SITRANS T
measuring instruments for temperature

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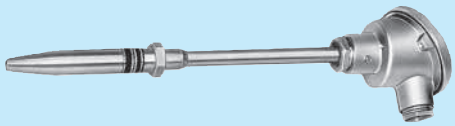
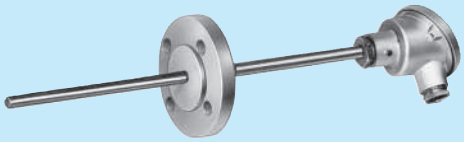
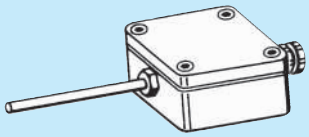
You can download all instructions, catalogs and certificates for SITRANS T free of charge at the following Internet address:
www.siemens.com/sitranst

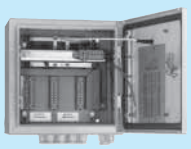
Product overview

Overview

	Application	Mounting of transmitter with Ex protection		Page	Software for parameterization
Four-wire system					
	**SITRANS TW** Transmitters for connection to resistance thermometers, resistance-based sensors, thermocouples, DC voltages and DC currents for: • Rail mounting	Transmitter Safe area	Sensor Zone 1, zone 0	3/5	SIMATIC PDM
Two-wire system					
	**SITRANS TK-L** Transmitters for Pt100 • Mounting in sensor head	Zone 2, zone 1	Zone 2, zone 1, zone 0	3/22	SIPROM TK
	**SITRANS TK/TK-H** Transmitters for connection to resistance thermometers, resistance-based sensors, thermocouples and DC voltages up to 1.1 V • Mounting in sensor head	Zone 2, zone 1	Zone 2, zone 1, zone 0	3/25	SIPROM TK for SITRANS TK, SIMATIC PDM for SITRANS TK-H
	**SITRANS TF** Transmitters for connection to resistance thermometers, resistance-based sensors, thermocouples and DC voltages up to 1.1 V • In field housing for heavy industrial use	Zone 2, zone 1	Zone 2, Zone 1, Zone 0	3/29	Depends on mounted transmitter TK/TK-H
	**SITRANS TF2** • Transmitter with LCD display and mounted Pt100	-	-	3/34	Local programming using keys
PROFIBUS PA system					
	**SITRANS T3K PA** Transmitters for connection to resistance thermometers, resistance-based sensors, thermocouples and DC voltages up to 1.1 V • Mounting in sensor head	Zone 1	Zone 1, Zone 0	3/17	SIMATIC PDM

	Device	Largest measuring range	Page
Resistance thermometers			
	Temperature transmitters factory-installed in connection head of a resistance thermometer (selection list) • SITRANS T3K PA • SITRANS TK/TK-H • SITRANS TK-L		3/41
	Flue gas resistance thermometers	-50 ... +600 °C (-58 ... +1112 °F)	3/43
	Low-pressure screw-in resistance thermometers • Without neck tube • With neck tube	 -50 ... +400 °C (-58 ... +752 °F) -50 ... +600 °C (-58 ... +1112 °F)	3/44
	High-pressure screw-in resistance thermometers	-50 ... +600 °C (-58 ... +1112 °F)	3/46
	High-pressure welding-type resistance thermometers	-50 ... 550 °C (-58 ... +1022 °F)	3/47
	Flange-type resistance thermometers	-50 ... +600 °C (-58 ... +1112 °F)	3/48
	Resistance thermometers for damp rooms	-30 ... +60 °C (-22 ... +140 °F)	3/50

Product overview

	Device	Largest measuring range	Page
Thermocouples			
	Temperature transmitters factory-installed in connection head of a thermocouple (selection list) • SITRANS T3K PA • SITRANS TK/TK-H		3/60
	Straight thermocouples	0 ... 1250 °C (32 ... 2282 °F)	3/62
	Jacket thermocouples with extension lead	0 ... 1100 °C (32 ... 2012 °F)	3/65
	Jacket thermocouples with connection head, form B	0 ... 1100 °C (32 ... 2012 °F)	3/66
	Jacket thermocouples with socket	0 ... 1100 °C (32 ... 2012 °F)	3/67
Cold junction/cold junction thermostat			
	Cold junction with built-in power supply unit	Reference temperature 0 or 20 °C (32 ... 68 °F)	3/69
	Cold junction thermostat	Reference temperature	
	• For max. 6 or 12 measuring points	50, 60 ... 70 °C (122, 144 ... 158 °F)	3/70
	• For max. 12 or 24 measuring points	50, 60 or 70 °C (122, 144 or 158 °F)	3/71
Resistance thermometers for food, pharmaceuticals and biotechnology			
	Resistance thermometers • For installation in pipelines and tanks • For temperature measurements with hygienic requirements	- 50 ... + 400 °C (-58 ... +752 °F)	3/72
	Resistance thermometers with clamp-on system The temperature sensors with pipe sleeve are primarily used for temperature monitoring in sterile applications in the food and pharmaceutical industries.	- 20 ... + 200 °C (-4 ... + 392 °F)	3/75

SITRANS TW universal transmitter

Four-wire system for rail mounting

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 thermometers
- Thermocouple elements
- 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.

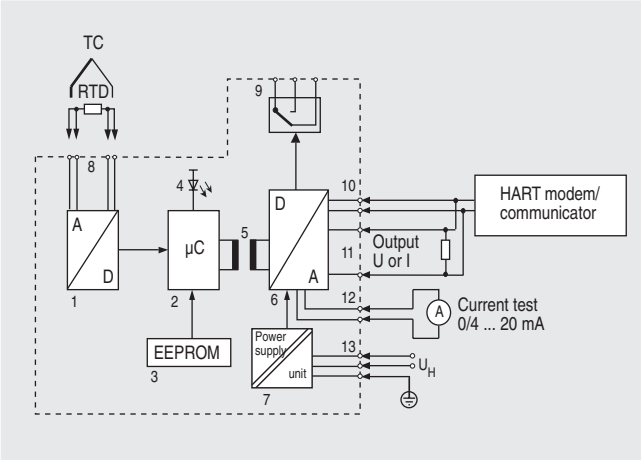
All SITRANS TW control room devices are available in a non-intrinsically safe version as well as in an intrinsically safe version for use with the most stringent requirements.

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

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.

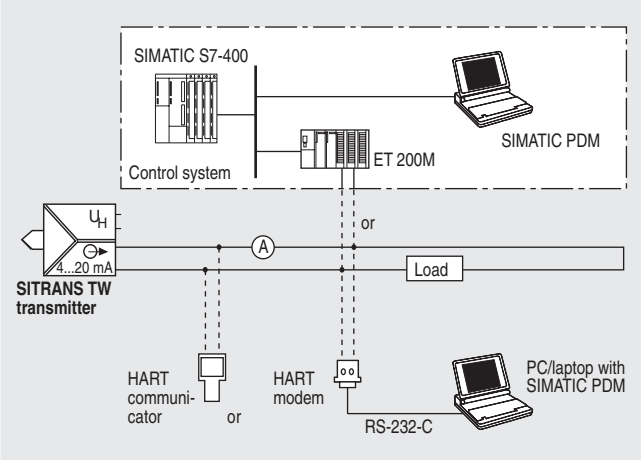
Physical values can be defined with the simulation function. It is thus possible to check the complete signal path from the sensor input to inside the control system without additional equipment. The slave pointer functions are used to record the minimum and maximum of the plant's process variable.

SITRANS TW universal transmitter

Four-wire system for rail mounting

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
Measured range	Parameterizable
Measured span	Min. 25 °C (45 °F) x 1/scaling factor
Sensor type	
• DIN IEC 751	Pt100 (DIN IEC 751)
• Acc. to JIS C 1604-81	Pt100 (JIS C1604-81)
• Acc. 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)
Voltage measurement	Temperature-linear, resistance-linear or customer-specific
Type of connection	• Normal connection • Sum or parallel connection • Mean-value or differential connection
Connection	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 sensors, potentiometers	
Measured variable	Ohmic impedance
Measured range	Parameterizable
Measured span	Min. 10 Ω
Voltage measurement	Resistance-linear or customer-specific
Type of connection	• Normal connection • Differential connection • Mean-value connection
Connection	2, 3 or 4-wire circuit
Input range	0 ... 6000 Ω; bei Mittelwert- und Differenzschaltung: 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)

Technical specifications (continued)

Thermocouple elements	
Measured variable	Temperature
Measured range	Parameterizable
Measured span	Min. 50 °C (32.22 °F) x 1/scaling factor
Measuring range limits	Depend. on type of thermocouple element
Thermocouple	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)
Voltage measurement	Temperature-linear, voltage-linear or customer-specific
Type of connection	• Normal connection
	• Sum 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
Measured range	Parameterizable
Measured span	Min. 4 mV
Input range	-120 ... +1000 mV
Voltage measurement	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
Measured range	Parameterizable
Voltage measurement	Voltage-linear or customer-specific
Input range/min. span	
• Devices with 7NG3242-xxxx**1** or 7NG3242-xxxx **0** with U/I plug	-1.2 V ... +10 V/0.04 V
• Devices with 7NG3242-xxxx**2**	-12 V ... +100 V/0.4 V
• Devices with 7NG3242-xxxx**3**	-120 V ... +140 V/4.0 V
Sensor breakage monitoring	Not possible
m A, mA sources	
Measured variable	DC voltage
Measured range	Parameterizable
Voltage measurement	Current-linear or customer- specific
Input range/min. span	
• Devices with 7NG3242-xxxx**4**	-12 µA ... +100 µA/0.4 µA
• Devices with 7NG3242-xxxx**5**	-120 µA ... +1000 µA/4 µA
• Devices with 7NG3242-xxxx**6**	-1.2 mA ... +10 mA/0.04 mA
• Devices with 7NG3242-xxxx**7** or 7NG3242-xxxx **0** with U/I plug	-12 mA ... +100 mA/0.4 mA
• Devices with 7NG3242-xxxx**8**	-120 mA ... +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	-0.5 ... +23.0 mA, continuously adjustable
• Load	≤ 650 Ω
• Open-circuit 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 voltage	≤ 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
• Overrange	Flashing frequency 1 Hz
Relay output	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	≤ DC 2.5 A
Overrange	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

