-0.25 ... +10.75 V, continuously adjustable
• Output range following sensor fault	-0.25 ... +10.75 V, continuously adjustable
• Load resistance	≥ 1 kΩ
• Load capacitance	≤ 10 nF
• Short-circuit current	≤ 100 mA (not permanently short-circuit-proof)
• Electrical damping	
- adjustable time constant T_{63}	0 ... 100 s, in steps of 0.1 s
• Current source/voltage source	Continuously adjustable within the total operating range
Sensor fault/limit signalling	By operation indicator, relay output or HART interface
Operation indicator	Flashing signal
• Limit violation	Flashing frequency 5 Hz
• Sensor fault monitoring	Flashing frequency 1 Hz
Relay outputs	Either as NO or NC contact with 1 changeover contact
• Switching capacity	≤ 150 W, ≤ 625 VA
• Switching voltage	≤ 125 V DC, ≤ 250 V AC
• Switching current	≤ 2.5 A DC
Sensor fault monitoring	Signalling of sensor or line breakage and sensor short-circuit
Limit monitoring	
• Operating delay	0 ... 10 s
• Monitoring functions of limit module	• Sensor fault (breakage and/or short-circuit) • Lower and upper limit • Window (combination of lower and upper limits) • Limit and sensor fault detection can be combined
• Hysteresis	Parameterizable between 0 and 100 % of measuring range

SITRANS TW
four-wire system, universal, HART

Auxiliary power	
Universal power supply unit	115/230 V AC/DC or 24 V AC/DC
Tolerance range for power supply	
• With 115/230 V AC/DC PSU	80 ... 300 V DC; 90 ... 250 V AC
• With 24 V AC/DC PSU	18 ... 80 V DC; 20.4 ... 55.2 V AC (in each case interruption-resistant up to 20 ms in the complete tolerance range)
Tolerance range for mains frequency	47 ... 63 Hz
Power consumption with	
• 230 V AC	≤ 5 VA
• 230 V DC	≤ 5 W
• 24 V AC	≤ 5 VA
• 24 V DC	≤ 5 W
Electrically isolated	
Electrically isolated circuits	Input, output, power supply and sensor fault/limit monitoring output are electrically isolated from one another. The HART interface is electrically connected to the output.
Working voltage between all electrically isolated circuits	The voltage U_{rms} between any two terminals must not exceed 300 V
Measuring accuracy	
Accuracy	
• Error in the internal cold junction	≤ 3 °C ± 0.1 °C / 10 °C (≤ 5.4 °F ± 0.18 °F / 18 °F)
• Error of external cold junction terminal 7NG3092-8AV	≤ 0.5 °C ± 0.1 °C / 10 °C (≤ 0.9 °F ± 0.18 °F / 18 °F)
• Digital output	See "Digital error"
• Analog output I_{AN} or U_{AN}	≤ 0.05 % of the span plus digital error
Influencing effects (referred to the digital output)	Compared to the max. span:
• Temperature drift	≤ 0.08 % / 10 °C (≤ 0.08 % /18 °F) ≤ 0.2 % in the range -10 ... +60 °C (14 ... 140 °F)
• Long-term drift	≤ 0.1 % / year
Influencing effects referred to the analog output I_{AN} or U_{AN}	Compared to the span:
• Temperature drift	≤ 0.08 % / 10°C (≤ 0.08 % / 18 °F) ≤ 0.2 % in the range -10 ... +60 °C (14 ... 140 °F)
• Power supply	≤ 0.05 % / 10 V
• Load with current output	≤ 0.05 % on change from 50 Ω to 650 Ω
• Load with voltage output	≤ 0.1 % on change in the load current from 0 mA to 10 mA
• Long-term drift (start-of-scale value, span)	≤ 0.03 % / month
Response time (T_{63} without electrical damping)	≤ 0.2 s
Electromagnetic compatibility	According to EN 61 326 and NAMUR NE21

Certificates and approvals	
ATEX	To DIN EN 50014: 1997, EN 50020: 1994
Intrinsic safety to EN 50 020	
• for 7NG3242-x**A**xxx	II (1) G D [EEx ia/ib] IIB
• for 7NG3242-x**B**xxx	II (1) G D [EEx ia/ib] IIC
EC type-examination certificate	TÜV (German Technical Inspectorate) 01 ATEX 1675
Other certificates	GOST, NEPSI
Conditions of use	
Installation conditions	
Location (for devices with explosion protection)	
• Transmitters	Outside the potentially explosive atmosphere
• Sensor	Within the potentially explosive atmosphere zone 1 (also in zone 0 in conjunction with the prescribed protection requirements for the sensor)
Ambient conditions	
Permissible ambient temperature	-25 ... +70 °C (-13 ... +158 °F)
Permissible storage temperature	-40 ... +85 °C (-40 ... +185 °F)
Climatic class	
• Relative humidity	5 ... 95 %, no condensation
Design	
Weight	Approx. 0.24 kg (0.53 lb)
Enclosure material	PBT, glass-fibre reinforced
Degree of protection to IEC 529	IP20
Degree of protection to VDE 0100	Protection class I
Type of installation	35-mm DIN rail (1.38 inch) (EN 50022) or 32-mm G-type rail (1.26 inch) (EN 50035)
Electrical connection / process connection	Screw plug connectors, max. 2.5 mm^2 (0.01 $inch^2$)
Parameterization interface	
Protocol	HART, version 5.9
Load with connection of	
• HART communicator	230 ... 650 Ω
• HART modem	230 ... 500 Ω
Software for PC/laptop	SIMATIC PDM version V5.1 and later

Digital error

Resistance thermometer

Input	Measuring range	Max. permissible line resistance	Digital error
	°C / (°F)	Ω	°C / (°F)
IEC 751			
• Pt10	-200 ... +850 (-328 ... +1562)	20	3.0 (5.4)
• Pt50	-200 ... +850 (-328 ... +1562)	50	0.6 (1.1)
• Pt100	-200 ... +850 (-328 ... +1562)	100	0.3 (0.5)
• Pt200	-200 ... +850 (-328 ... +1562)	100	0.6 (1.1)
• Pt500	-200 ... +850 (-328 ... +1562)	100	1.0 (1.8)
• Pt1000	-200 ... +850 (-328 ... +1562)	100	1.0 (1.8)
JIS C 1604-81			
• Pt10	-200 ... +649 (-328 ... +1200)	20	3.0 (5.4)
• Pt50	-200 ... +649 (-328 ... +1200)	50	0.6 (1.1)
• Pt100	-200 ... +649 (-328 ... +1200)	100	0.3 (0.5)
DIN 43760			
• Ni50	-60 ... +250 (-76 ... +482)	50	0.3 (0.5)
• Ni100	-60 ... +250 (-76 ... +482)	100	0.3 (0.5)
• Ni120	-60 ... +250 (-76 ... +482)	100	0.3 (0.5)
• Ni1000	-60 ... +250 (-76 ... +482)	100	0.3 (0.5)

Resistance-based sensors

Input	Measuring range	Max. permissible line resistance	Digital error
	Ω	Ω	Ω
Resistance (linear)	0 ... 24	5	0.08
	0 ... 47	15	0.06
	0 ... 94	30	0.06
	0 ... 188	50	0.08
	0 ... 375	100	0.1
	0 ... 750	100	0.2
	0 ... 1500	75	1.0
	0 ... 3000	100	1.0
	0 ... 6000	100	2.0

Thermocouples

Input	Measuring range	Digital error [1]
	°C / (°F)	°C (°F)
Type B	0 ... +1820 (+32 ... +3308)	3 (5.4)
Type C	0 ... +2300 (+32 ... +4172)	2 (3.6)
Type D	0 ... +2300 (+32 ... +4172)	1 (1.8)
Type E	-200 ... +1000 (-328 ... +1832)	1 (1.8)
Type J	-210 ... +1200 (-346 ... +2192)	1 (1.8)
Type K	-200 ... +1372 (-328 ... +2501)	1 (1.8)
Type L	-200 ... +900 (-328 ... +1652)	2 (3.6)
Type N	-200 ... +1300 (-328 ... +2372)	1 (1.8)
Type R	-50 ... +1760 (-58 ... +3200)	2 (3.6)
Type S	-50 ... +1760 (-58 ... +3200)	2 (3.6)
Type T	-200 ... +400 (-328 ... +752)	1 (1.8)
Type U	-200 ... +600 (-328 ... +1112)	2 (3.6)

[1] Accuracy data refer to the largest error in the complete measuring range

Voltage/current sources

Input	Measuring range	Digital error
mV sources (linear)	**mV**	**µV**
	-1 ... +16	35
	-3 ... +32	20
	-7 ... +65	20
	-15 ... +131	50
	-31 ... +262	100
	-63 ... +525	200
	-120 ... +1000	300
V sources (linear)	**V**	**mV**
	-1.2 ... +10	3
	-12 ... +100	30
	-120 ... +140	300
µA/mA sources (linear)	**µA/mA**	**µA**
	-12 ... +100 µA	0.05
	-120 ... +1000 µA	0.5
	-1.2 ... +10 mA	5
	-12 ... + 100 mA	50
	-120 ... +1000 mA	500

SITRANS TW
four-wire system, universal, HART

Ordering examples

Desired transmitter	Parameter: Standard	Parameter: Special	Ordering design
Example 1:			
SITRANS TW, transmitter in four-wire system			7NG3242-1AA00 (stock item)
• with explosion protection ATEX			
• 230 V AC/DC power supply			
• current output			
• without sensor fault/limit monitor			
- Sensor PT100, three-wire circuit	X		
- Measuring range 0 ... 150 °C	X		
- Temperature-linear characteristic	X		
- Filter time 1 s	X		
- Output 4 ... 20 mA, line filter 50 Hz	X		
- Output driven to full-scale in event of like breakage	X		
Example 2:			
SITRANS TW, transmitter in four-wire system			7NG3242-0BB10-Z Y01 + S76 + A05 + Y30 + H10 Y01: see Order code Y30: MA=0; ME= 950; D=C
• without explosion protection			
• 24 V AC/DC power supply			
• Voltage output			
• Sensor fault/limit monitor			
- Rating plate in English		S76	
- Sensor NiCr/Ni, type K		A05	
- Cold junction internal	X		
- Measuring range 0 ... 950 °C		Y30	
- Temperature-linear characteristic	X		
- Filter time 1 s	X		
- Output 0 ... 10 V, line filter 50 Hz		H10	
- Output driven to full-scale in event of like breakage	X		
- Limit monitoring switched off	X		
Example 3:			
SITRANS TW, transmitter in four-wire system			7NG3242-0BA01-Z Y01 + A40 + Y32 + G07 + H11 + J03 Y01: see Order code Y32: MA=0; ME= 5; D=V
• without explosion protection			
• 24 V AC/DC power supply			
• Current output			
• without sensor fault/limit monitor			
- Voltage input, measuring range -1.2 V ... +10 V		A40	
- Measuring range 0 ... 5 V		Y32	
- Source-proportional characteristic	X		
- Filter time 10 s		G07	
- Output 0 ... 20 mA, line filter 60 Hz		H11	
- No monitoring for sensor fault	(X)	J03	

Ordering information

The article number structure shown below is used to specify a fully functioning transmitter. The selection of the operating data (type of source, measuring range, characteristic etc.) is made according to the following rules:

- Operating data already set in factory to default values:
  The default settings can be obtained from the list of parameterizable operating data (see "Special operating data"). The presets can be modified by the customer to match the requirements precisely.
- Operating data set on delivery according to customer requirements:
  Supplement the Article No. by "**-Z**" and add the Order code "Y01". The operating data to be set can be obtained from the list of parameterize operating data. The Order codes A■■ to K■■ for operating data to be set need only be specified in the order if they deviate from the default setting.
  The default setting is used if no Order code is specified for operating data.

The selected parameters are printed on the transmitter's rating plate.

Selection and Ordering data		Article No.
SITRANS TW universal transmitter for rail mounting, in four-wire system (order instruction manual separately)		**7NG3242-** ■■■■
Explosion protection		
Without	▶⬟	**0**
For inputs [EEx ia] or [EEx ib]	▶⬟	**1**
Power supply		
115/230 V AC/DC	▶⬟	**A**
24 V AC/DC	▶⬟	**B**
Output signal		
0/4 ... 20 mA (can be switched to 0/2 ... 10 V)	▶⬟	**A**
0/2 ... 10 V (can be switched to 0/4 ... 20 mA)		**B**
Sensor fault/limit monitor		
Without (retrofitting not possible)	▶⬟	**0**
Relay with changeover contact		**1**
Input for		
Temperature sensor, resistance-based sensor and mV sensor with measuring range -120 ... +1000 mV DC and with U/I plug	▶⬟	**0**
Voltage input (V sources) [1] Measuring range:		
• -1.2 ... +10 V DC		**1**
• -12 ... +100 V DC (not Ex version)		**2**
• -120 ... +140 V DC (not Ex version)		**3**
Current input (µA, mA sources) [1] Measuring range:		
• -12 ... +100 µA DC		**4**
• -120 ... +1000 µA DC		**5**
• -1.2 ... +10 mA DC		**6**
• -12 ... +100 mA DC		**7**
• -120 ... +1000 mA DC		**8**
Further designs Please add "-**Z**" to Article No. and specify Order code(s) (see "List of parameterizable operating data").		Order code
Customer-specific setting of operating data (see "List of parameterizable operating data") **Note:** specify in plain text: „see Order code“		**Y01**
Meas. point description (max. 16 char.)		**Y23**
Text on front of device (max. 32 char.)		**Y24**
HART tag (max. 8 characters)		**Y25**
With test report		**P01**
With shorting plug to HART communication for 0 mA or 0 V		**S01**
With plug for external cold junction compensation		**S02**
With U/I plug (-1.2 ... +10 V DC or -12 ... +100 mA)		**S03**
Language of rating plate (together with Y01 Order Code only)		
Italian		**S72**
English		**S76**
French		**S77**
Spanish		**S78**

[1] Observe max. values with Ex version.

▶ Available ex stock.

⬟ We can offer shorter delivery times for configurations designated with the Quick Ship Symbol ⬟. For details see page 9/5 in the appendix.

Selection and Ordering data		Article No.
Accessories		
CD for measuring instruments for temperature With documentation in German, English, French, Spanish, Italian, Portuguese and SIPROM T parameterization software	▶	**A5E00364512**
Instruction Manual for SITRANS TW		
German/English	▶	**A5E00054075**
French/Italian/Spanish	▶	**A5E00064515**
Cold junction terminal	▶	**7NG3092-8AV**
U/I plug (-1.2 ... +10 V DC pr -12 ... +100 mA)	▶	**7NG3092-8AW**
SIMATIC PDM operating software		**see Chapter 8**
HART modem		
With RS232 interface	▶	**7MF4997-1DA**
With USB interface	▶	**7MF4997-1DB**

Transmitters for rail mounting

SITRANS TW
four-wire system, universal, HART

List of parameterizable operating data (Order codes A ■■ + B ■■ ... E ■■)

Operating data acc. to default setting Article No. with Order code: 7NG3242 - ■■■■■ -Z Y01

Order codes: A ■■ ... E ■■ | ■■■ | + | ■■■ | + | ■■■ | + | ■■■ | + | ■■■

Sensor

Thermocouples Type	Temperature range		**Connection**			**Cold junction compensation**			**Measuring ranges**	
B: Pt30 %Rh/Pt6 %Rh	0 ... 1820 °C	A00	Standard		B01	None	C00		-30 ... +60 °C	E00
C:W5 %Re	0 ... 2300 °C	A01	Sum n [1]	n = 2	B02	Internal	C10		-20 ... +20 °C	E01
D:W3 %Re	0 ... 2300 °C	A02		...	...	Fixed val. 0 °C	C20		0 ... 40 °C	E02
E:NiCr/CuNi	-200 ... +1000 °C	A03		n = 10	B10	20 °C	C22		0 ... 60 °C	E03
J:Fe/CuNi (IEC)	-210 ... +1200 °C	A04	Difference [2]	Diff1	B31	50 °C	C25		0 ... 80 °C	E04
K:NiCr/Ni	-200 ... +1372 °C	A05		Diff2	B32	60 °C	C26		0 ... 100 °C	E05
L: Fe/CuNi (DIN)	-200 ... +900 °C	A06	Mean-val. [2]	MW	B41	70 °C	C27		0 ... 120 °C	E06
N:NiCrSi/NiSi	-200 ... +1300 °C	A07				Special value [7]	Y10		0 ... 150 °C	E07
R:Pt13 %Rh/Pt	-50 ... +1760 °C	A08				External meas. (through Pt100 DIN IEC 751) [7]	Y11		0 ... 200 °C	E08
S:Pt10 %Rh/Pt	-50 ... +1760 °C	A09							0 ... 250 °C	E09
T:Cu/CuNi (IEC)	-200 ... +400 °C	A10							0 ... 300 °C	E10
U:Cu/CuNi (DIN)	-200 ... +600 °C	A11							0 ... 350 °C	E11
									0 ... 400 °C	E12
									0 ... 450 °C	E13
									0 ... 500 °C	E14
									0 ... 600 °C	E15
Resistance thermometer (or max. permissible line resistance see „Technical specifications“)			**Connection**			**Connection**		**Line resistance [3]**		
Pt100 (DIN IEC)	-200 ... +850 °C	A20	Standard		B01	2-wire-system	C32	0 Ω	D00	0 ... 700 °C E16
Pt100 (JIS)	-200 ... +649 °C	A21	Sum n [4]	n = 2	B02	3-wire-system	C33	10 Ω	D10	0 ... 800 °C E17
Ni100 (DIN)	-60 ... +250 °C	A22		...	...	4-wire-system	C34	20 Ω	D20	0 ... 900 °C E18
				n = 10	B10			50 Ω	D50	0 ... 1000 °C E19
			Parallel n [5]	n = 0.1	B21			Special val. [7]	Y20	0 ... 1200 °C E20
				n= 0.2	B22					0 ... 1400 °C E21
				n= 0.5	B25					0 ... 1600 °C E22
			Special value [6] [7]		Y00					0 ... 1800 °C E23
			Difference [2]	Diff1	B51					50 ... 100 °C E24
				Diff2	B52					50 ... 150 °C E25
			Mean-val. [2]	MW	B61					100 ... 200 °C E26
										100 ... 300 °C E27
										100 ... 400 °C E28
										200 ... 300 °C E29
										200 ... 400 °C E30
										200 ... 500 °C E31
										300 ... 600 °C E32
										500 ... 1000 °C E33
										600 ... 1200 °C E34
										800 ... 1600 °C E35
										Special range [7] Y30

Resistance-based sensors, potentiometers		**Connection**			**Connection**		**Line resistance [3]**		**Measuring ranges**	
(or max. permissible line resistance see „Technical specifications“)	A30	Standard		B01	2-wire-system	C32	0 Ω	D00	0 ... 100 Ω	E40
		Difference [2]	Diff1	B51	3-wire-system	C33	10 Ω	D10	0 ... 200 Ω	E41
			Diff2	B52	4-wire-system	C34	20 Ω	D20	0 ... 500 Ω	E42
		Mean val.[2]	MW	B61			50 Ω	D50	0 ... 1000 Ω	E43
							Special val. [7]	Y20	0 ... 2500 Ω	E44
									0 ... 5000 Ω [8]	E45
									0 ... 6000 Ω [8]	E46
									Special range [7]	Y31

mV, V and µA, mA sensors [9]	A40	**Meas. range with Article No. 7NG 3242 - ■■■■**	**-Z Y01**		E50
			0	-120 ... +1000 mV	
			1	-1,2 ... +10 V [10]	
			2	-12 ... +100 V [10]	
			3	-120 ... +140 V [10]	
			4	-12 ... +100 µA [10]	
			5	-120 ... +1000 µA [10]	
			6	-1,2 ... +10 mA [10]	
			7	-12 ... +100 mA [10]	
			8	-120 ... +1000 mA [10]	
				Special range [7]	Y32

1) n = number of thermocouple elements to be connected in series
2) See „Circuit diagrams“ for meaning of type circuit
3) Line resistance of channels 1 and 2, for max. permissible line resistance see „Technical specifications“ (only with C32, not with C33 and C34)
4) n = number of resistance thermometers to be connected in series
5) 1/n = number of resistance thermometers to be connected in parallel
6) Combination of series and parallel connection of resistance thermometers
7) Operating data: see „Special operating data“
8) This range does not apply to mean-value and difference circuits.
9) The max. permissible currents and voltages according to conformity certificate must be observed in devices with explosion protection.
10) Without detection of line breakage

List of parameterizable operating data (Order codes F ■■ ... K ■■)

Operating data according to default setting

Article No. with Order code: 7NG3242 - ■■■■■ -Z Y01

Order codes: F ■■ ... K ■■ ■■■ + ■■■ + ■■■ + ■■■ + ■■■ + ■■■

Sensor

Thermocouple elements

Type	Temperature range	
B: Pt30 %Rh/	0 ... 1820 °C	A00
C:W5 %Re	0 ... 2300 °C	A01
D:W3 %Re	0 ... 2300 °C	A02
E:NiCr/CuNi	-200 ... +1000 °C	A03
J:Fe/CuNi (IEC)	-210 ... +1200 °C	A04
K:NiCr/Ni	-200 ... +1372 °C	A05
L: Fe/CuNi (DIN)	-200 ... +900 °C	A06
N:NiCrSi/NiSi	-200 ... +1300 °C	A07
R:Pt13 %Rh/Pt	-50 ... +1760 °C	A08
S:Pt10 %Rh/Pt	-50 ... +1760 °C	A09
T:Cu/CuNi (IEC)	-200 ... +400 °C	A10
U:Cu/CuNi (DIN)	-200 ... +600 °C	A11

Resistance thermometer (max. permissible line resistances see „Technical specifications“)

Pt100 (DIN IEC)	-200 ... +850 °C	A20
Pt100 (JIS)	-200 ... +649 °C	A21
Ni100 (DIN)	-60 ... +250 °C	A22

Resistance-based sensors, potentiometers

(max. permissible line resistances see „Technical specifications“) A30

mV, V and µA, mA sources A40

Voltage measurement

Temperature-linear	F00
Voltage-linear	F10
Resistance-linear	F20
Source proportional	F30

Filter time [1]

0 s	G00
0.1 s	G01
0.2 s	G02
0.5 s	G03
1 s	G04
2 s	G05
5 s	G06
10 s	G07
20 s	G08
50 s	G09
100 s	G10
Special time [5]	Y50

Output signal and line filter [2]

4 ... 20 mA/ 2 ... 10 V with line filter:	
50 Hz	H00
60 Hz	H01
10 Hz [4]	H02
0 ... 20 mA/ 0 ... 10 V with line filter:	
50 Hz	H10
60 Hz	H11
10 Hz	H12

Failure signal

with line breakage/fault:	
to full scale	J00
to start of scale	J01
hold last value	J02
no monitoring	J03
Safety value [5]	Y60
with line breakage or short-circuit/fault:	
to full scale	J10
to start of scale	J11
hold last value	J12
no monitoring	J13
Safety value [5]	Y61

Limit monitor [3]

Limit monitoring ineffective (but sensor fault signalling with closed-circuit operation)	K00
Effective [5]	Y70

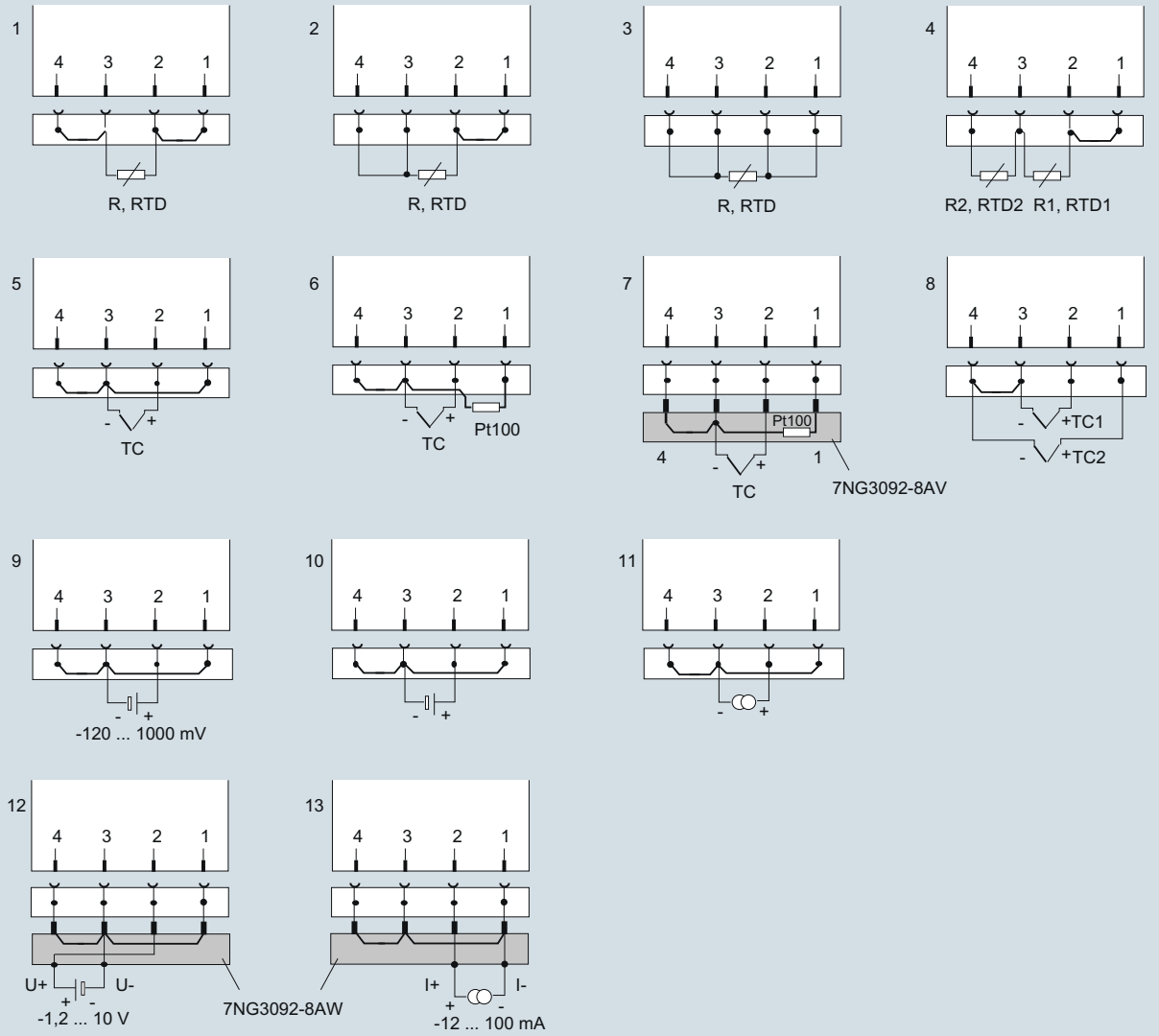
[1] Software filter to smooth the result
[2] Filter to suppress line disturbances on the measured signal.
[3] If signalling relay present
[4] for special appliciations
[5] Operating data: see „Special operating data“

Special operating data

Order code	Plain text required	Options
Y00	N=□□.□□	Factor N for multiplication with the characteristic values of resistance thermometers
		Range of values: 0.10 to 10.00
		1. Example: 3 x Pt500 parallel: N = 5/3 = 1.667; 2. Example: Ni120: N = 1.2
Y10	TV=□□□□.□□	Temperature TV of the fixed cold junction
	D=□	Dimension; range of values: C, K, F, R
Y11	RL=□□□.□□	Line resistance RL in Ω for compensation of cold junction line of external Pt100 DIN IEC 751
		Range of values: 0.00 to 100.00
Y20	RL1=□□□.□□ RL2=□□□.□□	Line resistances RL of channel 1 (RL1) and channel 2 (RL2) in Ω if the resistance thermometer or the resistance-based sensor is connected in a two-wire system
		Range of values depending on type of sensor: 0.00 to 100.00
Y30	MA=□□□□.□□ ME=□□□□.□□	Start-of-scale value MA and full-scale value ME for thermocouples and resistance thermometers
		(Range of values depending on type of sensor)
	D=□	Dimension, range of values: C, K, F, R)
Y31	MA=□□□□.□□ ME=□□□□.□□	Start-of-scale value MA and full-scale value ME for resistance-based sensors or potentiometers in Ω
		Range of values: 0.00 to 6,000.00
Y32	MA=□□□□.□□ ME=□□□□.□□	Start-of-scale value MA and full-scale value ME for mV, V, µA and mA sources
		Range of values depending on type of sensor: -120.00 to 1,000.00
	D=□□	Dimension (mV entered as MV, V as V, µA as UA, mA as MA)
Y50	T63=□□□.□	Response time T63 of software filter in s
		Range of values: 0.0 to 100.0
		Safety value S of signal output in mA or in V corresponding to the set type of output. Range of values - with current output: -0.50 to 23.00 - with voltage output: -0.25 to 10.75
Y60	S=□□.□□	Safety value S with line breakage of sensor
Y61	S=□□.□□	Safety value S with line breakage or short-circuit of sensor
Y70	UG=□□□□.□□	Lower limit value (dimension as defined by measuring range)
	OG=□□□□.□□	Upper limit value (dimension as defined by measuring range)
	H=□□□□.□□	Hysteresis (dimension as defined by measuring range)
	K=□	Switch on/off combination of limit function and sensor fault detection; J=on; N=off (standard: J)
	A=□	Type of relay output: A=open-circuit operation; R=closed-circuit operation (standard: R)
	T=□□.□	Switching delay T of relay output in s
		Range of values: 0.0 to 10.0 (standard: 0.0)

Schematics

Sensor input connections



Resistance thermometers, resistance-based sensors, potentiometers:

1 Two-wire system; resistance can be parameterized for line compensation

2 Three-wire system

3 Four-wire system

4 Difference/mean-value circuit; 2 resistors can be parameterized for line compensation

Thermocouples:

5 Determination of cold junction temperature using built-in Pt100 or fixed reference temperature

6 Determination of cold junction temperature using external Pt100; resistance can be parameterized for line compensation

7 Determination of cold junction temperature using cold junction terminal 7NG3092-8AV

8 Difference/mean-value circuit with internal cold junction temperature

Further sources:

9 mV sources with two-wire system (7NG3242-xxxx0)

10 V sources with two-wire system (7NG3242-xxxx[1-3])

11 mA/mA sources with two-wire system (7NG3242-xxxx[4-8])

12 Voltage measurement -1,2 to 10 V with U/I plug 7NG3092-8AW (7NG3242-xxxx0)

13 Current measurement -12 to 100 mA with U/I plug 7NG3092-8AW (7NG3242-xxxx0)

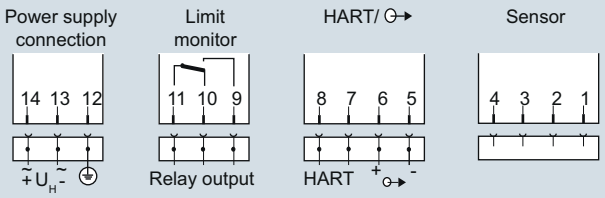
Connection diagram for the input signal

Channel 1 is the measured variable between the terminals 2 and 3 on the input plug. With a difference or mean-value circuit, the calculation of the measured value is defined by the type of measurement. Otherwise the measured value is determined via channel 1. The following code is used for the type of measurement:

type of measurement	Calculation of measured value
Single channel	Channel 1
Differential connection 1	Channel 1 - Channel 2
Differential connection 2	Channel 2 - Channel 1
Mean-value 1	½ · (Channel 1 + Channel 2)

The short-circuit jumpers shown in the circuits must be inserted in the respective system on site.

SITRANS TW
four-wire system, universal, HART



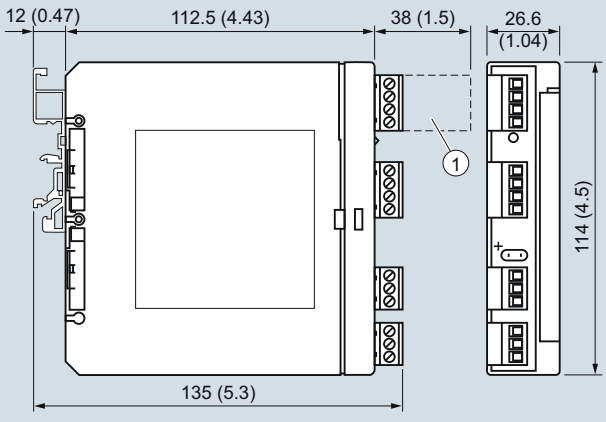
1 to 4	Signal input (see "sensor input connections" for possible types of connection)
5, 6	Analog output (U or I output parameterizable using plug-in jumpers)
7, 8	Connection with HART communication for local parameterization
9 to 11	Output for sensor fault/limit monitor as relay contact (see below for possible parameterization)
12	PE connection
13, 14	Power supply input (protected against reverse polarity)

Connection diagram for power supply, input and outputs

Relay outputs

	Connected terminals
Closed-circuit operation (relay opens when error)	
• Device switched off	10 and 11
• Device switched on and no error	9 and 11
• Device switched on and error	10 and 11
Open-circuit operation (relay closes when error)	
• Device switched off	10 and 11
• Device switched on and no error	10 and 11
• Device switched on and error	9 and 11

Dimensional drawings



(1) In devices with explosion protection

Dimensions for control room mounting, rail mounting in mm (inches)

Overview

SITRANS TF280 for flexible and cost-effective temperature measurements

- Supports the WirelessHART standard (HART V 7.1)
- Very high security level for wireless data transmission
- Built-in local user interface (LUI) with 3-button operation
- Optimum representation and readability using graphical display (104 x 80 pixels) with integrated backlight
- Stand-by (deep sleep phase) mode can be turned on and off with push of a button
- Battery power supply
- Battery life time up to 5 years
- Extend battery life time with HART modem interface which can be switch off
- Optimized power consumption through new design, and increase in battery life time
- Simple configuration thanks to SIMATIC PDM
- Housing meets IP65 degree of protection
- Supports all Pt100 sensors as per IEC 751/DIN EN 60751

Benefits

The SITRANS TF280 is a temperature transmitter that features WirelessHART as the standard communication interface.

Also available is a wired interface to connect a HART modem:

- Flexible temperature measurement
- Save costs on wiring at difficult installation conditions. Wireless technology offers cost advantages in cases where extensive wiring costs would normally apply.
- It enables additional hitherto unfeasible measuring points, particularly for monitoring purposes
- Easy installation also on moveable equipment parts
- Enables cost-effective temporary measurements, for example for process optimizations.
- Optimum solution in addition to wired communication and for system solutions in process automation

Application

The SITRANS TF280 is a WirelessHART field device for temperature measurement with a Pt100 sensor.

This sensor can be installed directly on the field device, or connected at an offset with a cable connection. On the wireless communication side, the transmitter supports the WirelessHART standard. A HART modem can be connected to the transmitter particularly for initial parameterization. Alternatively the device can be commissioned comfortably by means of the local push-buttons w/o any additional handset devices.

It can be used in all industries and applications in non-explosive areas.

Design

The SITRANS TF280 has a robust aluminum enclosure and is suitable for outside use. It conforms with the IP65 safety class.

The operation temperature range is -40 to +80 °C (-40 to +176 °F). Power supply is provided through an integrated battery, which is available as an accessory. The device is only approved for operation with this battery.

The antenna features a rotatable joint which can be used for directional alignment. Wireless signals can thus be optimally received and transmitted.

A special highlight is the possibility to operate directly on the device with 3 push buttons. It perfectly matches the strategy of all new Siemens field devices.

Using the device's push buttons, it is easy to turn the HART modem interface of the device on and off. The device can be put to passive status and reactivated at any time. This helps to extend the life time of the battery.

The SITRANS TF280 transmitter features a cable gland or a Pt100 sensor including protective piping.

Function

The SITRANS TF280 can join to a WirelessHART network. It can be parameterized and operated through this network. Measured process values are transmitted via the network to the SIEMENS IE/WSN-PA LINK.

Field device data received by the IE/WSN-PA LINK is transmitted to the connected systems, for example the process control system SIMATIC PCS 7. For an introduction of WirelessHART, please see the FI 01 catalogue Sec. 9 or www.siemens.com/wirelesshart.

Detailed information on IE/WSN-PA LINK can be found in the FI 01 catalogue Sec. 9 or www.siemens.com/wirelesshart.

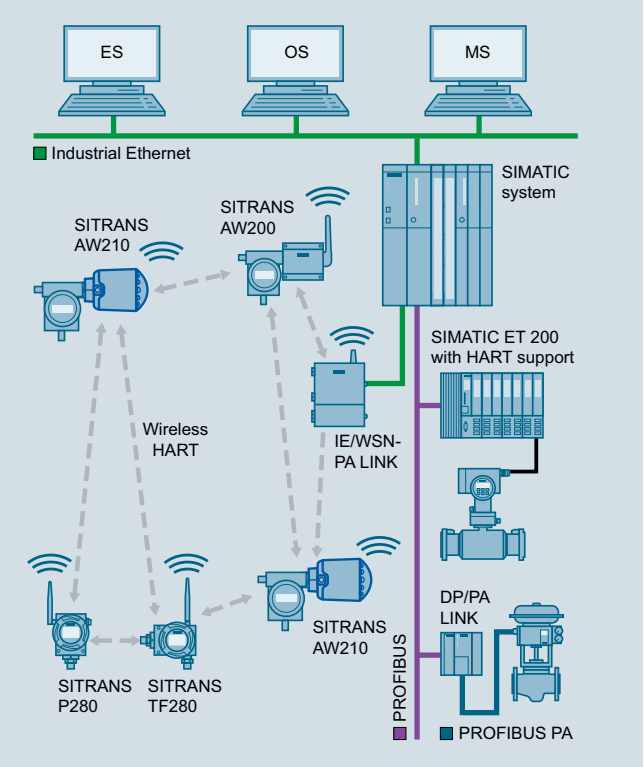
Integration

Connecting to SIMATIC PCS 7

The integration of field devices in SIMATIC PCS 7 and other process control systems can be now done seamlessly and cost-effectively with wireless technology, especially in situations where high wiring costs may be expected. Of particular interest are measuring points which are to be added and for which no wiring is available.

Where larger distances between the IE/WSN-PA LINK and control systems need to be overcome, this connection can also be implemented on a wireless and cost-effective basis using the SCALANCE W series of products. Siemens WirelessHART devices operate with optimum coexistence to SCALANCE W family products.

SITRANS TF280 WirelessHART



Integration of a meshed network into SIMATIC PCS 7

Configuration

Configuration of the SITRANS TF280 transmitter may be carried out as follows:

- Initial commissioning for the SITRANS TF280 with SIMATIC PDM is generally carried out via a HART modem or the integrated local user interface, since the network ID and join Key must be set up on the device before it can be accepted and integrated into the WirelessHART network.
- Once it is integrated into the network, the device can be conveniently operated with the WirelessHART network or onsite with a HART modem or via the local user interface.

Technical specifications

The SITRANS TF280 can be mechanically installed in two ways:

- Direct at the measuring point with a M20x1.5 thread. A connection to other threads can be done via the adapter.
- Remotely from the Pt100 sensor, which is connected to the transmitter via a cable.

The data in the following table refer to the transmitter only excluding a connected sensor, except as noted otherwise.

Input	
Sensor	
• Sensor type	Pt100 as per IEC 751/DIN EN 60751[1)]
• Connection	Two, three or four-wire system
• Measuring range	-200 ... +850 °C (-328 ... 1560 °F)
Cable length SITRANS TF280 and Pt100 sensor element	≤ 3 m
Measuring accuracy[2)]	
Accuracy	< 0.04 % of the measuring range
Long-term drift	< 0.035 % of the measuring range in first year
Ambient temperature effect	max. 0.1 °C/10 K
Rated conditions	
Ambient temperature	-40 ... +80 °C (-40 ... +176 °F)
Storage temperature	-40 ... +85 ° C (-40 ... +185 °F)
Relative humidity	< 95%
Climatic class	4K4H in accordance with EN 60721-3-4 (stationary use at locations not protected against weather)
Degree of protection	IP65/NEMA 4
Max. permissible temperature at transmitter for directly mounted Pt100	80 °C (176 °F)
Design	
Enclosure	Die-cast aluminum
Shock resistance	in accordance with DIN EN 60068-2-29 / 03.95
Resistance to vibration	DIN EN 60068-2-6/12.07
Weight	
• without battery	1.5 kg (3.3 lb)
• with battery	1.6 kg (3.5 lb)
Dimensions (W x H x D)	See "Dimensional drawing"
Thread for cable gland/ sensor connection	M20x1.5 other threads via adapter
Cable between transmitter and sensor element	≤ 3 m für two-, three- or four-wire connections Cable resistance < 1 Ω (setting range in mΩ 0...9999)
Sensor break	Recognized

Displays and controls	
Display (with illumination)	
• Size of display	104 x 80 pixels
• Number of digits	Adjustable
• Number of spaces after comma	Adjustable
Setting options	• on site with 3 push buttons • with SIMATIC PDM or HART Communicator
Auxiliary power	
Battery	3.6 V DC
Communication	
Wireless standard	WirelessHART V7.1 conforming
Transmission frequency band	2.4 GHz (ISM-Band)
Range under reference conditions	Up to 250 m (line of sight) in outside areas Up to 50 m (greatly dependent on obstacles) in Inside areas
Communication interfaces	• HART communication with HART modem • WirelessHART
Certificates and approvals	
Wireless communication approvals	R&TTE FCC
Classification according to pressure equipment directive (PED 97/23/EC)	This device does not fall under the pressure equipment directive

1) Pre-mounted Pt100: Class A (maximum MES: 0.15 + 0.002*|t| °C)
2) Calculation for errors:
Probable total error = $\sqrt{(MES^2 + AET^2 + LTD^2 + ATE^2)}$
Max. error = MES + AET + LTD + ATE
|t|: Absolut value of measured temperature
MES: Measurement error of sensor
AET: Accuracy error transmitter
LTD: Long term drift
ATE: Ambient temperature drift

Selection and Ordering data

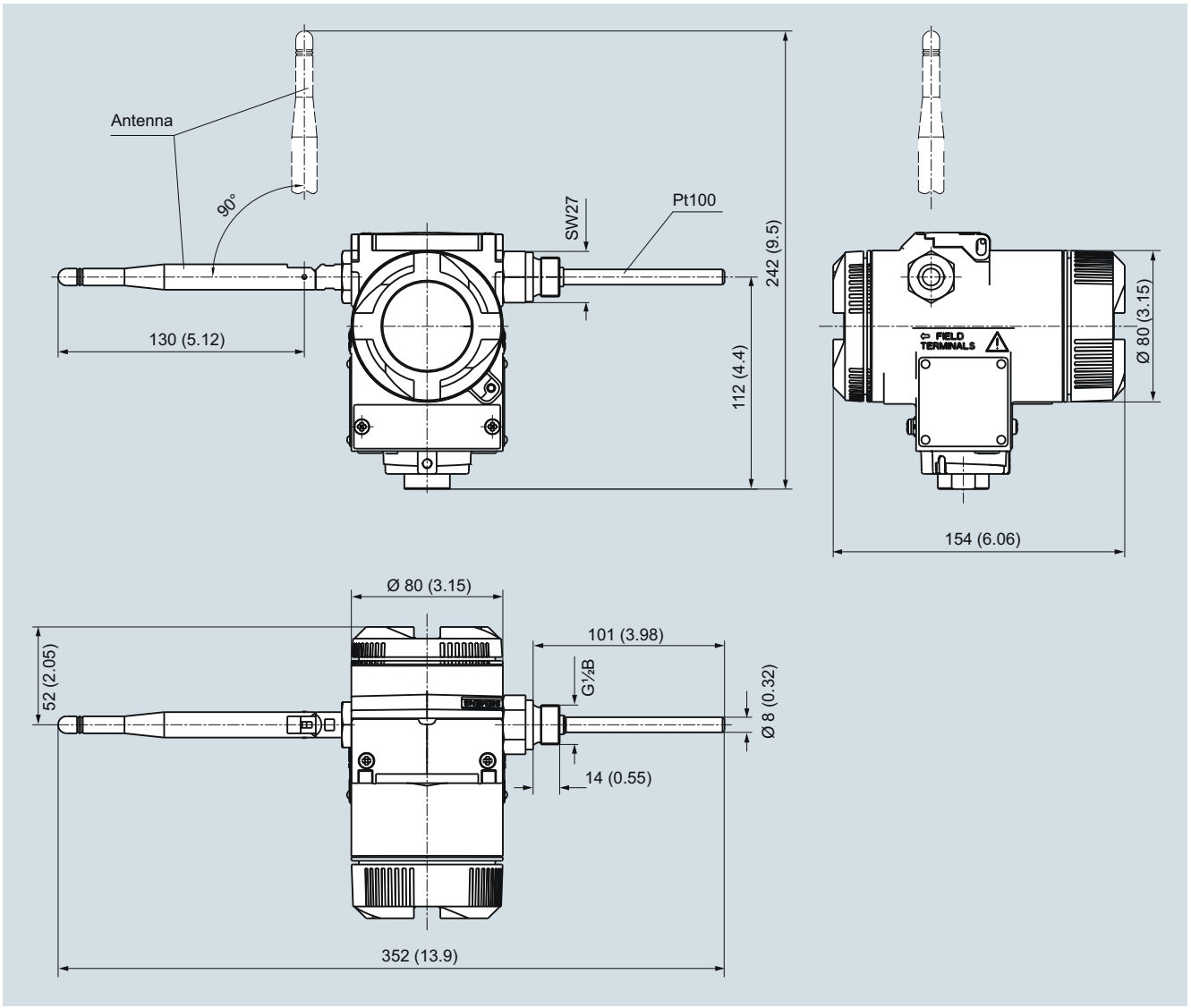
		Article No.
SITRANS TF280 WirelessHART Temperature transmitter (Required battery not included with delivery, see accessories)		**7MP1110-0A ■■■-0■■0**
Connections/cable entry		
Cable gland M20x1.5[1]	▶ ⬟	**C**
Sensor pipe with Pt100, G½" male thread, pre-mounted and connected	▶ ⬟	**D**
Display		
Digital display, visible	▶ ⬟	**1**
Enclosure		
Die-cast aluminum	▶ ⬟	**1**
Explosion protection		
Not included	▶ ⬟	**A**
Antenna		
Variable, attached to device	▶ ⬟	**A**
Further designs		Order code
Please add "**-Z**" to Article No. and specify Order code(s) and plain text.		
Measuring point number (TAG Nr.) max. 16 digits entered in plain text Y15:		**Y15**
Measuring point message max. 27 characters entered in plain text: Y16:		**Y16**
Accessories		Article No.
Lithium battery for SITRANS TF280/P280	▶	**7MP1990-0AA00**
Mounting bracket, steel		**7MF4997-1AC**
Mounting bracket, stainless steel	▶	**7MF4997-1AJ**
Cover, die-cast aluminum, without window	▶	**7MF4997-1BB**
Cover, die-cast aluminum, with window		**7MF4997-1BE**
Thread adapter M20x1.5 (male thread) on ½-14 NP (female thread)	▶	**7MP1990-0BA00**
Thread adapter M20x1.5 (male thread) on G½B (female thread)	▶	**7MP1990-0BB00**
IE/WSN-PA Link		**see Sec. 8**
HART modem with RS232 interface	▶	**7MF4997-1DA**
HART modem with USB interface	▶	**7MF4997-1DB**
SIMATIC PDM		**see Sec. 8**

▶ Available ex stock.

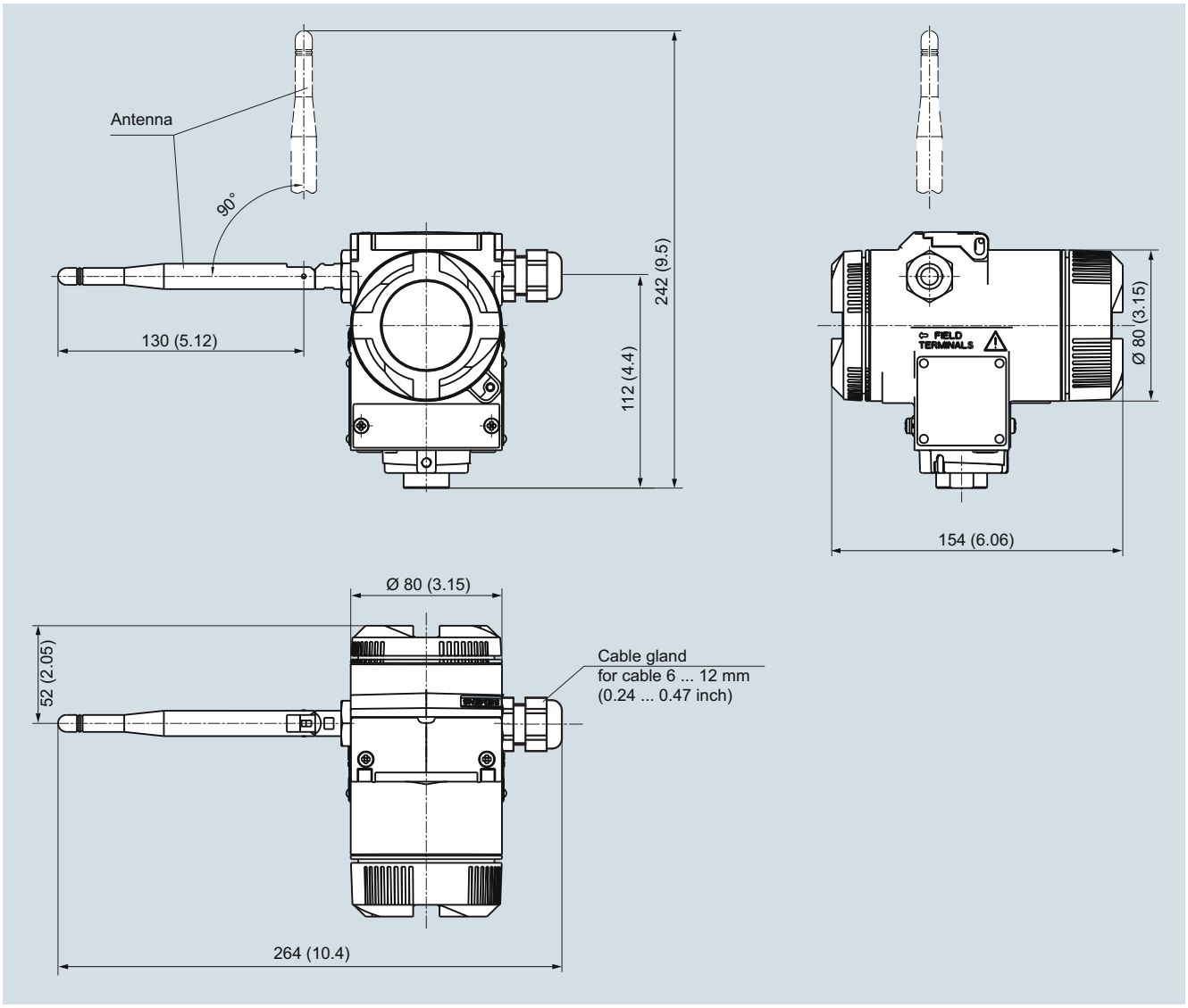
⬟ We can offer shorter delivery times for configurations designated with the Quick Ship Symbol ⬟. For details see page 9/5 in the appendix.

1) Please order sensor separately.

Dimensional drawings



SITRANS TF280 WirelessHART temperature transmitter with Pt100, dimensions in mm (inch).
Please see the dimensional drawing of the mounting bracket on page 1/166.



SITRANS TF280 WirelessHART temperature transmitter, dimensions in mm (inch)
Please see the dimensional drawing of the mounting bracket on page 1/166.

Transmitter for field mounting/field indicator

SITRANS TF - Transmitter, two-wire system and SITRANS TF - Field indicator for 4 to 20 mA

Overview

Our field devices for heavy industrial use

- HART, Universal
- 4 to 20 mA, universal
- Field indicator for 4 to 20 mA signals

The temperature transmitter SITRANS TF works where others feel uncomfortable.

Benefits

- Universal use
  - as transmitter for resistance thermometer, thermocouple element, Ω or mV signal
  - as field indicator for any 4 to 20 mA signals
- Local sensing of measured values over digital display
- Rugged two-chamber enclosure in die-cast aluminium or stainless steel
- Degree of protection IP67
- Test terminals for direct read-out of the output signal without breaking the current loop
- Can be mounted elsewhere if the measuring point
  - is hard to access,
  - is subject to high temperatures,
  - is subject to vibrations from the system,
  - or if you want to avoid long neck tubes and/or protective tubes.
- Can be mounted directly on American-design sensors
- Wide range of approvals for use in potentially explosive atmospheres. "Intrinsically safe, non-sparking and flameproof" type of protections, for Europe and USA.
- SIL2 (with Order Code C20), SIL2/3 (with C23)

Application

SITRANS TF can be used everywhere where temperatures need to be measured under particularly adverse conditions, or where a convenient local display is ideal. Which is why users from all industries have opted for this field device. The rugged enclosure protects the electronics. The stainless steel model is almost completely resistant to sea water and other aggressive elements. The inner workings offer high measuring accuracy, universal input and a wide range of diagnostic options.

Function

Configuration

The communication capability over the HART protocol V 5.9 of the SITRANS TF with an integrated SITRANS TH300 permits parameterization using a PC or HART communicator (hand-held communicator). The SIMATIC PDM makes it easy.

Parameterization is carried out using a PC for SITRANS TF with the integrated and programmable SITRANS TK. Available for this purpose are a special modem and the software tool SIPROM T.