Four-wire system for rail mounting

Technical specifications (continued)

Power supply	
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
Electrical isolation	
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_{eff} between any two terminals must not exceed 300 V
Measuring accuracy	
Measurement error	
• 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 span in addition to 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% with change from 50 Ω ... 650 Ω
• Load with voltage output	≤ 0.1% with change in load current from 0 mA ... 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
Certificate 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

Rated conditions	
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 top hat rail (1.38 inch) (DIN EN 50022) or 32-mm G-type rail (1.26 inch) (DIN 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	Measured range	Max. permissible line resistance	Digital error
	°C (°F)	Ω	°C (°F)
DIN 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	Measured 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

Thermocouple elements

Input	Measured 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 ... +2502)	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

Four-wire system for rail mounting

Ordering examples

Desired transmitter	Parameter: Standard	Parameter: Special	Ordering design
Example 1:			7NG3242-1AA00 (stock item)
SITRANS TW, transmitter in four-wire system			
• 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:			7NG3242-0BB10-Z Y01 + S76 + A05 + Y30 + H10 Y01: see Order code Y30: MA=0; ME= 950; D=C
SITRANS TW, transmitter in four-wire system			
• 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:			7NG3242-0BA01-Z Y01 + A40 + Y32 + G07 + H11 + J03 Y01: see Order code Y32: MA=0; ME= 5; D=V
SITRANS TW, transmitter in four-wire system			
• 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 order 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 Order 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.

Four-wire system for rail mounting

Selection and Ordering data	Order No.						
SITRANS TW universal transmitter ►	**7NG3242-**	■	■	■	■	■	
for rail mounting, in four-wire system (order instruction manual separately)							
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:							
- DC -1.2 ... +10 V						**1**	
- DC -12 ... +100 V (not Ex version)						**2**	
- DC -120 ... +140 V (not Ex version)						**3**	
• Current input (µA, mA sources) [1] Measuring range:							
- DC -12 ... +100 µA						**4**	
- DC -120 ... +1000 µA						**5**	
- DC -1.2 ... +10 mA						**6**	
- DC -12 ... +100 mA						**7**	
- DC -120 ... +1000 mA						**8**	
Further designs Please add "-**Z**" to Order 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.

Accessories		Order No.
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 9**
HART modem		
• with RS232 interface	► D)	**7MF4997-1DA**
• with USB interface	► D)	**7MF4997-1DB**

D) Subject to export regulations AL:N, ECCN: EAR99H.

Four-wire system for rail mounting

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

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

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

Sensor

Thermocouples

Type	Temperature range	
B: Pt30%Rh/Pt6%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

Connection

Standard		B01
Sum n [1]	n = 2	B02
	...	...
	n = 10	B10
Difference [2]	Diff1	B31
	Diff2	B32
Mean-val. [2]	MW	B41

Cold junction compensation

None		C00
Internal		C10
Fixed val.	0 °C	C20
	20 °C	C22
	50 °C	C25
	60 °C	C26
	70 °C	C27
Special value [7]		Y10
External meas. (through Pt100 DIN IEC 751) [7]		Y11

Measuring ranges

-30 ... +60 °C	E00
-20 ... +20 °C	E01
0 ... 40 °C	E02
0 ... 60 °C	E03
0 ... 80 °C	E04
0 ... 100 °C	E05
0 ... 120 °C	E06
0 ... 150 °C	E07
0 ... 200 °C	E08
0 ... 250 °C	E09
0 ... 300 °C	E10
0 ... 350 °C	E11
0 ... 400 °C	E12
0 ... 450 °C	E13
0 ... 500 °C	E14
0 ... 600 °C	E15
0 ... 700 °C	E16
0 ... 800 °C	E17
0 ... 900 °C	E18
0 ... 1000 °C	E19
0 ... 1200 °C	E20
0 ... 1400 °C	E21
0 ... 1600 °C	E22
0 ... 1800 °C	E23
50 ... 100 °C	E24
50 ... 150 °C	E25
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 thermometer
(or max. permissible line resistance see „Technical specifications“)

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

Connection

Standard		B01
Sum n [4]	n = 2	B02
	...	...
	n = 10	B10
Parallel n [5]	n = 0.1	B21
	n= 0.2	B22
	n= 0.5	B25
Special value [6] [7]		Y00
Difference [2]	Diff1	B51
	Diff2	B52
Mean-val. [2]	MW	B61

Connection

2-wire-system	C32
3-wire-system	C33
4-wire-system	C34

Line resistance [3]

0 Ω	D00
10 Ω	D10
20 Ω	D20
50 Ω	D50
Special val. [7]	Y20

Resistance-based sensors, potentiometers
(or max. permissible line resistance see „Technical specifications“) — A30

Connection

Standard		B01
Difference [2]	Diff1	B51
	Diff2	B52
Mean val.[2]	MW	B61

Connection

2-wire-system	C32
3-wire-system	C33
4-wire-system	C34

Line resistance [3]

0 Ω	D00
10 Ω	D10
20 Ω	D20
50 Ω	D50
Special val. [7]	Y20

Measuring ranges

0 ... 100 Ω	E40
0 ... 200 Ω	E41
0 ... 500 Ω	E42
0 ... 1000 Ω	E43
0 ... 2500 Ω	E44
0 ... 5000 Ω [8]	E45
0 ... 6000 Ω [8]	E46
Special range [7]	Y21

mV, V and µA, mA sensors [9] — A40

Meas. range with Order No. 7NG 3242 - ■■■■■

-Z Y01

0	-120 ... +1000 mV	E50
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

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

Order codes: F ■■ ... K ■■ ■■■

Sensor

Thermocouple elements

Type	Temperature range	
B: Pt30%Rh/	0 ... 1820 °C	A 0 0
C:W5%Re	0 ... 2300 °C	A 0 1
D:W3%Re	0 ... 2300 °C	A 0 2
E:NiCr/CuNi	-200 ... +1000 °C	A 0 3
J:Fe/CuNi (IEC)	-210 ... +1200 °C	A 0 4
K:NiCr/Ni	-200 ... +1372 °C	A 0 5
L: Fe/CuNi (DIN)	-200 ... +900 °C	A 0 6
N:NiCrSi/NiSi	-200 ... +1300 °C	A 0 7
R:Pt13%Rh/Pt	-50 ... +1760 °C	A 0 8
S:Pt10%Rh/Pt	-50 ... +1760 °C	A 0 9
T:Cu/CuNi (IEC)	-200 ... +400 °C	A 1 0
U:Cu/CuNi (DIN)	-200 ... +600 °C	A 1 1

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

Pt100 (DIN IEC)	-200 ... +850 °C	A 2 0
Pt100 (JIS)	-200 ... +649 °C	A 2 1
Ni100 (DIN)	-60 ... +250 °C	A 2 2

Resistance-based sensors, potentiometers
(max. permissible line resistances see „Technical specifications“) A 3 0

mV, V and µA, mA sources A 4 0

\+

Voltage measurement

Temperature-linear	F 0 0
Voltage-linear	F 1 0

Voltage measurment

Temperature-linear	F 0 0
Resistance-linear	F 2 0

Voltage measurment

Resistance-linear	F 2 0

Voltage measurment

Source proportional	F 3 0

\+

Filter time[1]

0 s	G 0 0
0.1 s	G 0 1
0.2 s	G 0 2
0.5 s	G 0 3
1 s	G 0 4
2 s	G 0 5
5 s	G 0 6
10 s	G 0 7
20 s	G 0 8
50 s	G 0 9
100 s	G 1 0
Special time[5]	Y 5 0

\+

Output signal and line filter[2]

4 ... 20 mA / 2 ... 10 V with line filter:	
50 Hz	H 0 0
60 Hz	H 0 1
10 Hz[4]	H 0 2
0 ... 20 mA / 0 ... 10 V with line filter:	
50 Hz	H 1 0
60 Hz	H 1 1
10 Hz	H 1 2

\+

Failure signal

with line breakage/fault:	
to full scale	J 0 0
to start of scale	J 0 1
hold last value	J 0 2
no monitoring	J 0 3
Safety value[5]	Y 6 0

Failure signal

with line breakage/fault:	
to full scale	J 0 0
to start of scale	J 0 1
hold last value	J 0 2
no monitoring	J 0 3
Safety value[5]	Y 6 0
with line breakage or short-circuit/fault:	
to full scale	J 1 0
to start of scale	J 1 1
hold last value	J 1 2
no monitoring	J 1 3
Safety value[5]	Y 6 1

Failure signal

with line breakage/fault:	
to full scale	J 0 0
to start of scale	J 0 1
hold last value	J 0 2
no monitoring	J 0 3
Safety value[5]	Y 6 0

Failure signal

with line breakage/fault:	
to full scale	J 0 0
to start of scale	J 0 1
hold last value	J 0 2
no monitoring	J 0 3
Safety value[5]	Y 6 0

\+

Limit monitor[3]

Limit monitoring ineffective (but sensor fault signalling with closed-circuit operation)	K 0 0
Effective[5]	Y 7 0

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“

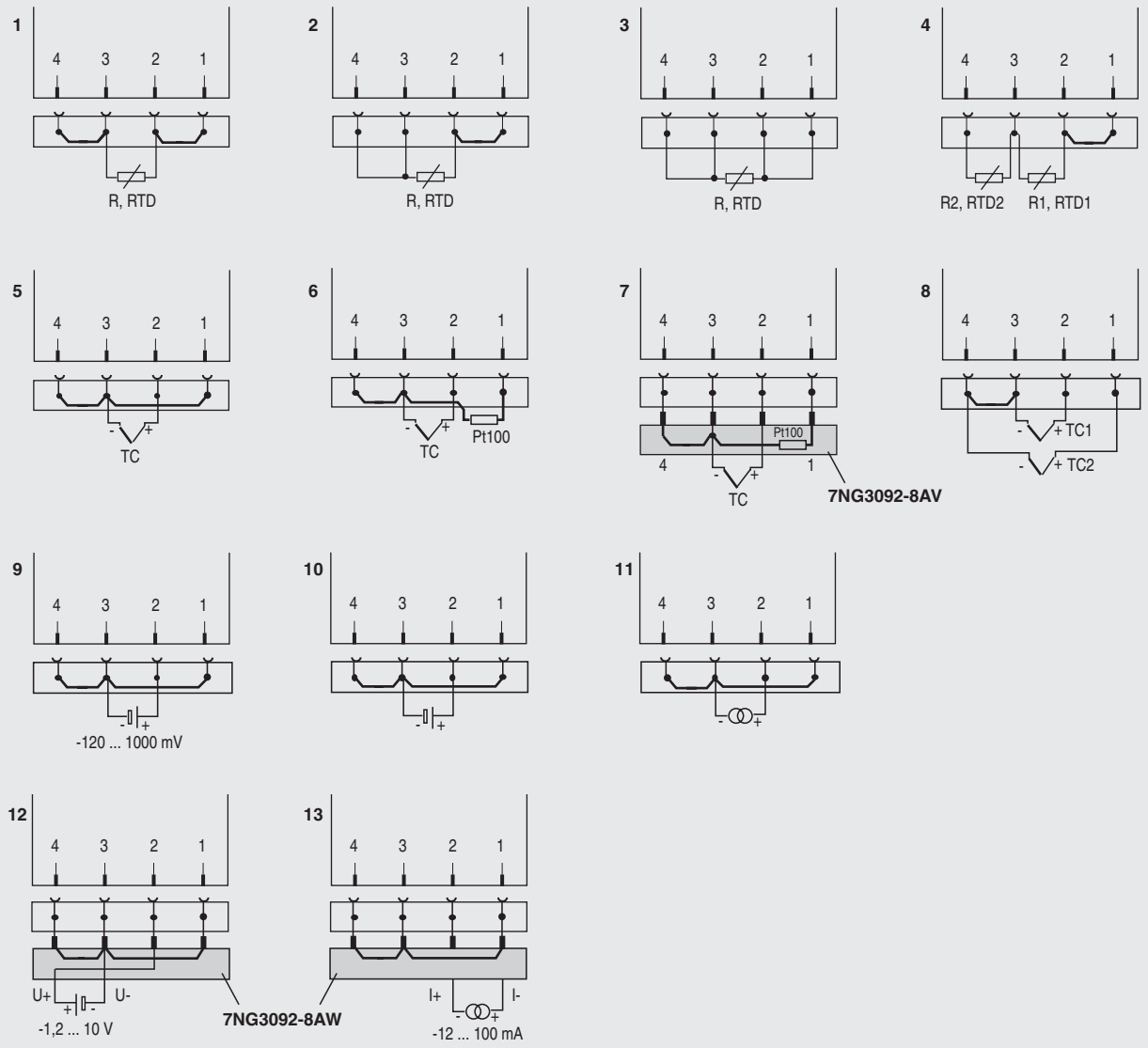
Four-wire system for rail mounting

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, restistance-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 µA/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)

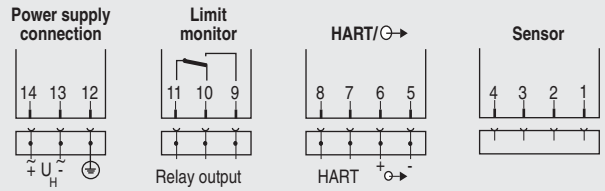
Connection diagram for the input signal

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.

Four-wire system for rail mounting



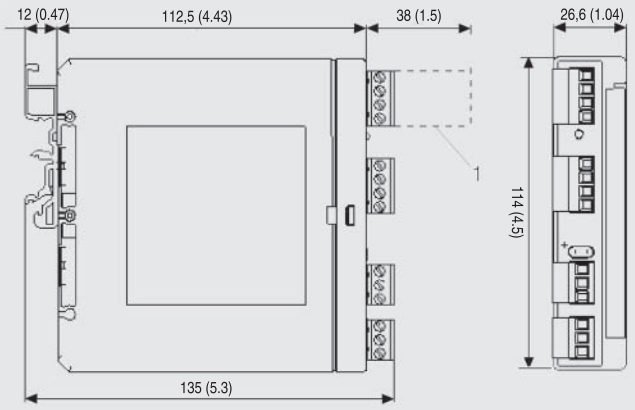
1 to 4	Signal input (see "Sensor input connections" for possible types of connection)
5, 6	Analog output (U or I output parameterizable using plug-in jumpers)
7, 8	Connection with HART communication for local parameterization
9 to 11	Output for sensor fault/limit monitor as relay contact (see below for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

Connection diagram for power supply, input and outputs

Relay output

	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

The bus-capable transmitter with Profibus PA interface in accordance with profile 3

You can use this bus-capable device with PROFIBUS PA interface in all branches and integrate it (like the SITRANS TK / TK-H) in keeping with the Totally Integrated Automation concept.

SITRANS T3K PA converts signals from resistance thermometers, resistance-based sensors, thermocouples and voltage sensors into digital signals. The measured value from the microprocessor is then made available with status as a quality specification and other parameters electrically isolated on PROFIBUS PA. Sensor, limit values, failure response etc. can be programmed. SITRANS T3K PA thus provides you with various diagnosis and simulation options.

Great safety

The current consumption amounts to less than 11 mA. For safety, the bus current is limited in the event of an error to less than 14 mA, and an EMC filter prevents malfunctions in the case of electromagnetic interference. Intrinsically safe versions are available for this device too. EEx ia and EEx ib.

Fast and error-free parameterization

SITRANS T3K PA fits in the connection head type B with raised cover. Parameterization is performed with the user-friendly software package SIMATIC PDM.

Application

The SITRANS T3K PA temperature transmitter can be used in all branches. The following sensors/signal sources can be connected via its universal input module:

- Resistance thermometer
- Thermocouple
- Resistance-based sensors/potentiometers
- DC voltage sources.

The useful data are provided on PROFIBUS PA.

SITRANS T3K PA with the "Non-incendive" type of protection can be mounted within potentially explosive atmospheres (zone 2).

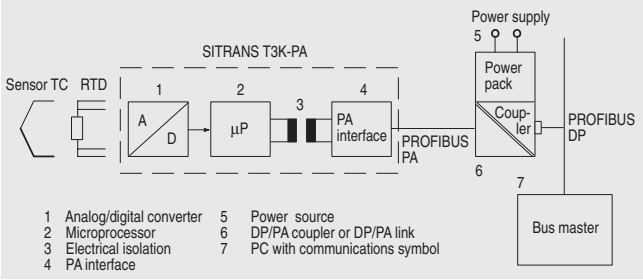
SITRANS T3K PA with the "Intrinsically safe" type of protection can be mounted within potentially explosive atmospheres (zone 1) and used for feeding sensors in zone 0. The conformity declarations comply with the European standard (ATEX) or with the American standard (FM).

Function

Features

- Temperature transmitters with bus connection according to DIN 61158-2 and EN 50170, part 4
- Data transmission and transmitter supply via common bus link
- Assembly in connection head type B (or larger, DIN 43729) with raised cover
- Can communicate via PROFIBUS PA (profile B, version 3.0); sensor, measuring range and much more can therefore be programmed .
- Quality data for the measured values: Status and limit values
- Fixed bus current limiting in the event of an error
- Electrical isolation (test voltage 500 V AC)
- Intrinsically safe version for use in potentially explosive areas

Mode of operation

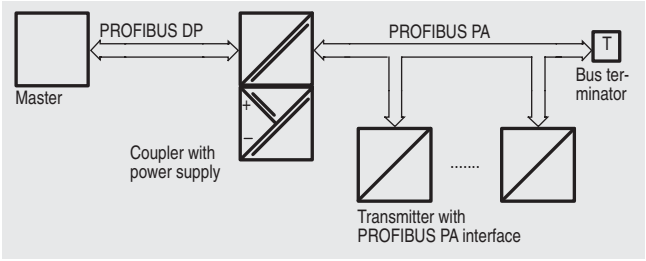


The signal supplied by a resistance-based sensor (two, three or four-wire circuit) or thermocouple element is amplified in the input stage. The voltage proportional to the input variable is then converted into digital signals by the analog/digital converter (1). The microprocessor (2) converts the digital signals in accordance with the sensor characteristic. Furthermore, the microprocessor interprets the bus commands, initiates device-internal actions and provides electrically-isolated (3) measured values, status and device data on the bus.

Integrated device protection functions:

- Electrical current limiting:
  avoids bus overloading in the event of a fault. the data traffic of the other, correctly operating nodes is maintained.
- Reverse polarity protection:
  allows the bus lines to be connected as required
- EMC filter:
  Prevents malfunctions in the case of electromagnetic interference

Parameterization



Communication via PROFIBUS PA interface

The parameterization of SITRANS T3K PA is performed by a master with the help of signals which are transmitted through PROFIBUS DP. These signals are converted by a SIMATIC DP/PA coupler with power supply (5, 6) into a signal for PROFIBUS PA. A bus terminator is required for cable lengths over 2 m. SIMATIC PDM is preferably used as parameterization software.