Mode of operation

Mode of operation of SITRANS TF as temperature transmitter

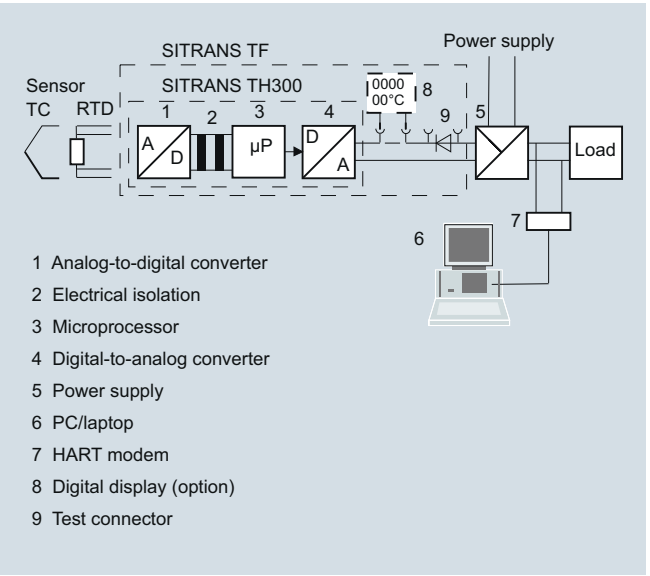
The sensor signal, whether resistance thermometer, thermocouple element or Ω or mV signal, is amplified and linearized. Sensor and output side are electrically isolated. An internal cold junction is integrated for measurements with thermocouple elements.

The device outputs a temperature-linear direct current of 4 to 20 mA. As well as the analog transmission of measured values from 4 to 20 mA, the HART version also supports digital communication for online diagnostics, measured value transmission and configuration.

SITRANS TF automatically detects when a sensor should be interrupted or is indicating a short-circuit. The practical test terminals allow direct measurement of 4 to 20 mA signals over an ammeter without interrupting the output current loop.

Mode of operation of SITRANS TF as field indicator

Any 4 to 20 mA signal can be applied to the generous terminal block. As well as a range of predefined measurement units, the adjustable indicator also supports the input of customized units. This means that any 4 to 20 mA signal can be represented as any type of unit, e.g. pressure, flow rate, filling level or temperature.



Mode of operation: SITRANS TF with integrated transmitter and digital display

Technical specifications

Input	
Resistance thermometer	
Measured variable	Temperature
Sensor type	
• to IEC 60751	Pt25 … Pt1000
• to JIS C 1604; a=0.00392 K-1	Pt25 … Pt1000
• to IEC 60751	Ni25 … Ni1000
Units	°C and °F
Connection	
• Normal connection	1 resistance thermometer (RTD) in 2-wire, 3-wire or 4-wire system
• Generation of average value	Series or parallel connection of several resistance thermometers in a two-wire system for the generation of average temperatures or for adaptation to other device types
• Generation of difference	2 resistance thermometers (RTD) in 2-wire system (RTD 1 – RTD 2 or RTD 2 – RTD 1)
Interface	
• Two-wire system	Parameterizable line resistance ≤ 100 Ω (loop resistance)
• Three-wire system	No balancing required
• Four-wire system	No balancing required
Sensor current	≤ 0.45 mA
Response time	≤ 250 ms for 1 sensor with open-circuit monitoring
Open-circuit monitoring	Always active (cannot be disabled)
Short-circuit monitoring	can be switched on/off (default value: ON)
Measuring range	parameterizable (see table "Digital measuring errors")
Min. measured span	10 °C (18 °F)
Characteristic curve	Temperature-linear or special characteristic
Resistance-based sensors	
Measured variable	Actual resistance
Sensor type	Resistance-based, potentiometers
Units	Ω
Connection	
• Normal connection	1 resistance-based sensor (R) in 2-wire, 3-wire or 4-wire system
• Generation of average value	2 resistance-based sensors in 2-wire system for generation of average value
• Generation of difference	2 resistance-based sensor in 2-wire system (R 1 – R 2 or R 2 – R 1)
Interface	
• Two-wire system	Parameterizable line resistance ≤ 100 Ω (loop resistance)
• Three-wire system	No balancing required
• Four-wire system	No balancing required
Sensor current	≤ 0.45 mA
Response time	≤ 250 ms for 1 sensor with open-circuit monitoring
Open-circuit monitoring	Can be switched off
Short-circuit monitoring	Can be switched off (value is adjustable)
Measuring range	parameterizable max. 0 ... 2200 Ω (see table "Digital measuring errors")
Min. measured span	5 ... 25 Ω (see Table "Digital measuring errors")
Characteristic curve	Resistance-linear or special characteristic
Thermocouples	
Measured variable	Temperature
Sensor type (thermocouples)	
• Type B	Pt30Rh-Pt6Rh to DIN IEC 584
• Type C	W5 %-Re acc. to ASTM 988
• Type D	W3 %-Re acc. to ASTM 988
• Type E	NiCr-CuNi to DIN IEC 584
• Type J	Fe-CuNi to DIN IEC 584
• Type K	NiCr-Ni to DIN IEC 584
• Type L	Fe-CuNi to DIN 43710
• Type N	NiCrSi-NiSi to DIN IEC 584
• Type R	Pt13Rh-Pt to DIN IEC 584
• Type S	Pt10Rh-Pt to DIN IEC 584
• Type T	Cu-CuNi to DIN IEC 584
• Type U	Cu-CuNi to DIN 43710
Units	°C or °F
Connection	
• Normal connection	1 thermocouple (TC)
• Generation of average value	2 thermocouples (TC)
• Generation of difference	2 thermocouples (TC) (TC 1 – TC 2 or TC 2 – TC 1)
Response time	≤ 250 ms for 1 sensor with open-circuit monitoring
Open-circuit monitoring	Can be switched off
Cold junction compensation	
• Internal	With integrated Pt100 resistance thermometer
• External	With external Pt100 IEC 60751 (2-wire or 3-wire connection)
• External fixed	Cold junction temperature can be set as fixed value
Measuring range	parameterizable (see table "Digital measuring errors")
Min. measured span	Min. 40 ... 100 °C (72 ... 180 °F) (see table "Digital measuring errors")
Characteristic curve	Temperature-linear or special characteristic
mV sensor	
Measured variable	DC voltage
Sensor type	DC voltage source (DC voltage source possible over an externally connected resistor)
Units	mV
Response time	≤ 250 ms for 1 sensor with open-circuit monitoring
Open-circuit monitoring	Can be switched off
Measuring range	-10 ... +70 mV -100 ... +1100 mV
Min. measured span	2 mV or 20 mV
Overload capability of the input	-1.5 ... +3.5 V DC
Input resistance	≥ 1 MΩ
Characteristic curve	Voltage-linear or special characteristic

SITRANS TF - Transmitter, two-wire system and SITRANS TF - Field indicator for 4 to 20 mA

Output	
Output signal	4 ... 20 mA, 2-wire
Communication with SITRANS TH300	acc. to HART Rev. 5.9
Digital display	
Digital display (optional)	In current loop
Display	Max. 5 digits
Digit height	9 mm (0.35 inch)
Display range	-99 999 ... + 99 999
Units	any (max. 5 char.)
Setting: Zero point, full-scale value and unit	with 3 buttons
Load voltage	2.1 V
Measuring accuracy	
Digital measuring errors	See table "Digital measuring errors"
Reference conditions	
• Auxiliary power	24 V ± 1 %
• Load	500 Ω
• Ambient temperature	23 °C (73.4 °F)
• Warming-up time	> 5 min
Error in the analog output (digital/analog converter)	< 0.025 % of span
Error due to internal cold junction	< 0.5 °C (0.9 °F)
Influence of ambient temperature	
• Analog measuring error	0.02 % of span/10 °C (18 °F)
• Digital measuring errors	
- with resistance thermometers	0.06 °C (0.11 °F)/10°C (18 °F)
- with thermocouples	0.6 °C (1.1 °F)/10°C (18 °F)
Auxiliary power effect	< 0.001 % of span/V
Effect of load impedance	< 0.002 % of span/100 Ω
Long-term drift	
• In the first month	< 0.02 % of span
• After one year	< 0.3 % of span
• After 5 years	< 0.4 % of span
Conditions of use	
Ambient conditions	
Storage temperature	-40 ... +85 °C (-40 ... +185 °F)
Condensation	Permissible
Electromagnetic compatibility	According to EN 61326 and NAMUR NE21
Degree of protection to EN 60529	IP67
Construction	
Weight	Approx. 1.5 kg (3.3 lb) without options
Dimensions	See "Dimensional drawings"
Enclosure material	Die-cast aluminum, low in copper, GD-AlSi 12 or stainless steel, polyester-based lacquer, stainless steel rating plate
Electrical connection, sensor connection	Screw terminals, cable inlet via M20 x 1.5 or ½-14 NPT screwed gland
Mounting bracket (optional)	Steel, galvanized and chrome-plated or stainless steel

Auxiliary power	
Without digital display	11 ... 35 V DC (30 V for Ex ib; 32 V for Ex ic and Ex nA)
With digital display	13.1 ... 5 V DC (30 V for Ex ib; 32 V for Ex ic and Ex nA)
Electrically isolated	Between input and output
• Test voltage	U_{eff} = 1 kV, 50 Hz, 1 min
Certificates and approvals	
Explosion protection ATEX	
• "Intrinsic safety" type of protection	with digital display: II 2 (1) G EEx ia IIC T4 without digital display: II 2 (1) G EEx ia IIC T6
- EC type test certificate	ZELM 99 ATEX 0007
• "Operating equipment that is non-ignitable and has limited energy for zone 2" type of protection	II 3G EEx nAL IIC T6/T4
- EC type test certificate	ZELM 99 ATEX 0007
• "Flame-proof enclosure" type of protection	II 2 G EEx d IIC T5/T6 II 1D Ex tD A20 IP65 T100 °C, T85 °C
- EC type test certificate	CESI 99 ATEX 079
Explosion protection to FM	Certificate of Compliance 3017742
• Identification (XP, DIP, NI, S)	• XP/I/1/BCD/T5 Ta = 85 °C (185 °F), T6 Ta = 50 °C (112 °F), Type 4X • DIP/II, III/1/EFG/T5 Ta = 85 °C (185 °F), T6 Ta = 50 °C (112 °F), Type 4X • NI/I/2/ABCD/T5 Ta = 85 °C (185 °F), T6 Ta = 50 °C (112 °F) , Type 4X • S/II, III/2/FG/T5 Ta = 85 °C (185 °F), T6 Ta = 50 °C (112 °F), Type 4X
Other certificates	IECEx, GOST, INMETRO, NEPSI, KOSHA
Hardware and software requirements	
• For the parameterization software SIPROM T for SITRANS TH200	
- Personal computer	PC with CD-ROM drive and USB
- PC operating system	Windows 98, NT, 2000, XP, 7
• For the parameterization software SIMATIC PDM for SITRANS TH300	See chapter 9 "Software", "SIMATIC PDM"
Communication	
Load for HART connection	230 ... 1100 Ω
• Two-core shielded	≤ 3.0 km (1.86 mi)
• Multi-core shielded	≤ 1.5 km (0.93 mi)
Protocol	HART protocol, version 5.9

Factory setting (transmitter):

- Pt100 (IEC 751) with 3-wire circuit
- Measuring range: 0 ... 100 °C (32 ... 212 °F)
- Error signal in the event of sensor breakage: 22.8 mA
- Sensor offset: 0 °C (0 °F)
- Damping 0.0 s

Digital measuring errors

Resistance thermometer

Input	Measuring range	Min. measured span		Digital accuracy	
	°C / (°F)	°C)	(°F)	°C	(°F)
to IEC 60751					
Pt25	-200 ... +850 (-328 ... +1562)	10	(18)	0.3	(0.54)
Pt50	-200 ... +850 (-328 ... +1562)	10	(18)	0.15	(0.27)
Pt100 ... Pt200	-200 ... +850 (-328 ... +1562)	10	(18)	0.1	(0.18)
Pt500	-200 ... +850 (-328 ... +1562)	10	(18)	0.15	(0.27)
Pt1000	-200 ... +350 (-328 ... +662)	10	(18)	0.15	(0.27)
to JIS C1604-81					
Pt25	-200 ... +649 (-328 ... +1200)	10	(18)	0.3	(0.54)
Pt50	-200 ... +649 (-328 ... +1200)	10	(18)	0.15	(0.27)
Pt100 ... Pt200	-200 ... +649 (-328 ... +1200)	10	(18)	0.1	(0.18)
Pt500	-200 ... +649 (-328 ... +1200)	10	(18)	0.15	(0.27)
Pt1000	-200 ... +350 (-328 ... +662)	10	(18)	0.15	(0.27)
Ni 25 to Ni1000	-60 ... +250 (-76 ... +482)	10	(18)	0.1	(0.18)

Resistance-based sensors

Input	Measuring range	Min. measured span	Digital accuracy
	Ω	Ω	Ω
Resistance	0 ... 390	5	0.05
Resistance	0 ... 2200	25	0.25

Thermocouples

Input	Measuring range	Min. measured span		Digital accuracy	
	°C / (°F)	°C	(°F)	°C	(°F)
Type B	0 ... 1820 (32 ... 3308)	100	(180)	2 [1]	(3.6) [1]
Type C (W5)	0 ... 2300 (32 ... 4172)	100	(180)	1 [2]	(1.8) [2]
Type D (W3)	0 ... 2300 (32 ... 4172)	100	(180)	1[2]	(1.8)[2]
Type E	-200 ... +1000 (-328 ... +1832)	50	(90)	1	(1.8)
Type J	-210 ... +1200 (-346 ... +2192)	50	(90)	1	(1.8)
Type K	-200 ... +1370 (-328 ... +2498)	50	(90)	1	(1.8)
Type L	-200 ... +900 (-328 ... +1652)	50	(90)	1	(1.8)
Type N	-200 ... +1300 (-328 ... +2372)	50	(90)	1	(1.8)
Type R	-50 ... +1760 (-58 ... +3200)	100	(180)	2	(3.6)
Type S	-50 ... +1760 (-58 ... +3200)	100	(180)	2	(3.6)
Type T	-20 ... +400 (-328 ... +752)	40	(72)	1	(1.8)
Type U	-200 ... +600 (-328 ... +1112)	50	(90)	2	(3.6)

[1] The digital accuracy in the range 0 to 300 °C (32 to 572 °F) is 3 °C (5.4 °F).
[2] The digital accuracy in the range 1750 to 2300 °C (3182 to 4172 °F) is 2 °C (3.6 °F).

mV sensor

Input	Measuring span	Min. measured span	Digital accuracy
	mV	mV	µV
mV sensor	-10 ... +70	2	40
mV sensor	-100 ... +1100	20	400

The digital accuracy is the accuracy after the analog/digital conversion including linearization and calculation of the measured value.

An additional error is generated in the output current 4 to 20 mA as a result of the digital/analog conversion of 0.025 % of the set span (digital-analog error).

The total error under reference conditions at the analog output is the sum from the digital error and the digital-analog error (poss. with the addition of cold junction errors in the case of thermocouple measurements).

Transmitter for field mounting/field indicator

SITRANS TF - Transmitter, two-wire system and SITRANS TF - Field indicator for 4 to 20 mA

Selection and Ordering data	Article No.
Temperature transmitter in field housing Two-wire system 4 ... 20 mA, with electrical isolation, with documentation on CD-ROM	**7NG313 - ■■■■**
Integrated transmitter	
SITRANS TH200, programmable	
• Without Ex protection	**5 0**
• With Ex ia	**5 1**
• With Ex nAL for zone 2	**5 2**
• Total device SITRANS TF Ex d[1]	**5 4**
• Total device SITRANS TF according to FM (XP, DIP, NI, S)[1]	**5 5**
SITRANS TH300, communication capability according to HART V 5.9	
• Without Ex-protection	**6 0**
• With Ex ia	**6 1**
• With Ex nAL for zone 2	**6 2**
• Total device SITRANS TF Ex d[1]	**6 4**
• Total device SITRANS TF according to FM (XP, DIP, NI, S)[1]	**6 5**
Enclosure	
Die-cast aluminium	**A**
Stainless steel precision casting	**E**
Connections/cable inlet	
Screwed glands M20x1.5	**B**
Screwed glands ½-14 NPT	**C**
Digital indicator	
Without	**0**
With	**1**
Mounting bracket and securing parts	
Without	**0**
Made of steel	**1**
Made of stainless steel	**2**
Further designs Please add "**-Z**" to Article No. and specify Order code(s) and plain text.	Order code
Test protocol (5 measuring points)	**C11**
Functional safety SIL2	**C20**
Functional safety SIL2/3	**C23**
Explosion protection	
• Explosion protection Ex ia to INMETRO (Brazil) (only with 7NG313.-1....)	**E25**
• Explosion protection Ex d to INMETRO (Brazil) (only with 7NG313.-4....)	**E26**
• Explosion protection Ex d to NEPSI (China) (only with 7NG313.-4....)	**E56**
Customer-specific programming Add "**-Z**" to Article No. and specify Order code(s)	
Measuring range to be set Enter in plain text (max. 5 digits): Y01: ... to ... °C, °F	**Y01[2]**
Measuring point no. (TAG), max. 8 characters	**Y17**
Meas. point descriptor, max. 16 characters	**Y23[3]**
Meas. point message, max. 32 characters	**Y24[4]**
Only inscription on measuring point label: specify in plain text: Measuring range	**Y22[4]**
Pt100 (IEC) 2-wire, R_L = 0 Ω	**U02**
Pt100 (IEC) 3-wire	**U03**
Pt100 (IEC) 4-wire	**U04**
Thermocouple type B	**U20**
Thermocouple type C (W5)	**U21**
Thermocouple type D (W3)	**U22**
Thermocouple type E	**U23**
Thermocouple type J	**U24**

Selection and Ordering data	Order code
Thermocouple type K	**U25[4]**
Thermocouple type L	**U26**
Thermocouple type N	**U27**
Thermocouple type R	**U28**
Thermocouple type S	**U29**
Thermocouple type T	**U30**
Thermocouple type U	**U31**
With TC: CJC internal	**U40**
With TC: CJC external (Pt100, 3-wire)	**U41**
With TC: CJC external with fixed value, specify in plain text	**Y50**
Special differing customer-specific programming, specify in plain text	**Y09[4]**
Fail-safe value 3.6 mA (instead of 22.8 mA)	**U36**

Supply units see Chapter 7 "Supplementary Components".

1) Without cable gland.

2) Here, you enter the initial and final value of the desired measurement range for customer-specific programming for RTD and TC.

3) If only Y22, Y23 and Y24 are ordered and the label only has to be on the tag plate, Y01 does not have to be specified.

4) Here, you enter the initial and final value of the desired measurement range for customer-specific programming for mV, Ω.

Selection and Ordering data		Article No.
Accessories		
Modem for SITRANS TH100, TH200 and TR200 incl. parameterization software T with USB interface	►	**7NG3092-8KU**
CD for measuring instruments for temperature with documentation in German, English, French, Spanish, Italian and Portuguese, and parameterization software SIPROM T (included in delivery with SITRANS TF)	►	**A5E00364512**
HART modem		
With RS 232 interface	►	**7MF4997-1DA**
With USB interface	►	**7MF4997-1DB**
SIMATIC PDM parameterization software also for SITRANS TH300		**see chapter 9**
Mounting bracket and securing parts		
Made of steel for 7NG313.-..B..		**7MF4997-1AC**
Made of steel for 7NG313.-..C..		**7MF4997-1AB**
Made of stainless steel for 7NG313.-..B..	►	**7MF4997-1AJ**
Made of stainless steel for 7NG313.-..C..		**7MF4997-1AH**
Digital indicator[1]		**7MF4997-1BS**
Connection board		**A5E02226423**

► Available ex stock.

Supply units see Chapter 7 "Supplementary Components".

1) It is not possible to upgrade devices with Ex protection

Ordering example 1:
7NG3135-0AB11-Z Y01+Y23+U03
Y01: 0...100 C
Y23: TICA1234HEAT

Ordering example 2:
7NG3136-0AC11-Z Y01+Y23+Y24+U25+U40
Y01: 0...300 C
Y23: TICA 1234 ABC
Y24: HEATING BOILER 56789

Factory setting (transmitter):
- Pt100 (IEC 751) with three-wire circuit
- Measuring range: 0 ... 100 °C (32 ... 212 °F)
- Fault current 22.8 mA
- Sensor offset: 0 °C (0 °F)
- Damping 0.0 s

Selection and Ordering data	Article No.				
SITRANS TF field indicator for 4 ... 20 mA signals, with documentation on CD-ROM	**7NG3130-**				
Without Ex-protection		**0**		**1**	
With Ex ia		**1**		**1**	
With Ex nAL for zone 2		**2**		**1**	
Total device SITRANS TF Ex d[1]		**4**		**1**	
Total device SITRANS TF according to FM (XP, DIP, NI, S)[1]		**5**		**1**	
Enclosure					
Die-cast aluminium			**A**		
Stainless steel precision casting			**E**		
Connections/cable inlet					
Screwed glands M20x1.5				**B**	
Screwed glands ½-14 NPT				**C**	
Digital indicator					
With					**1**
Mounting bracket and securing parts					
Without					**0**
Made of steel					**1**
Made of stainless steel					**2**
Further designs Please add "**-Z**" to Article No. and specify Order code(s) and plain text.	Order code				
Test protocol (5 measuring points)	**C11**				
Explosion protection					
• Explosion protection Ex ia to INMETRO (Brazil) (only with 7NG313.-1....)	**E25**				
• Explosion protection Ex d to INMETRO (Brazil) (only with 7NG313.-4....)	**E26**				
• Explosion protection Ex d to NEPSI (China) (only with 7NG313.-4....)	**E56**				
Customer-specific programming Add "**-Z**" to Article No. and specify Order code(s)					
Measuring range	**Y01**[2]				
Only inscription on TAG plate: specify in plain text: Measuring range	**Y22**				
Only inscription on TAG plate: Measuring point descriptor, max. 16 characters	**Y23**				
Only inscription on TAG plate: Measuring point message, max. 27 characters	**Y24**				
Special differing customer-specific programming, specify in plain text	**Y09**[3]				

Supply units see Chapter 7 "Supplementary Components".

[1] Without cable gland.

[2] Here, you enter the initial and final value of the desired measurement range for customer-specific programming for RTD and TC.

[3] Here, you enter the initial and final value of the desired measurement range for customer-specific programming for mV, Ω.

Selection and Ordering data	Article No.
Accessories	
CD for measuring instruments for temperature ► with documentation in German, English, French, Spanish, Italian and Portuguese, and parameterization software SIPROM T (included in delivery with SITRANS TF)	**A5E00364512**
Mounting bracket and securing parts	
Made of steel for 7NG313.-..B..	**7MF4997-1AC**
Made of steel for 7NG313.-..C..	**7MF4997-1AB**
Made of stainless steel for 7NG313.-..B.. ►	**7MF4997-1AJ**
Made of stainless steel for 7NG313.-..C..	**7MF4997-1AH**
Digital indicator[1]	**7MF4997-1BS**
Connection board	**A5E02226423**

► Available ex stock.

[1] It is not possible to upgrade devices with Ex protection

Ordering example 1:

7NG3130-0AB10-Z Y01+Y23
Y01: -5...100 C
Y23: TICA1234HEAT

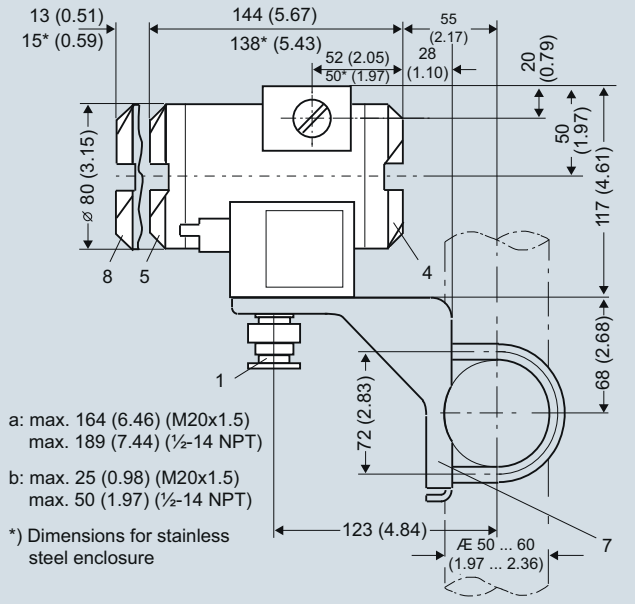
Ordering example 2:

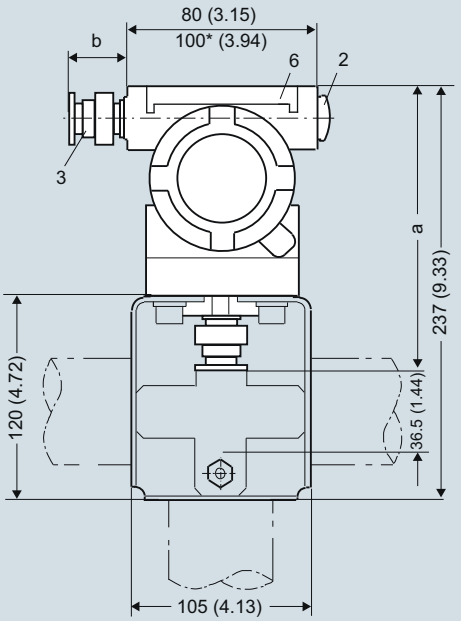
7NG3130-0AC10-Z Y01+Y23+Y24
Y01: 0 ... 20 BAR
Y23: PICA 1234 ABC
Y29: HEATING BOILER 67890

Factory setting (field indicator):

- 4 ... 20 mA

Dimensional drawings





1 Sensor connection (screwed gland M20x1.5 or ½-14 NPT)

2 Blanking plug

3 Electrical connection (screwed gland M20x1.5 or ½-14 NPT)

4 Terminal side, output signal

5 Terminal side, sensor

6 Protective cover (without function)

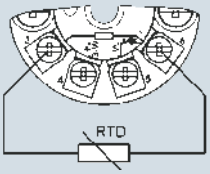
7 Mounting bracket (option) with clamp for securing to a vertical or horizontal pipe

8 Cover with window for digital display

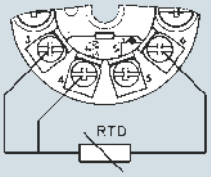
SITRANS TF, dimensions in mm (inches)

Schematics

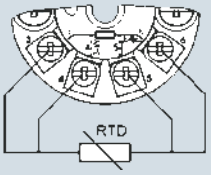
Resistance thermometer



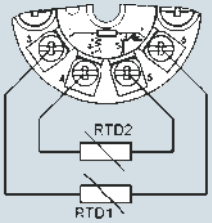
Two-wire system [1)]



Three-wire system

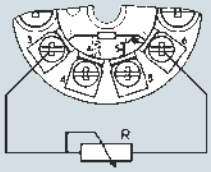


Four-wire system

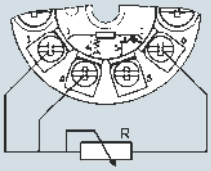


Generation of average value / difference [1)]

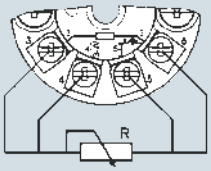
Resistance



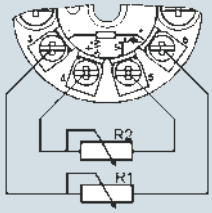
Two-wire system [1)]



Three-wire system

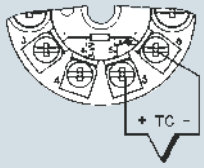


Four-wire system

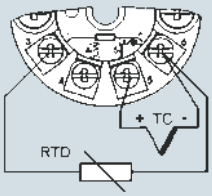


Generation of average value / difference [1)]

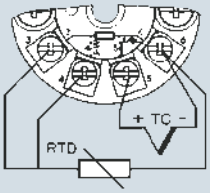
Thermocouple



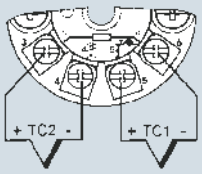
Cold junction compensation
Internal/fixed value



Cold junction compensation with external Pt100 in two-wire system [1)]



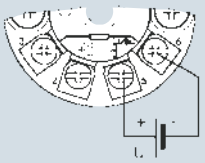
Cold junction compensation with external Pt100 in three-wire system



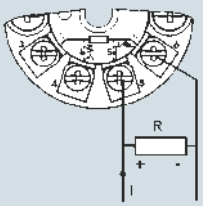
Generation of average value / difference with internal cold junction compensation

[1)] Programmable line resistance for the purpose of correction.

Voltage measurement



Current measurement



SITRANS TF, sensor connection assignment

SITRANS TF
fieldbus transmitter

Overview

Our field devices for heavy industrial use

- FOUNDATION fieldbus
- PROFIBUS PA

The SITRANS TF temperature transmitter works where others can't cope.

Benefits

- For universal use as a transmitter for resistance thermometers, thermocouple elements, Ω or mV signals
- Rugged two-chamber enclosure in die-cast aluminium or stainless steel
- Degree of protection IP67
- Can be mounted elsewhere if the measuring point
  - is hard to access,
  - is subject to high temperatures,
  - is subject to vibrations from the system,
  - or if you want to avoid long neck tubes and/or protective tubes.
- Can be mounted directly on American-design sensors
- Wide range of approvals for use in potentially explosive atmospheres. "Intrinsically safe, non-sparking and flameproof" type of protection, for Europe and USA

Application

The SITRANS TF can be used everywhere where temperatures need to be measured under particularly harsh conditions. Which is why users from all industries have opted for this field device. The rugged enclosure protects the electronics. The stainless steel model is almost completely resistant to sea water and other aggressive elements. The inner workings offer high measuring accuracy, universal input and a wide range of diagnostic options.

Function

Features

- Polarity-neutral bus connection
- 24-bit analog-digital converter for high resolution
- Electrically isolated
- Version for use in hazardous areas
- Special characteristic
- Sensor redundance

Transmitter with PROFIBUS PA communication

- Function blocks: 2 x analog

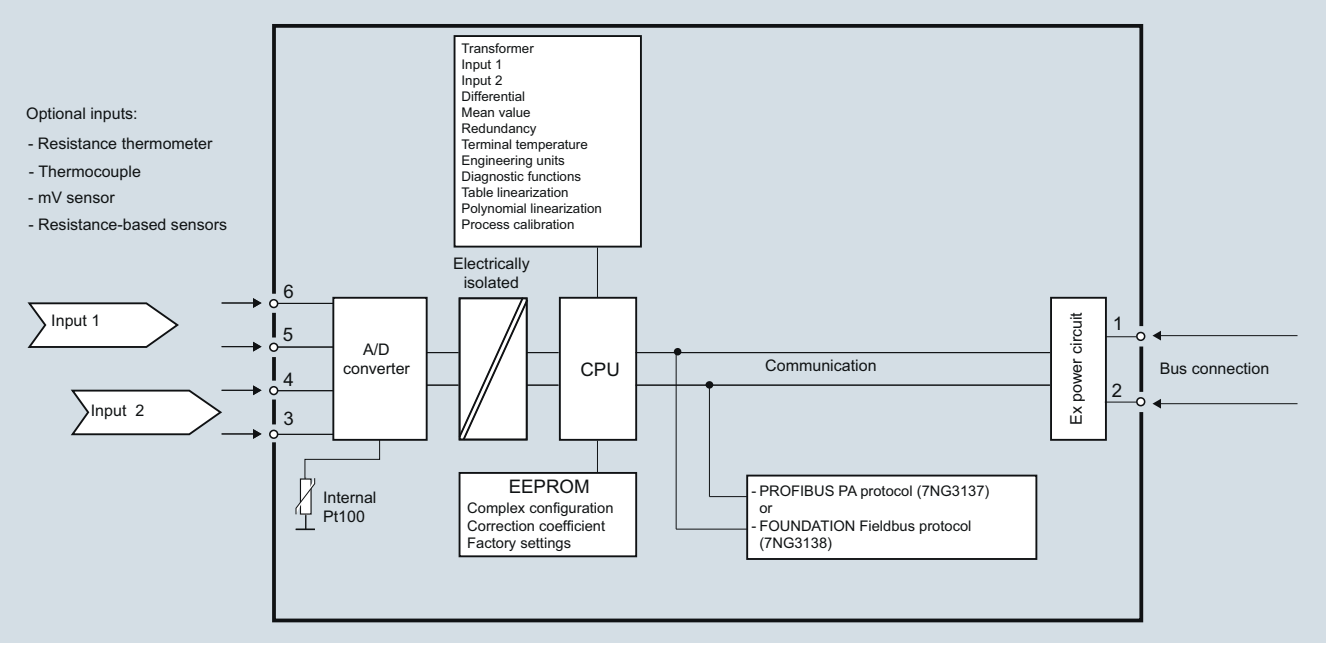
Transmitter with FOUNDATION fieldbus communication

- Function blocks: 2 x analog and 1 x PID
- Functionality: Basic or LAS

Mode of operation

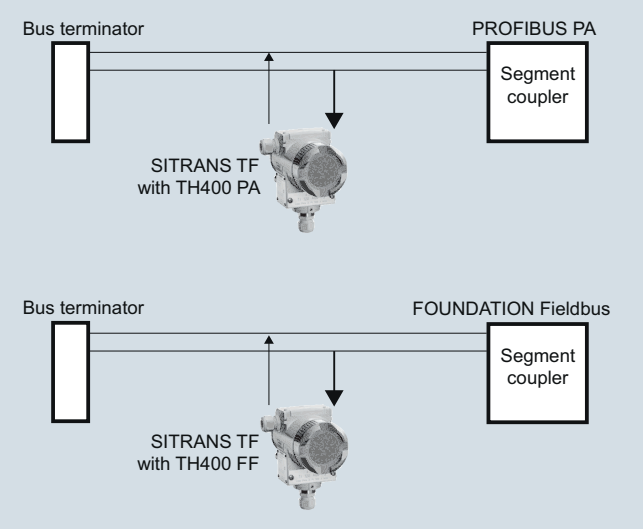
The following function diagram explains the mode of operation of the transmitter.

The only difference between the two versions of the SITRANS TF (7NG3137-... and 7NG3138-...) is the type of field bus protocol used (PROFIBUS PA or FOUNDATION fieldbus).



SITRANS TF with TH400, function diagram

System communication



SITRANS TF with TH400, communication interface

Technical specifications

Input	
Analog/digital conversion	
• Measurement rate	< 50 ms
• Resolution	24-bit
Resistance thermometer	
Pt25 ... 1000 to IEC 60751/JIS C 1604	
• Measuring range	-200 ... +850 °C (-328 ... +1562 °F)
Ni25 ... 1000 to DIN 43760	
• Measuring range	-60 ... +250 °C (-76 ... +482 °F)
Cu10 ... 1000, α = 0.00427	
• Measuring range	-50 ... +200 °C (-58 ... +392 °F)
Line resistance per sensor cable	Max. 50 Ω
Sensor current	Nominal 0.2 mA
Sensor fault detection	
• Sensor break detection	Yes
• Sensor short-circuit detection	Yes, < 15 Ω
Resistance-based sensors	
Measuring range	0 ... 10 kΩ
Line resistance per sensor cable	Max. 50 Ω
Sensor current	Nominal 0.2 mA
Sensor fault detection	
• Sensor break detection	Yes
• Sensor short-circuit detection	Yes, < 15 Ω
Thermocouple	
to IEC 584	Measuring range
• Type B	400 ... 1820 °C (752 ... 3308 °F)
• Type E	-100 ... +1000 °C (-148 ... +1832 °F)
• Type J	-100 ... +1000 °C (-148 ... +1832 °F)
• Type K	-100 ... +1200 °C (-148 ... +2192 °F)
• Type N	-180 ... +1300 °C (-292 ... +2372 °F)
• Type R	-50 ... +1760 °C (-58 ... +3200 °F)
• Type S	-50 ... +1760 °C (-58 ... +3200 °F)
• Type T	-200 ... +400 °C (-328 ... +752 °F)
to DIN 43710	
• Type L	-200 ... +900 °C (-328 ... +1652 °F)
• Type U	-200 ... +600 °C (-328 ... +1112 °F)
to ASTM E988-90	
• Type W3	0 ... 2300 °C (32 ... 4172 °F)
• Type W5	0 ... 2300 °C (32 ... 4172 °F)
External cold junction compensation	-40 ... +135 °C (-40 ... +275 °F)
Sensor fault detection	
• Sensor break detection	Yes
• Sensor short-circuit detection	Yes, < 3 mV
• Sensor current in the event of open-circuit monitoring	4 µA
mV sensor - voltage input	
Measuring range	-800 ... +800 mV
Input resistance	10 MΩ
Output	
Filter time (programmable)	0 ... 60 s
Update time	< 400 ms
Measuring accuracy	
Accuracy is defined as the higher value of general values and basic values.	

General values

Type of input	Absolute accuracy	Temperature coefficient
All	≤ ± 0.05 % of the measured value	≤ ± 0.002 % of the measured value/°C

Basic values

Type of input	Basic accuracy	Temperature coefficient
Pt100 and Pt1000	≤ ± 0.1 °C	≤ ± 0.002 °C/°C
Ni100	≤ ± 0.15 °C	≤ ± 0.002 °C/°C
Cu10	≤ ± 1.3 °C	≤ ± 0.02 °C/°C
Resistance-based sensors	≤ ± 0.05 Ω	≤ ± 0.002 Ω/°C
Voltage source	≤ ± 10 µV	≤ ± 0.2 µV/°C
Thermocouple, type: E, J, K, L, N, T, U	≤ ± 0.5 °C	≤ ± 0.01 °C/°C
Thermocouple, type: B, R, S, W3, W5	≤ ± 1 °C	≤ ± 0.025 °C/°C
Cold junction compensation	≤ ± 0.5 °C	

Reference conditions	
Warming-up time	30 s
Signal-to-noise ratio	Min. 60 dB
Calibration condition	20 ... 28 °C (68 ... 82 °F)

SITRANS TF
fieldbus transmitter

Conditions of use	
Ambient conditions	
Permissible ambient temperature	-40 ... +85 °C (-40 ... +185 °F)
Permissible storage temperature	-40 ... +85 °C (-40 ... +185 °F)
Relative humidity	≤ 98 %, with condensation
Insulation resistance	
• Test voltage	500 V AC for 60 s
• Continuous operation	50 V AC/75 V DC
Electromagnetic compatibility	
NAMUR	NE21
EMC 2004/108/EC Emission and Noise Immunity	EN 61326-1, EN 61326-2-5
Construction	
Weight	Approx. 1.5 kg (3.3 lb) without options
Dimensions	See "Dimensional drawings"
Enclosure materials	• Die-cast aluminum, low in copper, GD-AlSi 12 or stainless steel • Polyester-based lacquer for GD AlSi 12 enclosure • Stainless steel rating plate
Electrical connection, sensor connection	• screw terminals • Cable inlet via M20 x 1.5 or ½ -14 NPT screwed gland • Bus connection with M12 plug (optional)
Mounting bracket (optional)	Steel, galvanized and chrome-plated or stainless steel
Degree of protection	IP67 to EN 60529
Auxiliary power	
Power supply	
• Standard, Ex "d", Ex "nA", Ex "nL", XP, NI	10.0 ... 32 V DC
• Ex "ia", Ex "ib"	10.0 ... 30 V DC
• In FISCO/FNICO installations	10.0 ... 17.5 V DC
Power consumption	< 11 mA
Max. increase in power consumption in the event of a fault	< 7 mA
Certificates and approvals	
Explosion protection ATEX	
EC type test certificate	ZELM 99 ATEX 0007
• Type of protection "intrinsic safety i" (version: 7NG313x-1xxxx)	II 2(1) G Ex ia IIC T4/T6
Conformity statement	ZELM 07 ATEX 3349
• "Operating equipment that is non-ignitable and has limited energy" type of protection (version: 7NG313x-2xxxx)	II 3 G Ex nA [nL] IIC T4/T6 II 3 G Ex nL IIC T4/T6
EC type test certificate	CESI 99 ATEX 079
• "Flame-proof enclosure" type of protection (version: 7NG313x-4xxxx)	II 2 G Ex d IIC T5/T6 II 1D Ex tD A20 IP65 T100 °C, T85 °C
Explosion protection: FM for USA	
• FM approval	FM 3017742
• Type of protection XP, DIP, NI and S (version 7NG313x-5xxxx)	• XP / I / 1 / BCD / T5,T6; Type 4X • DIP / II, III / 1 / EFG / T5,T6; Type 4X • NI / I / 2 / ABCD / T5,T6; Type 4X • S / II, III / 2 / FG T5,T6; Type 4X
Other certificates	GOST, INMETRO, NEPSI

Communication	
Parameterization interface	
• PROFIBUS PA connection	
- Protocol	A&D profile, Version 3.0
- Protocol	EN 50170 Volume 2
- Address (for delivery)	126
- Function blocks	2 x analog
• FOUNDATION fieldbus connection	
- Protocol	FF protocol
- Protocol	FF design specifications
- Functionality	Basic or LAS
- Version	ITK 4.6
- Function blocks	2 x analog and 1 x PID
Factory setting	
for SITRANS TH400 PA	
Sensor	Pt100 (IEC)
Type of connection	3-wire circuit
Unit	°C
Failure mode	Last valid value
Filter time	0 s
PA address	126
PROFIBUS Ident No.	Manufacturer-specific
for SITRANS TH400 FF	
Sensor	Pt100 (IEC)
Type of connection	3-wire circuit
Unit	°C
Failure mode	Last valid value
Filter time	0 s
Node address	22

Selection and Ordering data	Article No.
Temperature transmitter in field enclosure with fieldbus communication and electrical isolation, with documentation on CD	**7NG313 - 0**
Integrated transmitter	
SITRANS TH400 with PROFIBUS PA	
• Without Ex protection	**70**
• With Ex ia (ATEX)	**71**
• With Ex nAL for zone 2 (ATEX)	**72**
• Total device SITRANS TF Ex d[1]	**74**
• Total device SITRANS TF according to FM (XP, DIP, NI, S)[1]	**75**
SITRANS TH400, with FOUNDATION fieldbus	
• Without Ex protection	**80**
• With Ex ia (ATEX)	**81**
• With Ex nAL for zone 2 (ATEX)	**82**
• Total device SITRANS TF Ex d[1]	**84**
• Total device SITRANS TF according to FM (XP, DIP, NI, S)[1]	**85**
Enclosure	
Die-cast aluminium	**A**
Stainless steel precision casting	**E**
Connections/cable inlet	
Screwed glands M20x1.5	**B**
Screwed gland s ½-14 NPT	**C**
Mounting bracket and fastening parts	
None	**0**
Made of steel	**1**
Stainless steel	**2**
Further designs Please add "**-Z**" to Article No. and specify Order code(s) and plain text.	Order code
Test report (5 measuring points)	**C11**
Bus connection	
• M12 plug (metal), without mating connector	**M00**[2]
• M12 plug (metal), with mating connector	**M01**[3]
Explosion protection	
• Explosion protection Ex ia to INMETRO (Brazil) (only with 7NG313.-1....)	**E25**
• Explosion protection Ex d to INMETRO (Brazil) (only with 7NG313.-4....)	**E26**
• Explosion protection Ex d to NEPSI (China) (only with 7NG313.-4....)	**E56**
Customer-specific programming Add "Ashley_18_09_13" to Article No. and specify Order code(s)	
Measuring range to be set Enter in plain text (max. 5 digits): Y01: ... to ... °C, °F	**Y01**[2]
Meas. point no. (TAG), max. 32 characters	**Y15**[4]
Meas. point descriptor, max. 32 characters	**Y23**[4]
Meas. point message, max. 32 characters	**Y24**
Bus address, specify in plain text	**Y25**[4]
Pt100 (IEC) 2-wire, R_L = 0 Ω	**U02**
Pt100 (IEC) 3-wire	**U03**
Pt100 (IEC) 4-wire	**U04**
Thermocouple type B	**U20**
Thermocouple type C (W5)	**U21**
Thermocouple type D (W3)	**U22**
Thermocouple type E	**U23**
Thermocouple type J	**U24**
Thermocouple type K	**U25**

Selection and Ordering data	Order code
Thermocouple type L	**U26**
Thermocouple type N	**U27**
Thermocouple type R	**U28**
Thermocouple type S	**U29**
Thermocouple type T	**U30**
Thermocouple type U	**U31**
With TC: CJC internal	**U40**
With TC: CJC: external (Pt100, 3-wire)	**U41**
With TC: CJC: external with fixed value, specify in plain text	**Y50**
Special differing customer-specific programming, specify in plain text	**Y09**[5]

[1] Without cable gland

[2] Here, you enter the initial and final value of the desired measurement range for customer-specific programming for RTD and TC.

[3] Not available for explosion protection Ex d or XP.

[4] If only Y15, Y23 or o.25 are ordered and the label only has to be on the tag plate, Y01 does not have to be specified.

[5] Here, you enter the initial and final value of the desired measurement range for customer-specific programming for mV, .

Selection and Ordering data	Article No.
Accessories	
CD for measuring instruments for temperature ► with documentation in German, English, French, Spanish, Italian and Portuguese, and parameterization software SIPROM T (included in delivery with SITRANS TF)	**A5E00364512**
SIMATIC PDM parameterization software also for SITRANS TF with TH400 PA	**see Sec. 8**
Mounting bracket and fastening parts	
Made of steel for 7NG313.-..B..	**7MF4997-1AC**
Made of steel for 7NG313.-..C..	**7MF4997-1AB**
Made of stainless steel for 7NG313.-..B.. ►	**7MF4997-1AJ**
Made of stainless steel for 7NG313.-..C..	**7MF4997-1AH**
Connection board	**A5E02391790**

► Available ex stock.

Ordering example 1:

7NG3137-0AB01-Z Y01+Y15+Y25+U03
Y01: 0...100 C
Y15: TICA1234HEAT
Y25: 33

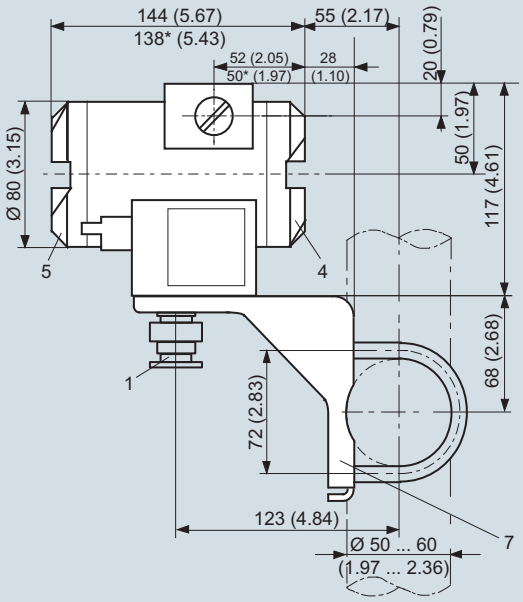
Ordering example 2:

7NG3137-0AC01-Z Y01+Y15+Y25+U25+U40
Y01: 0...300 C
Y15: TICA 1234 ABC 5678
Y25: 35

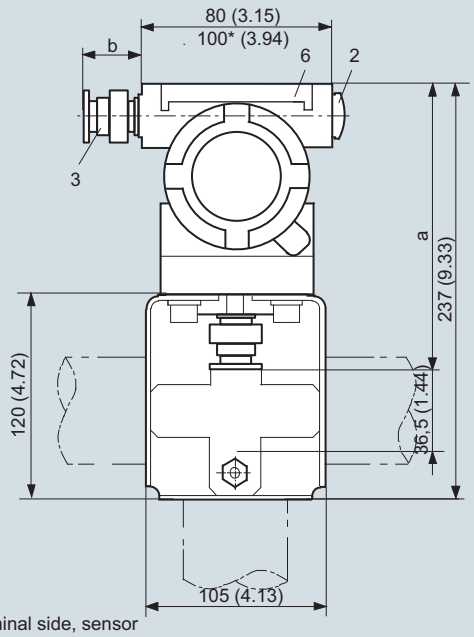
Factory setting:

- for SITRANS TH400 PA:
  - Pt100 (IEC) with 3-wire circuit
  - Unit: °C
  - Failure mode: last valid value
  - Filter time: 0 s
  - PA address: 126
  - PROFIBUS Ident No.: manufacturer-specific
- for SITRANS TH400 FF:
  - Pt100 (IEC) with 3-wire circuit
  - Unit: °C
  - Failure mode: last valid value
  - Filter time: 0 s
  - Node address: 22

Dimensional drawings



1 Sensor connection (screwed gland M20x1,5 or ½-14 NPT)
2 Blanking plug
3 Electrical connection (screwed plug M20x1,5 orr ½-14 NPT), optional M12 plug
4 Terminal side, bus connection

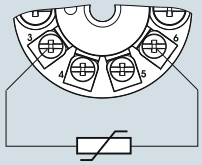


5 Terminal side, sensor
6 Protective cover (without function)
7 Mounting bracket (optional) with clamp securing to a vertical or horizontal pipe

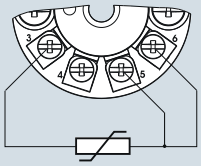
SITRANS TF with TH400, dimensions in mm (inches)

Schematics

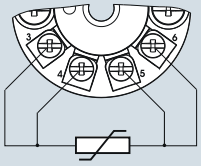
Resistance thermometer



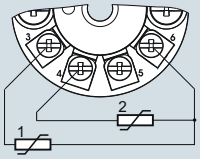
Two-wire system [1)]



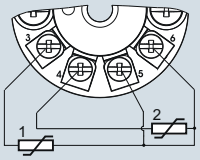
Three-wire system



Four-wire system

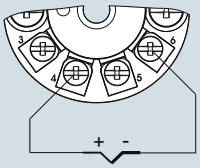


Mean-value/differential or
redundancy generation
2 x two-wire system [1)]

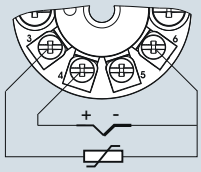


Mean-value/differential or
redundancy generation
1 sensor in two-wire system [1)]
1 sensor in three-wire system

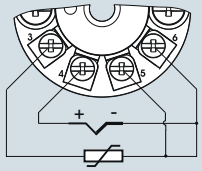
Thermocouple



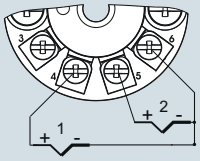
Internal
cold junction compensation



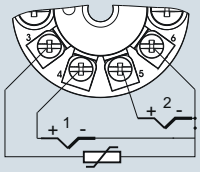
Cold junction compensation
with external Pt100 in two-wire system [1)]



Cold junction compensation
with external Pt100 in three-wire system

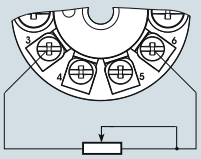


Mean value, differential or
redundancy generation with internal
cold junction compensation

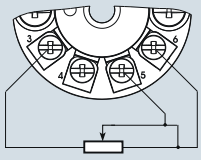


Mean value, differential or
redundancy generation and
cold junction compensation
with internal Pt100
in two-wire system [1)]

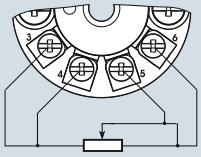
Resistance



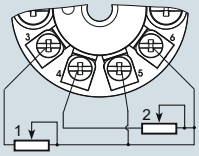
Two-wire system [1)]



Three-wire system

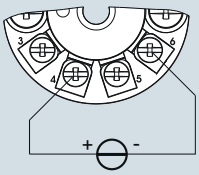


Four-wire system

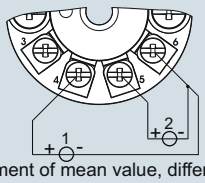


Mean value, differential or redundancy generation
1 resistor in two-wire system [1)]
1 resistor in three-wire system

Voltage measurement



One voltage source



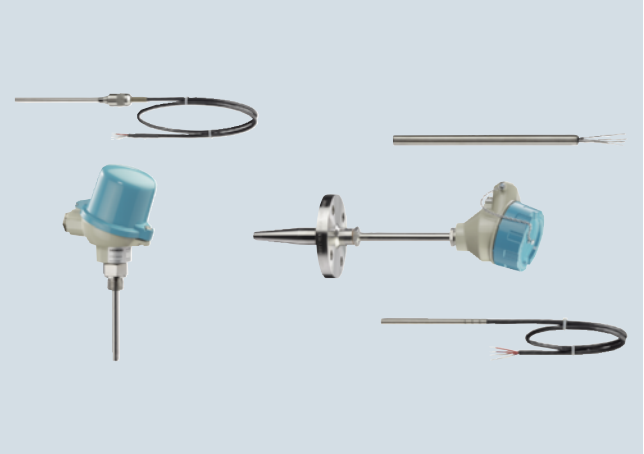
Measurement of mean value, differential and
redundancy with 2 voltage sources

[1)] Programmable line resistance for the purpose of correction.

SITRANS TF with TH400, sensor connection assignment

Technical description

Overview



Temperature sensors of the SITRANS TS product family are used to measure temperatures in industrial equipment.

Siemens offers the following temperature sensors:

- SITRANS TS100
  - General use
  - Compact design with connection cable
- SITRANS TS200
  - General use
  - Compact design with plug/wire ends
- SITRANS TS300
  - Use n food, pharmaceuticals and biotechnology
  - Modular or clamp-on design
- SITRANS TS500
  - General use
  - Modular design with connection head and thermowell

Benefits

The modular design makes it possible to customize the temperature sensor for most applications, while still being able to use many standardized individual components.

Application

Depending on the specification, sensors can be combined with different connection heads, neck tubes and process connections. As a result, the sensors can be used in a large number of technical applications in the following industries:

- Chemical industry
- Petrochemical industry
- Power engineering
- Primary industry
- Pharmaceutical industry
- Biotechnology
- Food manufacturing

SITRANS TS100 and SITRANS TS200

Temperature sensors of the SITRANS TS100 series are cable thermometers with different electrical connection options (e.g. plug, soldered connections, connection cables)

The SITRANS TS200 series of compact thermometers is charcterized by a compact design. Both temperature sensor series are suitable for the following:

- Measurements of temperatures of solids, where additional thermowells are not required for replacements done during ongoing operations, e.g. bearing block temperature.
- Measurements which are particularly critical with regard to response times. The advantages offered by an additional thermowell are purposely omitted.
- Measuring points which must be easy to convert or relocate.
- Surface temperature measurements: The temperature sensor is used in conjunction with a surface connection piece.
- Cost-effective transport: The mineral-insulated design allows for economically feasible transport even at large lengths. From a length of 0.8 m (2.63 ft), the sensors can be delivered rolled up or bended.