SITRANS T3K PA with PROFIBUS PA connection

Technical specifications

Input	
Selectable filters to suppress the line frequency	Selectable for 50/60 Hz (also 10 Hz for special applications)
Resistance thermometer	
Measured variable	Temperature
Measured range	Depending on type of connected sensor (defined sensor range)
Sensor type	
• Acc. to DIN IEC 751, DIN 43760, JIS C 1604-97, BS 1904	Pt10, Pt50, Pt100, Pt200, Pt1000
• Acc. to JIS C 1604-81	Pt10, Pt50, Pt100
• Acc. to DIN 43760	Ni50, Ni100, Ni120, Ni1000
Voltage measurement	Temperature-linear
Type of connection	Standard (logic channel 1), generation of average value or difference (of 2 channels)
Sensor current	≤ 0.55 mA
Resistance-based sensors	
Measured variable	Ohmic impedance
Measured range	9 resistance measuring ranges can be selected: • 0 ... 24 Ω • 0 ... 47 Ω • 0 ... 94 Ω • 0 ... 188 Ω • 0 ... 375 Ω • 0 ... 750 Ω • 0 ... 1500 Ω • 0 ... 3000 Ω • 0 ... 6000 Ω
Sensor type	Linear: 1 resistance-based senor in two, three or four-wire circuit
Voltage measurement	Resistance-linear
Type of connection	Standard (logic channel 1), generation of average value or difference (of 2 channels)
Sensor current	≤ 0.55 mA
Thermocouple elements	
Measured variable	Temperature
Measured range	Depending on type of connected sensor (defined sensor range)
Sensor type	Thermocouples • Type B: Pt30Rh-Pt6Rh (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 (BS 4937 Part 2) • Type R: Pt13Rh-Pt (DIN IEC 584) • Type S: Pt10Rh-Pt (DIN IEC 584) • Type T: Cu-CuNi (DIN 43710) • Type U: Cu-CuNi (DIN 43710)
Voltage measurement	Temperature-linear
Type of connection	Standard with 1 thermocouple with cold junction compensation (logic channel 1) or generation of difference or average value
Cold junction compensation	Type specification for • No compensation (2 channels) • Internal acquisition with integrated or external sensor: a manufacturer-specific PA parameter must be set for the "external sensor" case (default value: internal sensor) • Externally specified cold junction temperature can be set as a fixed value
mV Sensor	
Measured variable	DC voltage
Measured range	7 voltage measuring ranges can be selected: • - 1 ... +16 mV • -3 ... +32 mV • -7 ... +65 mV • -15 ... +131 mV • -31 ... +262 mV • -63 ... +525 mV • -120 ... +1000 mV
Sensor type	Linear
Voltage measurement	Voltage-linear
Type of connection	Normal connection with 1 mV sensor (logic channel 1)
Overload capacity of the input	max. 3.5 mV
Input resistance	≥ 1 MΩ
Sensor current	180 µA
Output	Digital bus signal
Bus voltage	• 9 ... 32 V (without Ex protection) • 9 ... 24 V for intrinsically safe operation (see Ex certificate) Active internal inductance L_i < 10 nH (acc. to FISCO model) Active internal capacitance C_i < 5 nF (acc. to FISCO model)
Communication	
• C2 connections	Four connections to master class 2 are supported; automatic connection setup 60 s after break in communication; response time to mater message typ. 10 ms
• Device profile	PROFIBUS PA profile B, version 3.0, more than 200 parameters
• Device address	126 when delivered
Temperature units	°C, °K, °F, °R parameterizable (°R (Rankine) = absolute °F)

Technical specifications (continued)

Measuring accuracy

Influencing effects	
• Error in the internal cold junction	< 0.25 °C (0.45 °F) ± 0.1%/10 °C (18 °F)
• Temperature drift	± 0.05%/10 °C (18 °F) FSR, 0.1% between -10 and +60 °C (14 and 140 °F)
• Influence of the power supply on the span	< 0.005%/V FSR
• Long-term drift	< 0.1%/year
• Measurement error	More information can be found in the table "Measurement error"

Rated conditions

Ambient conditions	
Permitted temperatures	
• Ambient temperature	
- at T4	-40 to +85 °C (-40 to +185 °F)
- With intrinsically-safe operation (T6)	-40 to +60 °C (-40 to +140 °F)
• Storage temperature	-40 to +95 °C (-40 to +203 °F)
Relative humidity	≤ 98%, with condensation
Electromagnetic compatibility	According to EN 61326 and NAMUR NE21

Design

Weight	250 g (0.55 lb)
Dimensions	see "Dimension drawings"
Enclosure material	Plastic PA6 (polyam., molded GF 20)
Electrical connection	Plug-in screw terminal, max. 2.5 mm^2 (0.01 $inch^2$)

Power supply

Supply voltage	Bus infeed 9 to 32 V (9 to 24 for Ex version)
Current consumption of device	11 mA
Max. excess current in the event of a fault	$I_{max} \leq 3$ mA
Electrical isolation	Input and output are electrically isolated
Test voltage	500 V AC, 50 Hz, 1 min.

Certificate and approvals

ATEX	
• "Intrinsic. safe" type of protection	II (1) 2G EEx ia IIB/IIC T4/T5/T6 II (1) 2G EEx ib IIB/IIC T4/T5/T6
• EC-Type Examination Certificate	ZELM 99 ATEX 0001
FM	
• Explosion protection to FM	IS/I/1/ABCD/T6, I/O/ AEx ia /IIC/T6, NI/I/2/ABCD/T6

Factory setting:

- Pt100 (IEC 751) with three-wire circuit
- PROFIBUS address: 126

Measurement error

Resistance thermometer

Input	Measured range	Max. parameterizable line resistance	Measurement error
	°C (°F)	Ω	°C (°F)
IEC 751, DIN 43760, JIS C 1604-97, MS 1904			
• Pt10 DIN-IEC	-200 ... +850 (-328 ... +1562)	2.35	1.5 (2.7)
• Pt50 DIN-IEC	-200 ... +850 (-328 ... +1562)	9.4	0.3 (0.54)
• Pt100 DIN-IEC	-200 ... +850 (-328 ... +1562)	18.75	0.15 (0.27)
• Pt200 DIN-IEC	-200 ... +850 (-328 ... +1562)	37.5	0.3 (0.54)
• Pt500 DIN-IEC	-200 ... +850 (-328 ... +1562)	37.5	0.5 (0.9)
• Pt1000 DIN-IEC	-200 ... +850 (-328 ... +1562)	300	0.5 (0.9)
JIS C 1604-81			
• Pt10	-200 ... +649 (-328 ... +1200)	2.35	1.5 (2.7)
• Pt50	-200 ... +649 (-328 ... +1200)	9.4	0.3 (0.54)
• Pt100	-200 ... +649 (-328 ... +1200)	18.75	0.15 (0.27)
DIN 43 760			
• Ni50	-60 ... +250 (-76 ... +482)	9.4	0.15 (0.27)
• Ni100	-60 ... +250 (-76 ... +482)	18.75	0.15 (0.27)
• Ni120	-60 ... +250 (-76 ... +482)	18.75	0.15 (0.27)
• Ni1000	-60 ... +250 (-76 ... +482)	150	0.15 (0.27)

Resistance-based sensors

Input	Measured range	Max. parameterizable line resistance	Measurement error
	Ω	Ω	Ω
Resistance	0 ... 24	1.2	0.04
	0 ... 47	2.35	0.03
	0 ... 94	4.7	0.03
	0 ... 188	9.4	0.04
	0 ... 375	18.75	0.05
	0 ... 750	37.5	0.1
	0 ... 1500	75	0.7
	0 ... 3000	150	0.4
	0 ... 6000	300	1.2

Thermocouple elements

Input	Measured range		Measurement error [1]	
	°C	(°F)	°C	(°F)
Type B	100 ... +1820	(+212 ... +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 ... +800	(-346 ... +1472)	1	(1.8)
Type K	-200 ... +1372	(-328 ... +2502)	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] Specified accuracy value refers to the largest error of the total measuring range.

SITRANS T transmitters for mounting in sensor head

SITRANS T3K PA with PROFIBUS PA connection

Voltage/current sources

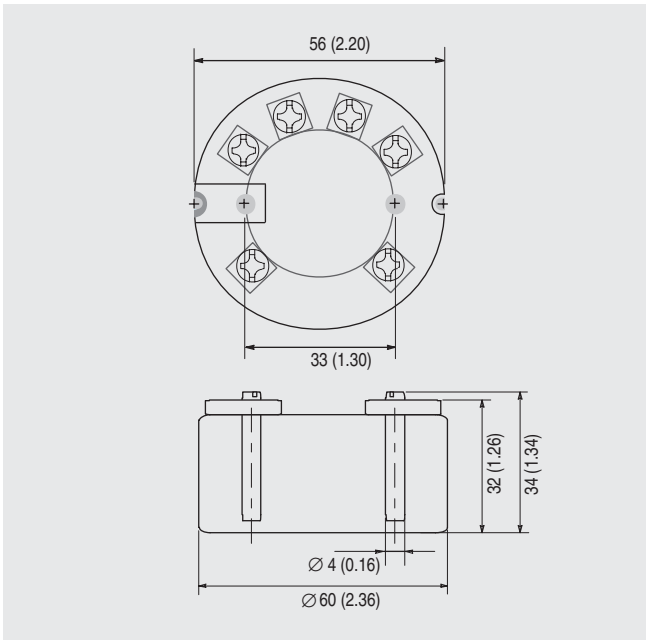
Input	Measuring range	Measurement error
	mV	µV
mV Sensor	-1 ... +16	10
	-3 ... +32	10
	-7 ... +65	10
	-15 ... +131	25
	-31 ... +262	50
	-63 ... +525	100
	-120 ... +1000	150

Selection and ordering data		Order No.
Temperature transmitter SITRANS T3K PA with PROFIBUS PA for installation in the sensor head, with electrical isolation (order instruction manual separately).		
• without explosion protection	►	**7NG3213-0NN00**
• with explosion protection EEx ia/ib (ATEX)	►	**7NG3213-1NN00**
• with explosion protection (FM) intrinsic safety	►	**7NG3213-3NN00**
Further designs Please add "**-Z**" to Order No. and specify Order code(s) and plain text.		**Order code**
• Customer-specific setting of operating data		**Y01**

Accessories		Order No.
Instruction manual for SITRANS T3K PA (German/English)	►	**C79000-B7174-C55**
DIN rail adapter for head mouted transmitters (set of 5 pcs.)	►	**7NG3092-8KA**
SIMATIC PDM operating software		**see Chapter 9**
for additional PA components,		**see Catalog IK PI**

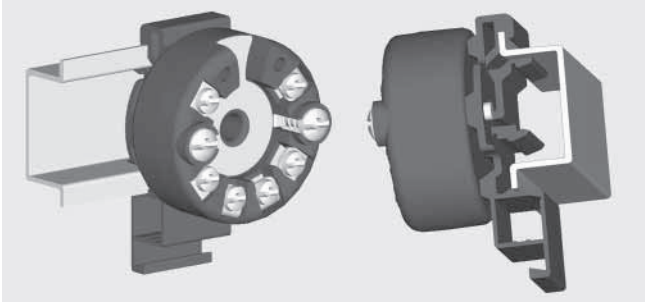
► Available ex stock.