SITRANS TS300 temperature sensors for food, pharmaceuticals and biotechnology

The temperature sensors of the SITRANS TS300 series are thermometers especially designed for measurements with high hygienic demands, such as in the food, pharmaceutical and biotechnology industries. The basic versions are:

- Thermometers in modular design with replaceable measuring insert and process connections usual in the industry
- Clamp-on thermometers for measurement of the pipe surface temperature without interrupting the process

SITRANS TS500 Temperature sensors as a module system

Due to their modular design, temperature sensors of the SITRANS TS500 series are well suited to a large number of applications.

The replaceable measuring insert makes it possible to conduct maintenance work even during ongoing operations. These devices are used particularly frequently in vessels and pipelines of the following industries:

- Power stations
- Chemical industry
- Petrochemical industry
- General process engineering
- Water, waste water

Design

SITRANS TS100 7MC711xx

The following image illustrates the available designs for SITRANS TS100 temperature sensors:

SITRANS TS100, mineral-insulated (MIC)
IP54 at the transition sensor/cable, plug see table

Version	Degree of protection
Flying leads	IP00
LEMO coupling 1S	IP50
M12 plugs	IP54
Thermocouple coupling	IP20

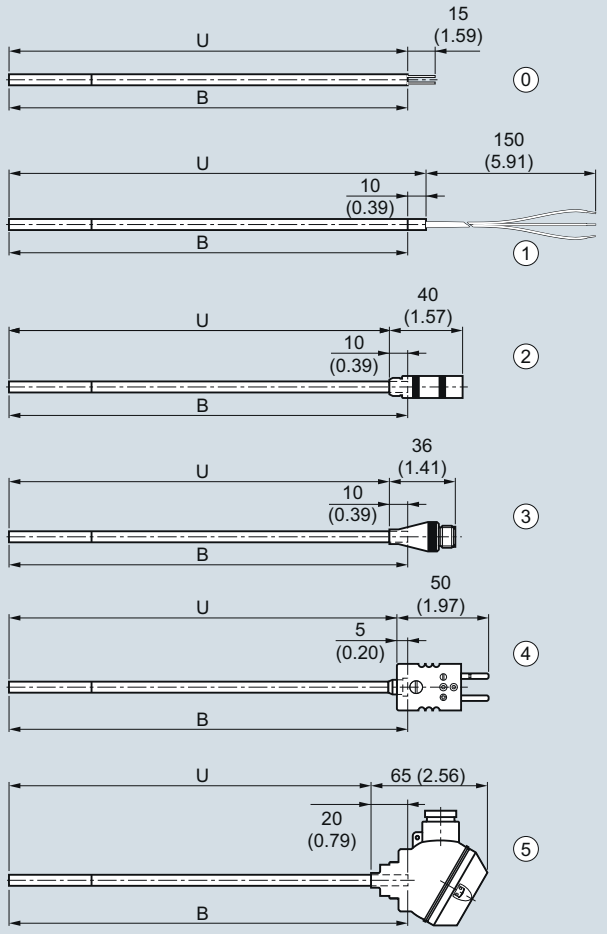
SITRANS TS100

The following types of process connections can be implemented:

- Compression fitting
- Spring-loaded compression fitting
- Soldering nipple
- Direct soldering/welding in

SITRANS TS200 7MC712xx

The following image illustrates the available designs for SITRANS TS200 temperature sensors:



B Measuring insert length
H Head height
U Insertion length

0	Basic sensor	**U = B**	IP00
1	Flying leads	**U = B + 10 (0.39)**	IP00
2	LEMO coupling 1S	**U = B - 10 (0.39)**	IP50
3	M12 plugs	U = B - 10 (0.39)	IP54
4	Thermocouple coupling	**U = B - 5 (0.20)**	IP20
5	Mini connection head	U = B - 20 (0.79)	IP54

SITRANS TS 200, dimensions in mm (inch)

The following types of process connections can be implemented:

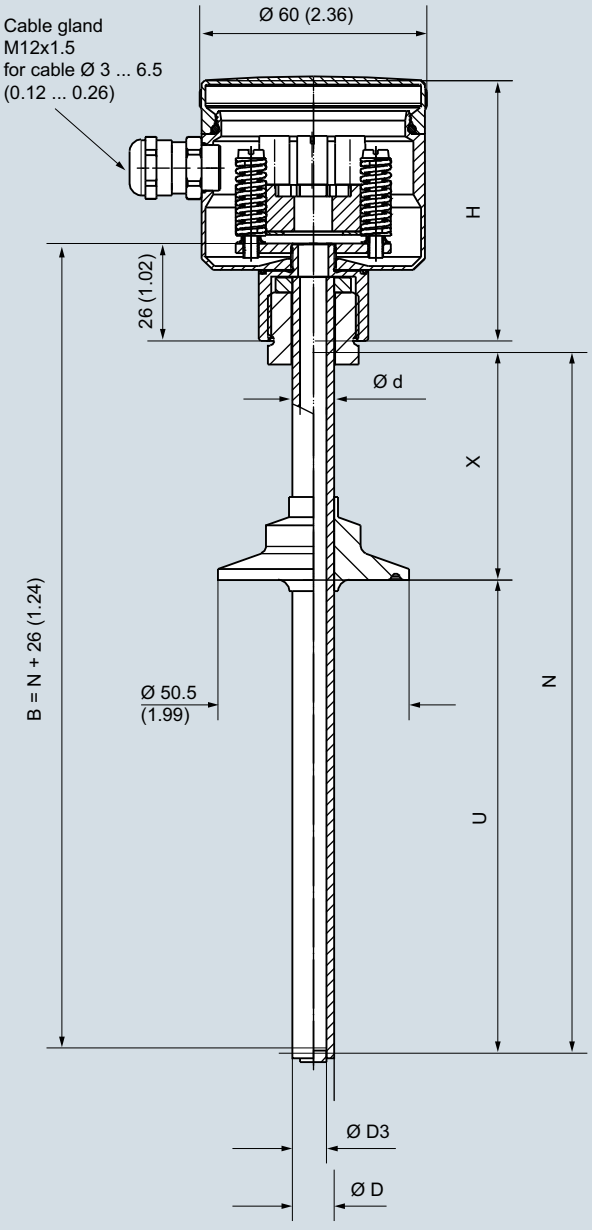
- Compression fitting
- Spring-loaded compression fitting
- Soldering nipple
- Direct soldering/welding in

Technical description

SITRANS TS300

SITRANS TS300 modular design

The following figure shows the available versions and components of the SITRANS TS300 temperature sensors in modular design.



B Measuring insert length
Ød Measuring insert outer diameter (6 (0.24))
ØD Process connection outer diameter
ØD3 Protective pipe inner diameter
H Head height
N Nominal length
U Insertion length
X Extension length

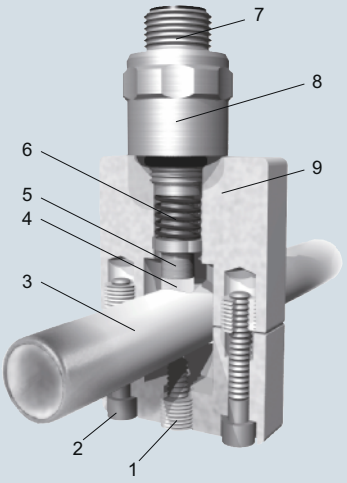
SITRANS TS modular design, dimensions in mm (inch)

SITRANS TS300 Clamp-on

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.

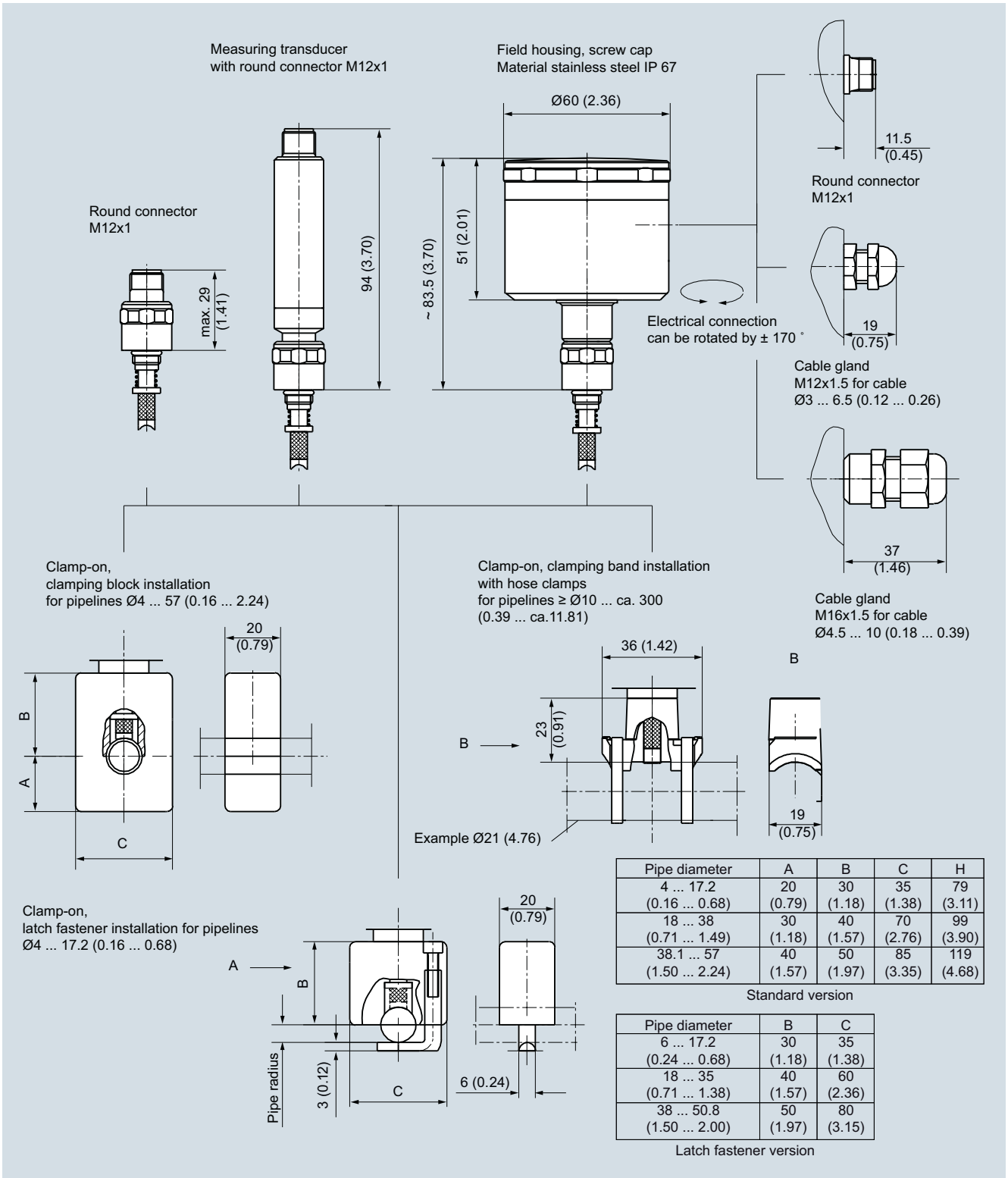


1 Vibration-locking-screw
2 Mounting screws
3 Process pipeline
4 Temperature sensor
5 Thermal decoupling
6 Spring load
7 Electrical connection M12
8 Replaceable measuring insert
9 Heat insulated pipe collar

Design

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

The following figure illustrates the available designs and components for SITRANS TS300 temperature sensors in clamp-on design:



Pipe diameter	A	B	C	H
4 ... 17.2 (0.16 ... 0.68)	20 (0.79)	30 (1.18)	35 (1.38)	79 (3.11)
18 ... 38 (0.71 ... 1.49)	30 (1.18)	40 (1.57)	70 (2.76)	99 (3.90)
38.1 ... 57 (1.50 ... 2.24)	40 (1.57)	50 (1.97)	85 (3.35)	119 (4.68)

Standard version

Pipe diameter	B	C
6 ... 17.2 (0.24 ... 0.68)	30 (1.18)	35 (1.38)
18 ... 35 (0.71 ... 1.38)	40 (1.57)	60 (2.36)
38 ... 50.8 (1.50 ... 2.00)	50 (1.97)	80 (3.15)

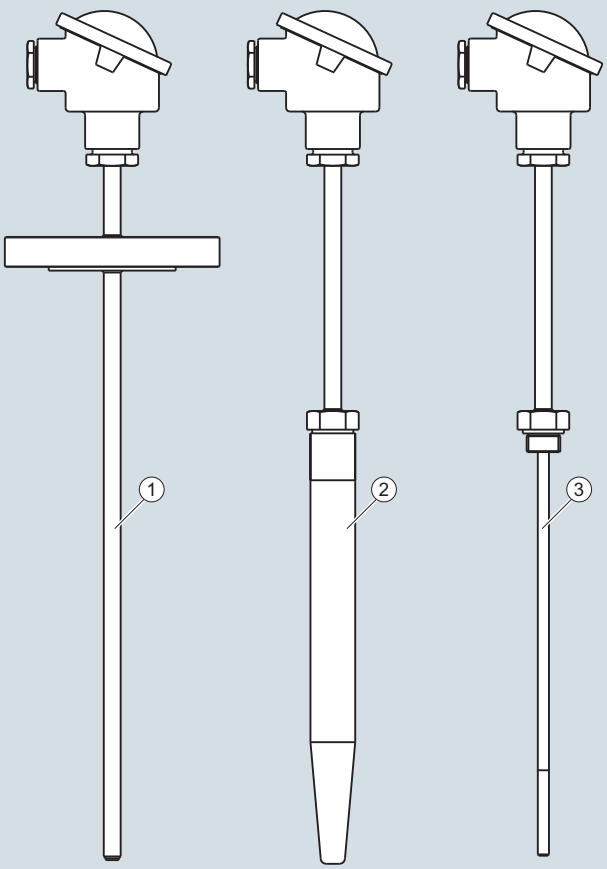
Latch fastener version

SITRANS TS300 clamp-on design, round connector, field enclosure, cable gland, versions, dimensions in mm (inch)

Technical description

SITRANS TS500 7MC75xx

The following image illustrates the available designs for SITRANS TS500 temperature sensors:



① SITRANS TS500, tubular thermowell
② SITRANS TS500, tubular thermowell
③ SITRANS TS500, for installation in an existing thermowell

SITRANS TS500 temperature sensors; the IP degree of protection depends on the connection head (see page 2/84)

The temperature sensors of the SITRANS TS500 series are available in three different designs:

Version	Description	Application	Process connection
1	• Tubular thermowell • Tubular thermowell and extension made of one pipe; closed at the tip with a welded bottom cap	Minimal to medium process load	• Welded connection with thread or flange • connection with compression fitting
2	• Barstock thermowell • Barstock thermowell, tubular extension, extension screwed into thermowell	Medium to highest process load	• Directly welded into pipeline • With welded flange • With male thread
3	• For installation into existing thermowells. • Tubular extension	Process load depends on thermowell design	Screwed into existing thermowell

Function

A complete measuring point consists of a measuring insert which contains the basic sensors, the protective fitting and an optional measurement value processor (transmitter).

The basic sensors are:

- Resistance thermometers:
  Temperature measurement is based on the temperature dependency of the installed measuring resistor.
- Thermocouples:
  Temperature measurement is based on the Seebeck effect. A thermocouple which subjected to a temperature drop produces thermoelectric voltage that can be measured.

Transmitters:

The optional Siemens transmitters assume the following functions:

- Optimum measurement processing
- Strengthening of weak sensor signals directly on site
- Transmits standardized signals
- Protects against electromagnetic interfrences
- Support enhanced diagnosis options

The resistance thermometer is intended for installation in containers and pipelines for hygienic requirements.

- Modular design consisting of protective pipe, measuring insert, connection head and optional transmitter for replacement during operation.
- Hygienic version, design according to recommendations of the EHEDG
- Transmitter can be integrated (4 to 20 mA, PROFIBUS PA or FOUNDATION Fieldbus)

Configuration

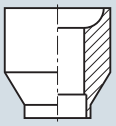
Components: Process connections

This catalog is limited to the standard versions. Special versions are available on request. The technical data is designed to assist the user. It is the responsibility of the ordering party to make the correct selection of suitable devices.

Welding

A welded thermowell provides a permanent, secure and highly resilient process connection. This advantage requires an adequate weld-in quality.

It is not possible to accidentally open the process conneciton. Additional gaskets are not required. If the tube is not thick enough to ensure a secure welding connection, the appropriate weldable sockets are used. With weldable sockets of matching length it is also possible to largely stadardize a plant's measuring points. Stocks of spare parts can therefore be reduced to a minimum

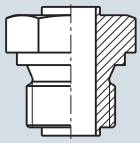


Weldable sockets

Thread

Type of installation: Welded threads

Welded threads of different thread types and sizes are firmly welded to the thermowell.



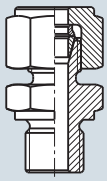
Welded threads

Type of installation: Compression fittings

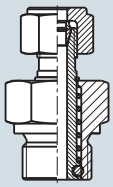
Compression fittings are available as accessories. They fit with the diameter of the thermowell and provide for flexible installation. The mounting length can be selected on site. When installed correctly, compression fittings are well suited for low and medium pressure.

The difference between a normal and spring-loaded design is as follows:

In the case of spring-loaded compression fitting, the sensor is pressed against the measured object or the tip of the thermowell, thus achieving outstanding heat contact.



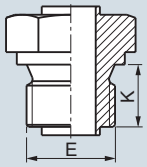
Compression fitting



Spring-loaded compression fitting

Thread type: Cylindrical thread

Cylindrical threads do not seal in the thread but due to an additional sealing face or seal. For example, threads with the short form "G" (as per ISO 228) feature a threat type with a defined screw gauge.

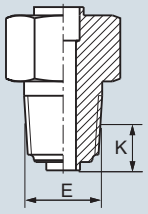


Cylindrical thread

The male threads of our G½ screw sockets fit with both female G½ as well as Rp½ threads.

Thread type: Tapered thread

Unlike cylindrical threads, tapered threads such as the American "NPT" seal metallically in the thread itself. The relevant length information in the catalog refers to the "torque point" of the thread, which cannot be precisely defined due to standardized tolerance levels. However, the spring unit of the measuring insert compensates for the differences in length.



NPT thread

Flanges

The different properties of the flanges are as follows:

- Standard series EN 1092, ASME 16.5,..
- Nominal pressure
- Nominal diameter
- Sealing face

This information is stamped into the flange, as well as the material code and batch number for "3.1 Material".

Industry-specific process connections

Special process connections have become popular in different industries. For example, hygiene technology: clamp connections, milk pipe unions and others.

Technical description

SITRANS TS300 Clamp-on

The pipe diameter of the measuring tube is required for correct device selection. For special sizes, you start by selecting the matching collar size and entering the required size in plain text. Space-saving designs are available (latch fastener version) for installation in a limited space (e.g., tube bundles).
For correct assignment after recalibration, the collar as well as the measuring insert are identified with serial number and pipe diameter. This information can also be engraved.

Components: Thermowell

Thermowells fulfill two basic functions:

- They protect the measuring insert from aggressive media
- They make it possible to replace units during ongoing operations

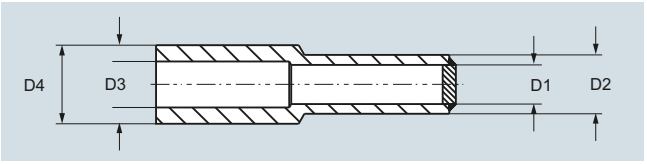
This catalog is limited to the standard versions. Special versions are available on request. The large number of available types can be classified as follows:

- Tubular thermowells
  Tubular thermowells are also described as "welded" or "multi-part" thermowells (not to be confused with "multi-part protective armatures"). They are suitable for low to medium process loads and can be manufactured on a cost-effective basis.
  Versions :
  - Form 2N similar to DIN 43772
    with straight tip and shortest possible extension length
    not adjustable connection head
  - Form 2 as per DIN 43772
    with straight tip and extension
    adjustable connection head
  - Form 2: with process connection
    Form 2G: Threaded connection
    Form 2F: Flange connection
  - Form 3 as per DIN 43772
    Design with tapered tip and extension
    adjustable connection head
    For these thermowells, thermowell tip is tapered by rotary swaging. This results in an excellent fit with the measuring insert and very good response times.
    Analogous to forms 2, versions 3/3G/3F are also available for form 3
- Barstock thermowells
  Where process loads are too high, or where thermowells with welded seams are not allowed, deep hole drilled barstock thermowells are used. Form 4 thermowells (as per DIN 43772) are very popular in this area. This thermowell type replaces the D1-D5 types of the predecessor standard DIN 43763:

DIN 43763 design invalid	DIN 43772 design 4 current	
	L	U
D1	140	65
D2	200	125
D4	200	65
D5	200	125

The following table shows the dimensions of the different thermowells.

	Tip		Process connection	
	Ø Inner [mm (inch)]	Ø Outer [mm (inch)]	Ø Inner [mm (inch)]	Ø Outer [mm (inch)]
Thermowell type, design	**D_1**	**D_2**	**D_3**	**D_4**
2N/2/2G/2F, tubular	7 (0.28)	9 (0.35)	7 (0.28)	9 (0.35)
2/2G/2F, tubular	7 (0.28)	12 (0.47)	7 (0.28)	12 (0.47)
3/3G/3F, tubular	6 (0.24) tolerance acc. to DIN 43772	9 (0.35)	7 (0.28)	12 (0.47)
4/4F, barstock	7 (0.28)	12,5 (0.49)	7 (0.28)	24 (0.94)
4/4F, fast response, barstock	3.5 (0.14)	9 (0.35)	3.5 (0.14)	18 (0.71)



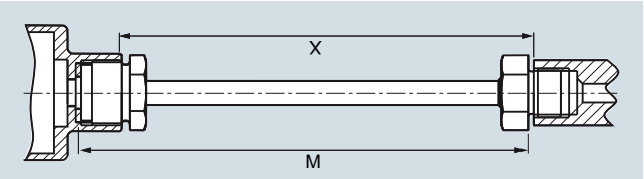
Sizing of thermowells

Components: Extension (neck tube)

The extension is the section from the lower edge of the connection head to the fixed point of the process connection or thermowell. There is a variety of terms for this components, e.g. neck tube. For this reason the term extension has been selected as a standardized term for the different designs. Function is the deciding factor:

- Thermal decoupling of connection head from process temperature see image page 16
- Installation of connection head over existing insulation
- Simple standardization of measuring inserts: In general, the length of the extension may be freely selected. However, when using standardized insertion lengths, the option "Extension as per DIN 43 772" is recommended. This ensures that measuring inserts which are quickly available can be used. In case of special lengths, it is possible to standardize the measuring insert length through a clever combination with the respective special extension length. This allows customers to optimize their costs in purchasing and logistics.
- In the case of American-designed sensors, the extension also takes the spring load of the measuring unit.
- Depending on the design, the extension can also be used to achieve an alignment of the connection head.
- The form of the extension depends on the form of the thermowell:
  - Tubular thermowell
    The extension and thermowell usually consist of one continuous tube. The process connection is welded on. (= one-piece protective armature).
  - Barstock thermowells
    Extension and thermowell of two components which are welded together. The process connection is attached to the thermowell (= multi-piece protective armature).

Thermowell type	X [mm (inch)]	M [mm (inch)]	Divisible
2G	129 (5.08)	145 (5.71)	No
2F	64 (2.52)	80 (3.15)	No
3G	131 (5.19)	147 (5.79)	No
3F	66 (2.60)	82 (3.23)	No
4 (only L=110)	139 (5.47)	155 (6.10)	Yes
4 (others)	149 (5.87)	165 (6.50)	Yes

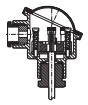
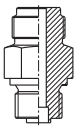
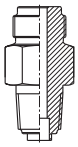
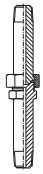


Extensions as per DIN 43772

Versions

With regard to their function, extensions can be classified into two types:

- Ajustable/not ajustable:
  Function on the neck tube to align the connection head to the desired direction
- Integrated measuring insert spring load:
  In the case of American-type sensors, the spring load of the measuring insert is integrated into the extension. Measuring insert and extension form one unit.

European type ajustable, cylindrical	European type ajustable, tapered	wihtout extension wihtout thread (optional gland)
		
European type not ajustable, cylindrical	**European type not ajustable, tapered**	**European type not ajustable, nipple**
		
European type ajustable nipple-union-nipple	**American type ajustable, nipple-union-nipple spring load**	**American type not ajustable nipple-union-nipple spring load**
		

Versions: particularly with heavy stainless steel connection heads in combination with vibration, a short extension length should be selected or external support should be provided.

Technical description

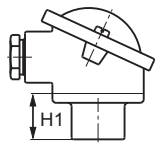
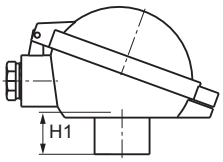
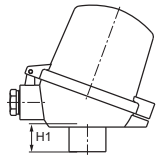
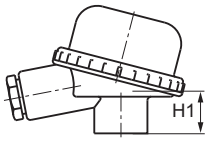
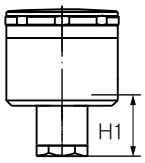
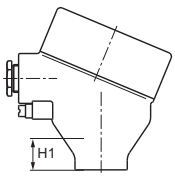
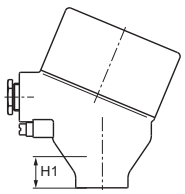
Components: Connection head

Connection head

The connection head protects the connection department.

The connection head features sufficient room for mounting a clamping base or transmitter.

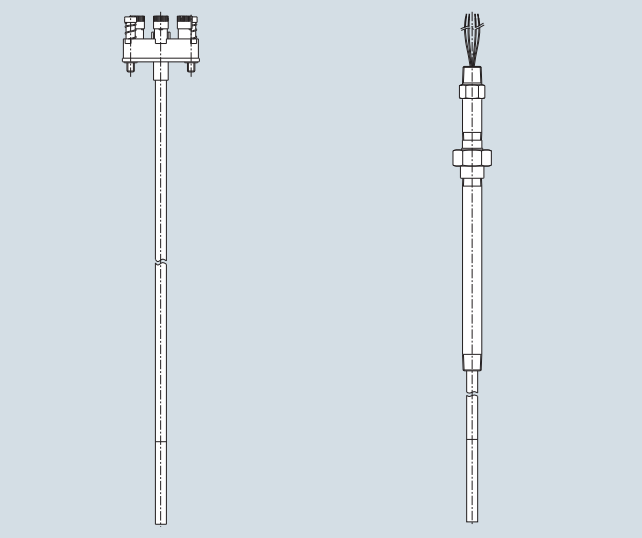
Different connection heads are used depending on the application and preference:

Connection head	Type Material	Designation	Degree of protection	Transmitter installation	Connection height H1 [mm (inch)]	Explosion protection optional
	BA0 Aluminum	Flange lid	IP54	Measuring insert	26 (1.02)	Ex i
	BB0 Aluminum	Hinged cover low	IP65	Measuring insert	26 (1.02)	Ex i
	BC0 Aluminum BP0 Plastic	Hinged cover high	IP65	Measuring insert and/or hinged cover (tandard)	26 (1.02)	Ex i
	BM0 Plastic	Screw cover	IP65	Measuring insert	26 (1.02)	Ex i
	BS0 Stainless steel	Screw cover	IP67	Measuring insert	26 (1.02)	Ex i
	AG0 Aluminum AU0 Stainless steel	Screw cover, heavy-duty	IP67	Measuring insert	41 (1.61)	Ex i, Ex d
	AH0 Aluminum AV0 Stainless steel	Screw cover, sight glass, heavy-duty	IP67	Measuring insert	41 (1.61)	Ex i, Ex d

Components: Measuring insert

Measuring insert

The measuring insert of the temperature sensor is built into the protective armature (thermowell, extension and connection head). The sensor element is protected in the measuring insert. The spring load of the Siemens measuring inserts provide good thermal contact with the bottom of the thermowell, and vibration resistance is significantly increased. Only highly resistant mineral-insulated cables (so-called MIC) are used for the electrical connection between the sensor element and connection head. The highly compacted insulation of magnesium oxide achieves excellent level of vibration resistance. The following measuring insert designs are the most widely used on the world market:



European type American type

European type

European type measuring inserts can be replaced without having to dismantle the connection head. The springs are located either on the transmitter or the terminal block. This makes it possible to achieve a 8 to 10 mm spring range. If no transmitter is mounted, there is a ceramic base in its place. However, with the order option G01, a version with free wire ends instead of a ceramic base can be selected for mounting head-mounted transmitters.

American type

American-type measuring inserts feature a large spring range. These measuring inserts are ideal for use with NPT threads with the typical loose tolerances. In this configuration, the extension function is partially or fully integrated (nipple-union-nipple). Moreover it is also possible to directly attach field devices, e.g. SITRANS TF.

Components: Transmitters

SITRANS TH head transmitters process the weak non-linear sensor signals and transmit a stable and temperature-linear standard signal, thereby minimizing sensor signal disruptions.

The transmitters permanently monitor the temperature sensors and transmit diagnostic data to superordinate systems.

Because of the low energy feed of the SITRANS TH head transmitters, self-heating of the temperature sensors can be maintained at minimal levels.

The electrical isolation and integrated cold junction ensure that temperature sensors with thermocouples provide reliable measurements at a low cost.

SITRANS TH product family

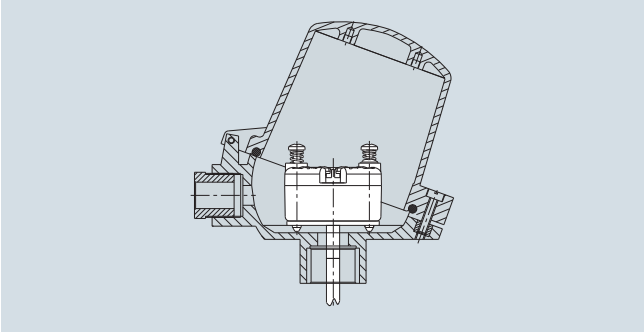
For detailed technical data on the SITRANS TH transmitters, please refer to the catalog FI 01.

- TH100 - the basic device
  - Output 4 to 20mA
  - for Pt100
  - can be configured using simple software
- TH200 - the universal device
  - Output 4 to 20mA
  - Resistance thermometer, thermocouples
  - can be configured using simple software
- TH300 - HART universal
  - Output 4 to 20 mA/HART
  - Resistance thermometer, thermocouples
  - HART conforming
  - Diagnostic functions
- TH400 - Fieldbus PA and FF
  - Output PROFIBUS PA or FOUNDATION Fieldbus
  - Resistance thermometer, thermocouples
  - Diagnostic functions; for detailed technical description of the SITRANS TH transmitter please refer to the related chapter of this catalog.

Installation types

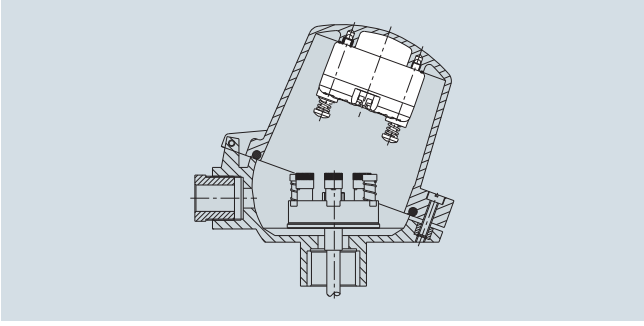
All SITRANS TH transmitters can be installed in type B connection heads. The following installation forms are used:

- Measuring insert installation
  Our standard version offers the following advantages
  - Small vibrating masses and compact design
  - Insert-transmitter unit can be replaced quickly



Installation of measuring insert

- Hinged cover installation
  - Standard for head type BC0 and BP0
  - Advantage: Measuring insert and transmitter can be repaired/maintained separately (recalibration).



Hinged cover installation

Technical description

Measuring technology: Sensor elements

The diverse application spectrum for industrial temperature measuring technology requires different sensor technologies.

Resistance thermometer

Sensor elements made of other basic materials with different nominal resistances or different underlying standards are available on request. Resistance thermometers can be classified as follows:

- Basic design:
  The sensor element is built with thin layer technology. The resistance material is applied in the form of a thin layer on a ceramic carrier material.
- Versions featuring increased vibration-resistance:
  In addition to the basic design, the vibration resistance is improved through extra measures.
- Versions with expanded measuring range:
  Elements in wire-wound design. The wire winding is embedded in a ceramic body.

Thermocouples

Other thermocouples based on other thermo couples or underlying standards are available upon request.

The most common base metal thermocouples include:

- Type N (NiCrSi-NiSi) high degree of stability even in upper temperature range.
- Type K (NiCr-Ni) more stable than type J, but drifts in upper range.
- Type J (Fe-CuNi) narrow application band

Measuring technology: Measuring range

The measuring range describes the temperature limits within which the thermometer can be used in a way that is meaningful for measurement purposes. Depending on the loads present, the thermowell materials and the desired accuracy levels, the actual application range for the thermometer may be smaller.

Resistance thermometer [°C (°F)]	
Basic version and increased vibration resistance	-50 ... +400 (-58 ... +752)
Expanded measuring range	-196 ... +600 (-320.8 ... +1112)

Thermocouple [°C (°F)]	
Type N	-40 ... +1100 (-40 ... +2112)
Type K	-40 ... +1000 (-40 ... +1132)
Type J	-40 ... +750 (-40 ... +1382)

Measuring technology: Measuring accuracy

Resistance thermometer

The tolerance classes of the resistance thermometers correspond with IEC 751/EN 60751:

Tolerance	**Δt**
Basic accuracy, Class B	±(0.30 °C +0.0050|t[°C]|) ±(0.54 °F +0.0050|t [°F]-32|)
Increased accuracy, Class A	±(0.15 °C +0.0020|t[°C]|) (±(0.27 °F +0.0020|t [°F]-32|))
High degree of accuracy, Class AA (1/3 B)	±(0.10 °C +0.0017|t[°C]|) (±(0.18 °F +0.0017|t [°F]-32|))

The following tables provide an overview of the scope of these tolerances. If you exceed the specified limits with a resistance thermometer, the values of the next lower accuracy class apply:

Resistance thermometer Basic version [°C (°F)]	
Tolerance	**Range**
Basic accuracy, Class B	-50 ... +400 (-58 ... +752)
Increased accuracy, Class A	-30 ... +300 (-22 ... +572)
High degree of accuracy Class AA (1/3 B)	0 ... 150 (32 ... 302)

Resistance thermometer Increased vibration-resistance [°C (°F)]	
Tolerance	**Range**
Basic accuracy, Class B	-50 ... +400 (-58 ... +752)
Increased accuracy, Class A	-30 ... +300 (-22 ... +572)
High degree of accuracy Class AA (1/3 B)	0 ... 150 (32 ... 302)

Resistance thermometer Expanded measuring range [°C (°F)]	
Tolerance	**Range**
Basic accuracy, Class B	-196 ... +600 (-321 ... +1112)
Increased accuracy, Class A	-100 ... +450 (-148 ... +842)

Thermocouples

The tolerance classes of the thermocouples correspond with IEC 584/EN 60584:

Catalog versions

Type	**Basic accuracy, Class 2**	**Increased accuracy, Class 1**
N	-40 °C ... +333 °C ±2.5 °C (-40 °F ... +631 °F ±4.5 °F) 333 °C ... 1100 °C ±0.0075x|t[°C]| (631 °F ... 2012 °F ±0.0075x|t[°F]-32|)	-40 °C ... +375 °C ±1.5 °C (-40 °F ... +707 °F ±2.7 °F) 375 °C ... 1000 °C ±0.004x|t[°C]| (707 °F ... 1832 °F ±0.004x|t[°F]-32|)
K	-40 °C ... +333 °C ±2.5 °C (-40 °F ... +631 °F ±4.5 °F) 333 °C ... 1000 °C ±0.0075x|t[°C]| (631 °F ... 1832 °F ±0.0075x|t[°F]-32|)	-40 °C ... +375 °C ±1.5 °C (-40 °F ... +707 °F ±2.7 °F) 375 °C ... 1000 °C ±0.004x|t[°C]| (707 °F ... 1832 °F ±0.004x|t[°F]-32|)
J	-40 °C ... +333 °C ±2.5 °C (-40 °F ... +631 °F ±4.5 °F) 333 °C ... 750 °C ±0.0075x|t[°C]| (631 °F ... 1382 °F ±0.0075x|t[°F]-32|)	-40 °C ... +375 °C ±1.5 °C (-40 °F ... +707 °F ±2.7 °F) 375 °C ... 750 °C ±0.004x|t[°C]| (707 °F ... 1382 °F ±0.004x|t[°F]-32|)

Other thermocouples, ignoble

Type	**Basic accuracy, Class 2**	**Increased accuracy, Class 1**
T	-40 °C ... 133 °C ±1 °C (-40 °F ... +271 °F ±1.8 °F) 133 °C ... 350 °C ±0.0075x|t[°C]| (271 °F ... 662 °F ±0.0075x|t[°F]-32|)	-40 °C ... +125 °C ±0.5 °C (-40 °F ... +257 °F ±0.9 °F) 125 °C ... 350 °C ±0.004x|t[°C]| (257 °F ... 662 °F ±0.004x|t[°F]-32|)
E	-40 °C ... +333 °C ±2.5 °C (-40 °F ... +631 °F ±4.5 °F) 333 °C ... 900 °C ±0.0075x|t[°C]| (631 °F ... 1652 °F ±0.0075x|t[°F]-32|)	-40 °C ... +375 °C ±1.5 °C (-40 °F ... +707 °F ±2.7 °F) 375 °C ... 800 °C ±0.004x|t[°C]| (707 °F ... 1472 °F ±0.004x|t[°F]-32|)

Other thermocouples. noble

Type	Basic accuracy, Class 2	Increased accuracy. Class 1
R and S	0 °C ... 600 °C±1.5 °C (32 °F ... 1112 °F±2.7 °F) 600 °C ... 1600 °C±0.0025 x |t| (1112 °F ... 2912 °F±0.0025 x |t|)	0 °C ... 1100 °C±1 °C (32 °F ... 2012 °F±1.8 °F) 1100 °C ... 1600 °C±[1 + 0.003 (t - 1100)] °C (2112 °F ... 2912 °F±[1.8 + 0.003 (t - 212)] °F)
B	600 °C ... 1700 °C±0.0025 x |t| (1112 °F ... 3092 °F±0.0025 x |t|)	

SITRANS TS300 Clamp-on

Measuring accuracy	
Reference conditions	
• Pipeline	13 x 1.5 mm (0.51 x 0.06 inch) made of stainless steel using using thermal paste
• Ambient temperature	20 °C (68 °F)
• Medium	Water, 120 °C (248 °F)
• Flow speed Measuring accuracy using thermal paste (The accuracy depends on the geometry of the pipeline, the medium and the ambient conditions. TM = process temperature; TA = ambient temperature)	3 m/s (9.84 ft/s)
• 3 m/s (9.84 ft/s) application	for 100 ... 150 °C (212 ... 302 °F) (TM-TA) x 0.01
• Application, alternative class A as per IEC 60751	-20 ... +150 °C (-4 ... 302 °F) (TM-TA) x 0.02

Measuring technology: Response times

Response time describes the speed of the measurement system in the case of a temperature change, and is typically indicated as T0.5 or T0.9. The values indicate the time in which a measured value has increased to 50% or 90% of the actual temperature increase.

The main variables which affect response time are as follows:

- Ideal thermowell geometry includes:
  - smallest possible material at the tip
  - use of conductive material
- Thermal connection of measuring insert to thermowell:
  Due to the optimized design of the Siemens inserts (small gap width, spring system), they feature very good response behavior. Because of the good fit, additional contact materials are not usually required except in certain applications e.g. attachment of a surface sensor.
- Size of temperature increase
- Medium and flow rate

Resistance thermometer

Typical values as per EN 60751 in water at 0.4m/s can be found in the following table.

Thermowell form	Diameter [mm (inch)]	T0.5	T0.9
None	6 (0.24)	6	15
Straight (2)	9 (0.35)	34	90
	12 (0.47)	45	143
Tapered (3)	12 (0.47)	15	31
Barstock (4) U=65	24 (0.95)	40	100
Barstock (4)] U=125	24 (0.95)	45	110

Thermocouples

Typical values as per EN 60751 in water at 0.4m/s can be found in the following table.

Thermowell form	Diameter [mm (inch)]	T0.5	T0.9
None	6 (0.24)	2	4
Straight (2)	9 (0.35)	20	63
	12 (0.47)	19	66
Tapered (3)	12 (0.47)	7	22
Barstock (4) U=65	24 (0.95)	22	73
Barstock (4)] U=125	24 (0.95)	20	53

Technical description

Measuring technology: Mounting depth

Measuring insert

Type	Temperature-sensitive length (TSL [mm (inch)]	Non-bendable length [mm (inch)]
Basic	50 (1.97)	30 (1.82)
Increased vibration resistance	50 (1.97)	30 (1.82)
Expanded measuring range	50 (1.97)	60 (2.36)
Thermocouple	20 (0.79)	5 (0.20)

Immersion depth/contact with media

Ambient conditions (temperature/climate/insulation) and the design of the thermowell, process connection and piping result in so-called "heat transmission errors".

To prevent such an error, the submersion depth and diameter of the thermowell tip will be defined. The temperature-sensitive length (TSL) of the thermowell must also be taken into account. The following rule of thumb can be used:

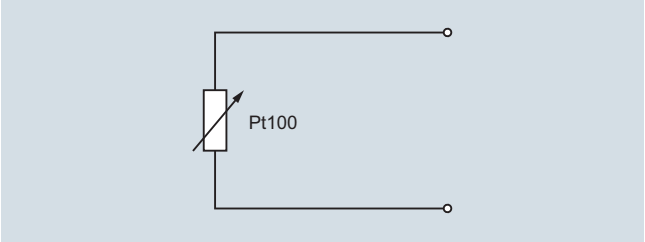
- Water
  Submersion depth ≥ TSL + 5 x Ø of thermowell
- Air
  Submersion depth ≥ TSL + 10 ... 15 x Ø of thermowell
- Recommendations
  - Select largest possible submersion depth
  - Select measuring location with higher flow velocity
  - Thermal insulation for outer thermometer components
  - Smallest possible surface for outer components
  - Insertion in pipe bends
  - Direct measurements without additional thermowell if no suitable solution can be found using other measures.

Measuring technology: Connection types

In the case of resistance thermometers, the type of sensor connection directly affects the level of accuracy:

Two-wire system

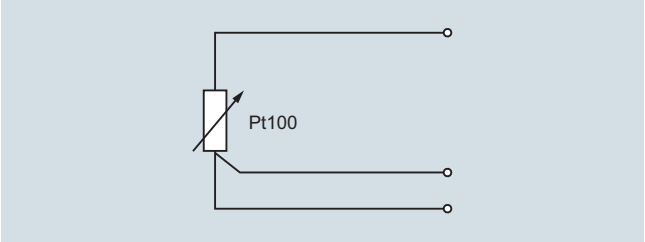
The resistance of sensor lines are included in the measurement result as an error. Adjustments are recommended in this case.



Pt100 Two-wire system

Three-wire system

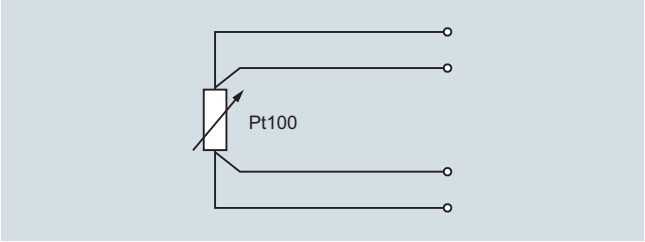
Line resistance is not included in the measurement result. Requirements: all terminal and line resistances (corrosion) are at the same level, and terminals are at the same temperature level.



Pt100 Three-wire system

Four-wire system

Line resistance is not included in the measurement result. This type of connection is the most secure and most accurate.



Pt100 Four-wire system

Siemens measuring inserts can be used to implement all types of connections for 1 x Pt100 devices. In the case of 2 x Pt100 versions, two- and three-wire systems are also possible. For measurement-related reasons, we always recommend a 1 x four-wire or 2 x 3-wire connection.

Temperature influence

At the connection head TS500[1)]

	Without transmitter [°C (°F)]	With transmitter [°C (°F)]
Aluminum or stainless steel	-40 ... +100 (-40 ... +212)	-40 ... +85 (-40 ... +185)
Plastic	-40 ... +85 (-40 ... +185)	-40 ... +85 (-40 ... +185)

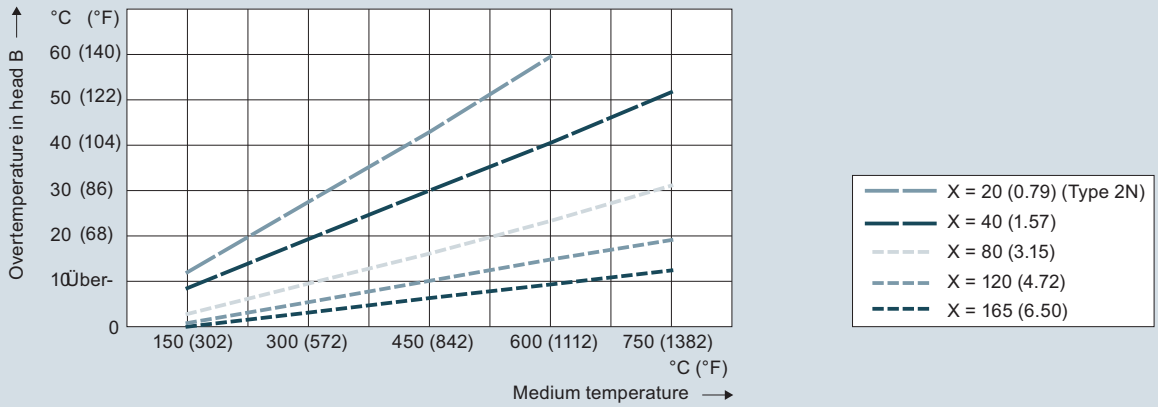
1) Notice manual at Ex-applications, please

At the TS100/200 connector/cable connection point:

The specified measuring range is valid for the hot end of the sensor. At the cold end, the maximum permitted temperature depends on the cables and plugs used. < 80 °C (176 °F) is uncritical for all types

Influence of extension

The illustration below assists you in selecting the right length for the neck tube. In this case, the following applies: Connection head temperature = Ambient temperature + Overtemperature. The temperature in the connection head can thus be assessed as follows:



Extension length X, effect on temperature, dimensions in mm (inch)

Please note that guidance values may change due to local conditions. Please consider these potential changes particularly with respect to explosion protection.

Also note that the accuracy of the transmitter also depends on the temperature in the connection head.

Technical description

SITRANS TS300 Clamp-on

Measuring accuracy	
Reference conditions	
• Pipeline	13 x 1.5 mm (0.51 x 0.06 inch) made of stainless steel using using thermal paste
• Ambient temperature	20 °C (68 °F)
• Medium	Water, 120 °C (248 °F)
• Flow speed Measuring accuracy using thermal paste (The accuracy depends on the geometry of the pipeline, the medium and the ambient conditions. TM = process temperature; TA = ambient temperature)	3 m/s (9.84 ft/s)
• 3 m/s (9.84 ft/s) application	for 100 ... 150 °C (212 ... 302 °F) (TM-TA) x 0.01
• Application, alternative class A as per IEC 60751	-20 ... +150 °C (-4 ... 302 °F) (TM-TA) x 0.02
Design	
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

Process connection/Thermowell

When selecting a process connection, the process parameters sometimes only allow a specific technology. In addition, regional standard-related and customer-specific requirements must be observed. The range of products therefore includes a broad selection of standard connections.

In the case of redesigned or newly designed facilities, it is possible to achieve cost savings by implementing various measures:

- Use of standard lengths through clever selection of screw, weld or flange sockets
- Moveable compression fittings

The temperature resistance of a material for process connections and thermowells also limits the application area of the temperature sensor. The temperature range indicated on the type plate always refers to the measuring insert, not the material which comes into contact with media. Two aspects must be considered when assessing temperature stability:

- What maximum temperature may the material reach without a load?
- What is the behavior under load?

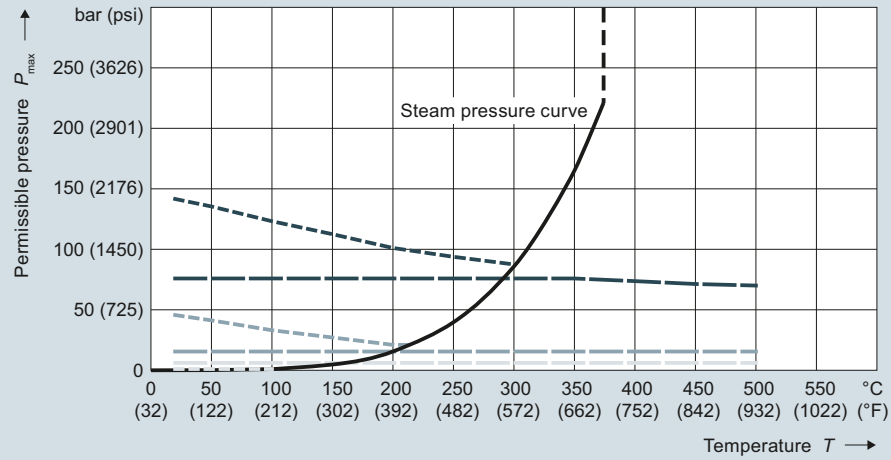
Process load

Because of the large variety of possible applications and variables, it is not possible to make general binding statements regarding the resilience of components which comes into contact with media. The load diagrams below can be used for common applications. However, where operating conditions vary significantly, please contact our technical support team.

Load on the thermowell and remedies:

The process itself	Correction options
Temperature	Material selection
Pressure	Thermowell type
Flow velocity	Insertion length, thermowell type
Viscosity	Insertion length, thermowell type
Vibration	Support against vibration
Corrosiveness	Material selection, coating
Abrasion (e.g. carbon dust)	Sensing rod, coating

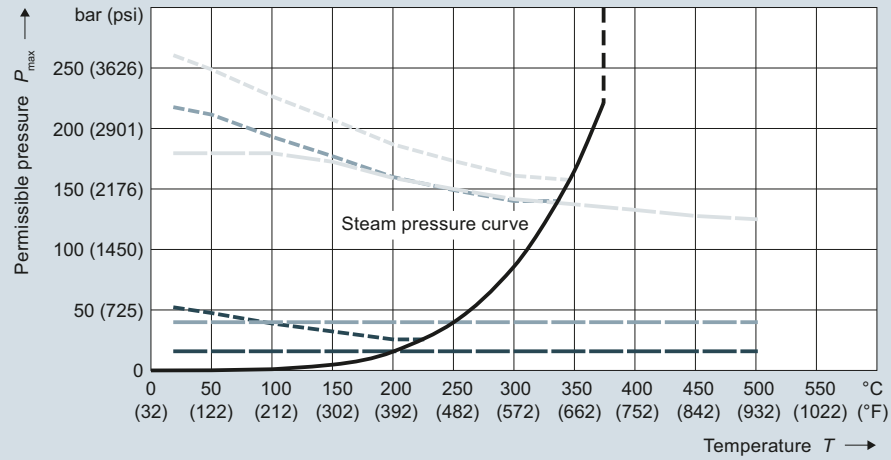
Load diagrams



Form 2/2G/2N/2F Ø9x1 (0.35x0.04)
Material No. 1.4571

	U	Speed v
– – –	140 (5.51)	v_W = 3 m/s
– – –	315 (12.40)	(9.84 ft/s)
– – –	510 (20.08)	
———	140 (5.51)	v_L = 25 m/s
———	315 (12.40)	(82.02 ft/s)
———	510 (20.08)	

Thermowells with Ø 9 x 1 mm (0.35 x 0.04 inch), dimensions in mm (inch)

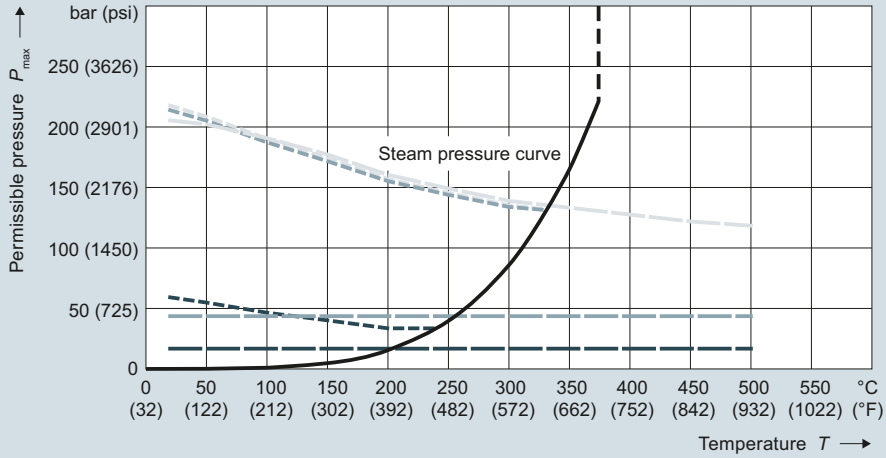


Form 2/2G/2N/2F Ø12x2.5 (0.47x0.10)
Material No. 1.4571

	U	Speed v
– – –	140 (5.51)	v_W = 3 m/s
– – –	315 (12.40)	(9.84 ft/s)
– – –	510 (20.08)	
———	140 (5.51)	v_L = 25 m/s
———	315 (12.40)	(82.02 ft/s)
———	510 (20.08)	

Thermowells with Ø 12 x 2.5 mm (0.47 x 0.10 inch), dimensions in mm (inch)

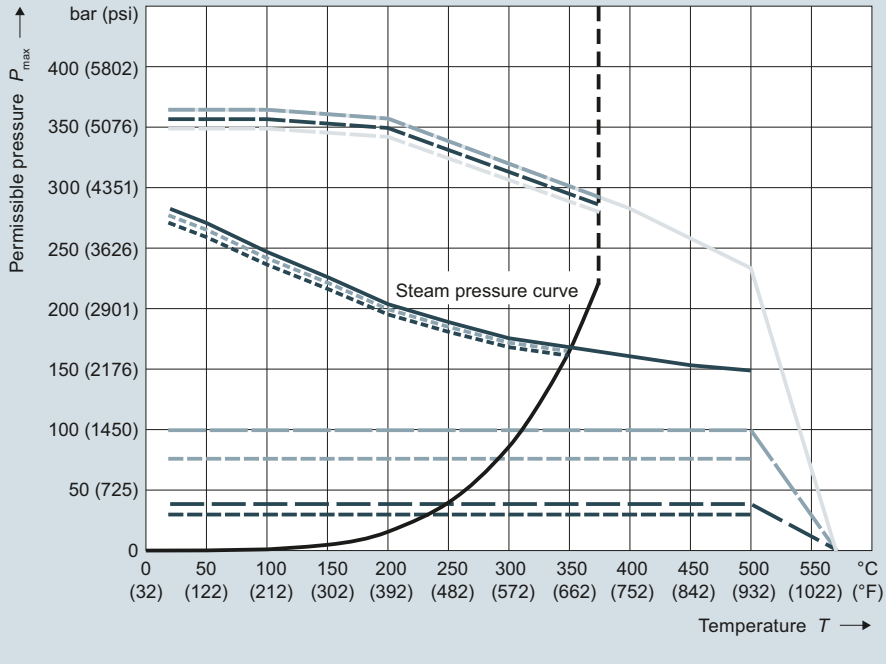
Technical description



Form 3/3G/2F Ø12x2.5 (0.47x0.10)
Material No. 1.4571

	U	Speed v
	140 (5.51) 315 (12.40) 510 (20.08)	v_W = 3 m/s (9.84 ft/s)
	140 (5.51) 315 (12.40) 510 (20.08)	v_L = 25 m/s (82.02 ft/s)

Thermowells with Ø 12 x 2.5 mm (0.47 x 0.10 inch), Ø 14 x 2.5 mm (0.55 x 0.10 inch), dimensions in mm (inch)



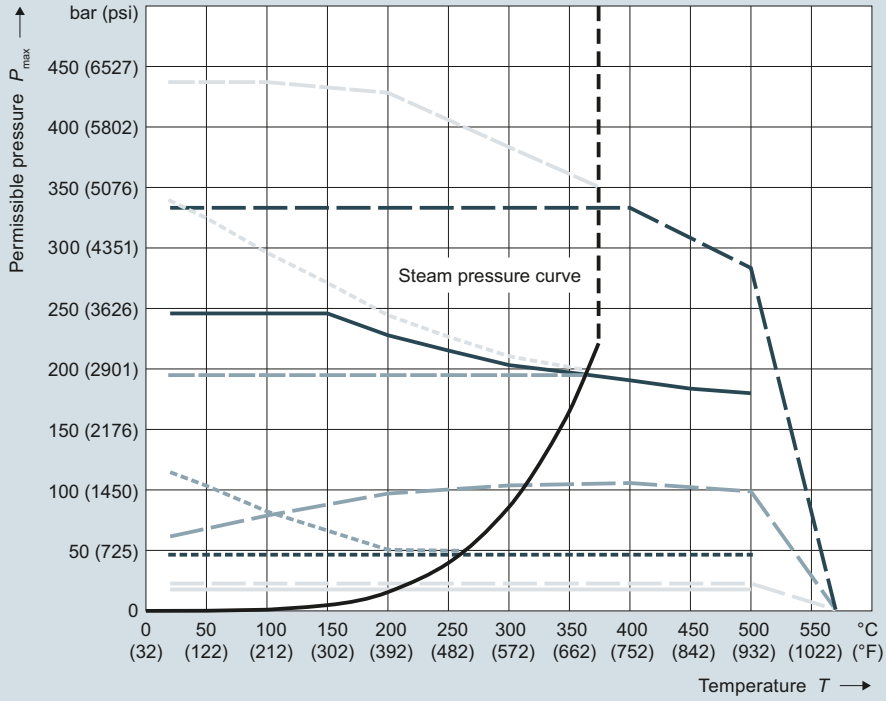
Form 4/4F Ø24 (0.94); C=65 (2.56)
Material No. 1.4571

	U	Speed v
	140/510 (5.51/20.08) 315 (12.40)	v_W = 5 m/s (16.40 ft/s)
	140 (5.51) 315 (12.40) 510 (20.08)	v_L = 40 m/s (131.20 ft/s)

Form 4/4F Ø24 (0.94); C=65 (2.56)
Material No. 1.7335

	U	Speed v
	140 (5.51) 315 (12.40) 510 (20.08)	v_W = 5 m/s (16.40 ft/s)
	140 (5.51) 315 (12.40) 510 (20.08)	v_L = 40 m/s (131.20 ft/s)

Thermowells with Ø 24 mm (0.95 inch), C= 65 mm (2.60 inch), dimensions in mm (inch)



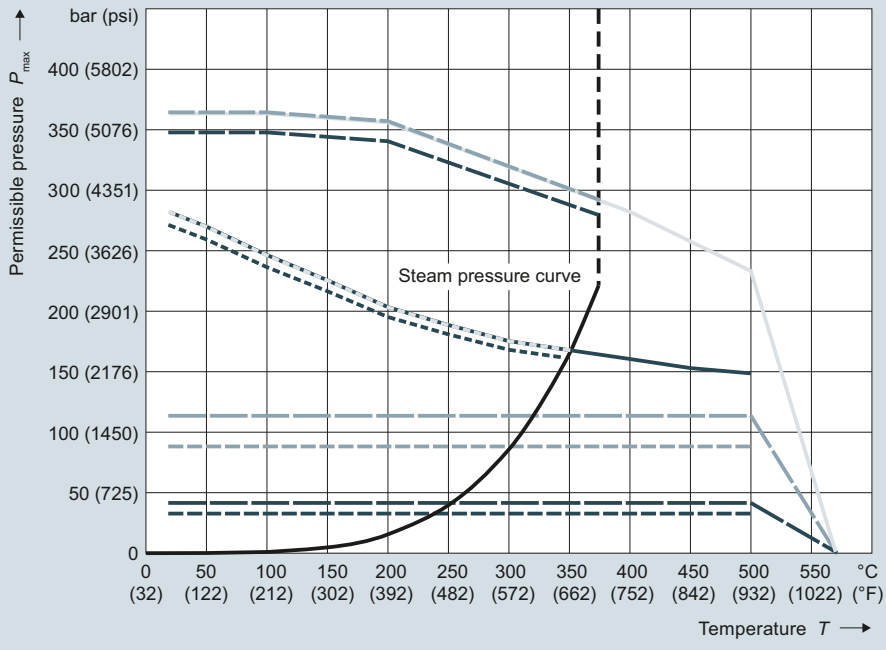
Form 4/4F Ø18 (0.71); C=65 (2.56)
Material No. 1.4571

	U	Speed v
	140/315 (5.51/12.40) 510 (20.08)	v_W = 5 m/s (16.40 ft/s)
	140 (5.51) 315 (12.40) 510 (20.08)	v_L = 40 m/s (131.20 ft/s)

Form 4/4F Ø18 (0.71); C=65 (2.56)
Material No. 1.7335

	U	Speed v
	140/315 (5.51/12.40) 510 (20.08)	v_W = 5 m/s (16.40 ft/s)
	140 (5.51) 315 (12.40) 510 (20.08)	v_L = 40 m/s (131.20 ft/s)

Thermowells with Ø 18 mm (0.71 in), C= 65 mm (2.60 inch), dimensions in mm (inch)



Form 4/4F Ø24 (0.94); C=125 (4.92)
Material No. 1.4571

	U	Speed v
	140/315 (5.51/12.40) 510 (20.08)	v_W = 5 m/s (16.40 ft/s)
	140 (5.51) 315 (12.40) 510 (20.08)	v_L = 40 m/s (131.20 ft/s)

Form 4/4F Ø24 (0.94); C=125 (4.92)
Material No. 1.7335

	U	Speed v
	140/315 (5.51/12.40) 510 (20.08)	v_W = 5 m/s (16.40 ft/s)
	140 (5.51) 315 (12.40) 510 (20.08)	v_L = 40 m/s (131.20 ft/s)

Thermowells with Ø 24 mm (0.95 inch), C= 125 in (4.92 in), dimensions in mm (inch)

Technical description

Thermowell calculation

Properly applied load diagrams will provide a sufficient degree of safety for the most common thermowell configurations.

However, there are cases in which operating conditions deviate too greatly from standard parameters. In this case, a customized thermowell calculation may be required.

Another reason for doing this calculation is the fact that flowing media can create turbulence at the tip of the thermowell under certain conditions. The thermowell will then vibrate and may even be destroyed if not configured correctly. This is the most frequent cause of thermowell bailure.

SIEMENS offers the two recognized methods for calculating the thermowell:

- DIN/Dittrich method
- ASME/Murdock method
  This method also takes into account turbulence formation on a mathematical level.

Both methods provide a high degree of safety with regard to thermowell configuration, however, they do not provide a guarantee against breakdowns.

Materials

Material descriptions/Standards comparison				**Max. temperature [°C (°F)] (unloaded)**	**Properties**	**Applications**
Mat. No.:	AISI/Trade name:	EN 10028-2:	Description			
1.4404	AISI 316 L	X2CrNiMo17-12-2	Austenitic stainless steel	600 (1112)	Good acid resistance, resistant against grain boundary corrosion	Chemical industry, waste treatment, paper and cellulose industry, food industry
1.4571	AISI 316 Ti	X6CrNiMoTi 17 12-2	Austenitic stainless steel	800 (1472)	Good acid resistance, resistant against grain boundary corrosion (supported by Ti portion)	Chemical industry, textile industry, paper and cellulose industry, water supply, food and pharmaceuticals
1.5415	A 204 size A	16Mo3	Carbon steel, high-alloy	500 (932)	Resistant at higher temperatures, well suited for welding	Steam turbines, steam lines, water pipes
1.7335	A 182 F11	13CrMo4-5	Carbon steel, high-alloy	540 (1004)	Resistant at higher temperatures, well suited for welding	Steam turbines, steam lines, water pipes
1.4841	SS 314	X15CrNiSi25-20	Austenitic heat-resistant stainless steel	1150 (2102)	Resistant at high temperatures, also resistant against low-O_2 and nitrogen-containing gases.	Flue gas, petrochemical industry, chemicals industry, power plants
1.4762	446	X10CrAl24	Ferritic heat-resistant steel	1150 (2102)	Resistant at high temperatures, in oxidizing and reducing sulphur-containing atmosphere	Chemical industry, power plants, steel industry, waste gas treatment
2.4816	Inconel 600	NiCr15Fe	Nickel-Chrome alloy	1150 (2102)	Resistant at high temperatures, resistant against chlorine-induced cold crack corrosion	Chemical industry, petrochemical industry, food industry
1.4876	Incoloy 800	X10NiCrAlTi32-21	Austenitic heat-resistant stainless steel	1100 (2012)	Excellent resistance against oxidation and carbonization at high temperatures, good corrosion resistance	O&G industry, waste gas treatment, power plants (steam boiler, heat exchanger), applications using aggressive fluids
2.4819	Hastelloy C 276	NiMo16Cr15W	Nickel-Chrome-Molybdenum alloy	1100 (2012)	Resistant at high temperatures, in oxidizing and reducing atmosphere, resistant against pitting and crevice corrosion, good corrosion resistance after welding	Chemicals industry, paper and cellulose industry, waste treatment, waste incinerators, emissions controls, shipbuilding and offshore industry
2.4360	Monel 400	NiCu30Fe	Nickel-Copper alloy	500 (932)	Excellent corrosion resistance, particularly against chlorine-induced cold crack corrosion	Chemical industry, offshore industry, nuclear technology, petrochemical industry

Where cost-intensive materials are used with flange thermowells, cost savings can be achieved by using a so-called flanged wheel. A thin disc of the material which comes into contact with media is applied prior to the flange (ordinary stainless steel).

Materials sensor tube/measuring inserts:

- SITRANS TSinserts, TS100, TS200
  - Resistance thermometer Cr-Ni-Mo
  - Thermocouples 2.4816/Inconel600

Vibration resistance of measuring insert, cable sensor

Similar to the thermowell, inner (Karman vortices) and outer (plant) vibrations also affect the measuring insert. For this reason, a special assembly of measurement elements is required. Other than a few exceptions for cable and compact thermometers, Siemens only produces sensors based on a mineral-insulated cable. Together with precautions taken when installing the measuring element, the Siemens basic version already exceeds EN 60751 by more than a factor of 3. Pursuant to the measurement methods of this standard, the following values are obtained (tip-tip):

- 10 g: Basic version and expanded measuring range
- 60 g: Increased vibration-resistance and thermocouple

Bending ability of measuring insert/cable sensor

All Siemens measuring inserts SITRANS TSinsert are made with a mineral-insulated cable (MIC). The same applies to a portion of the cable and compact thermometer. In addition to the properties already described, another advantage of the MIC is its bending ability. This makes it possible to install these thermometers even in difficult to access areas. Please ensure that you are not below the following bending radius:

Ø MIC [mm (inch)]	R_{min} = 4x Ø MIC [mm (inch)]
3 (0.12)	12 (0.48)
6 (0.24)	24 (0.95)

Where a smaller bending radius is required due to installation conditions, subsequent testing of the insulation resistance is recommended.

Electrical stability

Insulation resistance

The insulation resistance between each measuring circuit and the fitting is tested at a voltage of 500 V DC at room temperature.

$R_{iso} \geq 100\ M\Omega$

Due to the property of the mineral-insulated cable, the insulation resistance decreases as temperature increases. Because of the special production method, it is, however, possible to achieve very good values even at high temperatures.

Line resistance

When connected to two-wire systems, the line resistance is included in the measurement result. The following rule of thumb can be used:

- ∅ Measuring insert 3 mm (0.12 inch) 5 Ω/m or 12.8 °C (55.04 °F)
- ∅ Measuring insert 6 mm (0.24 in) 2.8 Ω/m or 44.78 (44.78)

For this reason a connection to three- or four-wire systems is highly recommended.

Approvals

Explosion protection according to ATEX and IECEx:

Designator	Addition	Type of protection	Ex-identifier
TS Insert	E01	Intrinsic safety "ia", "ic	II 1 D Ex ia IIIC T 200 °C Da II 1 G Ex ia IIC T6/T4…T1 Ga II 3 G Ex ic IIC T6/T4…T1 Gc
	E02	-	
	E03	for SITRANS TS500 with protection type Ex d	
	E04	-	
TS100	E01	Intrinsic safety "ia", "ic	II 1 D Ex ia IIIC T 200 °C Da II 1 G Ex ia IIC T6/T4…T1 Ga II 3 G Ex ic IIC T6/T4…T1 Gc
	E02, E03, E04	-	
TS200	E01	Intrinsic safety "ia", "ic	II 1 D Ex ia IIIC T 200 °C Da II 1 G Ex ia IIC T6/T4…T1 Ga II 3 G Ex ic IIC T6/T4…T1 Gc
	E02, E03, E04	-	
TS500	E01	Intrinsic safety "ia", "ic	II 1/2 D Ex ia/ib IIIC T200 °C Da/Db II 1/2 G Ex ia/ib IIC T6/T4…T1 Ga/Gb II 3 G Ex ic IIC T6/T4…T1 Gc
	E02	-	
	E03	Flameproof enclosure "d" Dust protection by enclosure "t" only in combination with connection heads code AG0, AH0, AU0, AV0, without cable gland	II 1/2 G Ex d IIC T6,T4,T3 II 1/2 D Ex tD A21 IP65 T85, 100, 150 °C
	E04	Non-sparking "n"	II 3 G Ex nA IIC T6/T4…T1 Gc

Pressure equipment directive:

This device is not included in the pressure device guideline; classification according to pressure device guideline (PED 97/23/EC), Directive 1/40; article 1, paragraph 2.1.4

In addition, statutory, standards-based or operating specifications also require additional testing. The results are certified in certificates as per EN 10204:

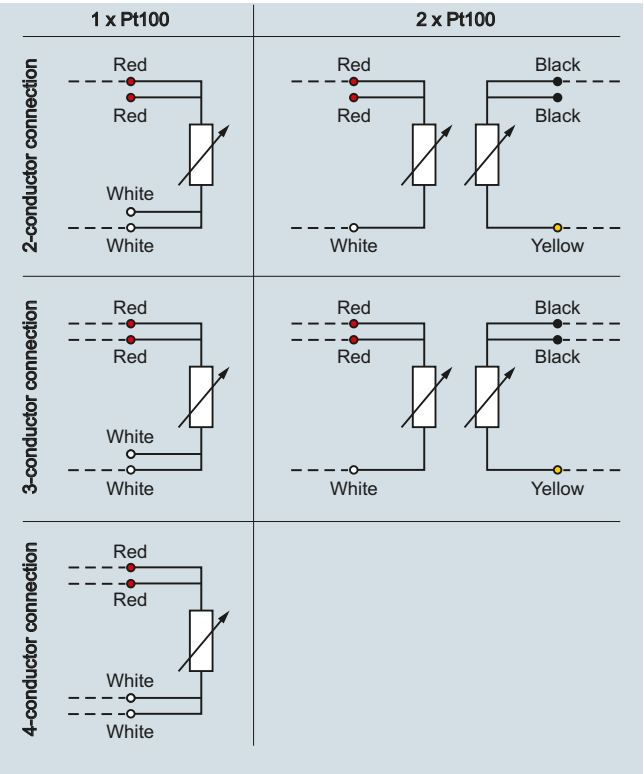
- As per EN 10204-2.1, order conformity
  Certificate in which Siemens confirms that the delivered products correspond with the requirements of the order, without indicating test results. The testing does not have to be carried out on the delivered devices.
- As per EN 10 204-3.1
  Certificate in which Siemens confirms that the delivered products meet the requirements set out in the order, with indication of the specific test results. Testing is carried out by an organization which is independent of production. The inspection certificate 3.1 replaces 3.1.B of the previous edition.
- Material certificate for parts which come into contact with media (C12)
  This certificate confirms the properties of the material and warrants traceability up to the melting batch.
- Pressure-resistant (C31)
  Hydrostatic pressure test on thermowell as per customer specifications. Where operating pressure is not specified, testing is carried out using the nominal pressure of the process connection.
- Helium leak test (C32)
  This test can be used to detect even the smallest leaks in thermowells and welded seams.
- Dye penetration test (C33)
  The dye penetration method can detect cracks and other surface defects.
- Comparative test (calibration) (Y33)
  The test object is measured in at an equalized temperature level against a highly precise thermometer, and the measured values of test object and normal values are documented. However, calibration requires the measuring insert to be of a certain minimum length.
  Measuring inserts can be calibrated together with the associated transmitter. Calibration values can be stored in the transmitter in order to increase the accuracy of the system.
- As per EN 10204-3.2
  This acceptance certificate can be prepared on request, together with an acceptance representative of the ordering party or a representative indicated as per official requirements (e.g. TÜV) It confirms that the delivered products meet the requirements set out in the order; it also contains the test results.

Schematics

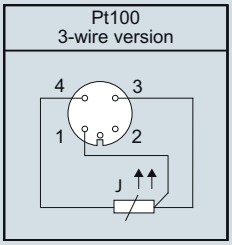
Resistance thermometer

Siemens measuring inserts are designed as a four-wire system for single Pt100 if not mentioned differently. This makes it possible to implement all of the aforementioned connection types.

Double Pt100 measuring inserts (for 6 mm OD only) are designed as a three-wire system.

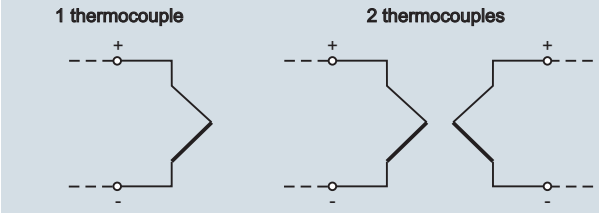


Schematics 1 x Pt100-2W up to 2 x Pt100-4W



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

Thermocouples



Type	+	-
J	Black	White
K	Green	White
N	Pink	White
E	Brown	White
L	Red	Blue
T	Red	White

Circuit diagram for thermocouple

Where thermocouples are used, the use of head transmitters offers particular advantages: The cold junction is already integrated into the universal transmitter. There is no need for expensive thermo or extension cable. This also removes a number of possible error sources. The weak millivolt signal of the thermocouple is already converted into a stable and temperature-linear DC or bus signal on site. This drastically reduces the effects of electromagnetic factors on the measurement result.

If a head transmitter is not installed, the sensor feed line consists either of the appropriate thermo or extension leads. The thermo line is made from the thermo material of the relevant thermocouple, while the extension lead uses a cost-effective substitute material. The extension cable behaves similar to a thermo line at an electrical level, within a limited temperature range of up to 200°C.

A wide spectrum of color coding is available for thermocouples on an international level. This must be taken into account during the electrical connecting.

Country	International/ Germany			North America			UK/ Czech Republic		
Standard	Not intrinsically safe[1]			Extension lead[2]			BS 1843		
	Jacket	+	-	Jacket	+	-	Jacket	+	-
N	PN	PN	WH	OG	OG	RD	OG	OG	BU
K	GN	GN	WH	YE	YE	RD	RD	BR	BU
J	BK	BK	WH	BK	WH	RD	BK	YE	BU
T	BR	BR	WH	BU	BU	RD	BU	WH	BU
E	VT	VT	WH	VT	VT	RD	BR	BR	BU
R+S	OG	OG	WH		BK	RD	GN	WH	BU
B	GY	GY	WH	GY	GY	RD	-	-	-

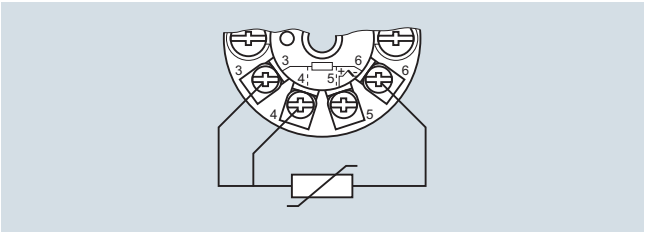
1) With an intrinsically safe line as per IEC 584-3, the sheath is always blue.
2) For thermo lines as per ANSI MC96, the sheath is always blue.

Country	Netherlands			Japan			France		
Standard	DIN 43714			ISC 1610-198			NF C42-323		
	Jacket	+	-	Jacket	+	-	Jacket	+	-
N	GN	RD	GN	BU	RD	WH	VT	VT	YE
K	BU	RD	BU	YE	RD	WH	BK	BK	YE
J	BR	RD	BR	BR	RD	WH	BU	BU	YE
T	BK	RD	BK	VT	RD	WH	OG	OG	YE
E	WH	RD	WH	BK	RD	WH	GN	GN	YE
R+S	GY	RD	GY	GY	RD	WH	-	-	-
B	GN	RD	GN	BU	RD	WH	VT	VT	YE

Abbreviation for colors				
BK: black	BR: brown	BU: blue	GD: gold	GN: green
GY: gray	OG: orange	PN: pink	RD: red	SR: silver
TQ: turquoise	VT: violet	WH: white	YE: yellow	

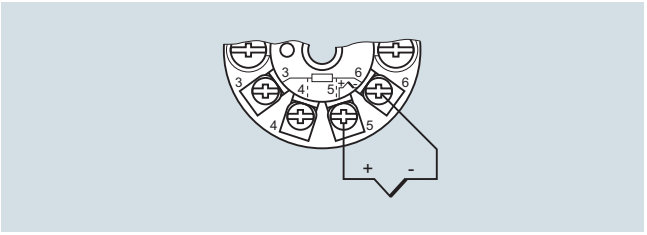
Transmitters

Where SITRANS TH transmitters are used in the connection head of the temperature sensor, connection takes place according to the following pattern

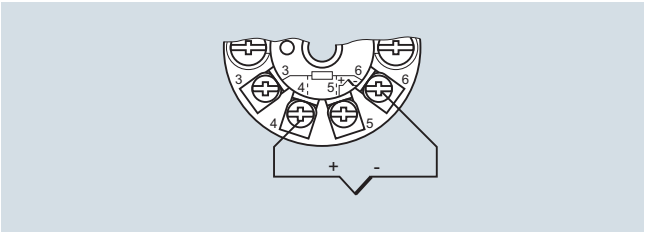


Resistance thermometer

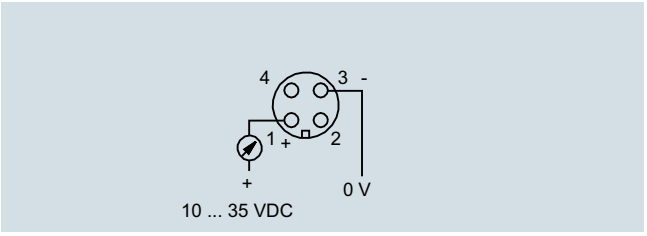
Thermocouples intern cold junction



SITRANS TH100/TH200/TH300



SITRANS TH400



SITRANS TS300SLIM

In addition, our transmitters also allow for a large number of other possible connections (e.g. difference, average, two sensors). More information can be obtained at:
http://www.siemens.com/temperature

Detailed product overview

Type	TSinserts	TS100	TS200
Description	Measuring insert	Temperature sensors in cable version	Temperature sensors in compact version
Application	Replaceable	Universal use	Universal use
Version	Mineral-insulated version	Mineral-insulated version	Mineral-insulated version
Type	in European or American type	For unfavorable space conditions	For unfavorable space conditions
Image			
Catalog page	2/160	2/108	2/112
Order	Nr. 7MC70*	7MC711*	7MC72*
Wetted material	Cr-Ni-Mo (RTD): 2.4816 (TC) (Cr-Ni-Mo; Inconnel600)	Cr-Ni-Mo (RTD); 2.4816 (TC) (Cr-Ni-Mo; Inconnel600)	Cr-Ni-Mo (RTD); 2.4816 (TC) (Cr-Ni-Mo; Inconnel600)
Thermowell types	To order separately	Without/with separate thermowell	Without/with separate thermowell
Process connections	-	Compression fittings • Soldering nipple: - G ¼, G ½ - ½ NPT - M 8x1, M18x1.5 • Surface connection piece for installation on surfaces/tubes	Compression fittings • Soldering nipple: - G ¼, G ½ - ½ NPT - M 8x1, M18x1.5 • Surface connection piece for installation on surfaces/tubes
Sensor elements	Pt100 + thermocouples	Pt100 + thermocouples	Pt100 + thermocouples
Sensor connection	• 1 x 4 wire • 2 x 3 wire	• 1 x 4 wire • 2 x 3 wire	• 1 x 4 wire • 2 x 3 wire
Sensor accuracy	• Class AA • Class A • Class B • Class 1 • Class 2	• Class AA • Class A • Class B • Class 1 • Class 2	• Class AA • Class A • Class B • Class 1 • Class 2
Connection heads	Type B (Type A flameproof)	Cable, optional with misc. plugs	• flying leads • misc. plugs
Explosion protection, (ATEX IECEx)	Intrinsic safety "ia", "ic" for TS500 in Ex d	Intrinsic safety "ia", "ic"	Intrinsic safety "ia", "ic"
Output signal	Sensor signal: • 4 ... 20 mA (TH100/TH200) • HART (TH300) • PA (TH400) • FF (TH400)	Sensor signal	Sensor signal
Application	Spare parts	• Machinery and equipment • Bearing temperature • Surfaces	• Machinery and equipment • Bearing temperature • Surfaces
Limit temperat.[1)] [°C (°F)]	• Pt100 basis: -30 ... +400 (-22 ... +752) • Pt100 extension: -196 ... +600 (-321 ... +1112) • Thermocouple: -40 ... +1100 (-40 ... +2012) (depends on type)	• Pt100 basis: -30 ... +400 (-22 ... +752) • Pt100 extension: -196 ... +600 (-321 ... +1112) • Thermocouple: -40 ... +1100 (-40 ... +2012) (depends on type)	• Pt100 basis: -30 ... +400 (-22 ... +752) • Pt100 extension: -196 ... +600 (-321 ... +1112) • Thermocouple: -40 ... +1100 (-40 ... +2012) (depends on type)
Max. nominal pressure[1)] (static pressure at 20°C)	-	Compression fitting max. 5 bar (145 psi)	Compression fitting max. 5 bar (145 psi)
Min. response time $t_{0.5}$	• 2 … 6 s	• 2 … 6 s	• 2 … 6 s
Degree of protection	IP54	See drawing page 2/77	See drawing page 2/77

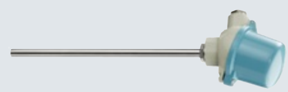
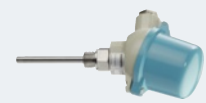
1) Load combinations (temperature, flow, vibration, pressure) can at times significantly restrict these values. Other temperature limits result from e.g. thermowel-materials with lower limit values [e.g. 1.4571 pressure resilient, 450 ... 550 °C (842 ... 1022 °F), limit temperature 800 °C (1472 °F)].

Type	TS300 Modular	TS300 Clamp-on
Description	Temperature sensors for food, pharmaceuticals and biotechnology	Temperature sensors for food, pharmaceuticals and biotechnology
Application	Measurements submersed in medium (pipelines and vessels)	Clamp-on measurement of pipe surface temperature
Version	Protective pipe similar to DIN 43772, Type 2F and tapered design	Protective pipe similar to DIN 43772, Type 2F and tapered design
Type		For unfavorable space conditions
Image		
Catalog page	2/116	2/120
Order	7MC8005*	7MC8016
Wetted material	1.4404 (316L)	1.4404 (316L)
Thermowell types	Similar to 2F	Similar to 2F
Process connections	DIN 11851, clamp connection (Triclamp/ISO 2852/DIN 32676), Varivent, Ingold connection (Fermenter connection), Neumo Biocontrol, ball weld sleeve, (gaskets are not included in scope of delivery)	Clamp-on connections suitable for the following pipe diameters: • Collar 4 ... 57 mm (0.16 ... 2.24 inch) • Tensioning 6 ... 50,8 mm (0.24 ... 2.00 inch) • Tensioning 50 ... 200 mm (1.97 ... 7.87 inch)
Sensor elements	Pt100	Pt100
Sensor connection	• 1x4 wire • 2x3 wire	• 1x3 wire
Sensor accuracy	• Class A	• Class A • Process-optimized design
Connection heads	Typ B	• Typ B
Explosion protection, (ATEX IECEx)	-	-
Output signal	Sensor signal: • 4 ... 20 mA (TH100/TH200) • HART (TH300) • PA (TH400) • FF (TH400)	Sensor signal: • 4 ... 20 mA TH100slim • HART (TH300) • PA (TH400) • FF (TH400)
Application	Surface roughness: Standard applications Ra < 1.5 µm (5.9 10^{-5} inch)	Surface roughness: Standard applications Ra < 1.5 µm (5.9 10^{-5} inch)
Limit temperat. [1] [°C (°F)]	-20 ... +400 °C (-4 ... +752 °F)	-40 ... +150 °C (-40 ... +302 °F)
Max. nominal pressure [1] (static pressure at 20°C)	0 ... 150 (0 ... 5.91) 50 bar 150 ... 300 (5.91 ... 11.81) 40 bar	No pressure load due to clamp-on principle
Min. response time $t_{0.5}$	20 ... 34 s	4 s (See "Reference conditions SITRANS TS300 Clamp-on" page 2/87)
Degree of protection	IP54 ... IP67 dep. to connection head, see page 2/84	IP65 for pipe collar, IP67 for elektrical connection

[1] Load combinations (temperature, flow, vibration, pressure) can at times significantly restrict these values. Other temperature limits result from e.g. thermowell-materials with lower limit values [e.g. 1.4571 pressure resilient, 450 ... 550 °C (842 ... 1022 °F), limit temperature 800 °C (1472 °F)].

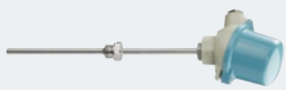
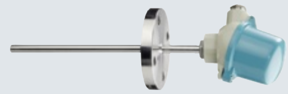
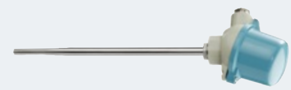
2

Detailed product overview

Type	TS500 for installation	TS500 Type 2	TS500 Type 2N
Description	Temperature sensors for the process industry (vessels and pipings)	Temperature sensors for the process industry (vessels and pipings)	Temperature sensors for the process industry (vessels and pipings)
Application	Temperature sensors for the installation of existing thermowells	Tubular version for minimal to medium stress	Tubular version for minimal to medium stress
Version	Suitable for thermowells as per DIN 43772 as well as ASME B40.9-2001	Thermowell as per DIN43722, Type 2 without process connection	Thermowell Type 2N similar to DIN 43772, screwed in
Type	With extension • European type • American type	• Without extension, plug-in • Use with moveable compression fittings	Without extension
Image			
Catalog page	2/156	2/124	2/128
Article No.	Nr. 7MC750*	7MC751*-0*(A/B)**-0***	7MC751*-1****-0***
Wetted material	None: Measuring insert made of 1.4404 (RTD); 2.4816 (TC) (316L; Inconnel600)	1.4404; 1.4571 (316L; 316TI)	1.4404; 1.4571 (316L; 316TI)
Thermowell types	To order separately	Form 2	Form 2N (similar to form 2)
Process connections	Connection to thermowell: • M14x1.5 • M18x1.5 • G ½ • ½ NPT	Compression fittings • G ½ • ½ NPT	• G ½ • ½ NPT
Insertion length	• 110 mm (4.33 inch) 2.5 inch 15 inch • 140 mm (5.51 inch) 4 inch 18 inch • 200 mm (7.87 inch) 6 inch 24 inch • 260 mm (10.24 inch) 9 inch • 410 mm (16.14 inch) 12 inch	Variable	• 100 mm (3.94 inch) • 160 mm (6.30 inch) • 230 mm (9.06 inch) • 360 mm (14.17 inch) • 510 mm (20.08 inch)
Neck tube length	as per DIN 43772	as per DIN 43772	not adjustable X=20 mm (0.79 inch)
Sensor elem.	Pt100 + thermocouples	Pt100 + thermocouples	Pt100 + thermocouples
Sensor connection	• 1 x 4 wire • 2 x 3 wire	• 1 x 4 wire • 2 x 3 wire	• 1 x 4 wire • 2 x 3 wire
Sensor accuracy	• Class AA • Class A • Class B • Class 1 • Class 2	• Class AA • Class A • Class B • Class 1 • Class 2	• Class AA • Class A • Class B • Class 1 • Class 2
Conn. heads	Type B (Type A for Ex d versions)	Type B (Type A for Ex d versions)	Type B (Type A for Ex d versions)
Explosion protection, (ATEX IECEx)	• Intrinsic safety "ia", "ic" • Flameproof enclosure "d" • Non sparking "n"	• Intrinsic safety "ia", "ic" • Flameproof enclosure "d" • Non sparking "n"	• Intrinsic safety "ia", "ic" • Flameproof enclosure "d" • Non sparking "n"
Output signal	Sensor signal: • 4 ... 20 mA (TH100/TH200) • HART (TH300) • PA (TH400) • FF (TH400)	Sensor signal: • 4 ... 20 mA (TH100/TH200) • HART (TH300) • PA (TH400) • FF (TH400)	Sensor signal: • 4 ... 20 mA (TH100/TH200) • HART (TH300) • PA (TH400) • FF (TH400)
Application	Pressure vessel and piping	Pressure vessel and piping	Pressure vessel and piping
Limit temperat.[1] [°C (°F)]	• Pt100 Basis: -30 ... +400 (-22 ... +752) • Pt100 extension: -196 ... +600 (-321 ... +1112) • Thermocouple: -40 ... +1100 (-40 ... +2012) (depends on type)	• Pt100 Basis: -30 ... +400 (-22 ... +752) • Pt100 extension: -196 ... +600 (-321 ... +1112) • Thermocouple: -40 ... +1100 (-40 ... +2012) (depends on type)	• Pt100 Basis: -30 ... +400 (-22 ... +752) • Pt100 extension: -196 ... +600 (-321 ... +1112) • Thermocouple: -40 ... +1100 (-40 ... +2012) (depends on type)
Max. nominal pressure[1] (static pressure at 20°C), dimensions in mm (inch)	s. thermowell	Tube Ø9 (0.35): • 0 ... 150 (0 ... 5.91) 50 bar • 150 ... 300 (5.91 ... 11.81) 40 bar • Compression fitting 5 bar Tube Ø12 (0.47): • 0 ... 150 (0 ... 5.91) 75 bar • 150 ... 300 (5.91 ... 11.81) 60 bar • Compression fitting 5 bar	Tube Ø9 (0.35): • 0 ... 150 (0 ... 5.91) 50 bar • 150 ... 300 (5.91 ... 11.81) 40 bar
Min. response time $t_{0.5}$	s. thermowell	20 … 45 s	20 … 34 s
Degree of prot.	IP54 ... IP67 dep. on connection head see page 2/84	IP54 ... IP67 dep. on connection head see page 2/84	IP54 ... IP67 dep. on connection head see page 2/84

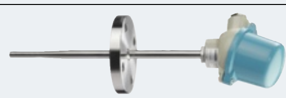
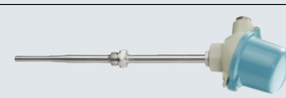
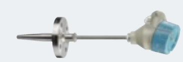
1) Load combinations (temperature, flow, vibration, pressure) can at times significantly restrict these values. Other temperature limits result from e.g. thermowell materials with lower limit values [e.g. 1.4571 pressure resilient, 450 ... 550 °C (842 ... 1022 °F), limit temperature 800 °C (1472 °F)].

Detailed product overview

Type	TS500 Type 2G	TS500 Type 2F	TS500 Type 3
Description	Temperature sensors for the process industry (vessels and pipings)	Temperature sensors for the process industry (vessels and pipings)	Temperature sensors for the process industry (vessels and pipings) **quicker than form 2**
Application	Pipe version for minimal to medium stress	Pipe version for minimal to medium stress	Pipe version for minimal to medium stress
Version	Thermowell as per DIN 43722, Type 2G, screwed in	Thermowell as per DIN 43722, Type 2F with flange	Thermowell as per DIN 43722, Type 3 without process connection, improved response time
Type	with extension	with extension	• Without extension, plug-in • Use with moveable compression fittings
Image			
Catalog page	2/132	2/136	2/140
Article No.	7MC751*-1*(A/B)**-1***	7MC751*-2*(A/B)**-1***	7MC751*-0*K**-0***
Wetted mater.	1.4404; 1.4571 (316L; 316TI)	1.4404; 1.4571 (316L; 316TI)	1.4404; 1.4571 (316L; 316TI)
Therm. types	Form 2G	Form 2F	Form 3
Process connections	Welded threads: • G 1 • G ½ • ½ NPT	Welded flange • DN 25, PN 40 • 1RF150 • 1.5RF150 • 1.5RF300	Compression fittings • G ½ • ½ NPT
Insertion length	• 160 mm (6.30 inch) • 250 mm (9.84 inch) • 400 mm (15.75 inch)	• 225 mm (8.86 inch) • 315 mm (12.40 inch) • 465 mm (18.31 inch)	• 225 mm (8.86 inch) • 315 mm (12.40 inch) • 465 mm (18.31 inch)
Neck tube length	As per DIN 43772	As per DIN 43772	As per DIN 43772
Sensor elements	Pt100 + thermocouples	Pt100 + thermocouples	Pt100 + thermocouples
Sensor connection	• 1 x 4 wire • 2 x 3 wire	• 1 x 4 wire • 2 x 3 wire	• 1 x 4 wire • 2 x 3 wire
Sensor accuracy	• Class AA • Class A • Class B • Class 1 • Class 2	• Class AA • Class A • Class B • Class 1 • Class 2	• Class AA • Class A • Class B • Class 1 • Class 2
Connection heads	Type B (Type A for Ex d versions)	Type B (Type A for Ex d versions)	Type B (Type A for Ex d versions)
Explosion protection, (ATEX IECEx)	• Intrinsic safety "ia", "ic" • Flameproof enclosure "d" • Non sparking "n"	• Intrinsic safety "ia", "ic" • Flameproof enclosure "d" • Non sparking "n"	• Intrinsic safety "ia", "ic" • Flameproof enclosure "d" • Non sparking "n"
Output signal	Sensor signal: • -4 ... 20 mA (TH100/TH200) • HART (TH300) • PA (TH400) • FF (TH400)	Sensor signal: • -4 ... 20 mA (TH100/TH200) • HART (TH300) • PA (TH400) • FF (TH400)	Sensor signal: • -4 ... 20 mA (TH100/TH200) • HART (TH300) • PA (TH400) • FF (TH400)
Application	Pressure vessel and piping	Pressure vessel and piping	Pressure vessel and piping
Limit temperat.[1] **[°C (°F)]**	• Pt100 Basis: -30 ... +400 (-22 ... +752) • Pt100 extension: -196 ... +600 (-321 ... +1112) • Thermocouple: -40 ... +1100 (-40 ... +2012) (depends on type)	• Pt100 Basis: -30 ... +400 (-22 ... +752) • Pt100 extension: -196 ... +600 (-321 ... +1112) • Thermocouple: -40 ... +1100 (-40 ... +2012) (depends on type)	• Pt100 Basis: -30 ... +400 (-22 ... +752) • Pt100 extension: -196 ... +600 (-321 ... +1112) • Thermocouple: -40 ... +1100 (-40 ... +2012) (depends on type)
Max. nominal pressure[1] **(static pressure at 20°C),** dimensions in mm (inch)	Tube Ø9 (0.35): • 0 ... 150 mm (0 ... 5.91 inch) 50 bar • 150 ... 300 (5.91 ... 11.81) 40 bar • Compression fitting 5 bar Tube Ø12 (0.47): • 0 ... 150 (0 ... 5.91) 75 bar • 150 ... 300 (5.91 ... 11.81) 60 bar	Tube Ø9 (0.35): • 0 ... 150 mm (0 ... 5.91 inch) 50 bar • 150 ... 300 (5.91 ... 11.81) 40 bar Tube Ø12 (0.47): • 0 ... 150 (0 ... 5.91) 75 bar • 150 ... 300 (5.91 ... 11.81) 60 bar Note restriction imposed by PN of the flange	Tube Ø12 (0.47): • 0 ... 200 (0 ... 7.87) 75 bar • 200 ... 300 mm (7.87 ... 11.81) 60 bar • Compression fitting 5 bar
Min. response time $t_{0.5}$	20 … 34 s	20 … 34 s	7 … 15 s
Degr. of protec.	IP54 ... IP67 dep. on connection head see page 2/84	IP54 ... IP67 dep. on connection head see page 2/84	IP54 ... IP67 dep. on connection head see page 2/84

[1] Load combinations (temperature, flow, vibration, pressure) can at times significantly restrict these values. Other temperature limits result from e.g. thermowell materials with lower limit values [e.g. 1.4571 pressure resilient, 450 ... 550 °C (842 ... 1022 °F), limit temperature 800 °C (1472 °F)].

Detailed product overview

Type	TS500 Type 3G	TS500 Type 3F	TS500 Type 4/4F
Description	Temperature sensors for the process industry (vessels and pipings) **faster as form 2**	Temperature sensors for the process industry (vessels and pipings) **faster as form 2**	Temperature sensors for the process industry (vessels and pipings) **Quick-respone version available**
Applic. area	Tubular version for minimal to medium stress	Tubular version for minimal to medium stress	Tubular version for medium to highest stress
Version	Thermowell as per DIN 43722, Type 3G, screwed in	Thermowell as per DIN 43722, Type 3F with flange	Thermowell to DIN 43722: • Type 4 for weld-in • Type 4F with flange
Type	with extension	with extension	with extension
Image			 
Catalog page	2/144	2/148	2/152
Article No.	7MC751*-1*K**-1***	7MC751*-2*K**-1***	7MC752*
Wetted material	1.4404; 1.4571 (316L; 316TI)	1.4404; 1.4571 (316L; 316TI)	Form 4F: 1.4404; 1.4571 (316L; 316TI) Additional Form 4: 1.7335; 1.5415(A 182 F11; A 204 Size A)
Thermowell types	Form 3G	Form 3F	• Form 4 • Form 4F
Process connections	Welded threads: • G 1 • G ½ • ½ NPT	Welded flange • DN 25, PN 40 • 1RF150 • 1.5RF150 • 1.5RF300	For 4 for welding in, Form 4F with flange: • DN 25, PN 40 • 1RF150 • 1RF300 • 1.5RF150 • 1.5RF300
Insertion length	• 160 mm (6.30 inch) • 220 mm (8.70 inch) • 280 mm (11.0 inch)	• 225 mm (8.86 inch) • 285 mm (11.22 inch) • 345 mm (13.60 inch)	Form 4F: as per customer-specification Form 4: • 110 mm (4.33 inch)fast • 140 mm (5.51 inch)fast/normal • 200 mm (7.87 inch)fast/normal • 260 mm (10.23 inch)normal
Neck tube length	As per DIN 43772	As per DIN 43772	As per DIN 43772
Sensor elem.	Pt100 + thermocouples	Pt100 + thermocouples	Pt100 + thermocouples
Sensor connection	• 1 x 4 wire • 2 x 3 wire	• 1 x 4 wire • 2 x 3 wire	• 1 x 4 wire • 2 x 3 wire
Sensor accuracy	• Class AA • Class A • Class B • Class 1 • Class 2	• Class AA • Class A • Class B • Class 1 • Class 2	• Class AA • Class A • Class B • Class 1 • Class 2
Conn. heads	Type B (Type A for Ex d versions)	Type B (Type A for Ex d versions)	Type B (Type A for Ex d versions)
Explosion prot., Europe	• Intrinsic safety "ia", "ic" • Flameproof enclosure "d" • Non sparking "n"	• Intrinsic safety "ia", "ic" • Flameproof enclosure "d" • Non sparking "n"	• Intrinsic safety "ia", "ic" • Flameproof enclosure "d" • Non sparking "n"
Output signal	Sensor signal: • -4 ... 20 mA (TH100/TH200) • HART (TH300) • PA (TH400) • FF (TH400)	Sensor signal: • -4 ... 20 mA (TH100/TH200) • HART (TH300) • PA (TH400) • FF (TH400)	Sensor signal: • -4 ... 20 mA (TH100/TH200) • HART (TH300) • PA (TH400) • FF (TH400)
Application	Vessels and pipings	Vessels and pipings	Vessels and pipings
Limit temperat.[1)] [°C (°F)]	• Pt100 Basis: -30 ... +400 (-22 ... +752) • Pt100 extension: -196 ... +600 °C (-321 ... +1112) • Thermocouple: -40 ... +1100 (-40 ... +2012) (depends on type)	• Pt100 Basis: -30 ... +400 (-22 ... +752) • Pt100 extension: -196 ... +600 °C (-321 ... +1112) • Thermocouple: -40 ... +1100 (-40 ... +2012) (depends on type)	• Pt100 Basis: -30 ... +400 (-22 ... +752) • Pt100 extension: -196 ... +600 °C (-321 ... +1112) • Thermocouple: -40 ... +1100 (-40 ... +2012) (depends on type)
Max. nominal pressure[1)] (static pressure at 20°C), dimensions in mm (inch)	Pipe Ø12 (0.47): • 0 ... 200 75 bar • 200 ... 300 60 bar	Pipe Ø12 (0.47): • 0 ... 200 75 bar • 200 ... 300 60 bar Note restriction imposed by PN of the flange	Mat. (1.4404; 1.4571) : • 65 450 bar • 125 350 bar • Mat. (1.7335; 1.5415) : • 65 500 bar • 125 400 bar Form 4F: Note restriction imposed by PN of the flange
Min. response time $t_{0.5}$	7 … 15 s	7 … 15 s	∅24 mm (0.95 inch): 20 … 45 s
Deg. of protect.	IP54 ... IP67 dep. on connection head, see page 2/84	IP54 ... IP67 dep. on connection head, see page 2/84	IP54 ... IP67 dep. on connection head, see page 2/84

1) Load combinations (temperature, flow, vibration, pressure) can at times significantly restrict these values. Other temperature limits result from e.g. thermowell materials with lower limit values [e.g. 1.4571 pressure resilient, 450 ... 550 °C (842 ... 1022 °F), limit temperature 800 °C (1472 °F)].