Dimensional drawings

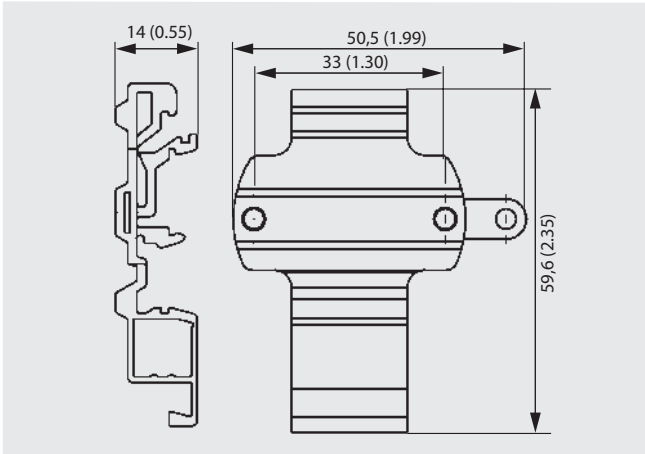


SITRANS T3K PA, dimensions in mm (inches)

Mounting on DIN rail

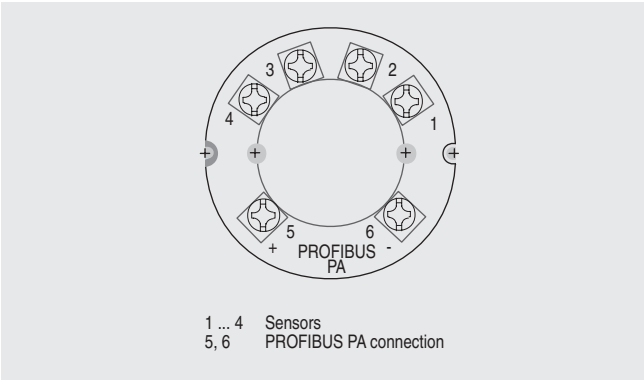


Mounting of transmitter on DIN rail, schematic diagram



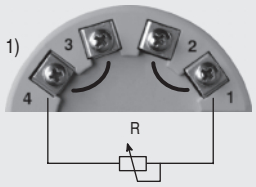
DIN rail adaptor, dimensions in mm (inch)

Schematics

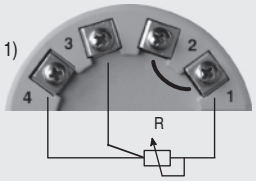


Connection diagram

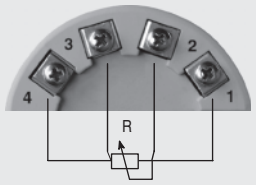
Resistance



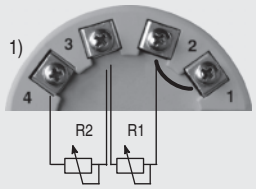
Two-wire circuit: resistor can be programmed for line compensation



Three-wire circuit

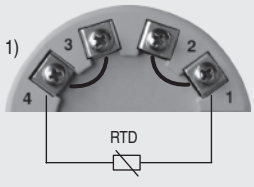


Four-wire circuit

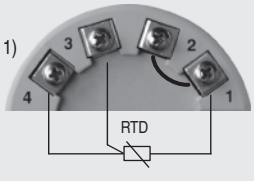


Difference/average value circuit: 2 resistors can be programmed for line compensation

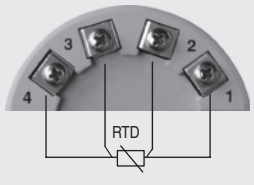
Resistance thermometer



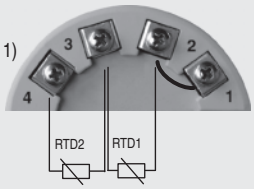
Two-wire circuit: resistor can be programmed for line compensation



Three-wire circuit

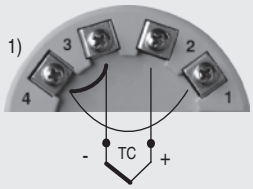


Four-wire circuit

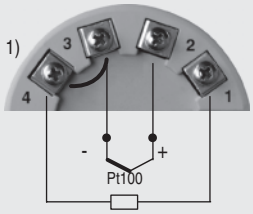


Difference/average value circuit 2 resistors can be programmed for line compensation

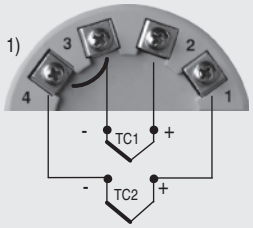
Thermocouple



Determination of cold junction temperature with built-in Pt100 or external reference temperature

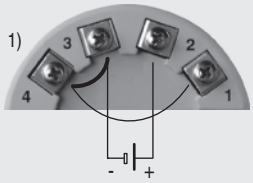


Determination of cold junction temperature with external Pt100 resistor can be programmed for line compensation



Difference/average value circuit with internal cold junction temperature

mV sensor



Two-wire circuit

1) **Important !**
Fit short-circuit jumpers on site.

Sensor connection assignment

SITRANS TK-L
Two-wire system (Pt100)

Overview

The economical transmitter for Pt100 measurements

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

SIPROM TK software is used in combination with the modem for SITRANS TK for the parameterization.

A very compact design makes the SITRANS TK-L 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.

Application

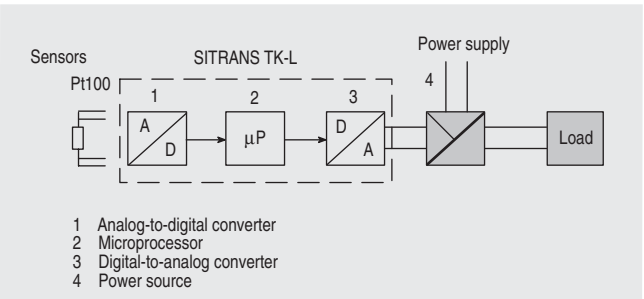
SITRANS TK-L temperature transmitters with "Non incendive" type protection can be mounted within potentially explosive atmospheres (zone 2).

SITRANS TK-L temperature transmitters with "Flame-proof enclosure" type protection can be mounted within potentially explosive atmospheres (zone 1).

Function

The SITRANS TK-L transmitter converts the signals from Pt100 resistance thermometers into a load-independent direct current corresponding to the sensor characteristic. As a result of its compact design, the transmitter fits in the sensor head type B (DIN 43729). Parameterization is carried out using a PC for the programmable SITRANS TK-L.

Mode of operation



1 Analog-to-digital converter
2 Microprocessor
3 Digital-to-analog converter
4 Power source

The signal supplied by a Pt100 (two, three or four-wire circuit) is amplified in the input stage. The voltage proportional to the input variable is then converted into digital signals in the analog/digital converter (1). They are converted in the microprocessor (2) in accordance with the sensor characteristic and further parameters (damping, ambient temperature etc.).

The signal prepared in this way is converted in the digital/analog converter (3) into a load-independent direct current of 4 to 20 mA. The power supply (4) is located in the output signal circuit.

Technical specifications

Input	
Resistance thermometer	
Measured variable	Temperature
Sensor type	Pt100 (DIN IEC 751)
Voltage measurement	Temperature-linear
Type of connection	Two, three or four-wire system
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	0.3 mA
Measuring cycle	< 0.7 s
Measured range	-200 ... 850 °C (-328 ... +1562 °F)
Measured span	> 25 °C (45 °F)
Unit	°C or °F
Offset	Programmable, max. 10 °C (18 °F)
Line resistance	Max. 20 Ω/line
Overload capability	DC ± 35 V
Noise rejection	50 and 60 Hz
Output	
Output signal	4 ... 20 mA, 2-wire
Power supply	DC 8 to 35 V (28 V with Ex)
Underrange/overrange limits	3.5/23 mA (programmable)
Filter time	0 ... 30 s
Protection	Against reversed polarity
Resolution	12 bit
Accuracy	< 0.1% of span
• Power supply effect	< 0.01% of span/V
• Temperature drift	typ. 0.003%/°C (0.0016%/°F) max. 0.01%/°C (0.0056%/°F)
Rated conditions	
Ambient conditions	
Ambient temperature	-40 ... +85 °C (-40 ... +185 °F)
Relative humidity	< 98%, with condensation
Electromagnetic compatibility	
• Interference immunity	According to EN 50082-2
• Emitted interference	According to EN 50081-1
Design	
Weight	50 g (0.11 lb)
Dimensions	see "Dimension drawings"
Material	Moulded plastic
Degree of protection	
• Housing	IP40
• Terminals	IP00
Certificate and approvals	
Explosion protection ATEX	
• "Intrinsic. safe" type of protection	ATEX II 1 G EEx ia IIC T4
- EC-Type Examination Certificate	DEMKO 01 ATEX 129483 X
• "Non incendive" type of protection	ATEX II 3G EEx nA IIC T4
- EC-Type Examination Certificate	DEMKO 01 ATEX 129482 X

Technical specifications (continued)

Hardware and software requirements for the parameterization software SIPROM TK for SITRANS TK and TK-L	
Personal computer	• CPU of type 486 upwards, compatible with industrial standard • 3.5" diskette drive • Hard disk with 5 MB vacant space • min. 4 MB RAM • VGA graphics adapter (or compatible) with at least 16 colors • One vacant serial port • Mouse or compatible pointing device and printer (recommended)
PC operating system	MS-DOS V 5.0 upwards, MS-Windows V 3.1 upwards

Factory setting:

- Pt100 (IEC 751) with three-wire circuit
- Measuring range: 0 ... 100 °C (32 ° ... 212 °F)
- Output with sensor breakage: 23 mA

Selection and ordering data	Order No.
Temperature transmitter SITRANS TK-L for Pt100 for installation in sensor head type B (DIN 43729); two-wire system 4 ... 20 mA; programmable	
• without explosion protection ►	**7NG3120-0JN00**
• with explosion protection EEx ia for zone 1 and Ex n for zone 2 ►	**7NG3122-0JN00**
Further designs Please add "**-Z**" to Order No. and specify Order code(s) and plain text.	**Order code**
• Customer-specific setting of operating data	**Y01**
• Test protocol (5 measuring points)	**C11**

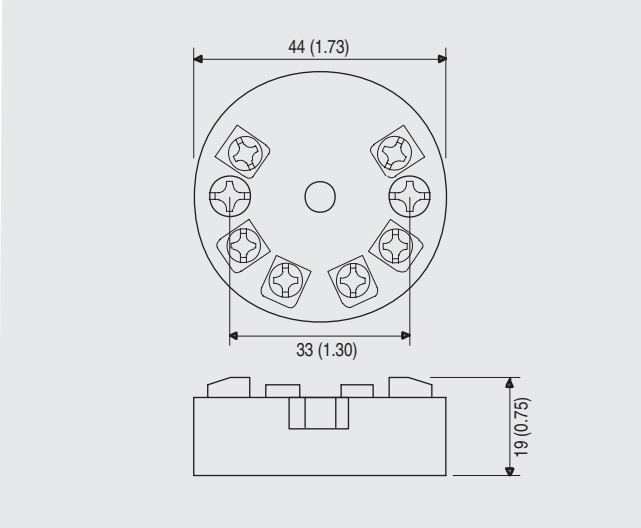
► Available ex stock.