Old	Length	Material	Number of sensors + Ex		Connection head		New	Material		PA weights	PA characteristic	Thermowell form	Length of 1st digit	Length of 2nd digit	-	Neck tube	Connection side	Sensor type	Number of sensors			Ex protection
7MC1006-	■	D	■	1	■		**7MC751**	1	-	1	C	A	■	■	-	0	■	A	■			
	1												0	1								
	2												0	4								
	3												1	0								
	4												2	0								
	5												3	1								
			A																1			
			B																5			
			E																1		-Z	E01
			F																5		-Z	E01
					1												A					
					4												B					
					6												C					
					7												-					
7MC1007-	■	D	■	1	■		**7MC751**	1	-	1	C	A	■	■	-	1	■	C	■			
	5												0	4								
	6												1	2								
	7												2	2								
			A																1			
			B																5			
			E																1		-Z	E01
			F																5		-Z	E01
					1												A					
					4												B					
					6												C					
					7												-					
7MC1008-	■	D	■	1	■		**7MC751**	1	-	1	E	B	■	■	-	1	■	C	■			
	6												0	4								
	7												1	2								
			A																1			
			B																5			
					1												A					
					4												B					
					6												C					
					7												-					

Conversion assistance old appliance

Old	Length	Material	Number of sensors + Ex		Connection head		New	Material		PA weights	PA characteristic	Thermowell form	Length of 1st digit	Length of 2nd digit	-	Neck tube	Connection side	Sensor type	Number of sensors			Ex protection
7MC1010-	■	■	■	2	*		**7MC752**	■	-	0	N	■	■	0	-	■	■	C	■			
	1											A	0			1						
	2											A	0			9						N2D: X45 {Y45:209 mm}
	3											A	0			9						N2D: X45 {Y45:179 mm}
	4											B	0			1						
	5											B	0			9						N2D: X45 {Y45:179 mm}
	6											D	0			1						
	7											D	0			9						N2D: X45 {Y45:179 mm}
	8											E	0			9						N1D: X45 {Y45:119 mm}
		G						3														
		F						1														
			A																1			
			B																5			
			E																1		-Z	E01
			F																5		-Z	E01
					1												A					
					4												B					
					6												C					
					7												-					
7MC1017-	■	F	■	1	■		**7MC751**	1	-	2	A	B	■	■	-	9	■	C	■			N2D: X45 {Y45:129 mm}
	1												0	4								
	2												1	2								
			A																1			
			B																5			
			E																1		-Z	E01
			F																5		-Z	E01
					1												A					
					4												B					
					6												C					
					7												-					
7MC1041-	■	F	■	0	■		**7MC751**	1	-	2	A	K	■	■	-	1	■	C	■			
	1												1	1								
	2												1	4								
	3												1	7								
		A	A																1			
		A	B																5			
		E	A																1		-Z	E01
		E	B																5		-Z	E01
					1												A					
					4												B					
					6												C					
					7												-					

Old	Length		Number of sensors		Connection head		New	Diameter		Measuring insert type	Sensor	Number of sensors	Length of 1st digit	Length of 2nd digit								Ex protection
7MC1900-	■	E	A				7MC701	8	-	1	C	A	■	■								
	1												3	3								
	2												4	1								
	3												4	7							-Z	Y44: B=1025 mm
	4												4	7							-Z	Y44: B=1425 mm
7MC1910-	■	J	■				7MC701	6	-	1	C	■	■	■								
	1												1	3								
	2												1	7								
	3												2	1								
	4												2	3								
	5												2	5								
	6												2	7								
	7												3	5								
	8												2	0								
			A									A										
			B									D										
7MC1913-	■	A	■	■	2		7MC701	6	-	1	C	■	■	■							-Z	E01
	1												1	3								
	2												1	7								
	3												2	1								
	4												2	3								
	5												2	5								
	6												2	7								
	7												2	0								
	8												3	5								
			A	2								A										
			B	1								D										

Old	Length	Type of cable		External diameter of sheath			New			External diameter of sheath	Nominal length	Sensor	Number of sensors	Connection side								Ex-protection
7MC2027-	■	■	A	■	0		7MC711	1	-	■	■	K	1	1	-	0	A	A	0			
	1										B											
	2										D										-Z	Y44: U=300 mm
	3										D											
		A																			-Z	J03
		B																			-Z	S03
		C																			-Z	L03
				1						-												
				2						-												
				3						-												
				4						-												

Conversion assistance old appliance

Old	External diameter of sheath	Material of sheath	Type + number of sensor		Length		New			External diameter of sheath	Length	Sensor type	Number									Ex-protection
7MC2021-	■	■	■	-Z			7MC721	2	-	■	■	■	■	5	-	0	A	A	0			
	2									3												
	4									6												
		C																				
		L																				
			E									J	1									
			F									J	4									
			A									-	-									
			B									-	-									
			C									K	1									
			D									K	4									
					A01					C										-Z		Y44: U=250 mm
					A02					F												
					A03					M												
					A04					T												

Old	Length		Number of sensors	External diameter of sheath	Material of sheath		New			External diameter of sheath	Length	Sensor type	Number									Ex-protection
7MC2028-	■	A	■	■	■		7MC721	2	-	■	■	K	■	4	-	0	A	A	0			
	1										D										-Z	Y44: U=300 mm
	2										D											
			C										1									
			D										4									
				1						-												
				2						-												
				3						3												
				4						6												
					1																	
					2																	

Connection head, Form B	Alt	Neu
• Made of cast light alloy, with 1 cable bushing and		
- Screw cover	1	A
- Standard hinged cover	4	B
- Hinged cover high	6	C
• Made of stainless steel, with 1 cable bushing and screw cover	7	-
Measuring insert, single	A	1
Measuring insert, single, explosion protection	E	1 and additional E01
Measuring insert, double	B	5
Measuring insert, double, explosion protection	F	5 and additional E01

More information

Ordering examples for SITRANS TS100/200

Desired features	Article No.
SITRANS TS100	**7MC7111**
Sensor diameter	**6**
Standard length 200 mm (scope of sensor length 101 ... 250 mm)	**C**
Sensor	**A1**
flying leads	**1**
Enclosed compression fitting	**A41**
Connection cable PVC, 10 m	**J10**
TAG plate	**Y15: TTSA5458**

Full article no.:

7MC7111-6CA11-Z A41+J10+Y15
Y15: TTSA5458

Desired features	Article No.
SITRANS TS100	**7MC7111**
Sensor diameter	**6**
Standard length 200 mm (scope of sensor length 101 ... 250 mm)	**C**
Sensor	**A1**
flying leads	**1**
Enclosed compression fitting	**A41**
Connection cable PVC, 10 m	**J10**
TAG plate	**Y15: TTSA5458**
Customer-specific length 211 mm	**Y44: 211 mm**

Full article no.:

7MC7111-6CA11-Z A41+J10+Y15+Y44
Y15: TTSA5458
Y44: 211 mm

Ordering example for SITRANS TS500

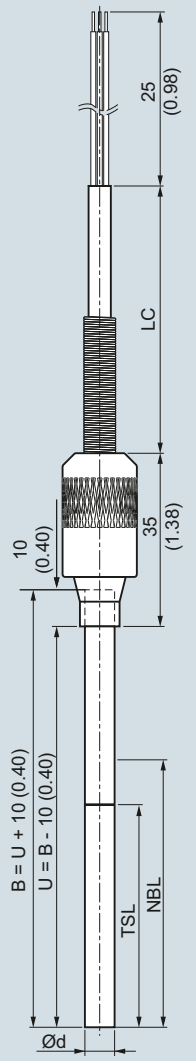
Desired features	Article No.
SITRANS TS500	**7MC751**
Material	**1**
Process connection	**1E**
Thermowell form	**A**
Insertion length U Standard 250 mm (insertion length customer-specific 220 mm)	**12**
Extension X customer-specific	**9**
Head	**C**
Sensor	**A**
Sensor number/Accuracy	**1**
Extension X customer-specific	**N2D**
Insertion length U customer-specific	**Y44: 220 mm**
Extension length X customer-specific	**Y45: 200 mm**
Plant calibration per 3-point	**Y33: 0°C** **Y33: 50°C** **Y33: 150°C**

Full article no.:

7MC7511-1EA12-9CA1-Z N2D+Y44+Y45 +Y33+Y33+Y33
Y44: 220 mm
Y45: 200 mm
Y33: 0°C
Y33: 50°C
Y33: 150°C

Cable mineral-insulated

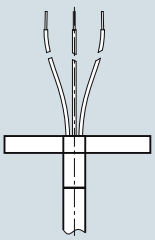
Dimensional drawings



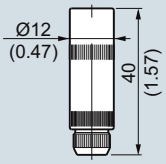
B	Measuring insert length
Ød	Measuring insert outer diameter (6 (0.24))
LC	Cable length
NBL	Non-bending length
TSL	Temperature-sensitive length
U	Insertion length

SITRANS TS100, temperature sensors in cable version, universal use, mineral-insulated version, for unfavorable space conditions, dimensions in mm (inch)

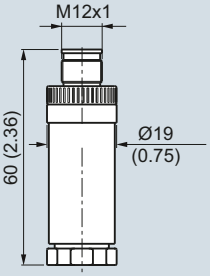
Design of connection side



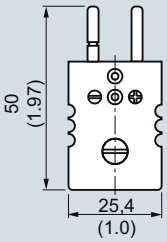
Flying leads, dimensions in mm (inch)



Coupling LEMO 1S, dimensions in mm (inch)



M12 plug, dimensions in mm (inch)



Thermocouple plug, dimensions in mm (inch)

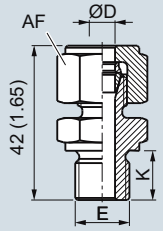
Selection and Ordering data	Article No.	Ord. Code
SITRANS TS100	**7MC7111-**	
Temperature sensors in cable version, universal use, mineral-insulated version, for unfavorable space conditions	■■■■■	■■■
Sensor diameter		
6 mm (0.24 inch)	**6**	
Special version	**7**	**H 1 Y**
Length of sensor element B, effective length U = B-10; see dimensional drawings page 2/108		
200 mm (7.87 inch)	**C**	
500 mm (19.68 inch)	**D**	
1 000 mm (39.37 inch)	**E**	
Customer-specific length of sensor element B, effective length U = B-10; see dimensional drawings page 2/108		
enter customer specific length with Y44, see Order Codes below		
70 ... 100 mm (2.76 ... 3.94 inch)	**B**	
Standard: 100 mm (3.94 inch)		
101 ... 250 mm (3.98 ... 9.84 inch)	**C**	
Standard: 200 mm (7.87 inch)		
251 ... 500 mm (9.88 ... 19.68 inch)	**D**	
Standard: 500 mm (19.68 inch)		
501 ... 750 mm (19.72 ... 29.53 inch)	**E**	
Standard: 750 mm (29.53 inch)		
751 ... 1 000 mm (19.72 ... 39.37 inch)	**F**	
Standard: 1 000 mm (39.37 inch)		
1 001 ... 1500 mm (39.4 ... 59.00 inch)	**G**	
Standard: 1500 mm (59.00 inch)		
Special length of sensor element, effective length U = B-10; see dimensional drawings page 2/108		
• Special length Sensor element >1 500 mm (59.06 inch)	**X**	
Sensor		
Pt100, basis, -50 ... +400 °C (-58 ... +752 °F)	**A**	
Pt100, vibration-resitant, -50 ... +400 °C (-58 ... +752 °F)	**B**	
Thermocouple Type K, -40 ... +1000 °C (-40 .... +1 832 °F)	**K**	
Thermocouple Type J, only class 2, -40 ... +750 °C (-40 ... +1 382 °F)	**J**	
Sensor number/Accuracy		
Single, basic accuracy (Class 2/Class B)	**1**	
Single, increased accuracy (Class 1/Class A)	**2**	
Single, highest accuracy (Class AA)	**3**	
Double, basic accuracy (Class 2/Class B)	**4**	
Double, increased accuracy (Class 1/Class A)	**5**	
Double, highest accuracy (Class AA)	**6**	
Special version of sensor type, number and accuracy	**Z 0**	**K 1 Y**
Design of connection side		
Flying leads	**1**	
LEMO coupling 1S	**2**	
M12 connector, not for double Pt100	**3**	
Thermocouple coupling, from TC-material (2xTC on request)	**4**	
Special version, connection side	**9**	**M 1 Y**

Selection and Ordering data	Order code
Further designs	
Add "**-Z**" to Article No. and specify Order Code.	
Enter sensor diameter in plain text	**H1Y**
Enter sensor type, number and accuracy in plain text	**K1Y**
Enter type of connection side in plain text	**M1Y**
Customer-specific length of sensor element B, effective length U = B-10 Select range, enter desired length in plain text (No entry = standard length)	**Y44**
Options	
Add "**-Z**" to Article No., add options, separate extensions with "+".	
Connection cable, type and length Cable type = 1st letter, Length 1 ... 99 m (3.28 ... 324.80 ft) = 2nd + 3rd place e.g.: 34 m (111.55 ft) connection cable PVC (PVC code is J34)	
with ?? meters connection cable (JJ) PVC/PVC, Operating temperature (-10...+105°C) (14 ... 221 °F)	**J01 ... J99**
with ?? meters connection cable (SLFP) Silicone/Fluorpolymer, operating temperature -10 ... +80 °C (-14 ... +356 °F)	**S01 ... S99**
with ?? meters connection cable (TGLV) PTFE/glass fiber/reinforced with stainless steel), Operating temperature (-100...+205°C (148 ... 401°F))	**L01 ... L99**
Special version of connection cable, enter cable type and length in plain text	**Y91**

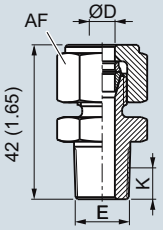
Additional configurations on page after next page!

You find ordering examples on page 2/107.

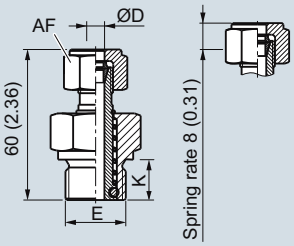
Cable mineral-insulated



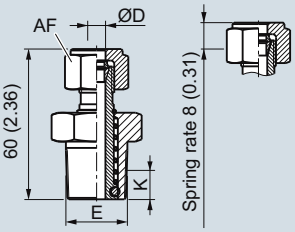
Compression fitting, dimensions in mm (inch)



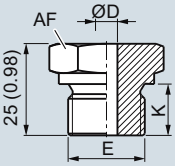
Compression fitting NPT, dimensions in mm (inch)



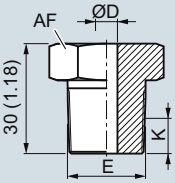
Spring-loaded compression fitting, dimensions in mm (inch)



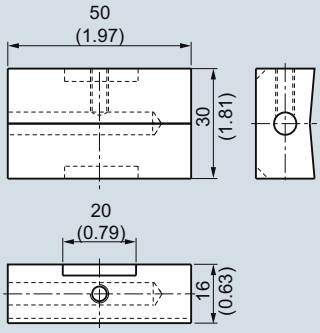
Spring-loaded compression fitting NPT, dimensions in mm (inch)



Soldering nipple, metric, dimensions in mm (inch)



Soldering nipple NPT, dimensions in mm (inch)



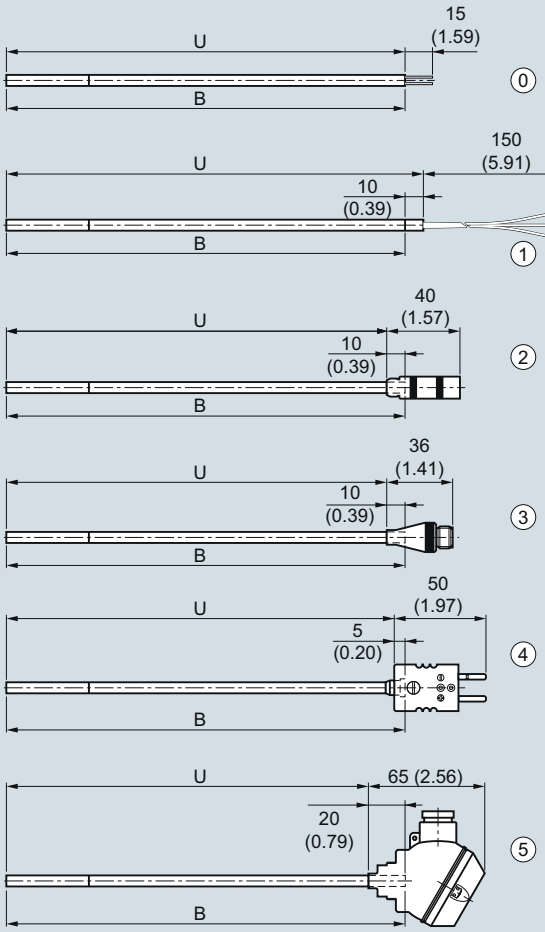
Surface connection piece, dimensions in mm (inch)

Selection and Ordering data	Order code
Process connection	
Soldering nipple G¼ ", enclosed	**A20**
Soldering nipple G½ ", enclosed	**A21**
Soldering nipple NPT½ ", enclosed	**A22**
Soldering nipple M18x1.5, enclosed	**A23**
Soldering nipple M8x1, enclosed	**A24**
Compression fitting G¼ ", enclosed	**A30**
Compression fitting G½ ", enclosed	**A31**
Compression fitting NP ½ ", enclosed	**A32**
Compression fitting M8x1, enclosed	**A34**
Compression fitting, spring-loaded G½ ", enclosed	**A41**
Compression fitting, spring-loaded NPT½ ", enclosed	**A42**
Compression fitting, spring-loaded M18x1.5, enclosed	**A43**
Compression fitting, spring-loaded, M8x1, enclosed	**A44**
Surface connection piece, enclosed	**A50**
Explosion protection	
Intrinsic safety "ia", "ic")	**E01**
Certificates and approvals	
EN10204-3.1 Inspection certificate for materials coming into contact with media	**C12**
EN10204-3.1 Inspection certificate visual: measurement and functional inspection	**C34**
NACE Standard MR-01-75 compliance	**C50**
ISO 9001 grease-free (cleaned for e.g. oxygen applications)	**C51**
Further options	
Stainless steel TAG plate , Enter lettering in plain text	**Y15**
Plant calibration per 1 point, enter temperature in plain text, Attention: For devices with built-in head transmitters, select test points within the set measurement range	**Y33**
Special versions	
Special version, enter in plain text	**Y99**

You find ordering examples on page 2/107.

Compact mineral-insulated

Dimensional drawings



B Measuring insert length
H Head height
U Insertion length

0	Basic sensor	**U = B**	IP00
1	Flying leads	**U = B + 10 (0.39)**	IP00
2	LEMO coupling 1S	**U = B - 10 (0.39)**	IP50
3	M12 plugs	U = B - 10 (0.39)	IP54
4	Thermocouple coupling	**U = B - 5 (0.20)**	IP20
5	Mini connection head	U = B - 20 (0.79)	IP54

SITRANS TS200, temperature sensors in cable version, universal use, mineral-insulated version, for unfavorable space conditions, dimensions in mm (inch)

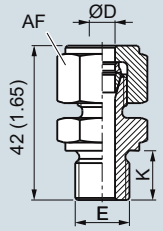
Selection and Ordering data	Article No.	Ord. Code
SITRANS TS200	**7MC7212-**	
Temperature sensors in compact version, universal use, mineral-insulated version, for unfavorable space conditions	■■■■■	■■■
Sensor diameter		
6 mm (0.24 inch)	**6**	
Special version	**9**	**H 1 Y**
Length of sensor element B, effective length U see dimensional drawing on page 2/112		
200 mm (7.87 inch)	**C**	
500 mm (19.68 inch)	**D**	
750 mm (29.53 inch)	**E**	
Customer-specific length of sensor element B, effective length U see dimensional drawing on page 2/112		
enter customer specific length with Y44, see Order Codes below		
70 ...100 mm (2.76 ... 3.94 inch) Standard: 100 mm (3.94 inch)	**B**	
101 ... 250 mm (3.98 ... 9.84 inch) Standard: 200 mm (7.87 inch)	**C**	
251 ... 500 mm (9.88 ... 19.68 inch) Standard: 500 mm (19.68 inch)	**D**	
501 ... 750 mm (19.72 ... 29.53 inch) Standard: 750 mm (29.53 inch)	**E**	
751 ... 1 000 mm (29.57 ... 39.37 inch) Standard: 1 000 mm (39.37 inch)	**F**	
1 001 ... 1 500 mm (39.4 ... 59.00 inch) Standard: 1 500 mm (59.00 inch)	**G**	
Special length for sensor element B, effective length U see dimensional drawing on page 2/112		
Special length Sensor element > 1 500 mm (59.06 inch)	**X**	
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 (-320.8 ... +1 112 °F)	**C**	
Thermocouple Type K, -40 ... +1 000 °C (-40 ... +1,832 °F)	**K**	
Thermocouple Type J, only class 2, -40 ... +750 °C (-40 ... +1,382 °F)	**J**	
Number/Accuracy		
Single, basic accuracy (Class 2/Class B)	**1**	
Single, increased accuracy (Class 1/Class A)	**2**	
Single, highest accuracy (Class AA)	**3**	
Double, basic accuracy (Class 2/Class B)	**4**	
Double, increased accuracy (Class 1/Class A)	**5**	
Double, highest accuracy (Class AA)	**6**	
Special version of sensor type, number and accuracy	**Z 0**	**K 1 Y**
Design of connection side		
Solid wire ends (sensor element)	**0**	
Flying leads	**1**	
LEMO coupling 1S	**2**	
M12 connector, not for double Pt100	**3**	
Thermocouple coupling, from TC-material (2xTC on request)	**4**	
Mini connection head, aluminum, not for double Pt 100	**5**	
Special version, connection side	**9**	**M 1 Y**

Selection and Ordering data	Order code
Further designs	
Add "**-Z**" to Article No. and specify Order Code.	
Enter sensor diameter in plain text	**H1Y**
Enter sensor type, number and accuracy in plain text	**K1Y**
Enter type of connection side in plain text	**M1Y**
Customer-specific length of sensor element B, effective length, U see dimensional drawing on page 2/112 Select range, enter desired length in plain text (No entry = standard length)	**Y44**

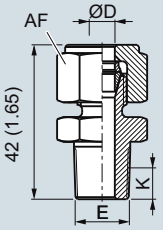
Additional configurations on page after next page!

You find ordering examples on page 2/107.

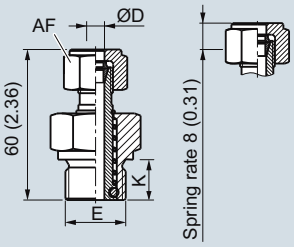
Compact mineral-insulated



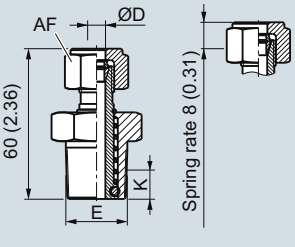
Compression fitting, dimensions in mm (inch)



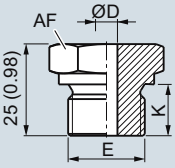
Compression fitting NPT, dimensions in mm (inch)



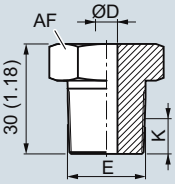
Spring-loaded compression fitting, dimensions in mm (inch)



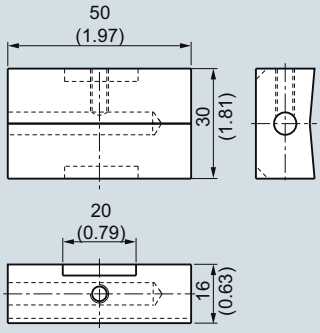
Spring-loaded compression fitting NPT, dimensions in mm (inch)



Soldering nipple, metric, dimensions in mm (inch)



Soldering nipple NPT, dimensions in mm (inch)

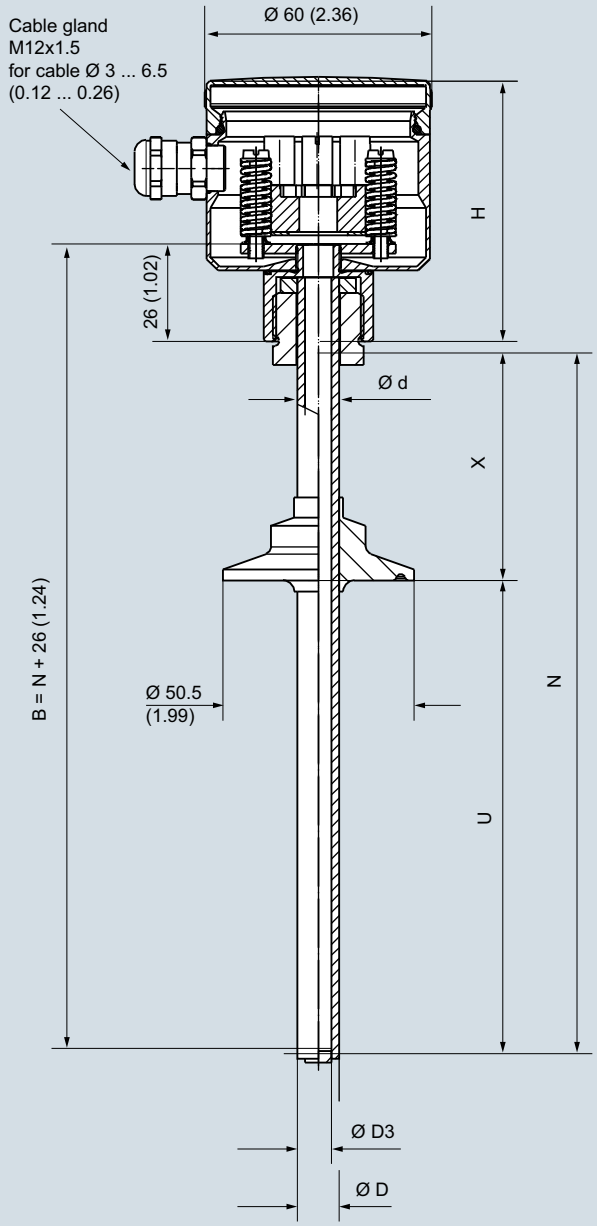


Surface connection piece, dimensions in mm (inch)

Selection and Ordering data	Order code
Options	
Add "**-Z**" to Article No., add options, separate extensions with "+".	
Process connection	
Soldering nipple G¼", enclosed	**A20**
Soldering nipple G½", enclosed	**A21**
Soldering nipple NPT½", enclosed	**A22**
Soldering nipple M18x1.5, enclosed	**A23**
Soldering nipple M8x1, enclosed	**A24**
Compression fitting G¼", enclosed	**A30**
Compression fitting G½", enclosed	**A31**
Compression fitting NPT½", enclosed	**A32**
Compression fitting M8x1, enclosed	**A34**
Compression fitting, spring-loaded G½", enclosed	**A41**
Compression fitting, spring-loaded NPT½ ", enclosed	**A42**
Compression fitting, spring-loaded M18x1.5, enclosed	**A43**
Compression fitting, spring-loaded, M8x1, enclosed	**A44**
Surface connection piece, enclosed	**A50**
Explosion protection (in preparation)	
Intrinsic safety "ia", "ic"	**E01**
Certificates and approvals	
EN10204-3.1 Inspection certificate for materials coming into contact with media	**C12**
EN10204-3.1 Inspection certificate visual, measurement and functional inspection	**C34**
NACE Standard MR-01-75 compliance	**C50**
ISO 9001 grease-free (cleaned for e.g. oxygen applications)	**C51**
Setting, designation, calibration	
Stainless steel TAG plate , Enter lettering in plain text	**Y15**
Plant calibration per 1 point, enter temperature in plain text. Attention: For devices with built-in head transmitters, select test points within the set measurement range	**Y33**
Further options	
Special version, enter in plain text	**Y99**

You find ordering examples on page 2/107.

Dimensional drawings



B	Measuring insert length
Ød	Measuring insert outer diameter (6 (0.24))
ØD	Process connection outer diameter
ØD3	Protective pipe inner diameter
H	Head height
N	Nominal length
U	Insertion length
X	Extension length

SITRANS TS300 modular design

Selection and Ordering data

Article No. 7MC8005- 0 - 0

Order code

SITRANS TS300 for food, pharmaceuticals and biotechnology, modular design for installation in pipelines and vessels

Head

Stainless steel head, BS0, screw cover (Standard version)	5
Aluminum head, BA0, flange cover standard	1
Plastic cover, BM0, srew cover	2
Aluminum head, BB0, hinged cover low	3
Aluminum head, BC0, hinged cover high	4
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	A A
DN 32/PN 40	A B
DN 40/PN 40	A C
DN 50/PN 25	A D

Clamp connection:

ISO 2852	DIN 32676	Tri-Clamp	Outer diameter D	
–	–	½“/ ¾“	25.0 mm	C A
DN 25/ 33.7/38	DN 25/32/40	1“, 1½“	50.5 mm	C B
DN 40/51	DN 50	2“	64.0 mm	C C
DN 63.5	–	2½“	77.5 mm	C D
DN 88.9	DN 80	–	106.0 mm	C E

Varivent connection (Tuchenhagen)	
Ø D_6 = 50 mm (1.97 inch), for Varivent housing DN 25 and DN 1"	K U
Ø D_6 = 68 mm (2.68 inch), for Varivent housing DN 40 ... 125 and 1½" ... 6"	K V
NEUMO/BioControl	
Size 25	B A
Size 50	B B
Size 65	B C
Ingold flange	
DN 25 with hexagon union nut G 1¼", mounting length 40 mm (1.57"), diameter 24.8 mm (0.98") incl. O-ring	J A
Welding piece (sphere diameter 30 x 40 mm (1.2 x 1.6 inch) long)	L A
Special version: Type of screwed gland and nominal diameter (add Order code and plain text)	Z A J 1 Y

Protective tube	Measuring insert	
Ø D = 6 mm (0.24 inch)	Ø 3/3.2 mm, (0.12/0.13 inch) miner. insul.	1
Ø D =9 mm (0.35 inch)	Ø 6 mm (0.24 inch)	2
Ø D =9 mm (0.35 inch)	Ø 6 mm (0.24 inch) miner. insul.	3
Ø D =9 mm (0.35 inch) tapered tip D_2 =5 Ø x 20 mm (0.2 x 0.79 inch)	Ø 3/3.2 mm, (0.12/0.12 inch) miner. insul.	4
Special version: (add Order code and plain text)		9 L 1 Y

Selection and Ordering data

Article No. 7MC8005- 0 - 0

Order code

SITRANS TS300 for food, pharmaceuticals and biotechnology, modular design for installation in pipelines and vessels

Neck tube length X

65 mm (2.56 inch)	1
130 mm (5.12 inch)	2
Special version: (add Order code and plain text)	9 N 1 Y

Mounting length

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

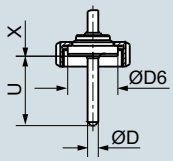
Sensor

Thin-film technology: measuring range -50 ... +400 °C (-58 ... +752 °F)	
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

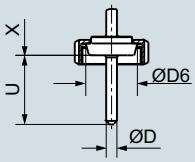
Further designs	Order code
Add "**-Z**" to Article No. and add Order code	
Process connection completely electropolished	P01
Hygiene version (R_a < 0.8 µm (3.1 x 10^{-5} inch))	H01
Certificates	
• Roughness depth measurement R_a certified by factory certificate to EN 10204-3.1	C18
• Material certificate to EN 10204-3.1	C19
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 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 Y01 addition is always required.	Y33
Special version description in palin text	Y98
Process number for the special version	Y99

Dimensional drawings

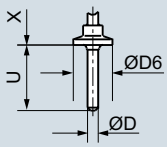
Female connection with union nut aseptic connection acc. to DIN 11864-1



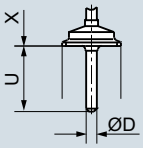
Conical connection with union nut according acc. to DIN 11851



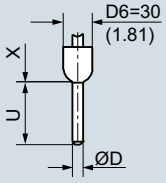
Tri-Clamp-connection



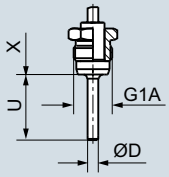
Clamp- connection acc. to DIN 32676 or ISO 2852



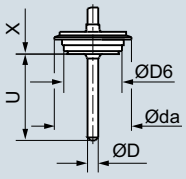
Ball weld sleeve Ball 30 x 40 (1.18 x 1.58)



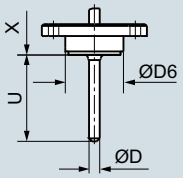
G1A without dead space due to conical metal cone



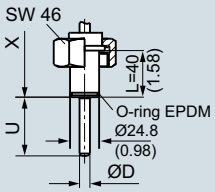
Varivent connection



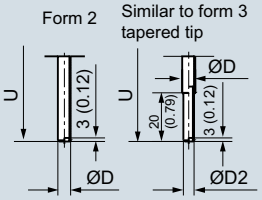
NEUMO BioControl



Ingold connection DN 25 with union nut



Protective pipe design based on DIN 43772

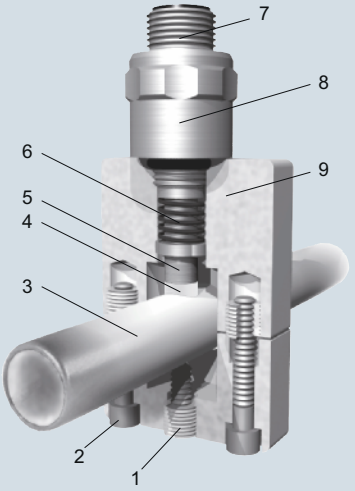


Process connections, dimensions in mm (inch)

Selection and Ordering data	Order code
Further designs	
Add "**-Z**" to Article No. and specify Order Code.	
Built-in head transmitter	
SITRANS TH100, 4 ... 20 mA, Pt100	**T10**
SITRANS TH100 Ex i (ATEX), 4 ... 20 mA, Pt100	**T11**
SITRANS TH200, 4 ... 20 mA, universal	**T20**
SITRANS TH200 Ex (ATEX), 4 ... 20 mA, universal	**T21**
SITRANS TH300, HART, universal	**T30**
SITRANS TH300 Ex (ATEX), HART, universal	**T31**
SITRANS TH400 PA, universal	**T40**
SITRANS TH400 PA Ex, universal	**T41**
SITRANS TH400 FF, universal	**T45**
SITRANS TH400 FF Ex, universal	**T46**
Transmitter options	
Transmitter, enter complete setting in plain text (Y11:+/-NNNN ... +/-NNNN C,F)	**Y11**
Enter measuring point (max. 8 characters) in plain text	**Y17**
Transmitter, enter measuring point description (max. 16 characters) in plain text	**Y23**
Transmitter, enter measuring point text (max. 32 characters) in plain text	**Y24**
Transmitter, enter bus address in plain text	**Y25**
Transmitter, fail-safe value 3.6 mA (instead of 22.8 mA)	**U36**
Transmitter with a SIL 2 conformity	**C20**
Transmitter with a SIL 2/3 conformity	**C23**
Transmitter test protocol (5 points)	**C11**
Further options	
Connection form, flying leads (for the direct transmitter assembly, delivery without screws and springs)	**G01**
M12 plug (in combination with 1x Pt100 and/or transmitter , Non-Ex)	**G12**
Harting plug Han 7 D (Non Ex)	**G13**
Connection head with ½" NPT thread without cable gland	**G20**
Plastic cable gland	**G21**
with spring lock for heads BB0 and BC0	**A01**
with outer earth screw for heads AG0, AH0, AU0 and AV0	**A02**
with inner earth screw for heads BC0, AG0, AH0, AU0 and AV0	**A03**
Option not found?	
Specify special version in plain text	**Y98**
Process number for the special version	**Y99**

For food, pharmaceuticals and biotechnology clamp-on design

Dimensional drawings



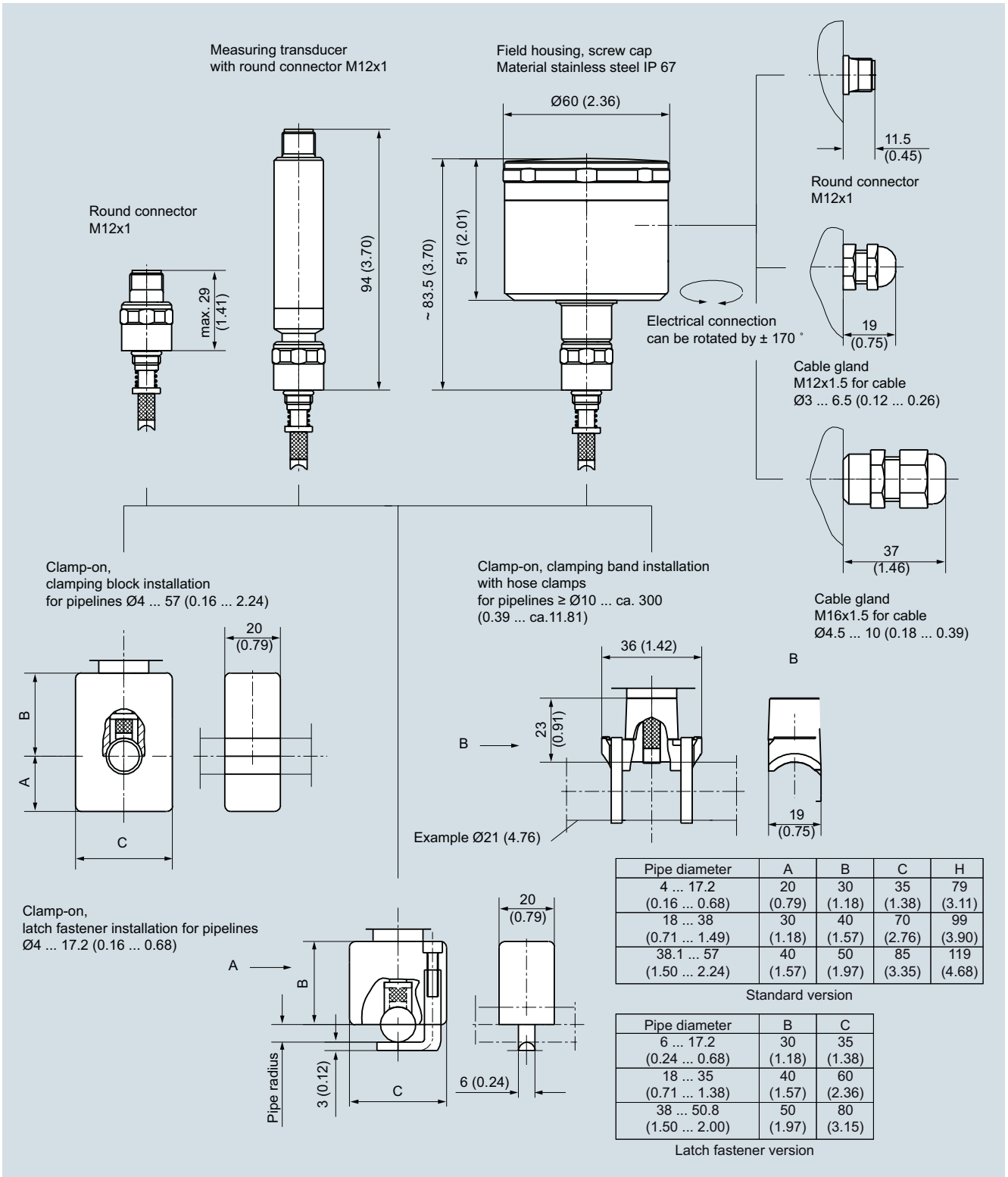
1 Vibration-locking-screw
2 Mounting screws
3 Process pipeline
4 Temperature sensor
5 Thermal decoupling
6 Spring load
7 Electrical connection M12
8 Replaceable measuring insert
9 Heat insulated pipe collar

Resitance thermometer with protection pipe in Clamp-on design, dimensions in mm (inch)

Selection and Ordering data		Article No.	Ord. code
SITRANS TS300		**7MC8016-**	**0**
for food, pharmaceuticals and biotechnology **Clamp-on design for the measuring of the pipe surface temperature**			
Design			
Process optimized for steam sterilisation			**0**
Alternative acc. to IEC 60751, class A			**1**
Type of connection			
Round connector M12 x 1			**A**
connection head form B, stainless steel			**B**
4 ... 20 mA compact transmitter SITRANS TH100slim (standard measuring range 0 ... 100 °C (32 ... 212 °F))			**C**
Mounting with pipe collar			
Pipe outer-Ø mm (inch)	**Collar size mm (inch)**		
4 (0.16)	50 x 35 x 20 (1.97 x 1.38 x 0.79)		**A 1**
6 (0.24)			**B 1**
6.35 (0.25)			**C 1**
8 (0.31)			**D 1**
9.35 (0.37)			**E 1**
10 (0.39)			**F 1**
10.2 (0.40)			**G 1**
10.3 (0.41)			**H 1**
12 (0.47)			**J 1**
12.7 (0.50)			**K 1**
13 (0.51)			**L 1**
13.5 (0.53)			**M 1**
13.7 (0.54)			**N 1**
14 (0.55)			**P 1**
15.88 (0.62)			**Q 1**
16 (0.63)			**R 1**
17.2 (0.68)	70 x 70 x 20 (2.76 x 2.76 x 0.79)		**S 1**
18.0 (0.71)			**A 2**
19.0 (0.74)			**B 2**
19.05 (0.75)			**C 2**
20.0 (0.79)			**D 2**
21.3 (0.84)			**E 2**
22.0 (0.87)			**F 2**
23.0 (0.90)			**G 2**
24.0 (0.94)			**H 2**
25.0 (0.98)			**J 2**
25.4 (1.00)			**K 2**
26.7 (1.05)			**L 2**
26.9 (1.06)			**M 2**
28.0 (1.10)			**N 2**
29.0 (1.14)			**P 2**
30.0 (1.18)			**Q 2**
31.8 (1.25)			**R 2**
32.0 (1.26)			**S 2**
33.4 (1.31)			**T 2**
33.7 (1.33)			**U 2**
34.0 (1.34)			**V 2**
35.0 (1.38)			**W 2**
36.0 (1.42)			**X 2**
38.0 (1.49)			**Y 2**
38.1 (1.50)	70 x 70 x 20 (2.76 x 2.76 x 0.79)		**A 3**
41.0 (1.61)			**B 3**
42.4 (1.67)			**C 3**
44.5 (1.75)			**D 3**
48.3 (1.90)	90 x 85 x 20 (3.54 x 3.35 x 0.79)		**E 3**
50.8 (2.00)			**F 3**
53.0 (2.09)			**G 3**
54.0 (2.13)			**H 3**
57.0 (2.24)			**J 3**
Special size[1]			**Z 0** **K 1 Y**
Mounting with strap			
Outer pipe-Ø mm (inch)	**Collar size mm (inch)**		
50 ... 60 (1.97 ... 2.36)	50/70 (1.97/2.76)		**A 7**
60 ... 75 (2.36 ... 2.95)	60/80 (2.76/3.15)		**B 7**
75 ... 85 (2.95 ... 3.35)	70/90 (1.97/3.54)		**C 7**
85 ... 105 (3.35 ... 4.13)	90/110 (3.54/4.33)		**D 7**
105 ... 125 (4.13 ... 4.92)	110/130 (4.33/5.12)		**E 7**
125 ... 155 (4.92 ... 6.10)	125/160 (4.92/6.30)		**F 7**
155 ... 200 (6.10 ... 7.87)	155/200 (6.10/7.87)		**G 7**
Without strap			**H 7**

[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")

Dimensional drawings



Pipe diameter	A	B	C	H
4 ... 17.2 (0.16 ... 0.68)	20 (0.79)	30 (1.18)	35 (1.38)	79 (3.11)
18 ... 38 (0.71 ... 1.49)	30 (1.18)	40 (1.57)	70 (2.76)	99 (3.90)
38.1 ... 57 (1.50 ... 2.24)	40 (1.57)	50 (1.97)	85 (3.35)	119 (4.68)

Standard version

Pipe diameter	B	C
6 ... 17.2 (0.24 ... 0.68)	30 (1.18)	35 (1.38)
18 ... 35 (0.71 ... 1.38)	40 (1.57)	60 (2.36)
38 ... 50.8 (1.50 ... 2.00)	50 (1.97)	80 (3.15)

Latch fastener version

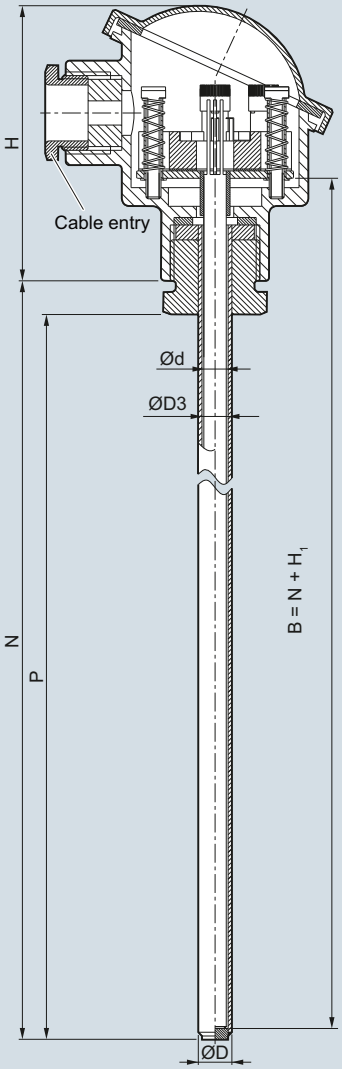
SITRANS TS300 Clamp-on design, round connector, field housing, cable gland, variants, dimensions in mm (inch)

Selection and Ordering data		Order code
Further designs		
Add "**-Z**" to Article No. and specify Order Code.		
Built in head transmitter		
SITRANS TH100, 4 ... 20 mA, Pt100		**T10**
SITRANS TH100 Ex i (ATEX), 4 ... 20 mA, Pt100		**T11**
SITRANS TH200, 4 ... 20 mA, universal		**T20**
SITRANS TH200 Ex i (ATEX), 4 ... 20 mA, universal		**T21**
SITRANS TH300, HART, universal		**T30**
SITRANS TH300 Ex i (ATEX), HART, universal		**T31**
SITRANS TH400 PA, universal		**T40**
SITRANS TH400 PA Ex i, universal		**T41**
SITRANS TH400 FF, universal		**T45**
SITRANS TH400 FF Ex i, universal		**T46**
Transmitter options		
Transmitter, enter complete setting in plain text (Y11:+/-NNNN ... +/-NNNN C,F)		**Y11**
Enter measuring point (max. 8 characters) in plain text		**Y17**
Transmitter, enter measuring point description (max. 16 characters) in plain text		**Y23**
Transmitter, enter measuring point text (max. 32 characters) in plain text		**Y24**
Transmitter, enter bus address in plain text		**Y25**
Transmitter, fail-safe value 3.6 mA (instead of 22.8 mA)		**U36**
Transmitter with a SIL 2 conformity		**C20**
Transmitter with a SIL 2/3 conformity		**C23**
Transmitter test protocol (5 points)		**C11**
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**
Deviating pipe; mm (inch)	**Collar size; mm (inch)**	
4 … 17,9 (0.16 … 0.70)	50 x 35 (1.97 x 1.38)	**S11**
18 … 38 (0.71 … 1.49)	70 x 70 (2.76 x 2.76)	**S12**
38,1 … 57 (1.5 … 2.24)	90 x 85 (3.54 x 3.35)	**S13**
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**

Selection and Ordering data	Order 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	
Add "**-Z**" to Article No. and specify Order code and plain text.	
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 Y01 addition is always required.	
Special version, specify in plain text	**Y98**
Process number for special version	**Y99**

Type 2, tubular version without process connection

Dimensional drawings



B	Measuring insert length
Ød	Measuring insert outer diameter (6 (0.24))
ØD	Process connection outer diameter
ØD3	Thermowell internal diameter
H	Head height
H_1	Typ Axx> 41 (1.61)
	Typ Bxx> 26 (1.02)
N	Nominal length
P	Space for process connection

SITRANS TS500, temperature sensors for vessels and pipings, tubular version for minimal to medium stress, without process connection, without extension, plug-in or use with moveable compression fittings, dimensions in mm (inch)

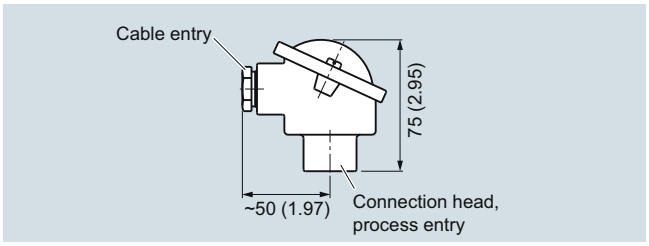
Type 2, tubular version without process connection

Selection and Ordering data	Article No.	Ord. Code
SITRANS TS500	**7MC751-**	
Pipe version for minimal to medium stress, as per thermowell DIN 43722, Type 2, without process connection, without extension, plug-in or use with moveable compression fittings	-	
Material, in contact with media		
316Ti (1.4571)	1	
316L (1.4404)	2	
Special version, enter thermowell material in plain text	8	
Process connection		
Without process connection (for compression fitting) N=U	0 N	
Thermowell form		
2; 9 mm (0.35 inch)	A	
2; 12 mm (0.47 inch)	B	
Special version, enter thermowell form in plain text	Z	K 1 Y
Insertion length U (=N), Standard		
160 mm (6.3 inch)	0 4	
250 mm (9.84 inch)	1 2	
400 mm (15.75 inch)	2 2	
Insertion length U (=N), customer-specific		
enter customer specific length with Y44, see Order Codes on page 2/127		
80 ... 100 mm (3.15 ... 3.94 inch) Standard: 100 mm (3.94 inch)	0 1	
101 ... 120 mm (3.98 ... 4.72 inch) Standard: 120 mm (4.72 inch)	0 2	
121 ... 140 mm (4.76 ... 5.51 inch) Standard: 140 mm (5.51 inch)	0 3	
141 ... 160 mm (5.55 ... 6.30 inch) Standard: 160 mm (6.3 inch)	0 4	
161 ... 180 (6.34 ... 7.09 inch) Standard: 180 mm (7.09)	0 5	
181 ... 200 (7.13 ... 7.87 inch) Standard: 200 mm (7.87 inch)	0 6	
201 ... 220 (7.91 ... 8.66 inch) Standard: 220 mm (8.66 inch)	0 7	
221 ... 240 (8.7 ... 9.45 inch) Standard: 225 mm (8.86 inch)	1 1	
241 ... 260 (9.48 ... 10.24 inch) Standard: 250 mm (9.84 inch)	1 2	
261 ... 280 (10.28 ... 11.02 inch) Standard: 280 mm (11.02 inch)	1 3	
281 ... 300 (11.02 ... 11.81 inch) Standard: 285 mm (11.22 inch)	1 4	
301 ... 320 (11.85 ... 12.6 inch) Standard: 315 mm (12.4 inch)	1 5	
321 ... 340 (12.64 ... 13.39 inch) Standard: 340 mm (13.39 inch)	1 6	
341 ... 360 (13.43 ... 14.17 inch) Standard: 360 mm (14.17 inch)	2 0	
361 ... 380 (14.21 ... 14.96 inch) Standard: 380 mm (14.96 inch)	2 1	
381 ... 400 (15 ... 15.75 inch) Standard: 400 mm (15.75 inch)	2 2	
401 ... 420 (15.79 ... 16.54 inch) Standard: 420 mm (16.54 inch)	2 3	
421 ... 440 (16.57 ... 17.32 inch) Standard: 440 mm (17.32 inch)	2 4	
441 ... 460 (17.36 ... 18.11 inch) Standard: 460 mm (18.11 inch)	2 5	
461 ... 480 (18.15 ... 18.90 inch) Standard: 465 mm (18.30 inch)	2 6	
481 ... 500 (18.94 ... 19.68 inch) Standard: 500 mm (19.68 inch)	2 7	
501 ... 550 (19.72 ... 21.65 inch) Standard: 510 mm (20.08 inch)	3 1	
551 ... 600 (21.69 ... 23.62 inch) Standard: 600 mm (23.62 inch)	3 2	
601 ... 650 (23.66 ... 25.59 inch) Standard: 650 mm (25.59 inch)	3 3	
651 ... 700 (25.63 ... 27.56 inch) Standard: 700 mm (27.56 inch)	3 4	
701 ... 750 (27.6 ... 29.53 inch) Standard: 750 mm (29.53 inch)	3 5	
751 ... 800 (29.57 ... 31.50 inch) Standard: 800 mm (31.50 inch)	3 6	
801 ... 850 (31.5 ... 33.47 inch) Standard: 850 mm (33.47 inch)	3 7	
851 ... 900 (33.5 ... 35.43 inch) Standard: 900 mm (35.43 inch)	4 1	
901 ... 950 (35.47 ... 37.4 inch) Standard: 950 (37.4 inch)	4 2	
951 ... 1 000 (37.44 ... 39.37 inch) Standard: 1 000 mm (39.37 inch)	4 3	
1001 ... 1 100 (39.4 ... (43.30 inch) Standard: 1 100 (43.30 inch)	4 4	
1 101 ... 1 200 (43.35 ... 47.24 inch) Standard: 1 200 mm (47.24 inch)	4 5	
1 201 ... 1 300 (47.28 ... 51.18 inch) Standard: 1 300 mm (51.18 inch)	4 6	
1 301 ... 1 400 (51.22 ... 55.11 inch) Standard: 1400 mm (55.11 inch)	4 7	
1 401 ... 1 500 (55.15 ... 59.05 inch) Standard: 1 500 mm (59.05 inch)	5 1	
Insertion U (=N), Special length		
Special length 1 501 ... 6 000 (59.05 ... 236.22 inch)	8 8	
Extension X		
Standard length for Type 2 as per DIN 43722 (without extension N=U)	0	

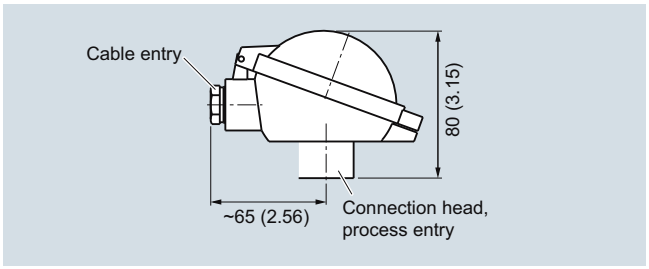
Additional configurations on page after next page!

You find ordering examples on page 2/107!

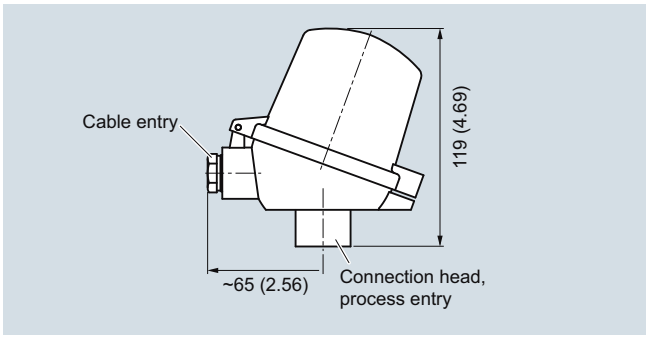
Type 2, tubular version without process connection



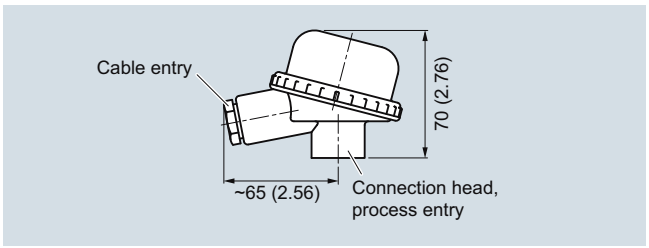
Connection head, aluminum, Type BA0, dimensions in mm (inch)



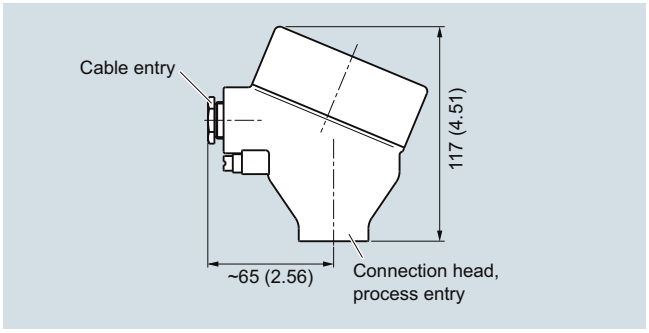
Connection head, aluminum, Type BB0, dimensions in mm (inch)



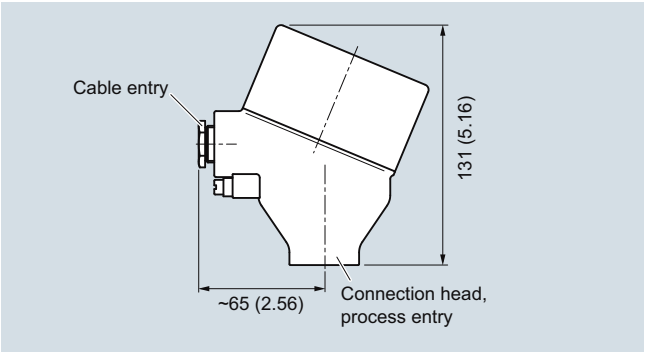
Connection head, aluminum, Type BC0, plastic, type BP0, dimensions in mm (inch)



Connection head, plastic, Type BM0, dimensions in mm (inch)



Connection head, aluminum, Type AG0, stainless steel, Type AU0, dimensions in mm (inch)



Connection head with display and glass lid, aluminum, Type AH0, stainless steel, Type AV0, dimensions in mm (inch)

Type 2, tubular version without process connection

Selection and Ordering data	Article No.	Ord. Code
SITRANS TS500 **Tubular version for minimal to medium stress, as per thermowell DIN 43722, Type 2, without process connection, without extension, plug-in or use with moveable compression fittings**	**7MC751-**	- - -
Head		
Aluminum head, BA0, flange cover, Standard		A
Aluminum head, BB0, low hinged cover, screw connection		B
Aluminum head, BC0, high hinged cover, screw connection		C
Aluminum head, AG0, screw cover, suitable for suitable for Ex d		G
Aluminum head, AH0, screw cover, suitable for Ex d, display (not for Ex i)		H
Plastic head, BM0, screw cover		M
Plastic head, BP0, high hinged cover, screw connection		P
Stainless steel head, AU0, screw cover, suitable for Ex d		U
Stainless steel head, AV0, screw cover, suitable for Ex d, display (not for Ex i)		V
Special version of connection head		Z P 1 Y
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 ... +1 112 °F)		C
Thermocouple Type K, -40 ... +1 000 °C (-40 ... +1 832 °F)		K
Thermocouple Type J, -40 ... +750 °C (-40 ... +1 382 °F)		J
Thermocouple Type N, -40 ... +1 000 °C (-40 ... +1 832 °F)		N
Sensor number/Accuracy		
Single, basic accuracy (Class 2/Class B)		1
Single, increased accuracy (Class 1/Class A)		2
Single, highest accuracy (Class AA)		3
Double, basic accuracy (Class 2/Class B)		5
Double, increased accuracy (Class 1/Class A)		6
Double, highest accuracy (Class AA)		7
Special version of sensor type, number and accuracy - to be specified		Z 0 Q 1 Y

Selection and Ordering data	Order code
Further designs Add "**-Z**" to Article No. and specify Order Code.	
Enter thermowell material in plain text	**G1Y**
Enter thermowell form in plain text	**K1Y**
Insertion length customer-specific Select range, enter desired length in plain text (No entry = standard length)	**Y44**
Head Enter connection head in plain text	**P1Y**
Sensor number/Accuracy Enter connection head in plain text	**Q1Y**

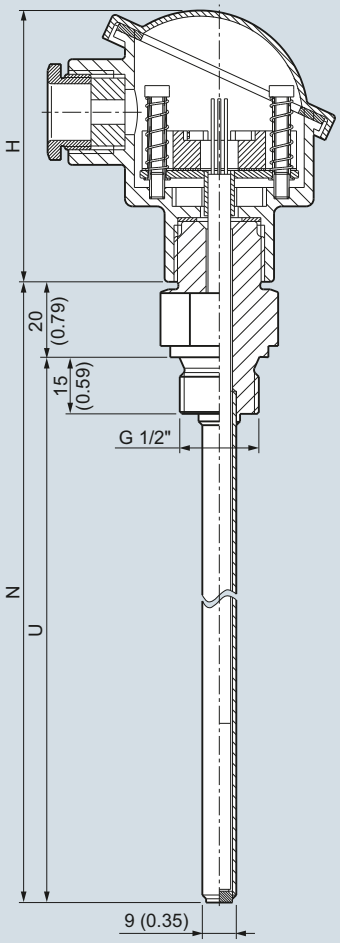
Selection and Ordering data	Order code
Options Add "**-Z**" to Article No. and add options, separate extensions with "+".	
Built-in head transmitter	
SITRANS TH100, 4 ... 20 mA, Pt100	**T10**
SITRANS TH100 Ex i (ATEX), 4 ... 20 mA, Pt100	**T11**
SITRANS TH200, 4 ... 20 mA, Universal	**T20**
SITRANS TH200 Ex (ATEX), 4 ... 20 mA, Universal	**T21**
SITRANS TH300, HART, Universal	**T30**
SITRANS TH300 Ex (ATEX), HART, Universal	**T31**
SITRANS TH400 PA, Universal	**T40**
SITRANS TH400 PA Ex, Universal	**T41**
SITRANS TH400 FF, Universal	**T45**
SITRANS TH400 FF Ex, Universal	**T46**
Explosion protection	
Intrinsic safety "ia", "ic"	**E01**
Flameproof enclosure "d"; Dust protection by enclosures "t" only in combination with connection heads code AG0, AH0, AU0, AV0, without cable gland	**E03**
Non sparking "n"	**E04**
Certificates and approvals	
EN10204-3.1 Inspection certificate for materials coming into contact with media	**C12**
EN10204-3.1 Inspection certificate for hydrostatic pressure test	**C31**
EN10204-3.1 Inspection certificate for helium leak test	**C32**
EN10204-3.1 Inspection certificate for surface tear test	**C33**
EN10204-3.1Inspection certificate: visual, measurement and functional inspection	**C34**
NACE Standard MR-01-75 compliance	**C50**
ISO 9001 grease-free (cleaned for e.g. oxygen applications)	**C51**
Designation, calibration	
Stainless steel TAG plate , enter lettering in plain text	**Y15**
Plant calibration per 1 point, enter temperature in plain text	**Y33**
Transmitter options	
Transmitter, enter complete setting in plain text (Y01:+/-NNNN ... +/-NNNN C,F)	**Y01**
Enter measuring point (max. 8 characters) in plain text	**Y17**
Transmitter, enter measuring point description (max. 16 characters) in plain text	**Y23**
Transmitter, enter measuring point text (max. 32 characters) in plain text	**Y24**
Transmitter, enter bus address in plain text	**Y25**
Transmitter, fail-safe value 3.6 mA (instead of 22.8 mA)	**U36**
Transmitter with a SIL 2 conformity	**C20**
Transmitter with a SIL 2/3 conformity	**C23**
Transmitter test protocol (5 points)	**C11**
Further options	
Connection form, flying leads (for the direct transmitter assembly, delivery without screws and springs)	**G01**
M12 plug (in combination with 1x Pt100 and/or transmitter , Non-Ex)	**G12**
Harting plug Han 7 D (Non Ex)	**G13**
Connection head with ½" NPT thread without cable gland	**G20**
Plastic cable gland	**G21**
with spring lock for heads BB0 and BC0	**A01**
with outer earth screw for heads AG0, AH0, AU0 and AV0	**A02**
with inner earth screw for heads BC0, AG0, AH0, AU0 and AV0	**A03**
Compression fitting G½", enclosed	**A31**
Compression fitting NPT½", enclosed	**A32**
Option not found?	
Specify special version in plain text	**Y99**

You find ordering examples on page 2/107!