Accessories	Order No.
SIPROM TK parameterization software ► for SITRANS TK and TK-L German/English/French	**7NG3190-8KB**
Modem for SITRANS TK and TK-L ►	**7NG3190-6KB**
Instruction manual for SITRANS TK-L ► German/English (not included in delivery of the device)	**A5E00095604**
DIN rail adaptor ► for head mouted transmitters (set of 5 pcs.)	**7NG3092-8KA**

► Available ex stock.

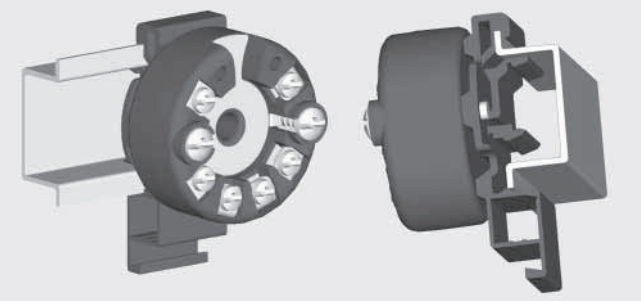
Power supply units see "SITRANS I supply units and input isolators".

Dimensional drawings

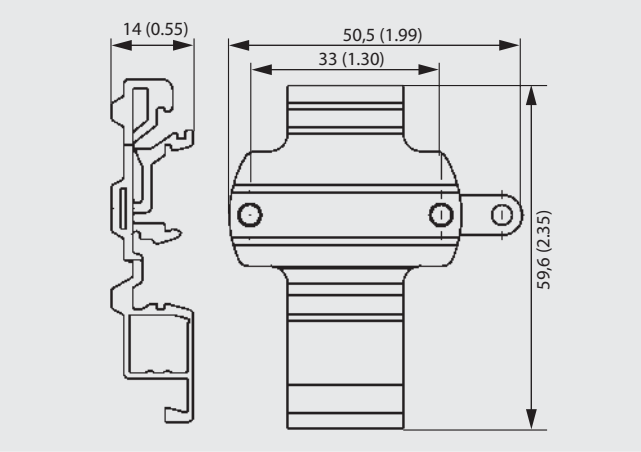


SITRANS TK-L, dimensions in mm (inches)

Mounting on DIN rail



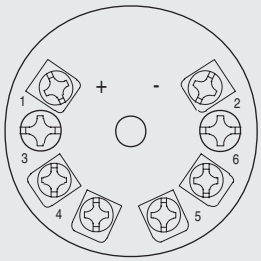
Mounting of transmitter on DIN rail, schematic diagram



DIN rail adaptor, dimensions in mm (inch)

SITRANS TK-L
Two-wire system (Pt100)

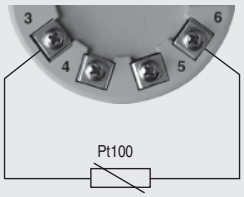
Schematics



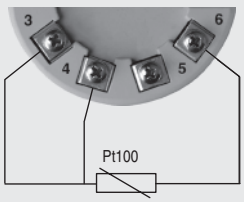
1, 2 U_H, I_A
3 ... 6 Sensors (Pt100)

Pin assignment

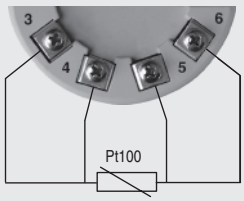
Resistance thermometer



No line compensation [1])



Three-wire line compensation



Four-wire line compensation

[1]) Line resistance for compensation is programmable.

Sensor connection assignment

SITRANS TK/TK-H
Two-wire system

Overview

The smart solution – The transmitter with the same capabilities as a SITRANS TK and a standardized HART interface.

This universal transmitter integrates your temperature measurement in the TIA concept (Totally Integrated Automation). This makes central engineering possible, bringing you time and cost benefits.

SIMATIC PDM or another HART programming tool can be used for the configuration. The transmitter provides electrical isolation and enables the connection of resistance thermometers, resistance-based sensors, thermocouples and voltage-based sensors.

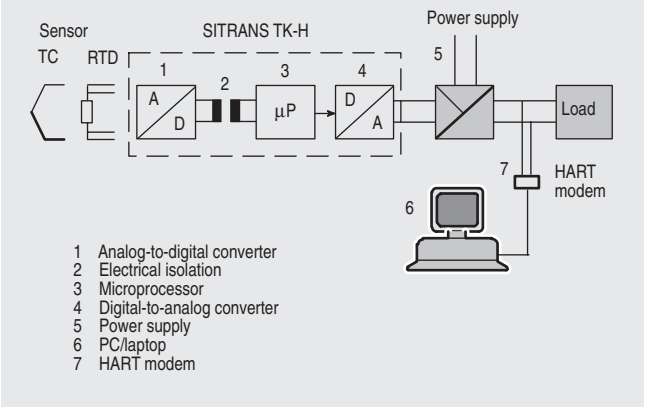
Application

SITRANS TK/TK-H temperature transmitters with "Non incendive" type protection can be mounted within potentially explosive atmospheres (zone 2).
SITRANS TK/TK-H temperature transmitters with "Flame-proof enclosure" type protection can be mounted within potentially explosive atmospheres (zone 1).

Function

The SITRANS TK/TK-H temperature transmitter converts the signals from resistance thermometers, resistance-based sensors, thermocouples or voltage sensors into a load-independent direct current corresponding to the sensor characteristic. As a result of its compact design, the transmitter fits in the sensor head type B (DIN 43 729).
The communication capability via the HART protocol V 5.x of the SITRANS TK-H permits parameterization using a PC or HART communicator (hand-held communicator).
Parameterization is carried out using a PC for the programmable SITRANS TK-L.

Mode of operation



The signal supplied by a resistance-based sensor (two, three or four-wire circuit) or a thermocouple element is amplified in the input stage. The voltage proportional to the input variable is then converted into digital signals in the analog/digital converter (1). These signals are forwarded electrically isolated (2) to the microprocessor (3). They are converted there in accordance with the sensor characteristic and further parameters (damping, ambient temperature etc.).

The signal prepared in this way is converted in the digital/analog converter (4) into a load-independent direct current (4 to 20 mA). The power supply (5) is located in the output signal circuit.

The SITRANS TK-H transmitter is parameterized and operated using a PC (6) connected to the two-wire line via the interface module for SIPROM software (HART modem, 7). A hand-held communicator can also be used for this purpose. The signals needed for communication in conformity with the HART r protocol V 5.7 are superimposed on the output current in accordance with the frequency shift keying (Frequency Shift Keying, FSK) method.

Technical specifications

Input	
Resistance thermometer	
Measured variable	Temperature
Sensor type	
• Acc. to DIN IEC 751	Pt25 ... Pt1000
• Acc. to JIS C 1604	Pt25 ... Pt1000
• Acc. to DIN IEC 751	Ni25 ... Ni1000 Cu25 ... Cu1000
Voltage measurement	Temperature-linear
Type of connection	Two, three or four-wire system
Resistance-based sensors	
Measured variable	Ohmic impedance
Measuring range limits	2200 Ω
Voltage measurement	Resistance-linear or programmable (TK)
Type of connection	Two, three or four-wire system
Thermocouple elements	
Measured variable	Temperature
Sensor type	
• Acc. to DIN IEC 584-1	Type B, E, J, K, R, S, T
• Acc. to DIN 43 710	Type L, U
• Acc. to DIN 4937	Type N
• Acc. to ASTM 988	Type C, D
Voltage measurement	Temperature-linear
Cold junction compensation	Internal, external with Pt100 or external with a fixed value
mV Sensor	
Measured variable	DC voltage
Measuring range limits	1100 mV
Voltage measurement	Voltage-linear or programmable
Overload capacity of the input	-0.5 ... +35 V DC
Input resistance	≥ 1 MΩ
Output	
Output signal	4 to 20 mA, 2-wire
Communication for SITRANS TK-H	Acc. to HART V 5.x
Measuring accuracy	
Digital measuring errors	See "Digital measuring errors"
Error in the analog output	< 0.1% of span
Error in the internal cold junction	< 0.5 K (0.9 °F)
Temperature drift	±0.01%/°C (0.0056%/°F), typ. ±0.003%/°C (0.0016%/°F)
Influence of the power supply on the span and zero point	< 0.005% of span/V
Long-term drift	< 0.03% in first month

SITRANS TK/TK-H
Two-wire system

Technical specifications (continued)