Type 2N, tubular version with screw socket

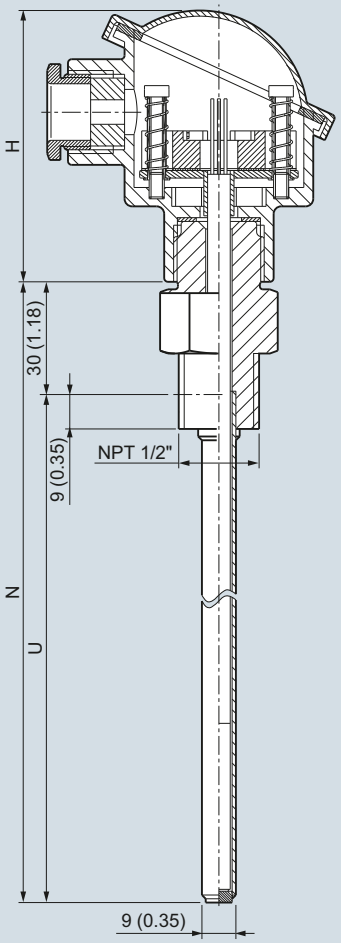
Dimensional drawings

SITRANS TS500, temperature sensors for vessels and pipelines, tubular version for minimal to medium stress, thermowell Type 2N similar to DIN 43722, screwed in, without extension.



H Head height
N Nominal length
U Insertion length

Connection type "G", dimensions in mm (inch)



H Head height
N Nominal length
U Insertion length

Connection type "NPT", dimensions in mm (inch)

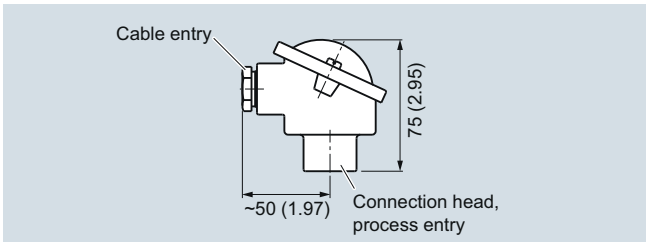
Selection and Ordering data	Article No.	Ord. Code
SITRANS TS500	**7MC751-**	
Tubular thermowell, minimal to medium stress, Type 2N similar to DIN 43722, screwed in, without extension, for maximum process temperatures of 100 °C	-	-
Material, in contact with media		
316Ti (1.4571)	1	
316L (1.4404)	2	
Special version	8	
Process connection		
G ½" (½"BSPF)	1 C	
½" NPT	1 J	
Special version	9 X	H 1 Y
Thermowell form		
2N, 9 mm (0.35 inch)	A	
Special version	Z	K 1 Y
Standard insertion length		
100 mm (3.97 inch)	0 1	
160 mm (6.30 inch)	0 4	
230 mm (9.06 inch)	1 0	
360 mm 143.17 inch)	2 0	
510 mm (20.08 inch)	3 1	
Customer-specific insertion length		
enter customer specific length with Y44, see page 2/131 Order Codes		
80 ... 100 mm (3.15 ... 3.94 inch) Standard: 100 mm (3.94 inch)	0 1	
101 ... 120 mm (3.98 ... 4.72 inch) Standard: 120 mm (4.72 inch)	0 2	
121 ... 140 mm (4.76 ... 5.51 inch) Standard: 140 mm (5.51 inch)	0 3	
141 ... 160 mm (5.55 ... 6.30 inch) Standard: 160 mm (6.30 inch)	0 4	
161 ... 180 mm (6.34 ... 7.09 inch) Standard: 180 mm (7.09 inch)	0 5	
181 ... 200 mm (7.13 ... 7.87 inch) Standard: 200 mm (7.87 inch)	0 6	
201 ... 220 mm (7.91 ... 8.66 inch) Standard: 220 mm (8.66 inch)	0 7	
221…240 mm (8.70 ... 9.45 inch) Standard: 230 mm (9.06 inch)	1 0	
241…260 mm (9.49 ... 10.24 inch) Standard: 250 mm (9.84 inch)	1 2	
261…280 mm (10.28 ...11.02 inch) Standard: 280 mm (11.02 inch)	1 3	
281…300 mm (11.06 ... 11.81 inch) Standard: 285 mm 11.22 inch)	1 4	
301…320 mm (11.85 ... 13.00 inch) Standard: 315 mm (12.40 inch)	1 5	
321…340 mm (12.64 ... 13.39 inch) Standard: 340 mm (13.39 inch)	1 6	
341…360 mm (13.43 ... 14.17 inch) Standard: 360 mm (14.17 inch)	2 0	
361…380 mm (14.21 ... 14.96 inch) Standard: 380 mm (14.96 inch)	2 1	
381…400 mm (14.99 ... 15.75 inch) Standard: 400 mm (15.75 inch)	2 2	
401…420 mm (15.79 ... 16.54 inch) Standard: 420 mm (16.54 inch)	2 3	
421…440 mm (16.57 ... 17.32 inch) Standard: 440 mm (17.32 inch)	2 4	
441…460 mm (17.36 ... 18.11 inch) Standard: 460 mm (18.11 inch)	2 5	
461…480 mm (18.15 ... 1890 inch) Standard: 465 mm (1830 inch)	2 6	
481…500 mm (18.94 ... 19.69 inch) Standard: 500 mm (19.69 inch)	2 7	

Selection and Ordering data	Article No.	Ord. Code
SITRANS TS500	**7MC751-**	
Tubular thermowell, minimal to medium stress, Type 2N similar to DIN 43722, screwed in, without extension, for maximum process temperatures of 100 °C	-	-
501…550 mm (19.72 ... 21.65 inch) Standard: 510 mm (20.08 inch)	3 1	
551…600 mm (21.69 ... 23.62 inch) Standard: 600 mm (23.62 inch)	3 2	
601…650 mm (23.66 ... 25.59 inch) Standard: 650 mm (25.59 inch)	3 3	
651…700 mm (25.63 ... 27.56 inch) Standard: 700 mm (27.56 inch)	3 4	
701…750 mm (27.60 ... 29.53 inch) Standard: 750 mm (29.53 inch)	3 5	
751…800 mm (29.57 ... 31.50 inch) Standard: 800 mm (31.50 inch)	3 6	
801…850 mm (31.54 ... 33.46 inch) Standard: 850 mm (33.46 inch)	3 7	
851…900 mm (33.50 ... 35.43 inch) Standard: 900 mm (35.43 inch)	4 1	
901…950 mm (35.47 ... 37.40 inch) Standard: 950 mm (37.40 inch)	4 2	
951…1 000 mm (37.44 ... 39.37 inch) Standard: 1 000 mm (39.37 inch)	4 3	
1 001…1 100 mm (39.41 ... 43.31 inch) Standard: 1 100 mm (43.31 inch)	4 4	
1 101…1 200 mm (43.35 ... 47.24 inch) Standard: 1 200 mm (47.24 inch)	4 5	
1 201…1 300 mm (47.28 ... 51.18 inch) Standard: 1 300 mm (51.18 inch)	4 6	
1 301…1 400 mm (51.22 ... 55.12 inch) Standard: 1400 mm (55.12 inch)	4 7	
1 401…1 500 mm (55.16 ... 59.05 inch) Standard: 1 500 mm (59.05 inch)	5 1	
Insertion length for special length		
1 501 ... 6 000 mm (59.09 ... 236.22 inch)	8 8	
Extension X		
without neck tube, (not adjustable)		0

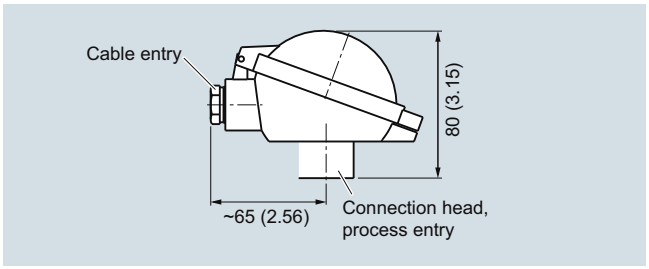
Additional configurations on page after next page!

You find ordering examples on page 2/107!

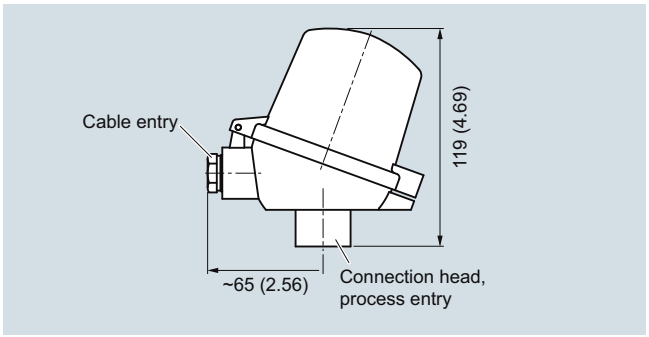
Type 2N, tubular version with screw socket



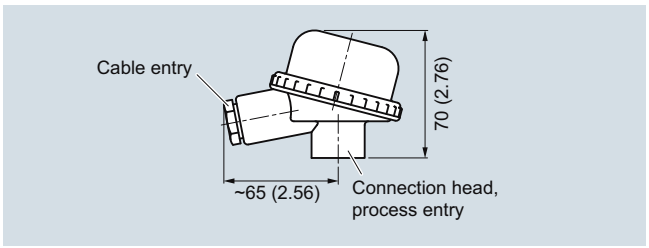
Connection head, aluminum, Type BA0, dimensions in mm (inch)



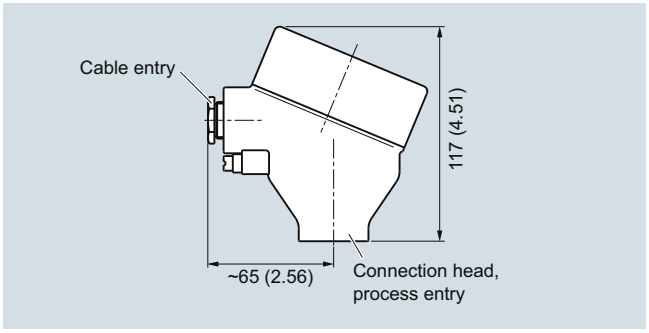
Connection head, aluminum, Type BB0, dimensions in mm (inch)



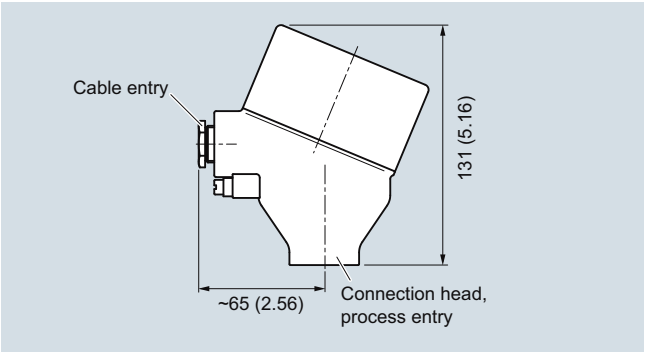
Connection head, aluminum, Type BC0, plastic, type BP0, dimensions in mm (inch)



Connection head, plastic, Type BM0, dimensions in mm (inch)



Connection head, aluminum, Type AG0, stainless steel, Type AU0, dimensions in mm (inch)



Connection head with display and glass lid, aluminum, Type AH0, stainless steel, Type AV0, dimensions in mm (inch)

Type 2N, tubular version with screw socket

Selection and Ordering data	Article No.	Ord. Code
SITRANS TS500	**7MC751-**	
Tubular thermowell, minimal to medium stress, Type 2N similar to DIN 43722, screwed in, without extension, for maximum process temperatures of 100 °C	-	-
Head		
Without connection head		N
Aluminum head, BA0, flange cover, Standard		A
Aluminum head, BB0, low hinged cover, screw connection		B
Aluminum head, BC0, high hinged cover, screw connection		C
Aluminum head, AG0, screw cover, suitable for Ex d		G
Aluminum head, AH0, screw cover, suitable for Ex d, display (not for Ex i)		H
Plastic head, BM0, screw cover		M
Plastic head, BP0high hinged cover, screw connection		P
Stainless steel head, AU0, screw cover, suitable for Ex d		U
Stainless steel head, AV0, screw cover, suitable for Ex d, display (not for Ex i)		V
Special version of connection head		Z P 1 Y
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 ... +1 112 °F)		C
Thermocouple Type K, -40 ... +1 000 °C (-40 ... +1 832 °F)		K
Thermocouple Type J, -40 ... +750 °C (-40 ... +1 382 °F)		J
Thermocouple Type N, -40 ... +1 000 °C (-40 ... +1 832 °F)		N
Sensor number/Accuracy		
Single, basic accuracy (Class 2/Class B)		1
Single, increased accuracy (Class 1/Class A)		2
Single, highest accuracy (Class AA)		3
Double, basic accuracy (Class 2/Class B)		5
Double, increased accuracy (Class 1/Class A)		6
Double, highest accuracy (Class AA)		7
Specify special version in plain text		Z 0 Q 1 Y

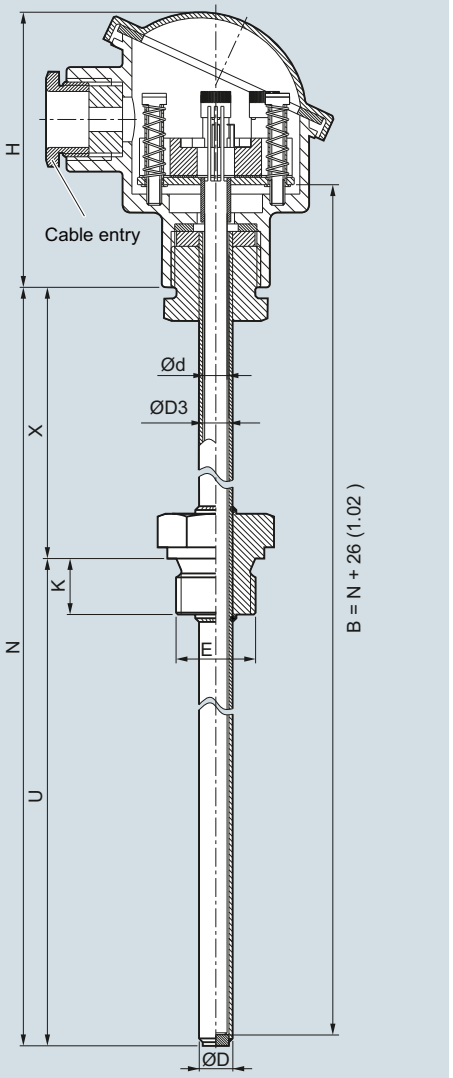
Selection and Ordering data	Order code
Further designs	
Add "**-Z**" to Article No. and specify Order Code.	
Enter thermowell material in plain text	**G1Y**
Enter process connection in plain text	**H1Y**
Enter thermowell form in plain text	**K1Y**
Head Enter connection head in plain text	**P1Y**
Sensor number/Accuracy Enter connection head in plain text	**Q1Y**
Insertion length customer-specific Select range, enter desired length in plain text (No entry = standard length)	**Y44**

Selection and Ordering data	Order code
Options	
Add "**-Z**" to Article No. and add options, separate extensions with "+".	
Built-in head transmitter	
SITRANS TH100, 4 ... 20 mA, Pt100	**T10**
SITRANS TH100 Ex i (ATEX), 4 ... 20 mA, Pt100	**T11**
SITRANS TH100 Ex i (FM), 4 ... 20 mA, Pt100	**T13**
SITRANS TH200, 4 ... 20 mA, Universal	**T20**
SITRANS TH200 Ex (ATEX), 4 ... 20 mA,Universal	**T21**
SITRANS TH200 Ex (FM), 4 ... 20 mA, Universal	**T23**
SITRANS TH300, HART, Universal	**T30**
SITRANS TH300 Ex (ATEX), HART, Universal	**T31**
SITRANS TH300 Ex (FM), HART, Universal	**T33**
SITRANS TH400 PA, Universal	**T40**
SITRANS TH400 PA Ex, Universal	**T41**
SITRANS TH400 FF, Universal	**T45**
SITRANS TH400 FF Ex, Universal	**T46**
Explosion protection	
Intrinsic safety "ia", "ic"	**E01**
Flameproof enclosure "d"; Dust protection by enclosures "t" only in combination with connection heads code AG0, AH0, AU0, AV0, without cable gland	**E03**
Non sparking "n"	**E04**
Certificates and approvals	
EN10204-3.1 Inspection certificate for materials coming into contact with media	**C12**
EN10204-3.1 Inspection certificate for hydrostatic pressure test	**C31**
EN10204-3.1 Inspection certificate for helium leak test	**C32**
EN10204-3.1 Inspection certificate for surface tear test	**C33**
EN10204-3.1 Inspection certificate: visual, measurement and functional inspection	**C34**
NACE Standard MR-01-75 compliance	**C50**
ISO 9001 grease-free (cleaned for e.g. oxygen applications)	**C51**
Designation, calibration	
Stainless steel TAG plate , enter lettering in plain text	**Y15**
Plant calibration per 1 point, enter temperature in plain text	**Y33**
Transmitter options	
Transmitter, enter complete setting in plain text (Y01:+/-NNNN ... +/-NNNN C,F)	**Y01**
Enter measuring point (max. 8 characters) in plain text	**Y17**
Transmitter, enter measuring point description (max. 16 characters) in plain text	**Y23**
Transmitter, enter measuring point text (max. 32 characters) in plain text	**Y24**
Transmitter, enter bus address in plain text	**Y25**
Transmitter, fail-safe value 3.6 mA (instead of 22.8 mA)	**U36**
Transmitter with a SIL 2 conformity	**C20**
Transmitter with a SIL 2/3 conformity	**C23**
Transmitter test protocol (5 points)	**C11**
Further options	
Connection form, flying leads (for the direct transmitter assembly, delivery without screws and springs)	**G01**
M12 plug (in combination with 1x Pt100 and/or transmitter , Non-Ex)	**G12**
Harting plug Han 7 D (Non Ex)	**G13**
Connection head with ½" NPT thread without cable gland	**G20**
Plastic cable gland	**G21**
with spring lock for heads BB0 and BC0	**A01**
with outer earth screw for heads AG0, AH0, AU0 and AV0	**A02**
with inner earth screw for heads BC0, AG0, AH0, AU0 and AV0	**A03**
Option not found?	
Specify special version in plain text	**Y99**

You find ordering examples on page 2/107!

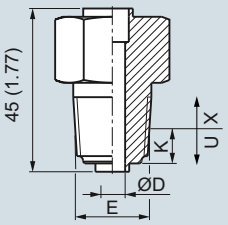
Type 2G, tubular version with screw socket and extension

Dimensional drawings



B	Measuring insert length
Ød	Measuring insert outer, diameter (6 (0.24))
ØD	Process connection, outer diameter
ØD3	Thermowell internal diameter
E	Process connection, thread size
H	Head height
K	Screw depth
N	Nominal length
U	Insertion length
X	Extension length

SITRANS TS500, temperature sensors for vessels and pipelines, tubular version for minimal to minimum to medium stress, thermowell as per DIN 43722, Type 2G, screwed in, with extension, dimensions in mm (inch)



Tapered process connection, dimensions in mm (inch)

Type 2G, tubular version with screw socket and extension

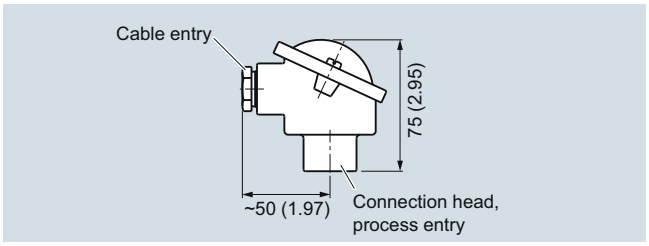
Selection and Ordering data	Article No.	Ord. Code
SITRANS TS500	**7MC751-**	
Tubular thermowell, minimal to medium stress, thermowell as per DIN 43722, Type 2G, screwed in, with extension	-	-
Material, in contact with media		
316Ti (1.4571)	1	
316L (1.4404)	2	
Special version	8	
Process connection		
Cylindrical: G½ " (½ "BSPF)	1 C	
Cylindrical: G1 " (1 "BSPF)	1 E	
Tapered: NPT½ "	1 J	
Special version	9 X	H 1 Y
Thermowell form		
2G, 9 mm (0.35 inch)	A	
2G, 12 mm (0.47 inch)	B	
Special version	Z	K 1 Y
Insertion length U standard		
160 mm (6.30 inch)	0 4	
250 mm (9.84 inch)	1 2	
400 mm (15.75 inch)	2 2	
Insertion length U customer-specific		
enter customer specific length with Y44, see page 2/135 Order Codes		
80 ... 100 mm (3.15 ... 3.94 inch) Standard: 100 mm (3.94 inch)	0 1	
101 ... 120 mm (3.98 ... 4.72 inch) Standard: 120 mm (4.72 inch)	0 2	
121 ... 140 mm (4.76 ... 5.51 inch) Standard: 140 mm (5.51 inch)	0 3	
141 ... 160 mm (5.55 ... 6.30 inch) Standard: 160 mm (6.30 inch)	0 4	
161 ... 180 mm (6.34 ... 7.09 inch) Standard: 180 mm (7.09 inch)	0 5	
181 ... 200 mm (7.13 ... 7.87 inch) Standard: 200 mm (7.87 inch)	0 6	
201 ... 220 mm (7.91 ... 8.66 inch) Standard: 220 mm (8.66 inch)	0 7	
221…240 mm (8.70 ... 9.45 inch) Standard: 225 mm (8.86 inch)	1 1	
241…260 mm (9.49 ... 10.24 inch) Standard: 250 mm (9.84 inch)	1 2	
261…280 mm (10.28 ...11.02 inch) Standard: 280 mm (11.02 inch)	1 3	
281…300 mm (11.06 ... 11.81 inch) Standard: 285 mm 11.22 inch)	1 4	
301…320 mm (11.85 ... 13.00 inch) Standard: 315 mm (12.40 inch)	1 5	
321…340 mm (12.64 ... 13.39 inch) Standard: 340 mm (13.39 inch)	1 6	
341…360 mm (13.43 ... 14.17 inch) Standard: 360 mm (14.17 inch)	2 0	
361…380 mm (14.21 ... 14.96 inch) Standard: 380 mm (14.96 inch)	2 1	
381…400 mm (14.99 ... 15.75 inch) Standard: 400 mm (15.75 inch)	2 2	
401…420 mm (15.79 ... 16.54 inch) Standard: 420 mm (16.54 inch)	2 3	
421…440 mm (16.57 ... 17.32 inch) Standard: 440 mm (17.32 inch)	2 4	
441…460 mm (17.36 ... 18.11 inch) Standard: 460 mm (18.11 inch)	2 5	
461…480 mm (18.15 ... 1890 inch) Standard: 465 mm (1830 inch)	2 6	
481…500 mm (18.94 ... 19.69 inch) Standard: 500 mm (19.69 inch)	2 7	

Selection and Ordering data	Article No.	Ord. Code
SITRANS TS500	**7MC751-**	
Tubular thermowell, minimal to medium stress, thermowell as per DIN 43722, Type 2G, screwed in, with extension	-	-
501…550 mm (19.72 ... 21.65 inch) Standard: 510 mm (20.08 inch)	3 1	
551…600 mm (21.69 ... 23.62 inch) Standard: 600 mm (23.62 inch)	3 2	
601…650 mm (23.66 ... 25.59 inch) Standard: 650 mm (25.59 inch)	3 3	
651…700 mm (25.63 ... 27.56 inch) Standard: 700 mm (27.56 inch)	3 4	
701…750 mm (27.60 ... 29.53 inch) Standard: 750 mm (29.53 inch)	3 5	
751…800 mm (29.57 ... 31.50 inch) Standard: 800 mm (31.50 inch)	3 6	
801…850 mm (31.54 ... 33.46 inch) Standard: 850 mm (33.46 inch)	3 7	
851…900 mm (33.50 ... 35.43 inch) Standard: 900 mm (35.43 inch)	4 1	
901…950 mm (35.47 ... 37.40 inch) Standard: 950 mm (37.40 inch)	4 2	
951…1 000 mm (37.44 ... 39.37 inch) Standard: 1 000 mm (39.37 inch)	4 3	
Insertion length U special length		
Special length 1 500 ... 6 000 (59.05 ... 236.22 inch)	8 0	
Extension X		
Standard length for Type 2G DIN 43772 (X=129 mm (5.08 inch))	1	
Extension length X - customer specific		
enter customer specific length with Y45, see page 2/135 Order Codes		
45 ...150 mm (1.77 ... 5.91 inch) Standard: 150 mm (5.91 inch)	9	N 1 D
151 ... 300 mm (5.95 ... 11.81 inch) Standard: 300 mm (11.81 inch)	9	N 2 D
301 ... 450 mm (11.85 ... 17.72 inch) Standard: 450 mm (17.72 inch)	9	N 3 D
Enter form and length in plain text	9	N 9 Y

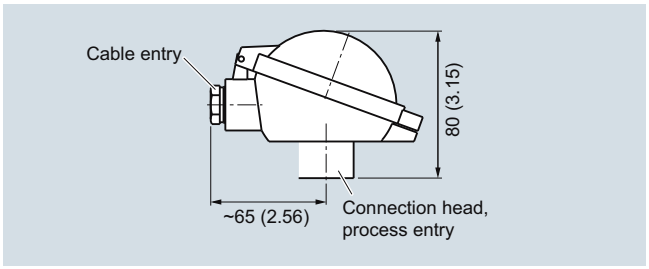
Additional configurations on page after next page!

You find ordering examples on page 2/107!

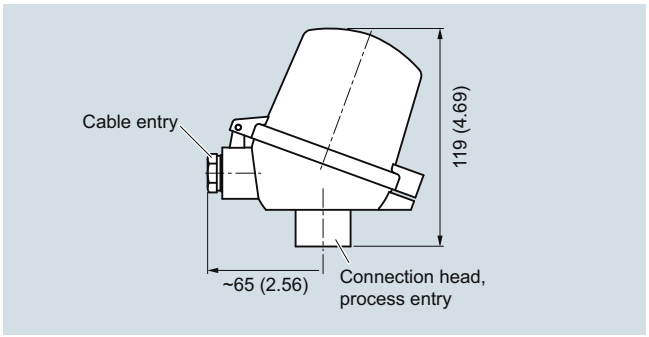
Type 2G, tubular version with screw socket and extension



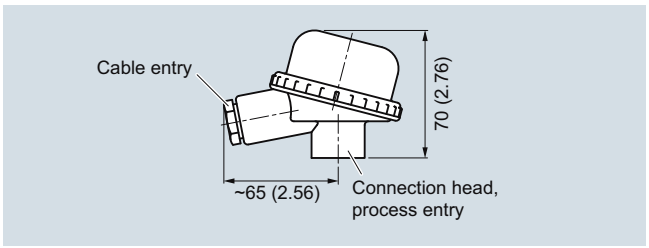
Connection head, aluminum, Type BA0, dimensions in mm (inch)



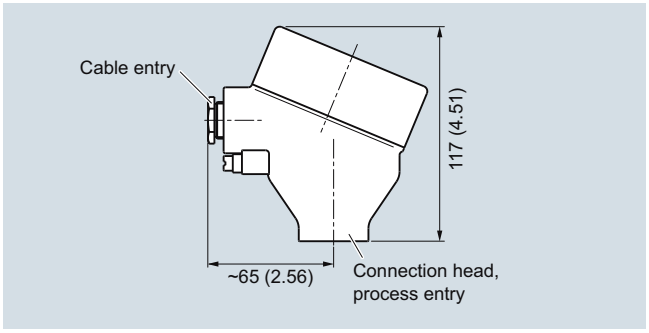
Connection head, aluminum, Type BB0, dimensions in mm (inch)



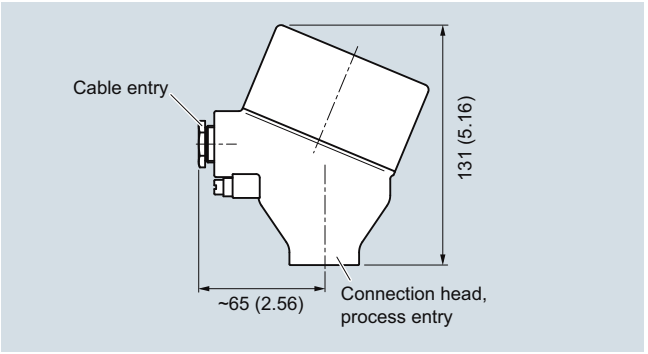
Connection head, aluminum, Type BC0, plastic, type BP0, dimensions in mm (inch)



Connection head, plastic, Type BM0, dimensions in mm (inch)



Connection head, aluminum, Type AG0, stainless steel, Type AU0, dimensions in mm (inch)



Connection head with display and glass lid, aluminum, Type AH0, stainless steel, Type AV0, dimensions in mm (inch)

Type 2G, tubular version with screw socket and extension

Selection and Ordering data	Article No.	Ord. Code
SITRANS TS500	**7MC751-**	
Tubular thermowell, minimal to medium stress, thermowell as per DIN 43722, Type 2G, screwed in, with extension	-	-
Head		
Aluminum head, BA0, flange cover, Standard		**A**
Aluminum head, BB0, low hinged cover, screw connection		**B**
Aluminum head, BC0, high hinged cover, screw connection		**C**
Aluminum head, AG0, screw cover, suitable for Ex d		**G**
Aluminum head, AH0, screw cover, suitable for Ex d, display (not for Ex i)		**H**
Plastic head, BM0, screw cover		**M**
Plastic head, BP0high hinged cover, screw connection		**P**
Stainless steel head, AU0, screw cover, suitable for Ex d		**U**
Stainless steel head, AV0, screw cover, suitable for Ex d, display (not for Ex i)		**V**
Special version of connection head		**Z** **P 1 Y**
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 ... +1 112 °F)		**C**
Thermocouple Type K, -40 ... +1 000 °C (-40 ... +1 832 °F)		**K**
Thermocouple Type J, -40 ... +750 °C (-40 ... +1 382 °F)		**J**
Thermocouple Type N, -40 ... +1 000 °C (-40 ... +1 832 °F)		**N**
Sensor number/Accuracy		
Single, basic accuracy (Class 2/Class B)		**1**
Single, increased accuracy (Class 1/Class A)		**2**
Single, highest accuracy (Class AA)		**3**
Double, basic accuracy (Class 2/Class B)		**5**
Double, increased accuracy (Class 1/Class A)		**6**
Double, highest accuracy (Class AA)		**7**
Special version of sensor type, number and accuracy - to be specified		**Z 0** **Q 1 Y**

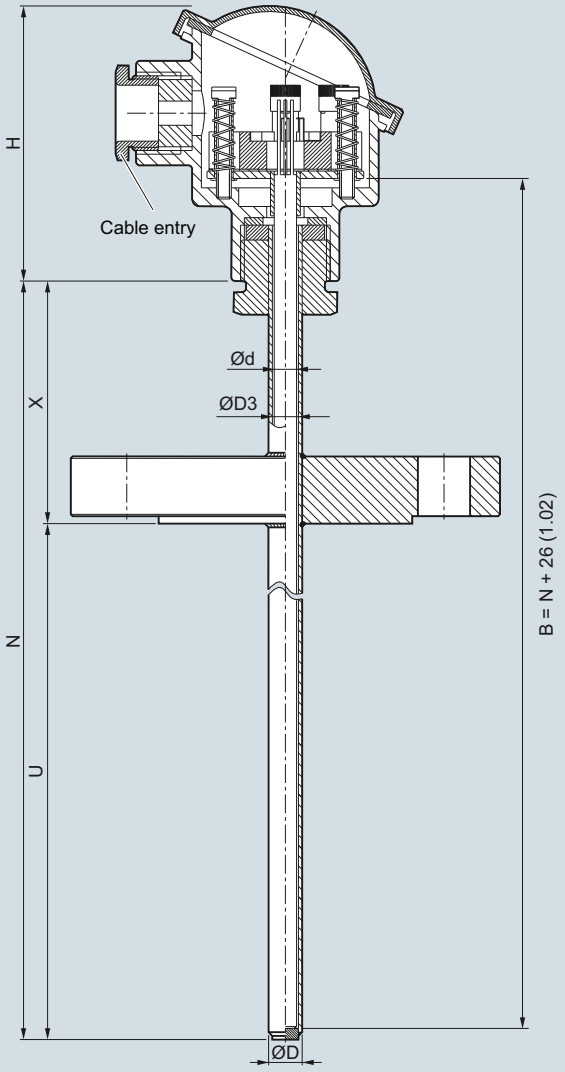
Selection and Ordering data	Order Code
Further designs	
Add "**-Z**" to Article No. and specify Order Code.	
Enter thermowell material in plain text	**G1Y**
Enter process connection in plain text	**H1Y**
Enter thermowell form in plain text	**K1Y**
Insertion length customer-specific Select range, enter desired length in plain text (No entry = standard length)	**Y44**
Extension X length customer-specific Select range, enter desired length in plain text (No entry = standard length)	**Y45**
Special version of extension Special version of extension, enter form and length in plain text	**N9Y**
Head Enter connection head in plain text	**P1Y**
Sensor number/Accuracy Enter connection head in plain text	**Q1Y**

Selection and Ordering data	Order Code
Options	
Add "**-Z**" to Article No. and add options, separate extensions with "+".	
Built-in head transmitter	
SITRANS TH100, 4 ... 20 mA, Pt100	**T10**
SITRANS TH100 Ex i (ATEX), 4 ... 20 mA, Pt100	**T11**
SITRANS TH100 Ex i (FM), 4 ... 20 mA, Pt100	**T13**
SITRANS TH200, 4 ... 20 mA, Universal	**T20**
SITRANS TH200 Ex (ATEX), 4 ... 20 mA, Universal	**T21**
SITRANS TH300, HART, Universal	**T30**
SITRANS TH300 Ex (ATEX), HART, Universal	**T31**
SITRANS TH400 PA, Universal	**T40**
SITRANS TH400 PA Ex, Universal	**T41**
SITRANS TH400 FF, Universal	**T45**
SITRANS TH400 FF Ex, Universal	**T46**
Explosion protection	
Intrinsic safety "ia", "ic"	**E01**
Flameproof enclosure "d"; Dust protection by enclosures "t" only in combination with connection heads code AG0, AH0, AU0, AV0, without cable gland	**E03**
Non sparking "n"	**E04**
Certificates and approvals	
EN10204-3.1 Inspection certificate for materials coming into contact with media	**C12**
EN10204-3.1 Inspection certificate for hydrostatic pressure test	**C31**
EN10204-3.1 Inspection certificate for helium leak test	**C32**
EN10204-3.1 Inspection certificate for surface tear test	**C33**
EN10204-3.1 Inspection certificate: visual, measurement and functional inspection	**C34**
NACE Standard MR-01-75 compliance	**C50**
ISO 9001 grease-free (cleaned for e.g. oxygen applications)	**C51**
Designation, calibration	
Stainless steel TAG plate , enter lettering in plain text	**Y15**
Plant calibration per 1 point, enter temperature in plain text	**Y33**
Transmitter options	
Transmitter, enter complete setting in plain text (Y01:+/-NNNN ... +/-NNNN C,F)	**Y01**
Enter measuring point (max. 8 characters) in plain text	**Y17**
Transmitter, enter measuring point description (max. 16 characters) in plain text	**Y23**
Transmitter, enter measuring point text (max. 32 characters) in plain text	**Y24**
Transmitter, enter bus address in plain text	**Y25**
Transmitter, fail-safe value 3.6 mA (instead of 22.8 mA)	**U36**
Transmitter with a SIL 2 conformity	**C20**
Transmitter with a SIL 2/3 conformity	**C23**
Transmitter test protocol (5 points)	**C11**
Further options	
Connection form, flying leads (for the direct transmitter assembly, delivery without screws and springs)	**G01**
M12 plug (in combination with 1x Pt100 and/or transmitter , Non-Ex)	**G12**
Harting plug Han 7 D (Non Ex)	**G13**
Connection head with ½" NPT thread without cable gland	**G20**
Plastic cable gland	**G21**
with spring lock for heads BB0 and BC0	**A01**
with outer earth screw for heads AG0, AH0, AU0 and AV0	**A02**
with inner earth screw for heads BC0, AG0, AH0, AU0 and AV0	**A03**
Option not found?	
Specify special version in plain text	**Y99**

You find ordering examples on page 2/107!

Type 2F, tubular version with flange and extension

Dimensional drawings



B	Measuring insert length
Ød	Measuring insert outer diameter (6 (0.24))
ØD	Process connection outer diameter
ØD3	Thermowell internal diameter
H	Head height
N	Nominal length
U	Insertion length
X	Extension length

SITRANS TS500, temperature sensors for vessels and pipelines, tubular version for minimal to minimum to medium stress, thermowell as per DIN 43722, Type2F, with flange, with extension, dimensions in mm (inch)

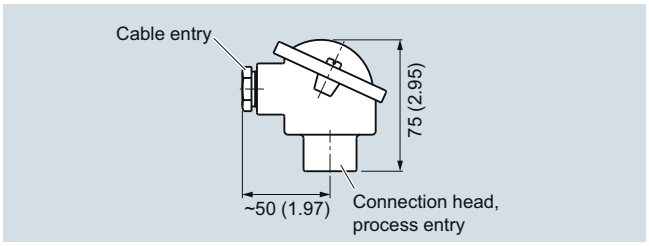
Selection and Ordering data	Article No.	Ord. Code
SITRANS TS500	**7MC751-**	
Tubular thermowell, minimal to medium stress, thermowell as per DIN 43722, Type 2F, with flange, with extension	-	-
Material, in contact with media		
316Ti (1.4571)	1	
316L (1.4404)	2	
Special version	8	
Process connection		
Flange EN, DN25PN40 B1	2 A	
Flange ASME, 1"RF150	2 E	
Flange ASME, 1.5"RF150	2 G	
Flange ASME, 1.5"RF300	2 H	
Special version	9 X	H 1 Y
Thermowell form		
2F, 9 mm (0.35 inch)	A	
2F, 12 mm (0.47 inch)	B	
Special version	Z	K 1 Y
Insertion U standard		
225 mm (8.86 inch)	1 1	
315 mm (12.40 inch)	1 5	
465 mm (18.31 inch)	2 6	
Insertion length U customer-specific		
enter customer specific length with Y44, see page 2/139 Order codes		
80 ... 100 mm (3.15 ... 3.94 inch) Standard: 100 mm (3.94 inch)	0 1	
101 ... 120 mm (3.98 ... 4.72 inch) Standard: 120 mm (4.72 inch)	0 2	
121 ... 140 mm (4.76 ... 5.51 inch) Standard: 140 mm (5.51 inch)	0 3	
141 ... 160 mm (5.55 ... 6.30 inch) Standard: 160 mm (6.30 inch)	0 4	
161 ... 180 mm (6.34 ... 7.09 inch) Standard: 180 mm (7.09 inch)	0 5	
181 ... 200 mm (7.13 ... 7.87 inch) Standard: 200 mm (7.87 inch)	0 6	
201 ... 220 mm (7.91 ... 8.66 inch) Standard: 220 mm (8.66 inch)	0 7	
221…240 mm (8.70 ... 9.45 inch) Standard: 225 mm (8.86 inch)	1 1	
241…260 mm (9.49 ... 10.24 inch) Standard: 250 mm (9.84 inch)	1 2	
261…280 mm (10.28 ...11.02 inch) Standard: 280 mm (11.02 inch)	1 3	
281…300 mm (11.06 ... 11.81 inch) Standard: 285 mm 11.22 inch)	1 4	
301…320 mm (11.85 ... 13.00 inch) Standard: 315 mm (12.40 inch)	1 5	
321…340 mm (12.64 ... 13.39 inch) Standard: 340 mm (13.39 inch)	1 6	
341…360 mm (13.43 ... 14.17 inch) Standard: 360 mm (14.17 inch)	2 0	
361…380 mm (14.21 ... 14.96 inch) Standard: 380 mm (14.96 inch)	2 1	
381…400 mm (14.99 ... 15.75 inch) Standard: 400 mm (15.75 inch)	2 2	
401…420 mm (15.79 ... 16.54 inch) Standard: 420 mm (16.54 inch)	2 3	
421…440 mm (16.57 ... 17.32 inch) Standard: 440 mm (17.32 inch)	2 4	
441…460 mm (17.36 ... 18.11 inch) Standard: 460 mm (18.11 inch)	2 5	
461…480 mm (18.15 ... 1890 inch) Standard: 465 mm (1830 inch)	2 6	
481…500 mm (18.94 ... 19.69 inch) Standard: 500 mm (19.69 inch)	2 7	

Selection and Ordering data	Article No.	Ord. Code
SITRANS TS500	**7MC751-**	
Tubular thermowell, minimal to medium stress, thermowell as per DIN 43722, Type 2F, with flange, with extension	-	-
501…550 mm (19.72 ... 21.65 inch) Standard: 510 mm (20.08 inch)	3 1	
551…600 mm (21.69 ... 23.62 inch) Standard: 600 mm (23.62 inch)	3 2	
601…650 mm (23.66 ... 25.59 inch) Standard: 650 mm (25.59 inch)	3 3	
651…700 mm (25.63 ... 27.56 inch) Standard: 700 mm (27.56 inch)	3 4	
701…750 mm (27.60 ... 29.53 inch) Standard: 750 mm (29.53 inch)	3 5	
751…800 mm (29.57 ... 31.50 inch) Standard: 800 mm (31.50 inch)	3 6	
801…850 mm (31.54 ... 33.46 inch) Standard: 850 mm (33.46 inch)	3 7	
851…900 mm (33.50 ... 35.43 inch) Standard: 900 mm (35.43 inch)	4 1	
901…950 mm (35.47 ... 37.40 inch) Standard: 950 mm (37.40 inch)	4 2	
951…1 000 mm (37.44 ... 39.37 inch) Standard: 1 000 mm (39.37 inch)	4 3	
Insertion length U special length		
Special length 1 500 ... 6 000 (59.05 ... 236.22 inch)	8 0	
Extension X		
Standard length for Type 2F DIN 43772 (X=64 mm (2.52 inch))	1	
Extension length X - customer specific		
enter customer specific length with Y45, see page 2/139 Order codes		
45 ...150 mm (1.77 ... 5.91 inch) Standard: 150 mm (5.91 inch)	9	N 1 D
151 ... 300 mm (5.95 ... 11.81 inch) Standard: 300 mm (11.81 inch)	9	N 2 D
301 ... 450 mm (11.85 ... 17.72 inch) Standard: 450 mm (17.72 inch)	9	N 3 D
Enter form and length in plain text	9	N 9 Y

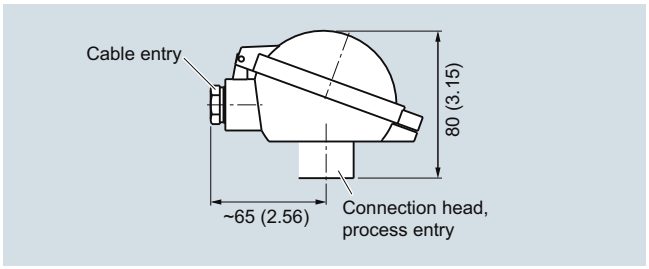
Additional configurations on page after next page!

You find ordering examples on page 2/107!

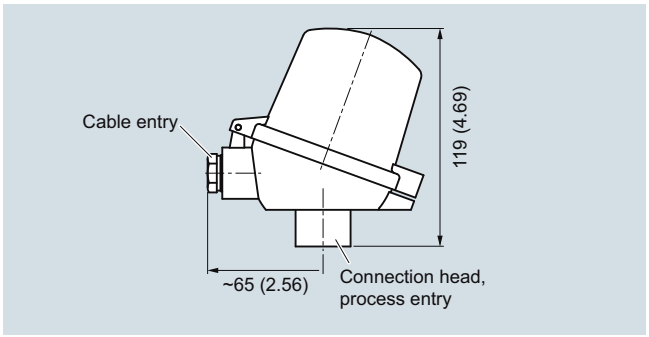
Type 2F, tubular version with flange and extension



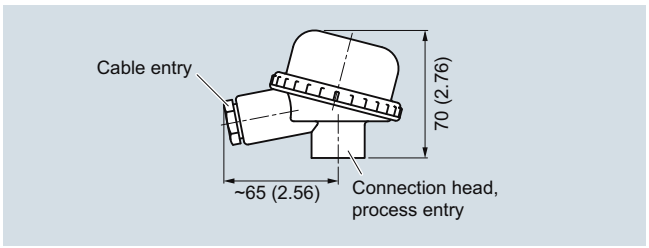
Connection head, aluminum, Type BA0, dimensions in mm (inch)



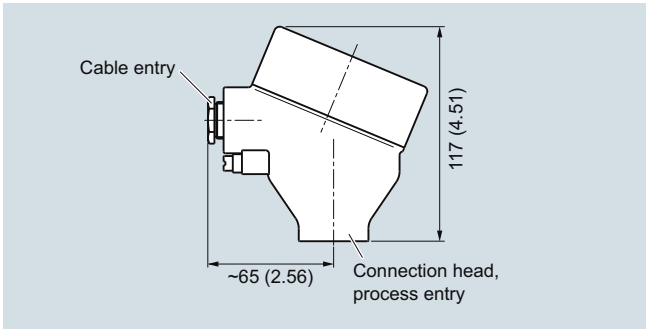
Connection head, aluminum, Type BB0, dimensions in mm (inch)



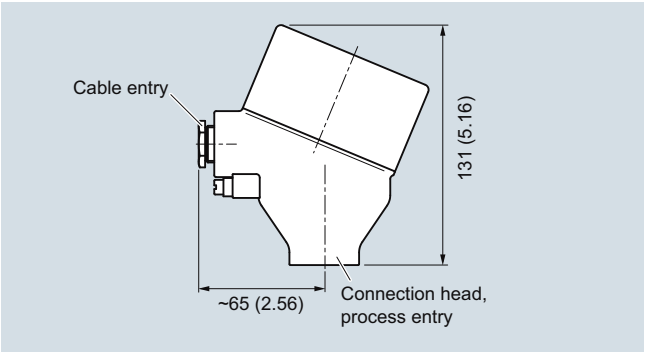
Connection head, aluminum, Type BC0, plastic, type BP0, dimensions in mm (inch)



Connection head, plastic, Type BM0, dimensions in mm (inch)



Connection head, aluminum, Type AG0, stainless steel, Type AU0, dimensions in mm (inch)



Connection head with display and glass lid, aluminum, Type AH0, stainless steel, Type AV0, dimensions in mm (inch)

Type 2F, tubular version with flange and extension

Selection and Ordering data	Article No.	Ord. Code
SITRANS TS500	**7MC751-**	
Tubular thermowell, minimal to medium stress, thermowell as per DIN 43722, Type 2F, with flange, with extension	-	-
Head		
Aluminum head, BA0, flange cover, Standard		**A**
Aluminum head, BB0, low hinged cover, screw connection		**B**
Aluminum head, BC0, high hinged cover, screw connection		**C**
Aluminum head, AG0, screw cover, suitable for Ex d		**G**
Aluminum head, AH0, screw cover, suitable for Ex d, display (not for Ex i)		**H**
Plastic head, BM0, screw cover		**M**
Plastic head, BP0high hinged cover, screw connection		**P**
Stainless steel head, AU0, screw cover, suitable for Ex d		**U**
Stainless steel head, AV0, screw cover, suitable for Ex d, display (not for Ex i)		**V**
Special version of connection head		**Z** **P 1 Y**
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 ... +1 112 °F)		**C**
Thermocouple Type K, -40 ... +1 000 °C (-40 ... +1 832 °F)		**K**
Thermocouple Type J, -40 ... +750 °C (-40 ... +1 382 °F)		**J**
Thermocouple Type N, -40 ... +1 000 °C (-40 ... +1 832 °F)		**N**
Sensor number/Accuracy		
Single, basic accuracy (Class 2/Class B)		**1**
Single, increased accuracy (Class 1/Class A)		**2**
Single, highest accuracy (Class AA)		**3**
Double, basic accuracy (Class 2/Class B)		**5**
Double, increased accuracy (Class 1/Class A)		**6**
Double, highest accuracy (Class AA)		**7**
Special version of sensor type, number and accuracy - to be specified		**Z 0 Q 1 Y**

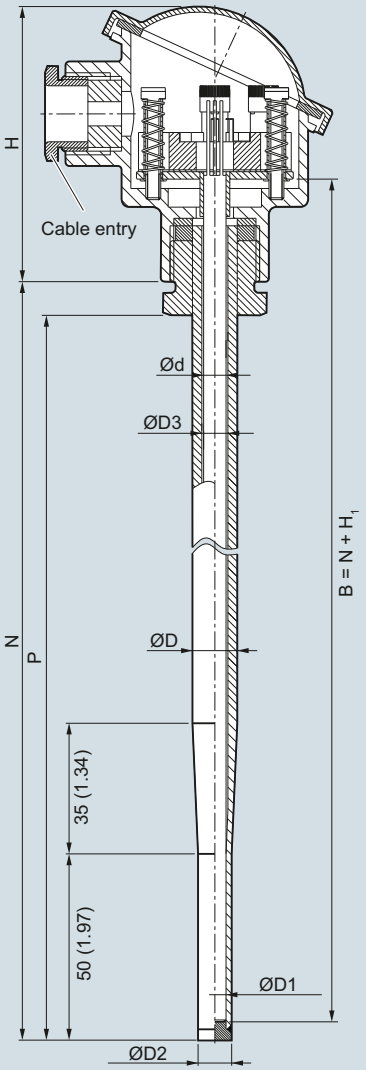
Selection and Ordering data	Order code
Further designs	
Add "**-Z**" to Article No. and specify Order Code.	
Enter thermowell material in plain text	**G1Y**
Enter process connection in plain text	**H1Y**
Enter thermowell form in plain text	**K1Y**
Extension X length customer-specific Select range, enter desired length in plain text (No entry = standard length)	**Y45**
Special version of extension Special version of extension, enter form and length in plain text	**N9Y**
Head Enter connection head in plain text	**P1Y**
Sensor number/Accuracy Enter connection head in plain text	**Q1Y**
Insertionlength customer-specific Select range, enter desired length in plain text (No entry = standard length)	**Y44**

Selection and Ordering data	Order code
Options	
Add "**-Z**" to Article No. and add options, separate extensions with "+".	
Built-in head transmitter	
SITRANS TH100, 4 ... 20 mA, Pt100	**T10**
SITRANS TH100 Ex i (ATEX), 4 ... 20 mA, Pt100	**T11**
SITRANS TH100 Ex i (FM), 4 ... 20 mA, Pt100	**T13**
SITRANS TH200, 4 ... 20 mA, Universal	**T20**
SITRANS TH200 Ex (ATEX), 4 ... 20 mA, Universal	**T21**
SITRANS TH300, HART, Universal	**T30**
SITRANS TH300 Ex (ATEX), HART, Universal	**T31**
SITRANS TH400 PA, Universal	**T40**
SITRANS TH400 PA Ex, Universal	**T41**
SITRANS TH400 FF, Universal	**T45**
SITRANS TH40a0 FF Ex, Universal	**T46**
Explosion protection	
Intrinsic safety "ia", "ic"	**E01**
Flameproof enclosure "d"; Dust protection by enclosures "t" only in combination with connection heads code AG0, AH0, AU0, AV0, without cable gland	**E03**
Non sparking "n"	**E04**
Certificates and approvals	
EN10204-3.1 Inspection certificate for materials coming into contact with media	**C12**
EN10204-3.1 Inspection certificate for hydrostatic pressure test	**C31**
EN10204-3.1 Inspection certificate for helium leak test	**C32**
EN10204-3.1 Inspection certificate for surface tear test	**C33**
EN10204-3.1 Inspection certificate: visual, measurement and functional inspection	**C34**
NACE Standard MR-01-75 compliance	**C50**
ISO 9001 grease-free (cleaned for e.g. oxygen applications)	**C51**
Designation, calibration	
Stainless steel TAG plate , enter lettering in plain text	**Y15**
Plant calibration per 1 point, enter temperature in plain text	**Y33**
Transmitter options	
Transmitter, enter complete setting in plain text (Y01:+/-NNNN ... +/-NNNN C,F)	**Y01**
Enter measuring point (max. 8 characters) in plain text	**Y17**
Transmitter, enter measuring point description (max. 16 characters) in plain text	**Y23**
Transmitter, enter measuring point text (max. 32 characters) in plain text	**Y24**
Transmitter, enter bus address in plain text	**Y25**
Transmitter, fail-safe value 3.6 mA (instead of 22.8 mA)	**U36**
Transmitter with a SIL 2 conformity	**C20**
Transmitter with a SIL 2/3 conformity	**C23**
Transmitter test protocol (5 points)	**C11**
Further options	
Connection form, flying leads (for the direct transmitter assembly, delivery without screws and springs)	**G01**
M12 plug (in combination with 1x Pt100 and/or transmitter , Non-Ex)	**G12**
Harting plug Han 7 D (Non Ex)	**G13**
Connection head with ½" NPT thread without cable gland	**G20**
Plastic cable gland	**G21**
with spring lock for heads BB0 and BC0	**A01**
with outer earth screw for heads AG0, AH0, AU0 and AV0	**A02**
with inner earth screw for heads BC0, AG0, AH0, AU0 and AV0	**A03**
Option not found?	
Specify special version in plain text	**Y99**

You find ordering examples on page 2/107!