Rated conditions	
Ambient conditions	
Ambient temperature	-40 ... +85 °C (-40 ... 185 °F)
Relative humidity	< 98%, with condensation
Electromagnetic compatibility	
• Interference immunity	Acc. to EN 61 326
• Emitted interference	Acc. to EN 50 081-2
Design	
Weight	50 g (0.11 lb)
Dimensions	see "Dimension drawings"
Material	Moulded plastic
Power supply	
For SITRANS TK	6.5 ... 35 V DC (30 V for EEx ia)
For SITRANS TK-H	8 ... 35 V DC (30 V for EEx ia)
Electrical isolation	Between input and output
• Test voltage	U_{eff} = 3.75 kV, 50 Hz, 1 min
• Insulation	500 V AC
Certificate and approvals	
Explosion protection ATEX	
• "Intrinsic. safe" type of protection	II 1 G EEx ia IIC T5/T6
- EC-Type Examination Certificate for TK and TK-H	DEMKO 03 ATEX 134603X
• Ex tested for zone 2n	II 3 G EEx nA IIC T5/T6
- Conformity statement	DEMKO 03 ATEX 134604X
Explosion protection to FM	Certificate of Compliance 3017742
• Identification (IS, I, NI)	• IS / I / 1 / ABCDEFG / T5 Ta = 85 °C (185 °F), T6 Ta = 50 °C (112 °F) • I / 0 / AEx ia / IIC / T5 Ta = 85 °C (185 °F), T6 Ta = 50 °C (112 °F) • NI / I / 2 / ABCD / T5 Ta = 85 °C (185 °F), T6 Ta = 50 °C (112 °F)
• Entity parameters	nach "control drawing" A5E00226012B U_i = 30 V, I_i = 100 mA, P_i = 0,75 W, C_i =5 nF, L_i = 15 µH
Hardware and software requirements for the parameterization software SIPROM TK for SITRANS TK	
Personal computer	• CPU of type 486 upwards, compatible with industrial standard • 3.5" diskette drive • Hard disk with 5 MB vacant space • min. 4 MB RAM • VGA graphics adapter (or compatible) with at least 16 colors • One vacant serial port • Mouse or compatible pointing device and printer (recommended)
PC operating system	MS-DOS V 5.0 upwards, MS-Windows V 3.1 upwards
SIMATIC PDM for SITRANS TK-H	see Chapter 9

Factory setting:

- Pt100 (IEC 751) with three-wire circuit
- Measuring range: 0 ... 100 °C (32 ... 212 °F)
- Output with sensor breakage: 23 mA

Digital measuring errors

Resistance thermometer

Input	Measured range	Min. measured span	Digital accuracy
	°C (°F)	°C (°F)	°C (°F)
Pt25 ... Pt500	-200 ... + 850 (-328 ... +1562)	10 (18)	0.1 (0.18)
Pt501 ... Pt1000 IEC	-200 ... + 350 (-328 ... +662)	10 (18)	0.1 (0.18)
Ni 25 ... Ni1000	-50 ... + 250 (-58 ... +482)	10 (18)	0.1 (0.18)
Cu25 ... Cu1000	-50 ... + 200 (-58 ... +392)	10 (18)	0.1 (0.18)

Resistance-based sensors

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

Thermocouple elements

Input	Measured range	Min. measured span	Digital accuracy
	°C (°F)	°C (°F)	°C (°F)
Type B	+500 ... +1820 (+932 ... +3308)	50 (90)	2 (3.6)
Type C	0 ... +2300 (+32 ... +4172)	100 (180)	2 (3.6)
Type D	0 ... +2300 (+32 ... +4172)	100 (180)	2 (3.6)
Type E	-250 ... +900 (-418 ... +1652)	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	0 ... +1750 (+32 ... +3182)	100 (180)	2 (3.6)
Type S	0 ... +1750 (+32 ... +3182)	100 (180)	2 (3.6)
Type T	-220 ... +400 (-364 ... +752)	40 (7.2)	1 (1.8)
Type U	-200 ... +600 (-328 ... +1112)	50 (90)	1 (1.8)

mV Sensor

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

Selection and ordering data	Order No.
Temperature transmitter SITRANS TK	
for installation in sensor head type B (DIN 43729); two-wire system 4 ... 20 mA; with electrical isolation	
• without explosion protection ►	**7NG3120-1JN01**
• with explosion protection Ex n for zone 2 ►	**7NG3121-1JN01**
• with explosion protection ATEX (EEx ia) and FM (IS, I, NI) ►	**7NG3122-1JN01**
Temperature transmitter SITRANS TK-H	
for installation in sensor head type B (DIN 43729); two-wire system 4 ... 20 mA; capable of communication according to HART V 5.x with electrical isolation	
• without explosion protection ►	**7NG3120-2JN01**
• with explosion protection Ex n for zone 2 ►	**7NG3121-2JN01**
• with explosion protection ATEX (EEx ia) and FM (IS, I, NI) ►	**7NG3122-2JN01**
Further designs Please add "**-Z**" to Order No. and specify Order code(s) and plain text.	**Order code**
• Customer-specific setting of operating data	**Y01**
• Test protocol (5 measuring points)	**C11**

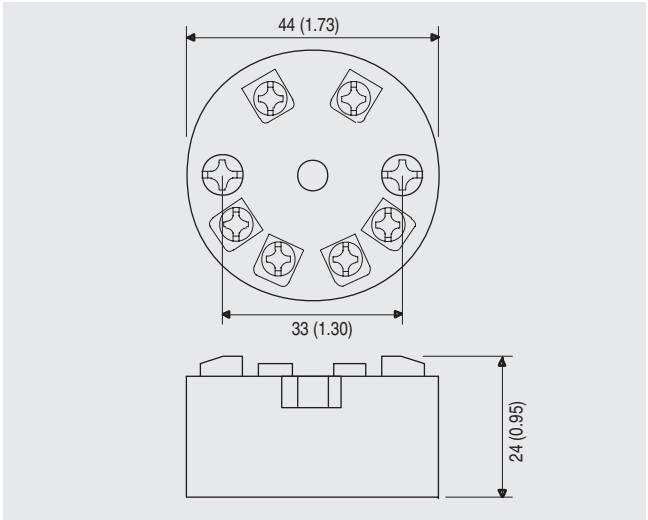
Accessories	Order No.
SIPROM TK parameterization software ► for SITRANS TK, German/English/French	**7NG3190-8KB**
Modem for SITRANS TK ►	**7NG3190-6KB**
Instruction Manual for SITRANS TK/TK-H ► German/English (not included in delivery of the device)	**A5E00226012**
DIN rail adaptor ► for head mounted transmitters (set of 5 pcs.)	**7NG3092-8KA**
SIMATIC PDM parameterization software also for SITRANS TK-H	**see Chapter 9**
HART modem	
• with RS232 interface ► D)	**7MF4997-1DA**
• with USB interface ► D)	**7MF4997-1DB**

► Available ex stock.

D) Subject to export regulations AL:N, ECCN: EAR99H.

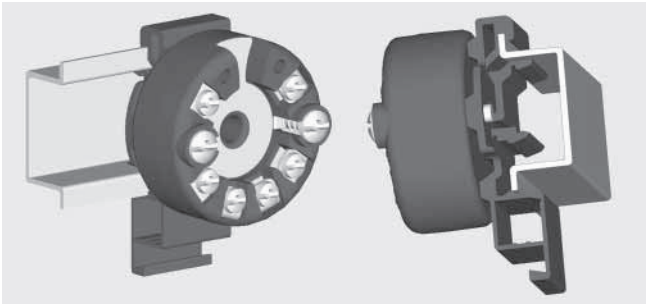
Power supply units see "SITRANS I supply units and input isolators".

Dimensional drawings

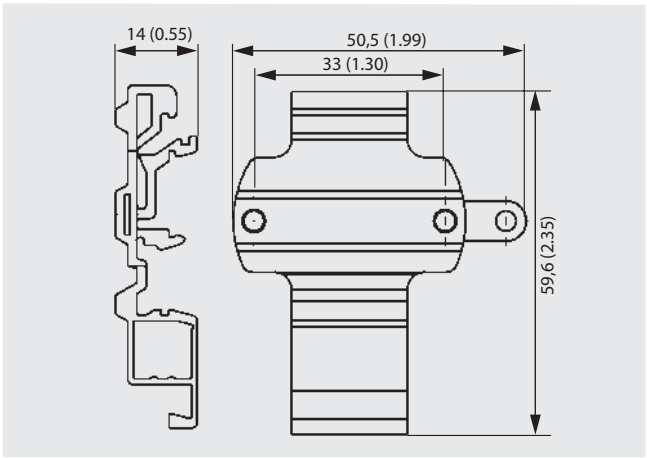


SITRANS TK/TK-H, dimensions in mm (inches)

Mounting on DIN rail

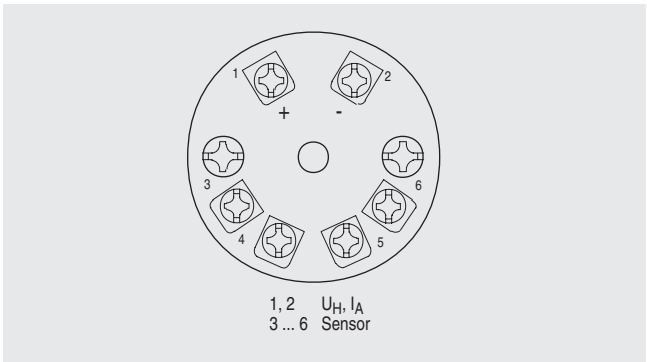


Mounting of transmitter on DIN rail, schematic diagram



DIN rail adaptor, dimensions in mm (inch)

Schematics

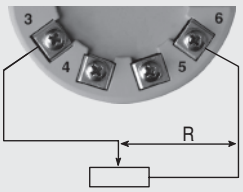


Pin assignment

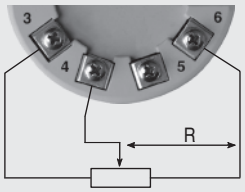
SITRANS T transmitters for mounting in sensor head

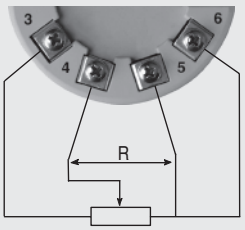
SITRANS TK/TK-H
Two-wire system

Potentiometer



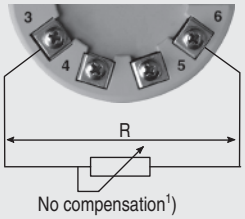
No compensation[1])