Type 3, tubular quick without process connection

Dimensional drawings



B	Measuring insert length
Ød	Measuring insert outer diameter (6 (0.24))
ØD	Process connection outer diameter
ØD1	Tip internal diameter
ØD2	Tip outer diameter
ØD3	Thermowell diameter
H	Head height
H_1	Typ Axx> 41 (1.61)
	Typ Bxx> 26 (1.02)
N	Nominal length
P	Space for process connection

SITRANS TS500, temperature sensors for vessel and pipings, tubular version for minimum to medium stress, without process connection, without extension, plug-in or use with moveable compression fitting, dimension in mm (inch)

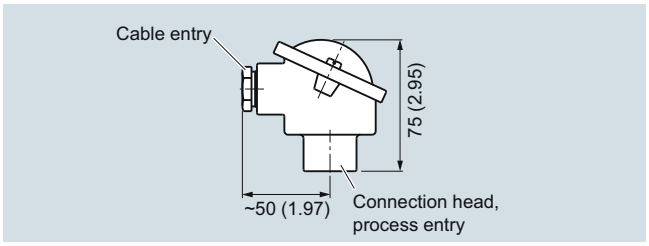
Type 3, tubular quick without process connection

Selection and Ordering data	Article No.	Ord. Code
SITRANS TS500	**7MC751-**	
Tubular version for minimal to medium stress, thermowell per DIN 43722, Type 3, without process connection, improved response time, plug-in or use with moveable compression fittings	-	-
Material, in contact with media		
316Ti (1.4571)	**1**	
316L (1.4404)	**2**	
Special version, enter thermowell material in plain text	**8**	
Process connection		
Without process connection (for compression joints) N=U	**0 N**	
Special version	**9 X**	**H 1 Y**
Thermowell form		
3, 12/9 mm (0.47/0.35 inch)	**K**	
Special version, enter thermowell form in plain text	**Z**	**K 1 Y**
Insertion length U (=N), Standard		
160 mm (6.3 inch)	**0 4**	
220 mm (8.66 inch)	**0 7**	
280 mm (11.02 inch)	**1 3**	
Insertion length U (=N), customer-specific		
enter customer specific length with Y44, see page 2/143 Order Codes		
80 ... 100 mm (3.15 ... 3.94 inch) Standard: 100 mm (3.94 inch)	**0 1**	
101 ... 120 mm (3.98 ... 4.72 inch) Standard: 120 mm (4.72 inch)	**0 2**	
121 ... 140 mm (4.76 ... 5.51 inch) Standard: 140 mm (5.51 inch)	**0 3**	
141 ... 160 mm (5.55 ... 6.30 inch) Standard: 160 mm (6.3 inch)	**0 4**	
161 ... 180 (6.34 ... 7.09 inch) Standard: 180 mm (7.09)	**0 5**	
181 ... 200 (7.13 ... 7.87 inch) Standard: 200 mm (7.87 inch)	**0 6**	
201 ... 220 (7.91 ... 8.66 inch) Standard: 220 mm (8.66 inch)	**0 7**	
221 ... 240 (8.7 ... 9.45 inch) Standard: 225 mm (8.86 inch)	**1 1**	
241 ... 260 (9.48 ... 10.24 inch) Standard: 250 mm (9.84 inch)	**1 2**	
261 ... 280 (10.28 ... 11.02 inch) Standard: 280 mm (11.02 inch)	**1 3**	
281 ... 300 (11.02 ... 11.81 inch) Standard: 285 mm (11.22 inch)	**1 4**	
301 ... 320 (11.85 ... 12.6 inch) Standard: 315 mm (12.4 inch)	**1 5**	
321 ... 340 (12.64 ... 13.39 inch) Standard: 340 mm (13.39 inch)	**1 6**	
341 ... 360 (13.43 ... 14.17 inch) Standard: 360 mm (14.17 inch)	**2 0**	
361 ... 380 (14.21 ... 14.96 inch) Standard: 380 mm (14.96 inch)	**2 1**	
381 ... 400 (15 ... 15.75 inch) Standard: 400 mm (15.75 inch)	**2 2**	
401 ... 420 (15.79 ... 16.54 inch) Standard: 420 mm (16.54 inch)	**2 3**	
421 ... 440 (16.57 ... 17.32 inch) Standard: 440 mm (17.32 inch)	**2 4**	
441 ... 460 (17.36 ... 18.11 inch) Standard: 460 mm (18.11 inch)	**2 5**	
461 ... 480 (18.15 ... 18.90 inch) Standard: 465 mm (18.30 inch)	**2 6**	
481 ... 500 (18.94 ... 19.68 inch) Standard: 500 mm (19.68 inch)	**2 7**	
501 ... 550 (19.72 ... 21.65 inch) Standard: 510 mm (20.08 inch)	**3 1**	
551 ... 600 (21.69 ... 23.62 inch) Standard: 600 mm (23.62 inch)	**3 2**	
601 ... 650 (23.66 ... 25.59 inch) Standard: 650 mm (25.59 inch)	**3 3**	
651 ... 700 (25.63 ... 27.56 inch) Standard: 700 mm (27.56 inch)	**3 4**	
701 ... 750 (27.6 ... 29.53 inch) Standard: 750 mm (29.53 inch)	**3 5**	
751 ... 800 (29.57 ... 31.50 inch) Standard: 800 mm (31.50 inch)	**3 6**	
Extension		
Standard length for Type 2 as per DIN 43722 (without extension N=U)		**0**

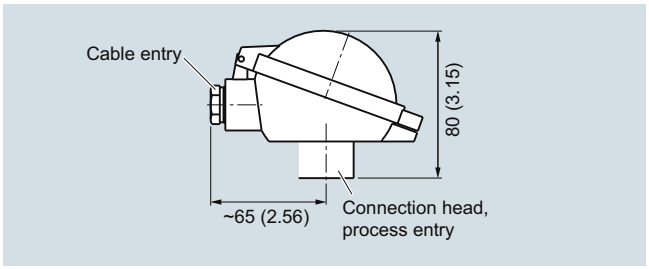
Additional configurations on page after next page!

You find ordering examples on page 2/107!

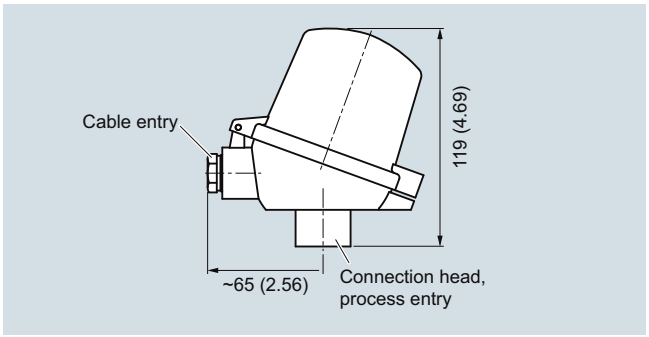
Type 3, tubular quick without process connection



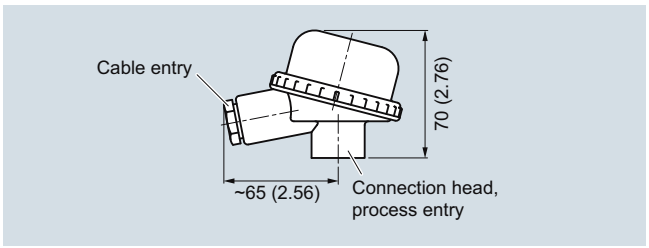
Connection head, aluminum, Type BA0, dimensions in mm (inch)



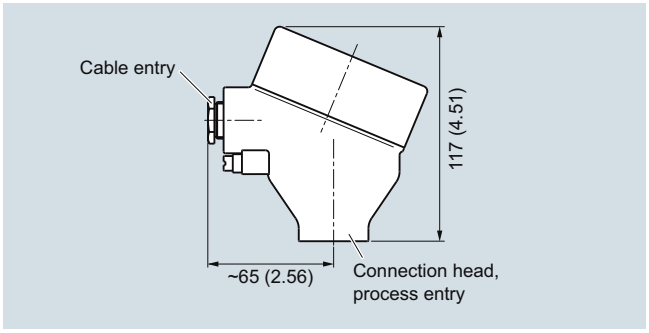
Connection head, aluminum, Type BB0, dimensions in mm (inch)



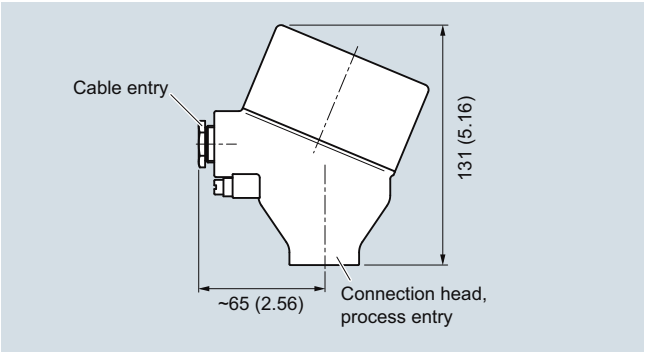
Connection head, aluminum, Type BC0, plastic, type BP0, dimensions in mm (inch)



Connection head, plastic, Type BM0, dimensions in mm (inch)



Connection head, aluminum, Type AG0, stainless steel, Type AU0, dimensions in mm (inch)



Connection head with display and glass lid, aluminum, Type AH0, stainless steel, Type AV0, dimensions in mm (inch)

Type 3, tubular quick without process connection

Selection and Ordering data	Article No.	Ord. Code
SITRANS TS500	**7MC751-**	
Tubular version for minimal to medium stress, thermowell as per DIN 43722, Type 3, without process connection, improved response time, plug-in or use with moveable compression fittings	-	-
Head		
Aluminum head, BA0, flange cover, Standard		A
Aluminum head, BB0, low hinged cover, screw connection		B
Aluminum head, BC0, high hinged cover, screw connection		C
Aluminum head, AG0, screw cover, suitable for Ex d		G
Aluminum head, AH0, screw cover, suitable for Ex d, display (not for Ex i)		H
Plastic head, BM0, screw cover		M
Plastic head, BP0high hinged cover, screw connection		P
Stainless steel head, AU0, screw cover, Ex d		U
Stainless steel head, AV0, screw cover, suitable for Ex d, display (not for Ex i)		V
Special version of connection head		Z P 1 Y
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, only class 2, -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)		1
Single, increased accuracy (Class 1/Class A)		2
Single, highest accuracy (Class AA)		3
Double, basic accuracy (Class 2/Class B)		5
Double, increased accuracy (Class 1/Class A)		6
Double, highest accuracy (Class AA)		7
Special version for sensor and accuracy - to be specified		Z 0 Q 1 Y

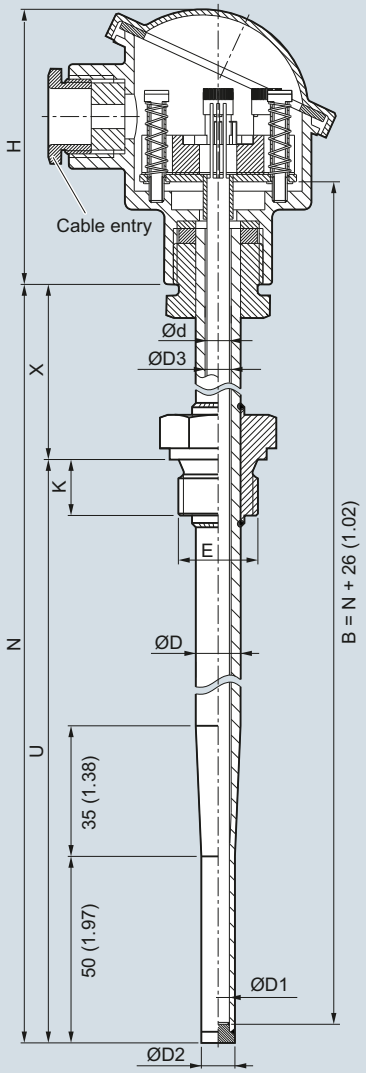
Selection and Ordering data	Order code
Further designs	
Add "**-Z**" to Article No. and specify Order Code.	
Enter thermowell material in plain text	**G1Y**
Enter process connection in plain text	**H1Y**
Enter thermowell form in plain text	**K1Y**
Insertion length customer-specific Select range, enter desired length in plain text (No entry = standard length)	**Y44**
Head Enter connection head in plain text	**P1Y**
Sensor number/Accuracy Enter connection head in plain text	**Q1Y**

Selection and Ordering data	Order code
Options	
Add "**-Z**" to Article No. and add options, separate extensions with "+".	
Built-in head transmitter	
SITRANS TH100, 4 ... 20 mA, Pt100	**T10**
SITRANS TH100 Ex i (ATEX), 4 ... 20 mA, Pt100	**T11**
SITRANS TH100 Ex i (FM), 4 ... 20 mA, Pt100	**T13**
SITRANS TH200, 4 ... 20 mA, Universal	**T20**
SITRANS TH200 Ex (ATEX), 4 ... 20 mA, Universal	**T21**
SITRANS TH200 Ex (FM), 4 ... 20 mA, Universal	**T23**
SITRANS TH300, HART, Universal	**T30**
SITRANS TH300 Ex (ATEX), HART, Universal	**T31**
SITRANS TH300 Ex (FM), HART, Universal	**T33**
SITRANS TH400 PA, Universal	**T40**
SITRANS TH400 PA Ex, Universal	**T41**
SITRANS TH400 FF, Universal	**T45**
SITRANS TH400 FF Ex, Universal	**T46**
Explosion protection	
Intrinsic safety "ia", "ic"	**E01**
Flameproof enclosure "d"; Dust protection by enclosures "t" only in combination with connection heads code AG0, AH0, AU0, AV0, without cable gland	**E03**
Non sparking "n"	**E04**
Certificates and approvals	
EN10204-3.1 Inspection certificate for materials coming into contact with media	**C12**
EN10204-3.1 Inspection certificate for hydrostatic pressure test	**C31**
EN10204-3.1 Inspection certificate for helium leak test	**C32**
EN10204-3.1 Inspection certificate for surface tear test	**C33**
EN10204-3.1 Inspection certificate: visual, measurement and functional inspection	**C34**
NACE Standard MR-01-75 compliance	**C50**
ISO 9001 grease-free (cleaned for e.g. oxygen applications)	**C51**
Designation, calibration	
Stainless steel TAG plate , enter lettering in plain text	**Y15**
Plant calibration per 1 point, enter temperature in plain text	**Y33**
Transmitter options	
Transmitter, enter complete setting in plain text (Y01:+/-NNNN ... +/-NNNN C,F)	**Y01**
Enter measuring point (max. 8 characters) in plain text	**Y17**
Transmitter, enter measuring point description (max. 16 characters) in plain text	**Y23**
Transmitter, enter measuring point text (max. 32 characters) in plain text	**Y24**
Transmitter, enter bus address in plain text	**Y25**
Transmitter, fail-safe value 3.6 mA (instead of 22.8 mA)	**U36**
Transmitter with a SIL 2 conformity	**C20**
Transmitter with a SIL 2/3 conformity	**C23**
Transmitter test protocol (5 points)	**C11**
Further options	
Connection form, flying leads (for the direct transmitter assembly, delivery without screws and springs)	**G01**
M12 plug(in combination with 1x Pt100 and/or transmitter , Non-Ex)	**G12**
Harting plug Han 7 D (Non Ex)	**G13**
Connection head with ½" NPT thread without cable gland	**G20**
Plastic cable gland	**G21**
with spring lock for heads BB0 and BC0	**A01**
with outer earth screw for heads AG0, AH0, AU0 and AV0	**A02**
with inner earth screw for heads BC0, AG0, AH0, AU0 and AV0	**A03**
Compression joint G½", enclosed	**A31**
Compression joint NPT½", enclosed	**A32**
Option not found?	
Specify special version in plain text	**Y99**

You find ordering examples on page 2/107!

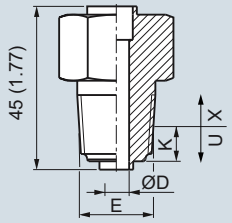
Type 3G, tubular quick with screw socket and extension

Dimensional drawings



B	Measuring insert length
Ød	Measuring insert outer diameter (6 (0.24))
ØD	Process connection outer diameter
ØD1	Tip internal diameter
ØD2	Tip outer diameter
ØD3	Thermowell internal diameter
E	Process connection, thread size
H	Head height
K	Screw depth
N	Nominal length
U	Insertion length
X	Extension length

SITRANS TS500, temperature sensors for vessels and pipelines, tubular version for minimal to minimum to medium stress, thermowell as per DIN 43722, Type 3G, screwed in, with extension, dimensions in mm (inch)



Tapered process connection, dimensions in mm (inch)

Type 3G, tubular quick with screw socket and extension

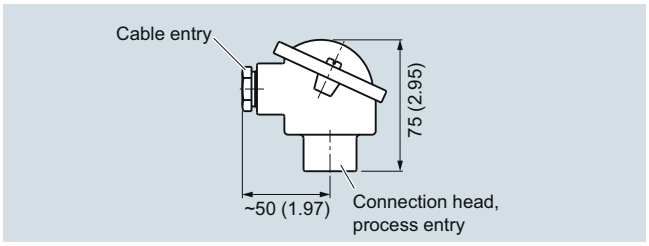
Selection and Ordering data	Article No.	Ord. Code
SITRANS TS500	**7MC751-**	
Tubular thermowell, minimal to medium stress, thermowell as per DIN 43722, Type 3G, screwed in, with extension	-	-
Material, in contact with media		
316Ti (1.4571)	1	
316L (1.4404)	2	
Special version	8	
Process connection		
Cylindrical: G½" inch (½" BSPF)	1 C	
Cylindrical: G1" inch (1" BSPF)	1 E	
Tapered: NPT½"	1 J	
Special version	9 X	H 1 Y
Thermowell form		
3G, 12/9 mm (0.47/0.35 inch)	K	
Special version	Z	K 1 Y
Insertion length U standard		
160 mm (6.30 inch)	0 4	
220 mm (8.66 inch)	0 7	
280 mm (11.02 inch)	1 3	
Insertion length U customer-specific		
enter customer specific length with Y44, see page 2/147 Order Codes		
80 ... 100 mm (3.15 ... 3.94 inch) Standard: 100 mm (3.94 inch)	0 1	
101 ... 120 mm (3.98 ... 4.72 inch) Standard: 120 mm (4.72 inch)	0 2	
121 ... 140 mm (4.76 ... 5.51 inch) Standard: 140 mm (5.51 inch)	0 3	
141 ... 160 mm (5.55 ... 6.30 inch) Standard: 160 mm (6.30 inch)	0 4	
161 ... 180 mm (6.34 ... 7.09 inch) Standard: 180 mm (7.09 inch)	0 5	
181 ... 200 mm (7.13 ... 7.87 inch) Standard: 200 mm (7.87 inch)	0 6	
201 ... 220 mm (7.91 ... 8.66 inch) Standard: 220 mm (8.66 inch)	0 7	
221…240 mm (8.70 ... 9.45 inch) Standard: 225 mm (8.86 inch)	1 1	
241…260 mm (9.49 ... 10.24 inch) Standard: 250 mm (9.84 inch)	1 2	
261…280 mm (10.28 ...11.02 inch) Standard: 280 mm (11.02 inch)	1 3	
281…300 mm (11.06 ... 11.81 inch) Standard: 285 mm 11.22 inch)	1 4	
301…320 mm (11.85 ... 13.00 inch) Standard: 315 mm (12.40 inch)	1 5	
321…340 mm (12.64 ... 13.39 inch) Standard: 340 mm (13.39 inch)	1 6	
341…360 mm (13.43 ... 14.17 inch) Standard: 360 mm (14.17 inch)	2 0	
361…380 mm (14.21 ... 14.96 inch) Standard: 380 mm (14.96 inch)	2 1	
381…400 mm (14.99 ... 15.75 inch) Standard: 400 mm (15.75 inch)	2 2	
401…420 mm (15.79 ... 16.54 inch) Standard: 420 mm (16.54 inch)	2 3	
421…440 mm (16.57 ... 17.32 inch) Standard: 440 mm (17.32 inch)	2 4	
441…460 mm (17.36 ... 18.11 inch) Standard: 460 mm (18.11 inch)	2 5	
461…480 mm (18.15 ... 1890 inch) Standard: 465 mm (1830 inch)	2 6	
481…500 mm (18.94 ... 19.69 inch) Standard: 500 mm (19.69 inch)	2 7	

Selection and Ordering data	Article No.	Ord. Code
SITRANS TS500	**7MC751-**	
Tubular thermowell, minimal to medium stress, thermowell as per DIN 43722, Type 3G, screwed in, with extension	-	-
Insertion length U special length		
Special length 1 500 ... 6 000 mm (59.05 ... 236.22 inch)	8 0	
Extension X		
Standard length for Type 2G DIN 43772 (X=131 mm (5.08 inch))	1	
Extension length - customer specific		
enter customer specific length with Y45, see page 2/147 Order Codes		
45 ...150 mm (1.77 ... 5.91 inch) Standard: 150 mm (5.91 inch)	9	N 1 D
151 ... 300 mm (5.95 ... 11.81 inch) Standard: 300 mm (11.81 inch)	9	N 2 D

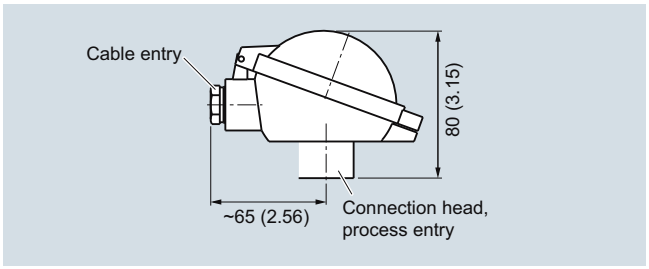
Additional configurations on page after next page!

You find ordering examples on page 2/107!

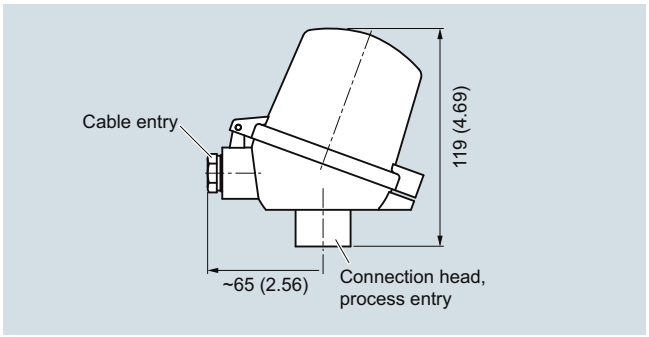
Type 3G, tubular quick with screw socket and extension



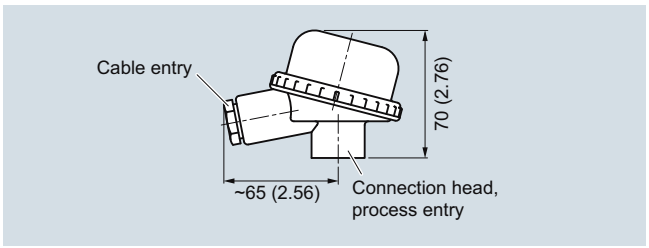
Connection head, aluminum, Type BA0, dimensions in mm (inch)



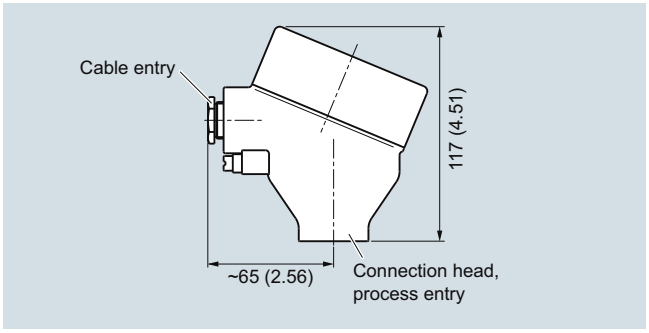
Connection head, aluminum, Type BB0, dimensions in mm (inch)



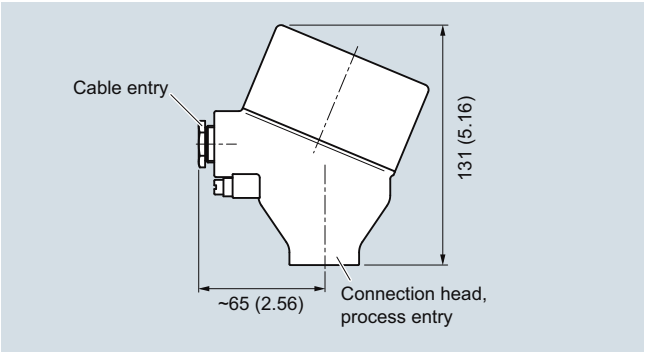
Connection head, aluminum, Type BC0, plastic, type BP0, dimensions in mm (inch)



Connection head, plastic, Type BM0, dimensions in mm (inch)



Connection head, aluminum, Type AG0, stainless steel, Type AU0, dimensions in mm (inch)



Connection head with display and glass lid, aluminum, Type AH0, stainless steel, Type AV0, dimensions in mm (inch)

Type 3G, tubular quick with screw socket and extension

Selection and Ordering data	Article No.	Ord. Code
SITRANS TS500 **Tubular thermowell, minimal to medium stress, thermowell as per DIN 43722, Type 3G, screwed in, with extension**	**7MC751-**	- -
Head		
Aluminum head, BA0, flange cover, Standard		**A**
Aluminum head, BB0, low hinged cover, screw connection		**B**
Aluminum head, BC0, high hinged cover, screw connection		**C**
Aluminum head, AG0, screw cover, suitable for Ex d		**G**
Aluminum head, AH0, screw cover, suitable for Ex d, display (not for Ex i)		**H**
Plastic head, BM0, screw cover		**M**
Plastic head, BP0high hinged cover, screw connection		**P**
Stainless steel head, AU0, screw cover, Ex d		**U**
Stainless steel head, screw cover, Ex d, display (not for Ex i)		**V**
Special version of connection head		**Z** **P 1 Y**
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, only class 2, -40 ... +750 °C (-40 ... +1 382 °F)		**J**
Thermocouple Type K, -40 .. . +1 000 °C (-40 ... +1 832 °F)		**K**
Thermocouple Type N, -40 ... + 000 °C (-40 ... +1 832 °F)		**N**
Sensor number/Accuracy		
Single, basic accuracy (Class 2/Class B)		**1**
Single, increased accuracy (Class 1/Class A)		**2**
Single, highest accuracy (Class AA)		**3**
Double, basic accuracy (Class 2/Class B)		**5**
Double, increased accuracy (Class 1/Class A)		**6**
Double, highest accuracy (Class AA)		**7**
Special version for sensor and accuracy - to be specified		**Z 0** **Q 1 Y**

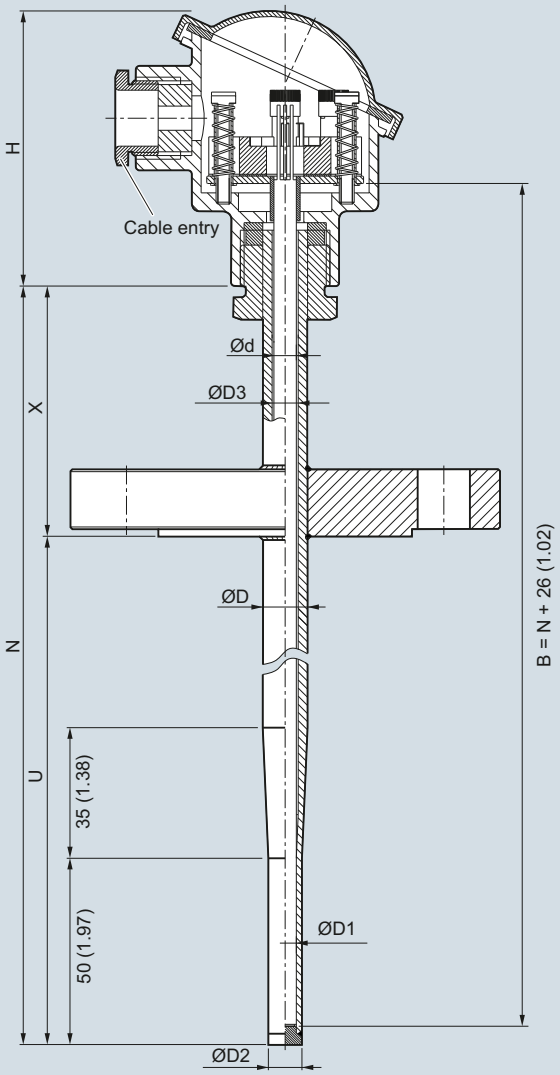
Selection and Ordering data	Order code
Further designs Add "**-Z**" to Article No. and specify Order Code.	
Enter thermowell material in plain text	**G1Y**
Enter process connection in plain text	**H1Y**
Enter thermowell form in plain text	**K1Y**
Insertion length customer-specific Select range, enter desired length in plain text (No entry = standard length)	**Y44**
Extension length customer-specific Select range, enter desired length in plain text (No entry = standard length)	**Y45**
Special version of extension Special version of extension, enter form and length in plain text	**N9Y**
Head Enter connection head in plain text	**P1Y**
Sensor number/Accuracy Enter connection head in plain text	**Q1Y**

Selection and Ordering data	Order code
Options Add "**-Z**" to Article No. and add options, separate extensions with "+".	
Built-in head transmitter	
SITRANS TH100, 4 ... 20 mA, Pt100	**T10**
SITRANS TH100 Ex i (ATEX), 4 ... 20 mA, Pt100	**T11**
SITRANS TH100 Ex i (FM), 4 ... 20 mA, Pt100	**T13**
SITRANS TH200, 4 ... 20 mA, Universal	**T20**
SITRANS TH200 Ex (ATEX), 4 ... 20 mA, Universal	**T21**
SITRANS TH200 Ex (FM), 4 ... 20 mA, Universal	**T23**
SITRANS TH300, HART, Universal	**T30**
SITRANS TH300 Ex (ATEX), HART, Universal	**T31**
SITRANS TH300 Ex (FM), HART, Universal	**T33**
SITRANS TH400 PA, Universal	**T40**
SITRANS TH400 PA Ex, Universal	**T41**
SITRANS TH400 FF, Universal	**T45**
SITRANS TH400 FF Ex, Universal	**T46**
Explosion protection	
Intrinsic safety "ia", "ic"	**E01**
Flameproof enclosure "d"; Dust protection by enclosures "t" only in combination with connection heads code AG0, AH0, AU0, AV0, without cable gland	**E03**
Non sparking "n"	**E04**
Certificates and approvals	
EN10204-3.1 Inspeciton certificate for materials coming into contact with media	**C12**
EN10204-3.1 Inspection certificate for hydrostatic pressure test	**C31**
EN10204-3.1 Inspection certificate for helium leak test	**C32**
EN10204-3.1 Inspection certificate for surface tear test	**C33**
EN10204-3.1 Inspectiont certificate: visual, measurement and functional inspection	**C34**
NACE Standard MR-01-75 compliance	**C50**
ISO 9001 grease-free (cleaned for e.g. oxygen applications)	**C51**
Designation, calibration	
Stainless steel TAG plate , enter lettering in plain text	**Y15**
Plant calibration per 1 point, enter temperature in plain text	**Y33**
Transmitter options	
Transmitter, enter complete setting in plain text (Y01:+/-NNNN ... +/-NNNN C,F)	**Y01**
Enter measuring point (max. 8 characters) in plain text	**Y17**
Transmitter, enter measuring point description (max. 16 characters) in plain text	**Y23**
Transmitter, enter measuring point text (max. 32 characters) in plain text	**Y24**
Transmitter, enter bus address in plain text	**Y25**
Transmitter, fail-safe value 3.6 mA (instead of 22.8 mA)	**U36**
Transmitter with a SIL 2 conformity	**C20**
Transmitter with a SIL 2/3 conformity	**C23**
Transmitter test protocol (5 points)	**C11**
Further options	
Connection form, flying leads (for the direct transmitter assembly, delivery without screws and springs)	**G01**
M12 plug (in combination with 1x Pt100 and/or transmitter , Non-Ex)	**G12**
Harting plug Han 7 D (Non Ex)	**G13**
Connection head with ½" NPT thread without cable gland	**G20**
Plastic cable gland	**G21**
with spring lock for heads BB0 and BC0	**A01**
with outer earth screw for heads AG0, AH0, AU0 and AV0	**A02**
with inner earth screw for heads BC0, AG0, AH0, AU0 and AV0	**A03**
Option not found?	
Specify special version in plain text	**Y99**

You find ordering examples on page 2/107!

Type 3F, tubular quick with flange and extension

Dimensional drawings



B	Measuring insert length
Ød	Measuring insert outer diameter (6 (0.24))
ØD	Process connection outer diameter
ØD1	Tip internal diameter
ØD2	Tip outer diameter
ØD3	Thermowell internal diameter
H	Head height
N	Nominal length
U	Insertion length
X	Extension length

SITRANS TS500, temperature sensors for vessels and pipelines, tubular version for minimal to minimum to medium stress, thermowell as per DIN 43722, Type 3F, with flange, with extension, dimensions in mm (inch)

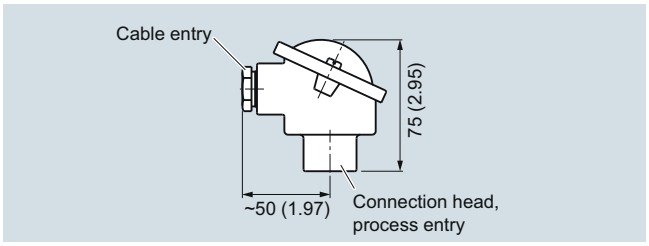
Selection and Ordering data	Article No.	Ord. Code
SITRANS TS500	**7MC751-**	
Tubular thermowell, minimal to medium stress, thermowell as per DIN 43722, Type 3F, with flange, with extension	-	-
Material, in contact with media		
316Ti (1.4571)	1	
316L (1.4404)	2	
Special version	8	
Process connection		
Flange EN; DN25PN40 B1	2 A	
Flange ASME; 1"RF150	2 E	
Flange ASME; 1.5"RF150	2 G	
Flange ASME; 1.5"RF300	2 H	
Special version	9 X	H 1 Y
Thermowell form		
3F; 12/9 mm (0.47/0.35 inch)	K	
Special version	Z	K 1 Y
Insertion length U standard		
225 mm (8.86 inch)	1 1	
285 mm (11.22 inch)	1 4	
345 mm (13.58 inch)	1 7	
Insertion length U customer-specific		
enter customer specific length with Y44, see page 2/151 Order Codes		
80 ... 100 mm (3.15 ... 3.94 inch) Standard: 100 mm (3.94 inch)	0 1	
101 ... 120 mm (3.98 ... 4.72 inch) Standard: 120 mm (4.72 inch)	0 2	
121 ... 140 mm (4.76 ... 5.51 inch) Standard: 140 mm (5.51 inch)	0 3	
141 ... 160 mm (5.55 ... 6.30 inch) Standard: 160 mm (6.3 inch)	0 4	
161 ... 180 (6.34 ... 7.09 inch) Standard: 180 mm (7.09)	0 5	
181 ... 200 (7.13 ... 7.87 inch) Standard: 200 mm (7.87 inch)	0 6	
201 ... 220 (7.91 ... 8.66 inch) Standard: 220 mm (8.66 inch)	0 7	
221 ... 240 (8.7 ... 9.45 inch) Standard: 225 mm (8.86 inch)	1 1	
241 ... 260 (9.48 ... 10.24 inch) Standard: 250 mm (9.84 inch)	1 2	
261 ... 280 (10.28 ... 11.02 inch) Standard: 280 mm (11.02 inch)	1 3	
281 ... 300 (11.02 ... 11.81 inch) Standard: 285 mm (11.22 inch)	1 4	
301 ... 320 (11.85 ... 12.6 inch) Standard: 315 mm (12.4 inch)	1 5	
321 ... 340 (12.64 ... 13.39 inch) Standard: 340 mm (13.39 inch)	1 6	
341 ... 360 (13.43 ... 14.17 inch) Standard: 345 mm (13.58 inch)	1 7	
361 ... 380 (14.21 ... 14.96 inch) Standard: 380 mm (14.96 inch)	2 1	
381 ... 400 (15 ... 15.75 inch) Standard: 400 mm (15.75 inch)	2 2	
401 ... 420 (15.79 ... 16.54 inch) Standard: 420 mm (16.54 inch)	2 3	
421 ... 440 (16.57 ... 17.32 inch) Standard: 440 mm (17.32 inch)	2 4	
441 ... 460 (17.36 ... 18.11 inch) Standard: 460 mm (18.11 inch)	2 5	
461 ... 480 (18.15 ... 18.90 inch) Standard: 465 mm (18.30 inch)	2 6	
481 ... 500 (18.94 ... 19.68 inch) Standard: 500 mm (19.68 inch)	2 7	

Selection and Ordering data	Article No.	Ord. Code
SITRANS TS500	**7MC751-**	
Tubular thermowell, minimal to medium stress, thermowell as per DIN 43722, Type 3F, with flange, with extension	-	-
Insertion length U special length		
Special length 1 500 ... 6 000 (59.05 ... 236.22 inch)	8 0	
Extension		
Standard length for Type 2G DIN 43772 (X=66 mm (2.60 inch))	1	
Extension length - customer specific		
enter customer specific length with Y45, see page 2/151 Order Codes		
45 ...150 mm (1.77 ... 5.91 inch) Standard: 150 mm (5.91 inch)	9	N 1 D
151 ... 300 mm (5.95 ... 11.81 inch) Standard: 300 mm (11.81 inch)	9	N 2 D

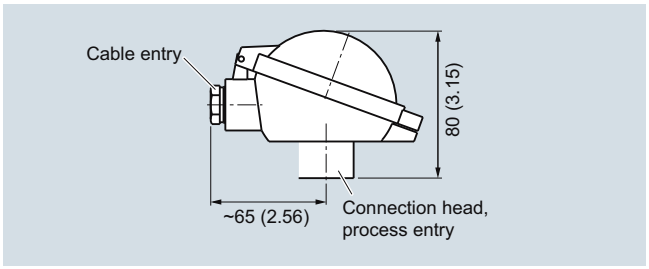
Additional configurations on page after next page!

You find ordering examples on page 2/107!

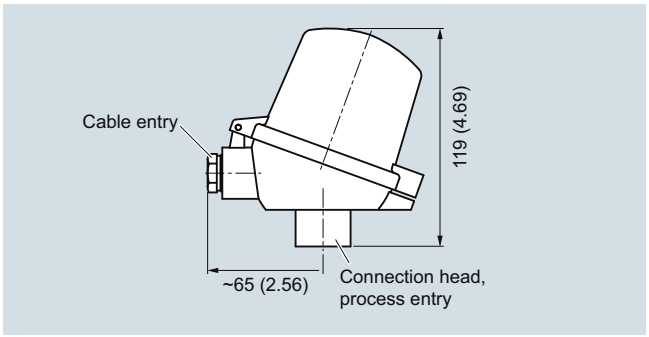
Type 3F, tubular quick with flange and extension



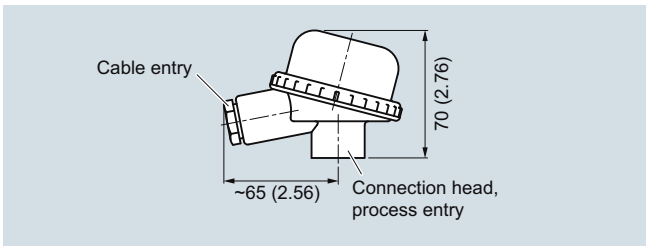
Connection head, aluminum, Type BA0, dimensions in mm (inch)



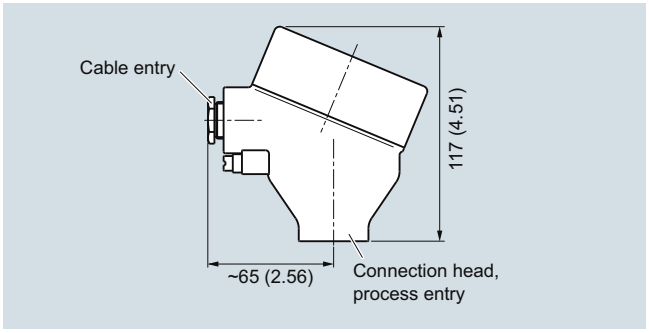
Connection head, aluminum, Type BB0, dimensions in mm (inch)



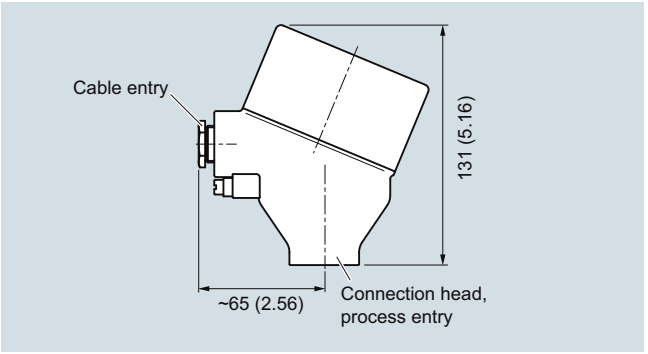
Connection head, aluminum, Type BC0, plastic, type BP0, dimensions in mm (inch)



Connection head, plastic, Type BM0, dimensions in mm (inch)



Connection head, aluminum, Type AG0, stainless steel, Type AU0, dimensions in mm (inch)



Connection head with display and glass lid, aluminum, Type AH0, stainless steel, Type AV0, dimensions in mm (inch)

Type 3F, tubular quick with flange and extension

Selection and Ordering data	Article No.	Ord. Code
SITRANS TS500	**7MC751-**	
Tubular thermowell, minimal to medium stress, thermowell as per DIN 43722, Type 3F, with flange, with extension	-	-
Head		
Aluminum head, BA0, flange cover, Standard		A
Aluminum head, BB0, low hinged cover, screw connection		B
Aluminum head, BC0, high hinged cover, screw connection		C
Aluminum head, AG0, screw cover, suitable for Ex d		G
Aluminum head, AH0, screw cover, suitable for Ex d, display (not for Ex i)		H
Plastic head, BM0, screw cover		M
Plastic head, BP0high hinged cover, screw connection		P
Stainless steel head, AU0, screw cover, Ex d		U
Stainless steel head, screw cover, Ex d, display (not for Ex i)		V
Special version of connection head		Z P 1 Y
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, only class 2, -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)		1
Single, increased accuracy (Class 1/Class A)		2
Single, highest accuracy (Class AA)		3
Double, basic accuracy (Class 2/Class B)		5
Double, increased accuracy (Class 1/Class A)		6
Double, highest accuracy (Class AA)		7
Special version of sensor type - number and accuracy - to be specified		Z 0 Q 1 Y

Selection and Ordering data	Order code
Further designs	
Add "**-Z**" to Article No. and specify Order Code.	
Enter thermowell material in plain text	**G1Y**
Enter process connection in plain text	**H1Y**
Enter thermowell form in plain text	**K1Y**
Special version of extension Special version of extension, enter form and length in plain text	**N9Y**
Head Enter connection head in plain text	**P1Y**
Sensor number/Accuracy Enter connection head in plain text	**Q1Y**
Insertion length customer-specific Select range, enter desired length in plain text (No entry = standard length)	**Y44**
Extension length customer-specific Select range, enter desired length in plain text (No entry = standard length)	**Y45**

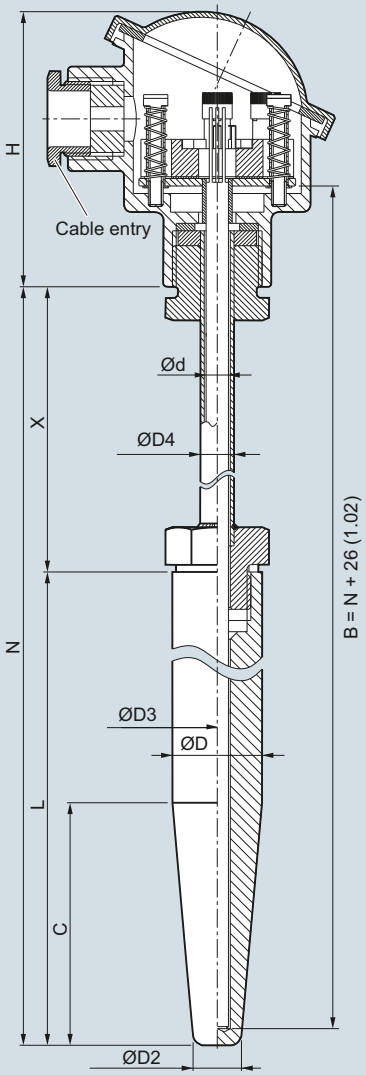
Selection and Ordering data	Order code
Options Add "**-Z**" to Article No. and add options, separate extensions with "+".	
Built-in head transmitter	
SITRANS TH100, 4 ... 20 mA, Pt100	**T10**
SITRANS TH100 Ex i (ATEX), 4 ... 20 mA, Pt100	**T11**
SITRANS TH100 Ex i (FM), 4 ... 20 mA, Pt100	**T13**
SITRANS TH200, 4 ... 20 mA, Universal	**T20**
SITRANS TH200 Ex (ATEX), 4 ... 20 mA, Universal	**T21**
SITRANS TH200 Ex (FM), 4 ... 20 mA, Universal	**T23**
SITRANS TH300, HART, Universal	**T30**
SITRANS TH300 Ex (ATEX), HART, Universal	**T31**
SITRANS TH300 Ex (FM), HART, Universal	**T33**
SITRANS TH400 PA, Universal	**T40**
SITRANS TH400 PA Ex, Universal	**T41**
SITRANS TH400 FF, Universal	**T45**
SITRANS TH400 FF Ex, Universal	**T46**
Explosion protection	
Intrinsic safety "ia", "ic"	**E01**
Flameproof enclosure "d"; Dust protection by enclosures "t" only in combination with connection heads code AG0, AH0, AU0, AV0, without cable gland	**E03**
Non sparking "n"	**E04**
Certificates and approvals	
EN10204-3.1 Inspection certificate for materials coming into contact with media	**C12**
EN10204-3.1 Inspection certificate for hydrostatic pressure test	**C31**
EN10204-3.1 Inspection certificate for helium leak test	**C32**
EN10204-3.1 Inspection certificate for surface tear test	**C33**
EN10204-3.1 Inspection certificate: visual, measurement and functional inspection	**C34**
NACE Standard MR-01-75 compliance	**C50**
ISO 9001 grease-free (cleaned for e.g. oxygen applications)	**C51**
Designation, calibration	
Stainless steel TAG plate , enter lettering in plain text	**Y15**
Plant calibration per 1 point, enter temperature in plain text	**Y33**
Transmitter options	
Transmitter, enter complete setting in plain text (Y01:+/-NNNN ... +/-NNNN C,F)	**Y01**
Enter measuring point (max. 8 characters) in plain text	**Y17**
Transmitter, enter measuring point description (max. 16 characters) in plain text	**Y23**
Transmitter, enter measuring point text (max. 32 characters) in plain text	**Y24**
Transmitter, enter bus address in plain text	**Y25**
Transmitter, fail-safe value 3.6 mA (instead of 22.8 mA)	**U36**
Transmitter with a SIL 2 conformity	**C20**
Transmitter with a SIL 2/3 conformity	**C23**
Transmitter test protocol (5 points)	**C11**
Further options	
Connection form, flying leads (for the direct transmitter assembly, delivery without screws and springs)	**G01**
M12 plug (in combination with 1x Pt100 and/or transmitter , Non-Ex)	**G12**
Harting plug Han 7 D (Non Ex)	**G13**
Connection head with ½" NPT thread without cable gland	**G20**
Plastic cable gland	**G21**
with spring lock for heads BB0 and BC0	**A01**
with outer earth screw for heads AG0, AH0, AU0 and AV0	**A02**
with inner earth screw for heads BC0, AG0, AH0, AU0 and AV0	**A03**
Option not found?	
Specify special version in plain text	**Y99**

You find ordering examples on page 2/107!

Type 4+4F
barstock thermowell, with extension

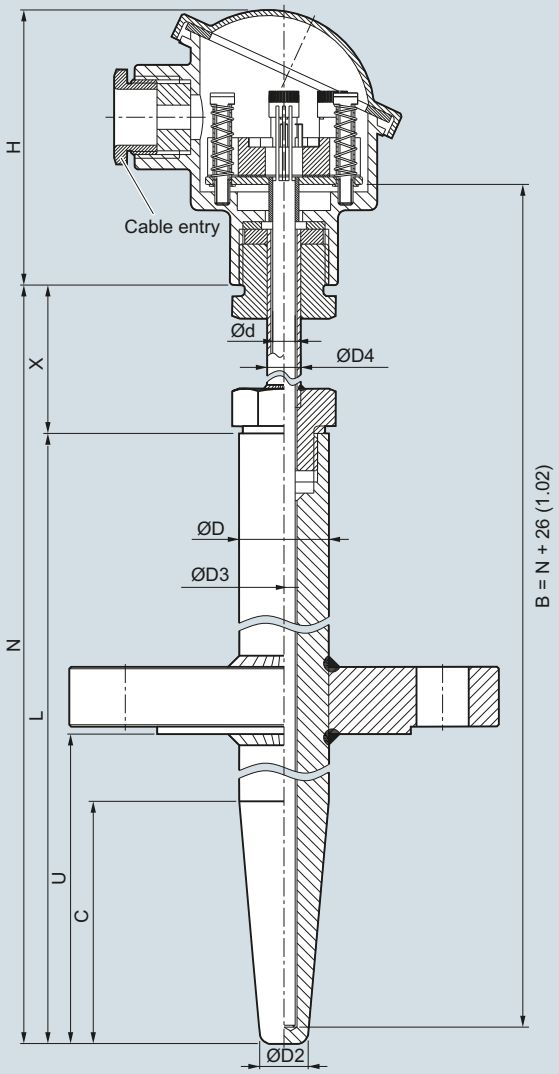
Dimensional drawings

SITRANS TS500, temperature sensors for vessels and pipelines, barstock version for minimal to minimum to medium stress, thermowell as per DIN 43722.



B Measuring insert length
C Cone length = U_{min}
Ød Measuring insert outer diameter (6 (0.24))
ØD Process connection outer diameter
ØD2 Tip outer diameter
ØD3 Thermowell internal diameter
ØD4 Extension outer diameter
H Head height
L Length of thermowell
N Nominal length
X Extension length

Thermowell type 4, for welding in, with extension, dimensions in mm (inch)



B Measuring insert length
C Cone length = U_{min}
Ød Measuring insert outer diameter (6 (0.24))
ØD Process connection outer diameter
ØD2 Tip outer diameter
ØD3 Thermowell internal diameter
ØD4 Extension outer diameter
H Head height
L Length of thermowell
N Nominal length
U Insertion length (Standard: U = L - 70 (2.76))
X Extension length

Thermowell type 4F, with flange, with extension, dimensions in mm (inch)

Type 4+4F
barstock thermowell, with extension

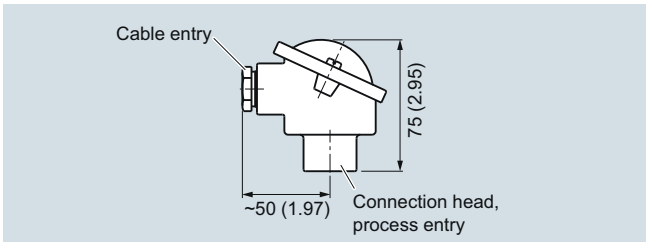
Selection and Ordering data	Article No.	Ord. Code
SITRANS TS500	**7MC752-**	
Barstock thermowell for medium to highest stress, thermowell as per DIN 43722, Type 4, for welding in, Type 4F with flange, with extension	-	-
Material, in contact with media		
316Ti (1.4571)	1	
316L (1.4404)	2	
1.7335 heat resistant, only for versions without flange	3	
1.5415 heat resistant, only for versions without flange	4	
Process connection		
Without (for welding in)	0 N	
Flange DN25 PN40 B1	2 A	
Flange 1"RF150	2 E	
Flange 1"RF300	2 F	
Flange 1.5"RF150	2 G	
Flange 1.5"RF300	2 H	
Special version	9 X	H 1 Y
Thermowell form		
For flanged types only: specify with Y44 in plain text if insertion length "U" deviates from standard (U=L-70 mm (2.76 inch)). (Min: U = C; Max; U= L-50 mm (1.97 inch)) Specify with Y46 in plain text if protective tube length "L" deviates from standard		
Type 4/4F, L=140 (5.51 inch), C= 65 (3.74 inch), Ød=24 (0.95 inch), Ød=6 (0.24 inch)	A 0 0	
Type 4/4F, L=200 (7.87 inch), C= 65 (3.74 inch), Ød=24 (0.95 inch), Ød=6 (0.24 inch)	B 0 0	
Type 4/4F, L=200 (7.87 inch), C= 125 (4.92 inch), Ød=24 (0.95 inch), Ød=6 (0.24 inch)	D 0 0	
Type 4/4F, L=260 (10.24 inch), C= 125 (4.92 inch), Ød=24 (0.95 inch), Ød=6 (0.24 inch)	E 0 0	
Special version	Z 0 0	K 1 Y
Extension X		
as per DIN 43772 (X=149 mm (5.87 inch))	1	
Extension X, customer-specific enter customer specific length with Y45, see page 2/155 Order Codes		
45 ...150 mm (1.77 ... 5.91 inch) Standard: 150 mm (5.91 inch)	9	N 1 D
151 ... 300 mm (5.95 ... 11.81 inch) Standard: 300 mm (11.81 inch)	9	N 2 D
301 ... 450 mm (11.85 ... 17.72 inch) Standard: 450 mm (17.72 inch)	9	N 3 D
451 ... 600 mm (17.86 ... 23.62 inch) Standard: 600 mm (23.62 inch)	9	N 4 D
601 ... 750 mm (23.66 ... 29.53 inch) Standard: 750 mm (29.53 inch)	9	N 5 D
751 ... 900 mm (29.57 ... 45.43 inch) Standard: 900 mm (45.43 inch)	9	N 6 D
901 ... 1 050 mm (45.47 ... 41.34 inch) Standard: 1 050 mm (41.34 inch)	9	N 7 D

Selection and Ordering data	Article No.	Ord. Code
SITRANS TS500	**7MC752-**	
Barstock thermowell for medium to highest stress, thermowell as per DIN 43722, Type 4, for welding in, Type 4F with flange, with extension	-	-
Head		
Aluminum head, BA0, flange cover, Standard	A	
Aluminum head, BB0, low hinged cover, screw connection	B	
Aluminum head, BC0, high hinged cover, screw connection	C	
Aluminum head, AG0, screw cover, suitable for Ex d	G	
Aluminum head, AH0, screw cover, suitable for Ex d, display (not for Ex i)	H	
Plastic head, BM0, screw cover	M	
Plastic head, BP0high hinged cover, screw connection	P	
Stainless steel head, AU0, screw cover, Ex d	U	
Stainless steel head, AV0, screw cover, Ex d, display (not for Ex i)	V	
Special version of connection head	Z	P 1 Y
Sensor		
Pt100, basis, -50 ... +400 °C (-58 ... +752)	A	
Pt100, vibration resistant, -50 ... +400 °C (-58 ... +752)	B	
Pt100, expanded range, -196 ... 600 °C (-321 ... +1 112)	C	
Thermocouple Type K, -40 ... +1 000 °C (-40 ... +1 832)	K	
Thermocouple Type J, only class 2, -40 ... +750 °C (-40 ... +1 382)	J	
Thermocouple Type N, -40 ... +1 000 °C (-40 ... +1 832)	N	
Sensor number/Accuracy		
Single, basic accuracy (Class 2/Class B)	1	
Single, increased accuracy (Class 1/Class A)	2	
Single, highest accuracy (Class AA)	3	
Double, basic accuracy (Class 2/Class B)	5	
Double, increased accuracy (Class 1/Class A)	6	
Double, highest accuracy (Class AA)	7	
Special version of sensor type, number and accuracy - to be specified	Z 0	Q 1 Y

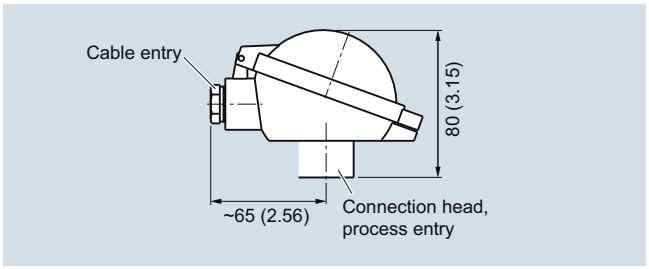
Additional configurations on page after next page!

You find ordering examples on page 2/107!

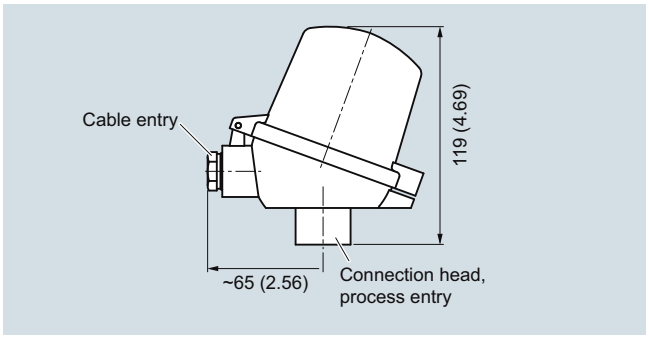
Type 4+4F
barstock thermowell, with extension



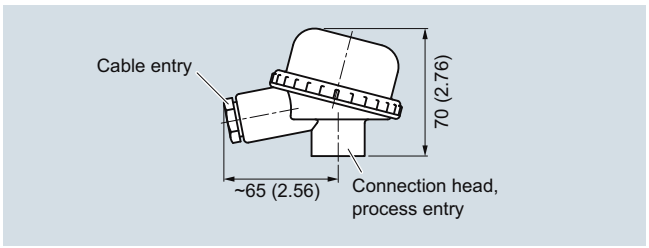
Connection head, aluminum, Type BA0, dimensions in mm (inch)



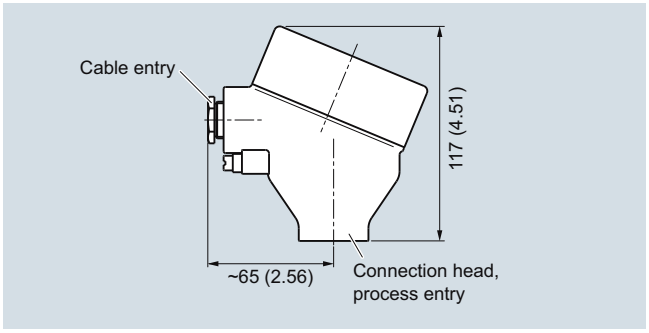
Connection head, aluminum, Type BB0, dimensions in mm (inch)



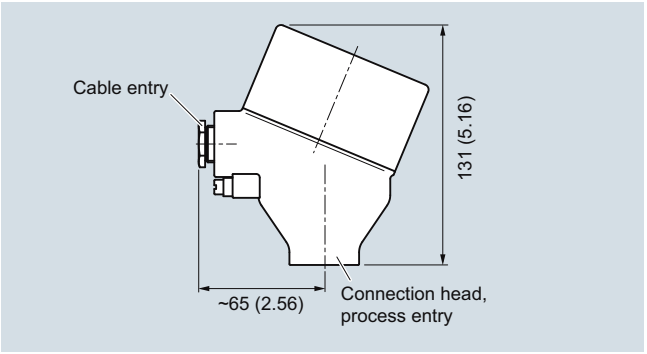
Connection head, aluminum, Type BC0, plastic, type BP0, dimensions in mm (inch)



Connection head, plastic, Type BM0, dimensions in mm (inch)



Connection head, aluminum, Type AG0, stainless steel, Type AU0, dimensions in mm (inch)



Connection head with display and glass lid, aluminum, Type AH0, stainless steel, Type AV0, dimensions in mm (inch)

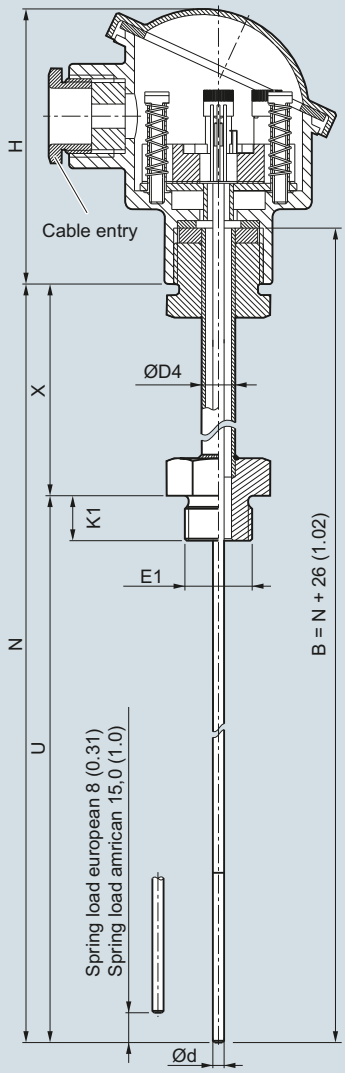
Selection and Ordering data	Order code
Further designs	
Add "**-Z**" to Article No. and specify Order Code.	
Enter thermowell material in plain text	**G1Y**
Enter process connection in plain text	**H1Y**
Enter thermowell form in plain text: L, U, C, D, D2, D3 (Y44 and Y46 specifications not relevant here)	**K1Y**
Insertionlength customer-specific Select range, enter desired length in plain text Insertion length U deviating from standard; (Min: U = C; Max; U= L-50 mm (1.97 inch)), no entry = standard length (U=L-70 mm (2.76 inch))	**Y44**
Extension length customer-specific Select range, enter desired length in plain text (No entry = standard length)	**Y45**
Thermowell length L customer-specific in plain text	**Y46**
Special version of extension Enter form and length in plain text	**N9Y**
Head Enter connection head in plain text	**P1Y**
Sensor number/Accuracy Enter connection head in plain text	**Q1Y**
Options	
Add "**-Z**" to Article No. and add options, separate extensions with "+".	
Built-in head transmitter	
SITRANS TH100, 4 ... 20 mA, Pt100	**T10**
SITRANS TH100 Ex i (ATEX), 4 ... 20 mA, Pt100	**T11**
SITRANS TH100 Ex i (FM), 4 ... 20 mA, Pt100	**T13**
SITRANS TH200, 4 ... 20 mA, Universal	**T20**
SITRANS TH200 Ex (ATEX), 4 ... 20 mA, Universal	**T21**
SITRANS TH300, HART, Universal	**T30**
SITRANS TH300 Ex (ATEX), HART, Universal	**T31**
SITRANS TH400 PA, Universal	**T33**
SITRANS TH400 PA Ex, Universal	**T41**
SITRANS TH400 FF, Universal	**T45**
SITRANS TH400 FF Ex, Universal	**T46**
Explosion protection	
Intrinsic safety "ia", "ic"	**E01**
Flameproof enclosure "d"; Dust protection by enclosures "t" only in combination with connection heads code AG0, AH0, AU0, AV0, without cable gland	**E03**
Non sparking "n"	**E04**
Certificates and approvals	
EN10204-3.1 Inspection certificate for materials coming into contact with media	**C12**
EN10204-3.1 Inspection certificate for hydrostatic pressure test	**C31**
EN10204-3.1 Inspection certificate for helium leak test	**C32**
EN10204-3.1 Inspection certificate for surface tear test	**C33**
EN10204-3.1 Inspection certificate: visual, measurement and functional inspection	**C34**
NACE Standard MR-01-75 compliance	**C50**
ISO 9001 grease-free (cleaned for e.g. oxygen applications)	**C51**

Selection and Ordering data	Order code
Designation, calibration	
Stainless steel TAG plate , enter lettering in plain text	**Y15**
Plant calibration per 1 point, enter temperature in plain text	**Y33**
Transmitter options	
Transmitter, enter complete setting in plain text (Y01:+/-NNNN ... +/-NNNN C,F)	**Y01**
Enter measuring point (max. 8 characters) in plain text	**Y17**
Transmitter, enter measuring point description (max. 16 characters) in plain text	**Y23**
Transmitter, enter measuring point text (max. 32 characters) in plain text	**Y24**
Transmitter, enter bus address in plain text	**Y25**
Transmitter, fail-safe value 3.6 mA (instead of 22.8 mA)	**U36**
Transmitter with a SIL 2 conformity	**C20**
Transmitter with a SIL 2/3 conformity	**C23**
Transmitter test protocol (5 points)	**C11**
Further options	
Connection form, flying leads (for the direct transmitter assembly, delivery without screws and springs)	**G01**
M12 plug (in combination with 1x Pt100 and/or transmitter , Non-Ex)	**G12**
Harting plug Han 7 D (Non Ex)	**G13**
Connection head with ½ NPT thread without cable gland	**G20**
Plastic cable gland	**G21**
with spring lock for heads BB0 and BC0	**A01**
with outer earth screw for heads AG0, AH0, AU0 and AV0	**A02**
with inner earth screw for heads BC0, AG0, AH0, AU0 and AV0	**A03**
Option not found?	
Specify special version in plain text	**Y99**

You find ordering examples on page 2/107!

For the installation of existing protective tubes

Dimensional drawings

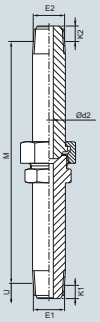


B	Measuring insert length
Ød	Measuring insert outer diameter
ØD4	Extension outer diameter
E1	Process connection, thread size
H	Head height
K1	Screw depth
N	Nominal length
U	Insertion length
X	Extension length

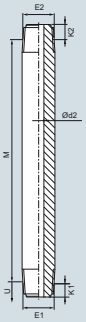
SITRANS TS500, temperature sensors for vessels and pipings, temperature sensors for installation in existing thermowells, suitable for thermowells as per DIN 43772 as well as ASME B40.9-2001 with extension European or American types, dimensions in mm (inch)

Neck tube (1, 2, 3), ajustable, european, cylindrical, dimensions in mm (inch)

Neck tube NPT (1, 2, 3), ajustable, european, conical, dimensions in mm (inch)



Neck tube NUN, ajustable, conical, european (5), american (8), dimensions in mm (inch)



Neck tube, nipple, non ajustable, conical, european (4), american (6), dimensions in mm (inch)

[1] Numerics 1 ... 8: s. Selection and Ordering data option extension page 2/157

For the installation of existing protective tubes

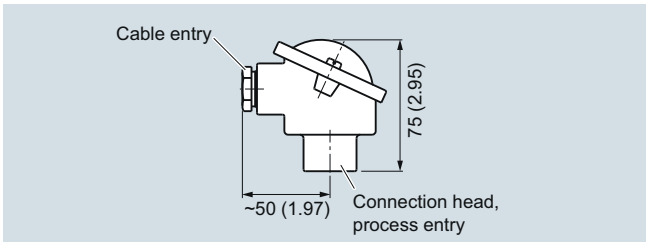
Selection and Ordering data	Article No.	Ord. Code
SITRANS TS500	**7MC7500-**	
Temperature sensors for installation in existing thermowells, suitable for thermowells as per DIN 43772 as well as ASME B40.9-2001 with extension European or American types		
Model		
existing thermowells	1	
Thread type		
G½" (½"BSPF) (not for American type)	C	
NPT½"	J	
M14x1.5 (not for American type)	T	
M18x1.5 (not for American type)	U	
Special version	Z	J 1 Y
Insertion ength U free length, standard lengths		
110 mm (3.97 inch)	B 1	
140 mm (6.30 inch)	B 2	
200 mm (9.06 inch)	C 1	
260 mm 143.17 inch)	C 2	
410 mm (20.08 inch)	E 1	
2 ½" + 1/8"	A 5	
4" + 1/8"	B 5	
6" + 1/8"	B 6	
9" + 1/8"	C 5	
12" + 1/8"	D 5	
15" + 1/8"	D 6	
18" + 1/8"	E 6	
24" + 1/8"	G 5	
Insertion U free length, customer-specific		
enter customer specific length with Y44, see page 2/159 Order Codes		
10 ... 100 mm (0.39 ... 3.94 inch) Standard: 100 mm (3.94 inch)	A 0	
101 ... 200 mm (3.98 ... 7.87 inch) Standard: 200 mm (7.87 inch)	B 0	
201 ... 300 mm (7.91 ... 11.81 inch) Standard: 300 mm (11.81 inch)	C 0	
301 ... 400 mm (11.85 ... 15.75 inch) Standard: 400 mm (15.75 inch)	D 0	
401 ... 500 mm (15.79 ... 19.68 inch) Standard: 500 mm (19.68 inch)	E 0	
501 ... 600 mm (19.72 ... 23.62 inch) Standard: 600 mm (23.62 inch)	F 0	
601 ... 800 mm (23.66 ... 31.50 inch) Standard: 800 mm (31.50 inch)	G 0	
801 ... 1 000 mm (31.54 ... 39.37 inch) Standard: 1 000 mm (39.37 inch)	H 0	
Insertion length U free length, special length		
Special length > 3 000 mm (118.11 inch)	X 0	
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	
Special version	9	M 1 Y

Selection and Ordering data	Article No.	Ord. Code
SITRANS TS500	**7MC7500-**	
Temperature sensors for installation in existing thermowells, suitable for thermowells as per DIN 43772 as well as ASME B40.9-2001 with extension European or American types		
Extension X		
European type: without extension	0	
European type: X=65 (M=80 mm) (3.15 inch) adjustable	1	
European type: X=139 mm (5.47 inch) (M=155 mm (6.10 inch)) adjustable (DIN standard length for L=110)	2	
European type: X=149 mm (5.87 inch) (M=165 mm (6.50 inch)) adjustable	3	
European type:NIP, =150 mm (5.91 inch) not adjustable (NPT½")	4	
European type: X=150 mm (5.91 inch) NUN adjustable (NPT½")	5	
American type: X=74 mm (2.91 inch) integrated sensor spring, NIP, not adjustable (NPT½")	6	
American type: X=150 mm (5.91 inch) integrated sensor spring NUN adjustable (NPT½")	8	
Extension X, customer-specific		
enter customer specific length with Y45, see page 2/159 Order Codes		
45 ...150 mm (1.77 ... 5.91 inch) Standard: 150 mm (5.91 inch)	9	N 1
151 ... 300 mm (5.95 ... 11.81 inch) Standard: 300 mm (11.81 inch)	9	N 2
301 ... 450 mm (11.85 ... 17.72 inch) Standard: 450 mm (17.72 inch)	9	N 3
Model		
DIN type (M24 adjustable)		D
ANSI-Type spring loaded		A
Nipple 2x NPT not spring loaded		N
N-U-N 2x NPT not spring loaded		U
Extension special version		
Extension special version	9	N 9 Y

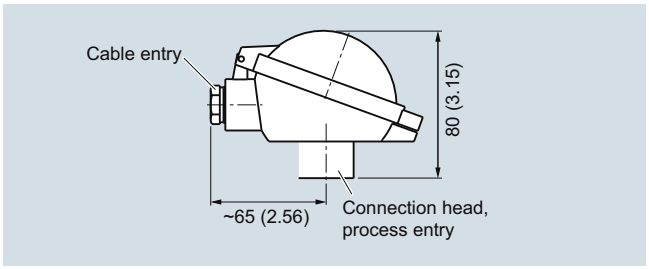
Additional configurations on page after next page!

You find ordering examples on page 2/107!

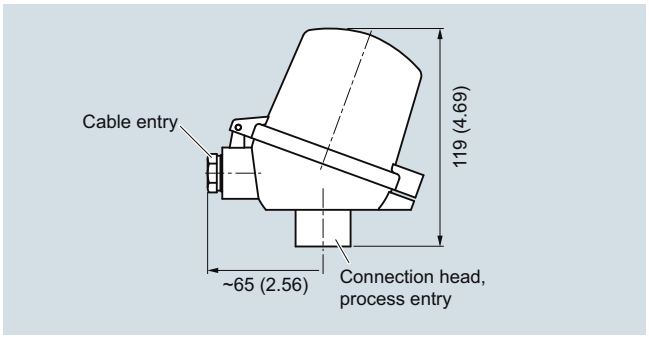
For the installation of existing protective tubes



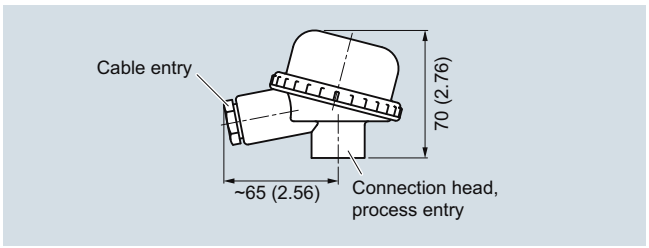
Connection head, aluminum, Type BA0, dimensions in mm (inch)



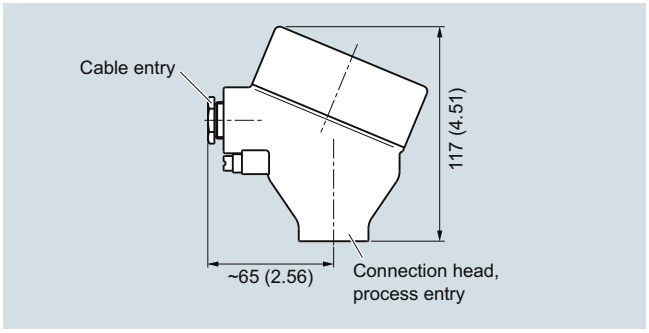
Connection head, aluminum, Type BB0, dimensions in mm (inch)



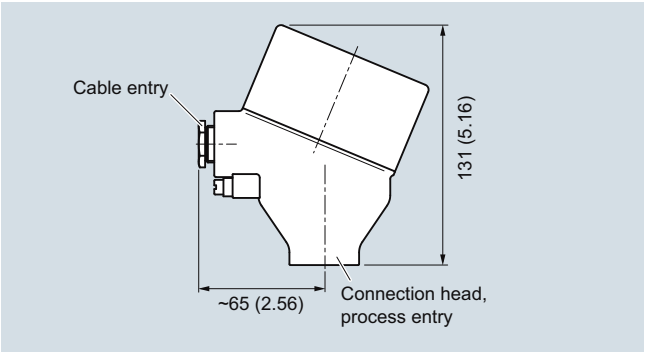
Connection head, aluminum, Type BC0, plastic, type BP0, dimensions in mm (inch)



Connection head, plastic, Type BM0, dimensions in mm (inch)



Connection head, aluminum, Type AG0, stainless steel, Type AU0, dimensions in mm (inch)



Connection head with display and glass lid, aluminum, Type AH0, stainless steel, Type AV0, dimensions in mm (inch)

For the installation of existing protective tubes

Selection and Ordering data	Article No.	Ord. Code
SITRANS TS500 **Temperature sensors for installation in existing thermowells, suitable for thermowells as per DIN 43772 as well as ASME B40.9-2001 with extension European or American types**	**7MC7500-**	-
Head		
without connection head for American type sensors with integrated spring load		**N**
Aluminum head, BA0, flange cover, Standard		**A**
Aluminum head, BB0, low hinged cover, screw connection		**B**
Aluminum head, BC0, high hinged cover, screw connection		**C**
Aluminum head, AG0, screw cover, suitable for Ex d		**G**
Aluminum head, AH0, screw cover, suitable for Ex d, display (not for Ex i)		**H**
Plastic head, BM0, screw cover		**M**
Plastic head, BP0high hinged cover, screw connection		**P**
Stainless steel head, AU0, screw cover, Ex d		**U**
Stainless steel head, AV0, screw cover, Ex d, display (not for Ex i)		**V**
Special version of connection head		**Z** **P 1 Y**
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, only class 2, -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)		**1**
Single, increased accuracy (Class 1/Class A)		**2**
Single, highest accuracy (Class AA)		**3**
Double, basic accuracy (Class 2/Class B)		**5**
Double, increased accuracy (Class 1/Class A)		**6**
Double, highest accuracy (Class AA)		**7**
Specify special version in plain text		**Z 0** **Q 1 Y**

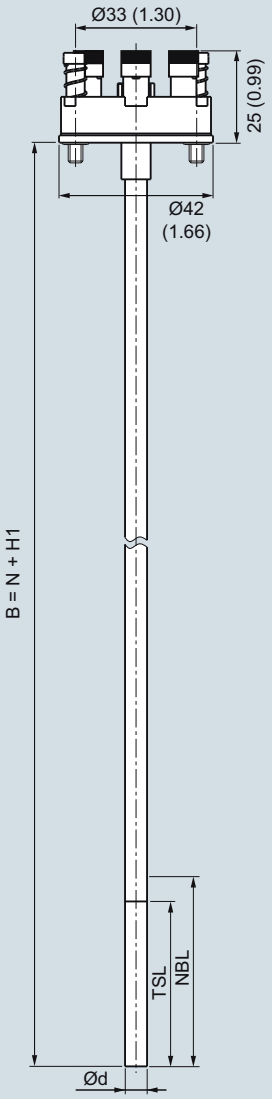
Selection and Ordering data	Order code
Further designs Add "**-Z**" to Article No. and specify Order Code.	
Enter thread type in plain text	**J1Y**
Enter diameter of measurement in plain text	**M1Y**
Special version of extension Special version of extension, enter form and length in plain text	**N9Y**
Head Enter connection head in plain text	**P1Y**
Sensor number/Accuracy Enter connection head in plain text	**Q1Y**
Insertion length customer-specific Select range, enter desired length in plain text (No entry = standard length)	**Y44**
Extension length customer-specific Select range, enter desired length in plain text (No entry = standard length)	**Y45**

Selection and Ordering data	Order code
Options Add "**-Z**" to Article No. and add options, separate extensions with "+".	
Built-in head transmitter	
SITRANS TH100, 4 ... 20 mA, Pt100	**T10**
SITRANS TH100 Ex i (ATEX), 4 ... 20 mA, Pt100	**T11**
SITRANS TH100 Ex i (FM), 4 ... 20 mA, Pt100	**T13**
SITRANS TH200, 4 ... 20 mA, Universal	**T20**
SITRANS TH200 Ex (ATEX), 4 ... 20 mA, Universal	**T21**
SITRANS TH300, HART, Universal	**T30**
SITRANS TH300 Ex (ATEX), HART, Universal	**T31**
SITRANS TH400 PA, Universal	**T40**
SITRANS TH400 PA Ex, Universal	**T41**
SITRANS TH400 FF, Universal	**T45**
SITRANS TH400 FF Ex, Universal	**T46**
Explosion protection	
Intrinsic safety "ia", "ic"	**E01**
Flameproof enclosure "d"; Dust protection by enclosures "t" only in combination with connection heads code AG0, AH0, AU0, AV0, without cable gland	**E03**
Non sparking "n"	**E04**
Certificates and approvals	
EN10204-3.1 Factory certificate: visual, measurement and functional inspection	**C34**
Factory calibration per 1 point: enter temperature in plain text	**Y33**
Designation, calibration	
Stainless steel TAG plate , enter lettering in plain text	**Y15**
Plant calibration per 1 point, enter temperature in plain text	**Y33**
Transmitter options	
Transmitter, enter complete setting in plain text (Y01:+/-NNNN ... +/-NNNN C,F)	**Y01**
Enter measuring point (max. 8 characters) in plain text	**Y17**
Transmitter, enter measuring point description (max. 16 characters) in plain text	**Y23**
Transmitter, enter measuring point text (max. 32 characters) in plain text	**Y24**
Transmitter, enter bus address in plain text	**Y25**
Transmitter, fail-safe value 3.6 mA (instead of 22.8 mA)	**U36**
Transmitter with a SIL 2 conformity	**C20**
Transmitter with a SIL 2/3 conformity	**C23**
Transmitter test protocol (5 points)	**C11**
Further options	
Connection form, flying leads (for the direct transmitter assembly, delivery without screws and springs)	**G01**
M12 plug (in combination with 1x Pt100 and/or transmitter , Non-Ex)	**G12**
Harting plug Han 7 D (Non Ex)	**G13**
Connection head with ½" NPT thread without cable gland	**G20**
Plastic cable gland	**G21**
with spring lock for heads BB0 and BC0	**A01**
with outer earth screw for heads AG0, AH0, AU0 and AV0	**A02**
with inner earth screw for heads BC0, AG0, AH0, AU0 and AV0	**A03**
Option not found?	
Specify special version in plain text	**Y99**

You find ordering examples on page 2/107!

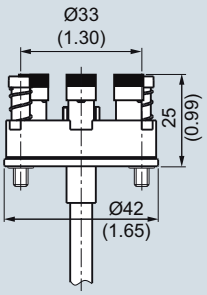
Measuring inserts for retrofits and upgrades European and American type

Dimensional drawings

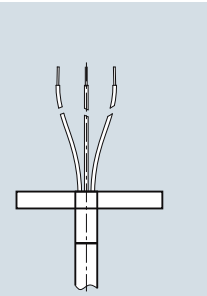


B	Measuring insert length
Ød	Measuring insert outer diameter
N	Nominal length
NBL	Non-bending length
TSL	Temperature-sensitive length

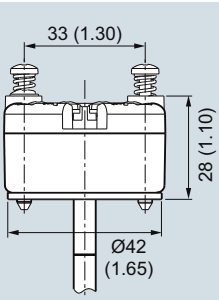
SITRANS TSinserts measuring inserts for temperature sensors, replaceable, mineral-insulated design
European type (DIN ceramic base), spring load approx. 8 mm (0.31 inch)
Cold End types: see drawings on right side, dimensions in mm (inch)



Cold End type, ceramic base, dimensions in mm (inch)



Cold End type, free wire ends, dimensions in mm (inch)



Cold End type, built-on transmitter, dimensions in mm (inch)

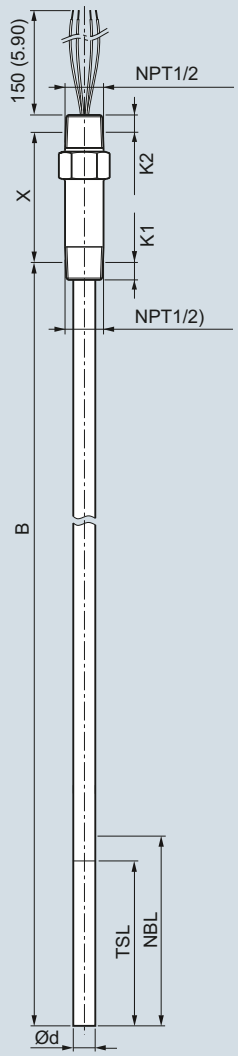
Selection and Ordering data	Article No.	Ord. Code
SITRANS TSinserts for temperature sensors, replaceable, mineral-insulated design, European or American type	**7MC701** -	
Measurement tip diameter		
6 mm (0.24 inch)	6	
8 mm (0.31 inch) (with sleeve)	8	
10 mm (0.39 inch) (with sleeve)	0	
Type		
European 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	J 1 Y
Measuring insert length B, standard		
145 mm (6.89 inch)	1 3	
205 mm (8.07 inch)	1 7	
275 mm (10.83 inch)	2 1	
315 mm (12.40 inch)	2 3	
345 mm (13.58 inch)	2 4	
375 mm (14.76 inch)	2 5	
405 mm (15.94 inch)	2 7	
435 mm (17.13 inch)	2 0	
555 mm (21.85 inch)	3 5	
585 mm (23.03 inch)	3 6	

Selection and Ordering data	Article No.	Ord. Code
SITRANS TSinserts for temperature sensors, replaceable, mineral-insulated design, European or American type	**7MC701** -	
Measuring insert length B, customer-specific		
specify length with Y44, s. page 2/163		
50 ... 100 mm (1.97 ... 3.94 inch) Standard: 100 mm (3.94 inch)	1 1	
101 ... 150 mm (3.98 ... 5.91 inch) Standard: 145 mm (5.71 inch)	1 3	
151 … 200 mm (5.95 ... 7.87 inch) Standard: 200 mm (7.87 inch)	1 5	
201 … 250 mm (7.91 ... 9.84 inch) Standard: 205 mm (8.07 inch)	1 7	
251 … 300 mm (9.88 ... 11.81 inch) Standard: 275 mm (10.83 inch)	2 1	
301 … 350 mm (11.85 ... 13.78 inch) Standard: 315 mm (12.40 inch)	2 3	
351 … 400 mm (13.82 ... 15.75 inch) Standard: 375 mm (14.76 inch)	2 5	
401 … 450 mm (15.79 ... 17.72 inch) Standard: 405 mm (15.94 inch)	2 7	
451 … 500 mm (17.76 ... 19.68 inch) Standard: 500 mm (19.68 inch)	3 1	
501 … 550 mm (19.72 ... 21.65 inch) Standard: 525 mm (20.67 inch)	3 3	
551 … 600 mm (21.69 ... 23.92 inch) Standard: 555 mm (21.85 inch)	3 5	
601 … 700 mm (23.66 ... 27.56 inch) Standard: 655 mm (25.79 inch)	3 7	
701 … 800 mm (27.60 ... 31.50 inch) Standard: 735 mm (28.94 inch)	4 1	
801 … 900 mm (31.54 ... 35.43 inch) Standard: 825 mm (32.48 inch)	4 3	
901 … 1 000 mm (35.47 ... 39.37 inch) Standard: 950 mm (37.40 inch)	4 5	
1 001 … 1 500 mm (39.41 ... 59.05 inch) Standard: 1 250 mm (49.21 inch)	4 7	
Measuring insert length B, special length		
Special length > 1 500 mm (59.05 inch)	8 0	

Additional configurations on page after next page!

You find ordering examples on page 2/107!

Measuring inserts for retrofits and upgrades European and 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 TSinserts, measuring inserts for temperature sensors, replaceable, mineral-insulated design
American type, spring load approx. 21 mm (0.83 inch)

Selection and Ordering data	Order code
Further designs	
Add "**-Z**" to Article No. and specify Order Code.	
Sensor/Sensor number/Accuracy	
Enter in plain text	
Specify special version in plain text	**J1Y**
Measeuring insert length B	**Y44**
Select range, enter desired length in plain text	
(No entry = standard length)	
Options	
Add "**-Z**" to Article No. and add options, separate extensions with "+".	
Built-in head transmitter	
SITRANS TH100, 4 ... 20 mA, Pt100	**T10**
SITRANS TH100 Ex i (ATEX), 4 ... 20 mA, Pt100	**T11**
SITRANS TH100 Ex i (FM), 4 ... 20 mA, Pt100	**T13**
SITRANS TH200, 4 ... 20 mA, Universal	**T20**
SITRANS TH200 Ex (ATEX), 4 ... 20 mA, Universal	**T21**
SITRANS TH200 Ex (FM), 4 ... 20 mA, Universal	**T23**
SITRANS TH300, HART, Universal	**T30**
SITRANS TH300 Ex (ATEX), HART, Universal	**T31**
SITRANS TH300 Ex (FM), HART, Universal	**T33**
SITRANS TH400 PA, Universal	**T40**
SITRANS TH400 PA Ex, Universal	**T41**
SITRANS TH400 FF, Universal	**T45**
SITRANS TH400 FF Ex, Universal	**T46**
Explosion protection	
Intrinsic safety "ia", "ic"	**E01**
for SITRANS TS500 with protection type Ex d	**E03**
for SITRANS TS500 with protection type Ex n	**E04**
Designation, calibration	
Stainless steel TAG plate , enter lettering in plain text	**Y15**
Plant calibration per 1 point, enter temperature in plain text	**Y33**
Transmitter options	
Transmitter, enter complete setting in plain text (Y01:+/-NNNN ... +/-NNNN C,F)	**Y01**
Enter measuring point (max. 8 characters) in plain text	**Y17**
Transmitter, enter measuring point description (max. 16 characters) in plain text	**Y23**
Transmitter, enter measuring point text (max. 32 characters) in plain text	**Y24**
Transmitter, enter bus address in plain text	**Y25**
Transmitter, fail-safe value 3.6 mA (instead of 22.8 mA)	**U36**
Transmitter with a SIL 2 conformity	**C20**
Transmitter with a SIL 2/3 conformity	**C23**
Transmitter test protocol (5 points)	**C11**
Option not found?	
Specify special version in plain text	**Y99**

You find ordering examples on page 2/107!

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 Article 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)	**Y01**

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: .....
   .....

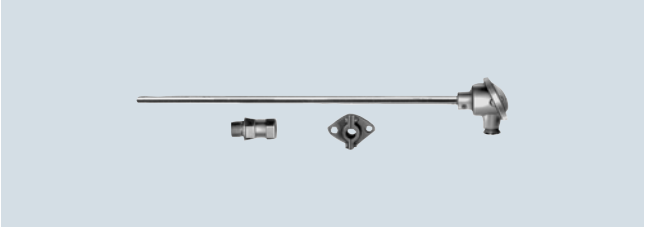
5. Tests: .....
   .....

6. Accessories: .....
   .....

7. Supplementary requirements: .....
   .....

Flue gas resistance thermometers with connection head

Overview



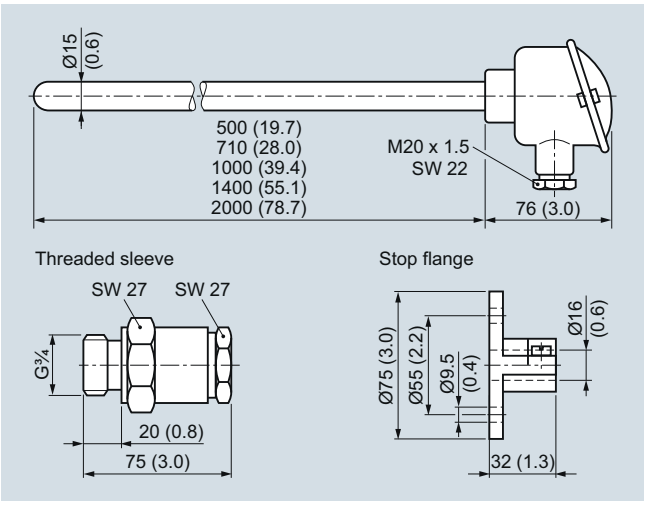
The flue gas resistance thermometer with connection head is suitable for the temperature range from -50 to +600 °C (-58 to +1112 °F) and can also be supplied with a built-in temperature transmitter.

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

	Article 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)	**7MC1000 - 1BA2** ■
• 710 (28.0) / 1.1 (2.43)	**7MC1000 - 2BA2** ■
• 1000 (39.4) / 1.5 (3.31)	**7MC1000 - 3BA2** ■
• 1400 (55.1) / 1.9 (4.19)	**7MC1000 - 4BA2** ■
• 2000 (78.7) / 2.7 (5.95)	**7MC1000 - 5BA2** ■
Connection head, form B, made of cast light alloy, with 1 cable inlet and	
• Screw cover	**1**
• Standard hinged cover	**4**
• High hinged cover	**6**
Further designs Please add "**-Z**" to Article No. and specify Order code(s) and plain text.	Order code
Special version, specify in plain text	**Y98**
Process number for special version	**Y99**
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**
Accessories	Article 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)	**7MC2998 - 5CA**
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)	
• G¾ internal thread with gasket	**7MC2998 - 5DA**
• G½ internal thread with gasket	**7MC2998 - 5DC**

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 2/164).

Individual parts: Measuring inserts, see "Accessories".on page 2/168

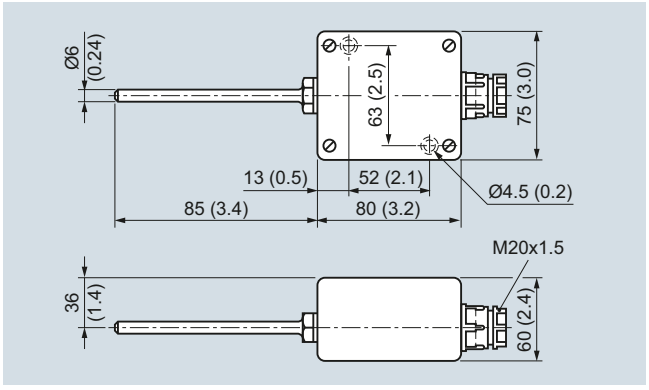
Overview

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

	Article No.
Resistance thermometer for damp rooms stainless steel protective tube	
• with one Pt100 measuring resistor 0.1 kg (0.22 kg) ►	**7MC1027-1AA**
• with two Pt100 measuring resistors 0.1 kg (0.22 kg)	**7MC1027-1AB**
Further designs Please add "**-Z**" to Article No. and specify Order code(s) and plain text.	Order code
Special version, specify in plain text	**Y98**
Process number for special version	**Y99**
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**

► 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 2/164).

Note:

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

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)

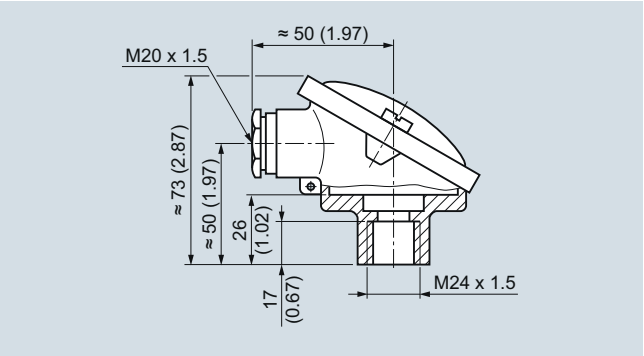
Neck tube

Neck tube for high-pressure screw-in resistance thermometer

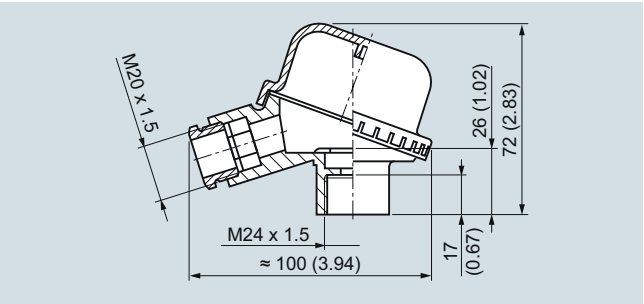
- Made of stainless steel, mat. No. 1.4571
- With threads at both ends
- For measuring insert tube with 6 mm (0.24 inch) OD

Dimensional drawings

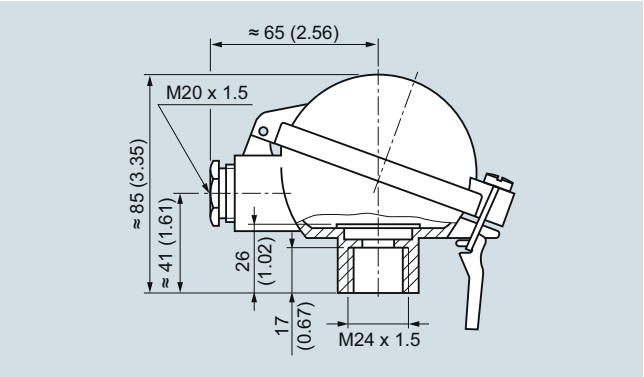
Connection heads for low and high-pressure resistance thermometers, flue gas and flange-type resistance thermometers



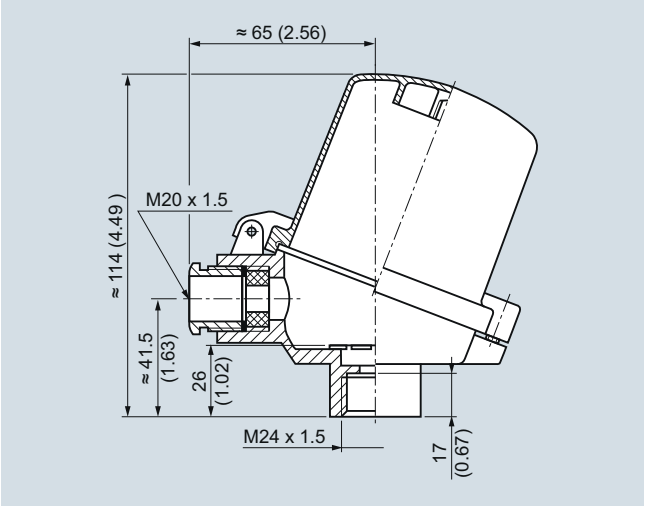
Connection head, form B, degree of protection IP54, made of cast light alloy, with screw cover, dimensions in mm (inches)



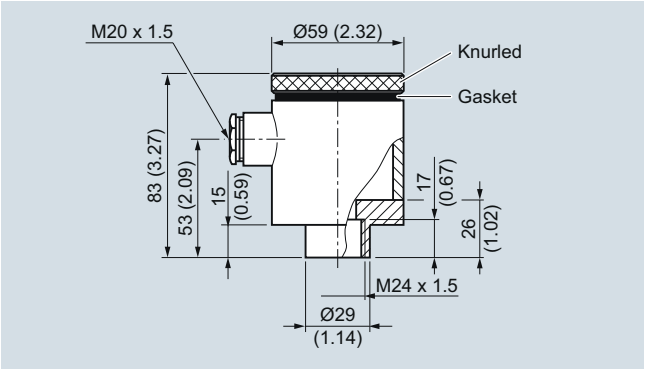
Connection head, form B, degree of protection IP54, made of plastic, with screw cover, dimensions in mm (inches)



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)

Selection and Ordering data

Article 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

Cone length C 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

Cone length C 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

Article 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)	**7MC1906-1AA**
• 165 (6.50)	305/365 (12.01/14.37)	140/200 (5.51/7.87)	0.15 (0.33)	**7MC1906-2AA**
• 195 (7.68)	395 (15.55)	200 (7.87)	0.18 (0.40)	**7MC1906-3AA**
• 225 (8.86)	365 (14.37)	140 (5.51)	0.20 (0.44)	**7MC1906-4AA**
• 255 (10.04)	395 (15.55)	140 (5.51)	0.22 (0.49)	**7MC1906-5AA**

Selection and Ordering data

Article 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) Weight: 0.02 kg (0.04 lb) — **7MC1907-1BS**

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.

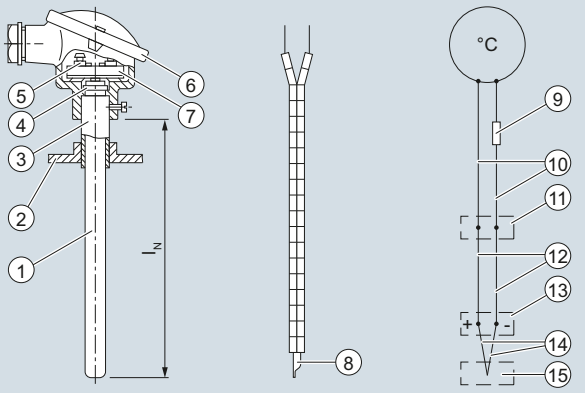
Technical description

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:



Cross section of thermocouple | Thermocouple element with insulating beads | Connection diagram

l_N Nominal length

1. Ceramic protective tube
2. Locating flange
3. Support tube
4. Retaining ring
5. Terminal
6. Connection head
7. Terminal block
8. Temperature sensor
9. Balancing resistor
10. Lead
11. Cold junction
12. Extension lead
13. Connection point
14. Thermocouple element with positive and negative legs
15. 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 conjunction) 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 isee 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 thermo-couples.

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.

Straight thermocouples to DIN 43733, with connection head

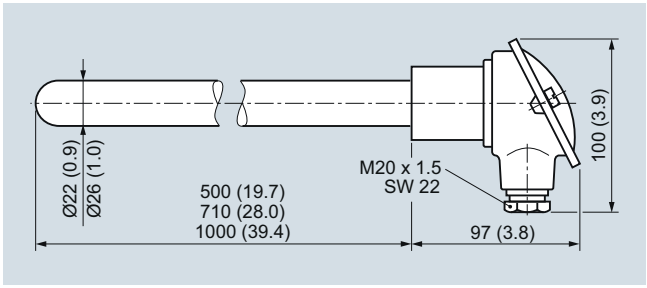
Overview

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

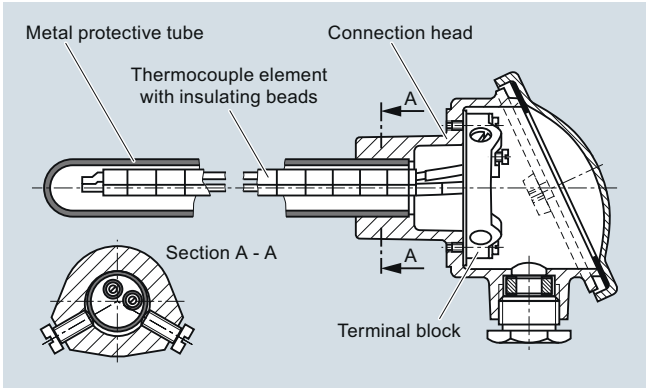
Thermocouples	Ni Cr/Ni type K
• Number	1 or 2
• Leg diameter	2 ... 3 mm (0.08 ... 0.12 inch)
• Insulation of legs	Insulating beads
Protective tube	Metal
Connection head	Form A, DIN 43729; made of cast light alloy, with one cable bushing

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

	Article 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)	7MC2000 - 1DC0
• 710 (28.0)	7MC2000 - 2DC0
• 1000 (39.4)	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)	7MC2000 - 1DD0
• 710 (28.0)	7MC2000 - 2DD0
• 1000 (39.4)	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)	7MC2000 - 1EC0
• 710 (28.0)	7MC2000 - 2EC0
• 1000 (39.4)	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)	7MC2000 - 1ED0
• 710 (28.0)	7MC2000 - 2ED0
• 1000 (39.4)	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)	7MC2000 - 1FC0
• 710 (28.0)	7MC2000 - 2FC0
• 1000 (39.4)	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)	7MC2000 - 1FD0
• 710 (28.0)	7MC2000 - 2FD0
• 1000 (39.4)	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)	7MC2000 - 1HC0
• 710 (28.0)	7MC2000 - 2HC0
• 1000 (39.4)	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)	7MC2000 - 1HD0
• 710 (28.0)	7MC2000 - 2HD0
• 1000 (39.4)	7MC2000 - 3HD0
Connection head, form A, made of cast light alloy, with 1 cable inlet and	
• screw cover	1
• high hinged cover	6

Straight thermocouples
Individual parts and accessories

Selection and Ordering data	Order code
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 Article No. and specify Order code(s) and plain text.	
Special version, specify in plain text	**Y98**
Process number for special version	**Y99**
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 2/164).

Installation of a transmitter is only possible here in the versions with a high hinged cover (7MC2000-....6).

Selection and Ordering data	Article No.
Metallic protective tubes for straight thermocouple elements according to DIN 43733	
X 10 CrAl 24, material No. 1.4762	
∅ 22 mm x 2 mm (∅ 0.87 inch x 0.08 inch), 0.55 ... 1.10 kg (1.21 ... 2.42 lb), dished	
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	
∅ 26 mm x 4 mm (∅ 1.02 inch x 0.16 inch), 1.25 ... 2.20 kg (2.76 ... 4.85 lb), dished	
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	
∅ 22 mm x 2 mm (∅ 0.87 inch x 0.08 inch), 1.05 kg (2.31 lb), dished	
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	
∅ 22 mm x 2 mm (∅ 0.87 inch x 0.05 inch), 0.55 ... 1.10 kg (1.21 ... 2.42 lb)	
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**

Selection and Ordering data	Article 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)	
Nominal length *L1* in mm (inch): / Thermocouple length *L2* in mm (inch):	
• 500 (19.7) / 540 (21.3)	**7MC2903-1CA**
• 710 (28.0) / 750 (29.5)	**7MC2903-2CA**
• 1000 (39.4) / 1040 (40.9)	**7MC2903-3CA**

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))

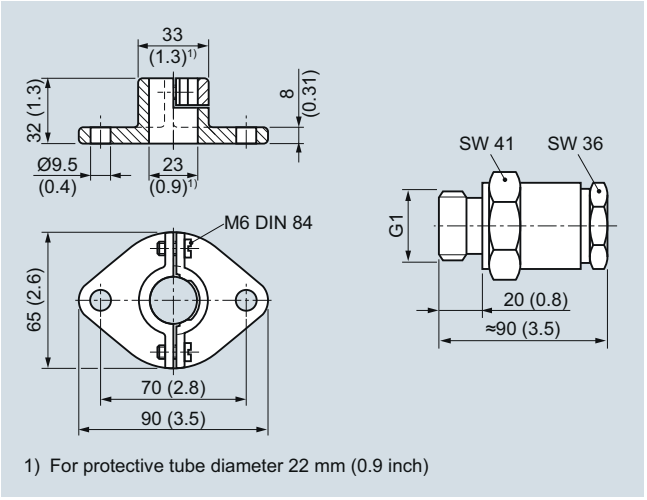
Selection and Ordering data	Article No.
Connection head, form A, (without terminal block and terminals) 1 Cable inlet, degree of protection IP53, 0.35 kg (0.77 lb)	
Cast light alloy fastener, unscrewable for protective tube diameter in mm (inch) (bore = protective tube diam. +0.5 mm) (0.02 inch): • 22 (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	Article 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, materiall 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



1) For protective tube diameter 22 mm (0.9 inch)

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

Notes