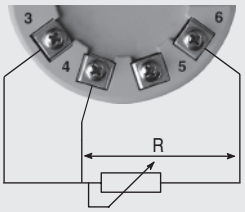


Four-wire compensation for line and transfer resistance [2])

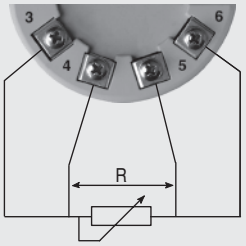
Resistance



No compensation[1])

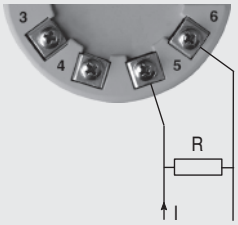


Three-wire line compensation

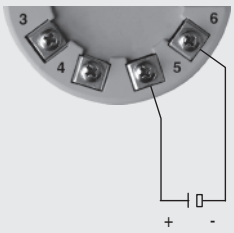


Four-wire line compensation

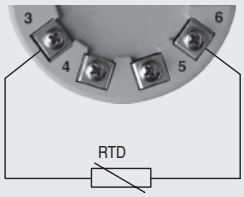
Current measurment



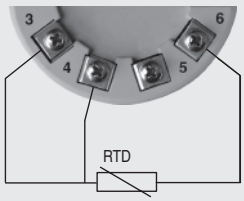
Voltage measurement



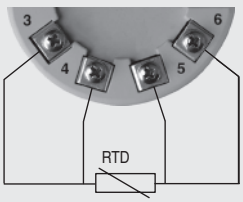
Resistance thermometer



No line compensation[1])

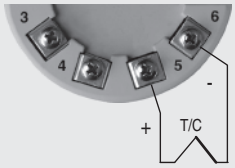


Three-wire line compensation

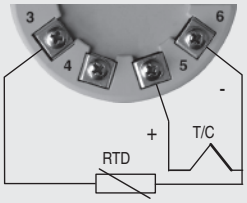


Four-wire line compensation

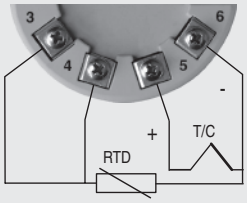
Thermocouple



Internal cold junction compensation (CJC)



External CJC-compensation
No line compensation[1])



External CJC-compensation
Three-wire line compensation

Note:
Line resistance (per wire in the case of three- and four-wire connections)
T > 600 °C (> 1112 °F): max. 10 Ω
T < 600 °C (> 1112 °F): max. 30 Ω

[1]) Line resistance for compensation is programmable.

[2]) Resistance between start of resistance and sliding contact.

Sensor connection assignment

**SITRANS TF
two-wire system**

Overview

The field transmitter for tough industrial duty

The temperature transmitter SITRANS TF works where others feel uncomfortable. These field transmitters are equipped namely with protection type IP68.

SITRANS TF comes in robust die-cast aluminium or in durable stainless steel. It converts signals from resistance thermometers, resistance-based sensors, thermocouples and voltage-based sensors into a load-independent direct current corresponding to the sensor characteristic. The offset mounted sensor prevents the transmitter from heating up at high temperature. Vibrations and oscillations due to long neck tubes and protective do not occur with SITRANS TF.

In the case of hard to reach measuring points you can mount the SITRANS TF in offset positions offering easy access and have the measured value shown on the freely programmable digital indicator.

The SITRANS TF can be used in a version without a transmitter as a user-friendly indicating device for all 4 to 20 mA signals.

All versions of the SITRANS TF are also available in an intrinsically safe or flameproof design.

Application

SITRANS TF temperature transmitters with "Non incendive" type protection can be operated within potentially explosive atmospheres (zone 2).

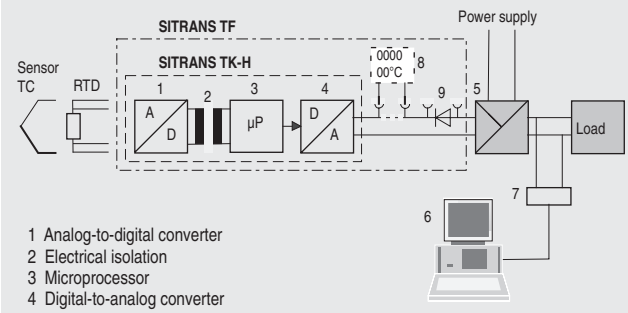
SITRANS TF temperature transmitters with "Non incendive" or "Flame-proof enclosure" type protection can be operated within potentially explosive atmospheres (zone 1).

Function

The communication capability via the HART protocol V 5.7 of the S ITRANS TF permits parameterization using a PC or HART communicator (hand-held communicator).

Parameterization is carried out using a PC for SITRANS TF with the integrated and programmable SITRANS TK.

Mode of operation



Operating principle: SITRANS TF with an integrated SITRANS TK-H and digital display

The signal supplied by a resistance-based sensor (two, three or four-wire circuit) or a thermocouple element is amplified in the input stage. The voltage proportional to the input variable is then converted into digital signals in the analog/digital converter (1). These signals are forwarded electrically isolated (2) to the microprocessor (3). They are converted there in accordance with the sensor characteristic and further parameters (damping, ambient temperature etc.).

The signal prepared in this way is converted in the digital/analog converter (4) into a load-independent direct current (4 to 20 mA). The power supply (5) is located in the output signal circuit.

The SITRANS TK-H transmitter is parameterized and operated using a PC (6) connected to the two-wire line via the interface module for SIPROM software (HART modem, 7). A hand-held communicator can also be used for this purpose. The signals needed for communication in conformity with the HART protocol V 5.7 are superimposed on the output current in accordance with the frequency shift keying (Frequency Shift Keying, FSK) method.

Technical specifications

Input

Resistance thermometer	
Measured variable	Temperature
Sensor type	
• Acc. to DIN IEC 751	Pt25 ... Pt1000
• Acc. to JIS C 1604)	Pt25 ... Pt1000
• Acc. to DIN IEC 75	Ni25 ... Ni1000
	Cu25 ... Cu1000
Voltage measurement	Temperature-linear
Type of connection	2, 3 or 4-wire circuit
Resistance-based sensors	
Measured variable	Ohmic impedance
Measuring range limits	2200 Ω
Voltage measurement	Resistance-linear or programmable (TK)
Type of connection	2, 3 or 4-wire circuit

SITRANS TF
two-wire system

3

Technical specifications (continued)

Thermocouple elements	
Measured variable	Temperature
Sensor type	
• Acc. to DIN IEC 584-1	Type B, E, J, K, R, S, T
• Acc. to DIN 43710	Type L, U
• Acc. to BS 4937	Type N
• Acc. to ASTM 988	Type C, D
Voltage measurement	Temperature-linear
Cold junction compensation	Internal, external with Pt100 or external with a fixed value
mV Sensor	
Measured variable	DC voltage
Measuring range limits	1100 mV
Voltage measurement	Voltage-linear or programmable (TK)
Overload capacity of the input	-0.5 ... +35 V DC
Input resistance	≥ 1 MΩ
Output	
Output signal	4 ... 20 mA, 2-wire
Communication for SITRANS TK-H	Acc. to HART V 5.x
Measuring accuracy	
Digital measuring errors	See "Digital measuring errors"
Error in the analog output	< 0.1% of span
Error in the internal cold junction	< 0.5 K (0.9 °F)
Temperature drift	±0.01%/°C (0.0056%/°F), typ. ±0.003%/°C (0.0016%/°F)
Influence of the power supply on the span and zero point	< 0.005% of span/V
Long-term drift	< 0.03% in first month
Rated conditions	
Ambient conditions	
Ambient temperature	-40 ... +85 °C (-40 ... +185 °F)
Condensation	Permissible
Electromagnetic compatibility	
• Interference immunity	According to EN 50 082-2 and NAMUR NE21
• Emitted interference	Acc. to EN 50 081-2
Degree of protection to EN 60 529	IP68
Design	
Weight	Approx. 1.5 kg (3.3 lb) (without options)
Dimensions	see "Dimension drawings"
Enclosure material	Die-cast aluminum, low in copper, GD-AlSi 12, polyester-based lacquer, stainless steel rating plate
Electrical connection, sensor connection	Screw terminals, cable inlet via M20 x 1.5 or ½-14 NPT threaded gland
Mounting bracket (optional)	Steel, galvanized and chrome-plated or stainless steel
Digital display (optional)	In current loop
Display	Max. 5 digits
Display range	-99 999 ... + 99 999
Units	Any
Setting: Zero point, upper range value and unit	With 3 keys

Power supply	
Without digital display	
• For SITRANS TK	6.5 ... 35 V DC (28 V for EEx ia)
• For SITRANS TK-H	12 ... 35 V DC (28 V for EEx ia)
With digital display	
• For SITRANS TK	9.3 ... 35 V DC (28 V for EEx ia)
• For SITRANS TK-H	14.8 ... 35 V DC (28 V for EEx ia)
Electrical isolation	Between input and output
• Test voltage	U_{eff} = 3.75 kV, 50 Hz, 1 min
• Insulation	500 V AC
Certificate and approvals	
Explosion protection ATEX	
• "Intrinsic. safe" type of protection	II 2 (1) G EEx ia IIC T4
- EC-Type Examination Certificate	ZELM 99 ATEX 0007
• "Flame-proof enclosure" type of protection	II 2 G EEx d IIC T5/6
- EC-Type Examination Certificate	CESI 99 ATEX 079
Explosion protection (German Technical Inspectorate)	
• Ex tested for zone 2n	
- Conformity statement	In preparation
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
Hardware and software requirements for the parameteriz.software SIPROM TK for SITRANS TK	
Personal computer	• CPU of type 486 upwards, compatible with industrial standard • 3.5" diskette drive • Hard disk with 5 MB vacant space • min. 4 MB RAM • VGA graphics adapter (or compatible) with at least 16 colors • One vacant serial port • Mouse or compatible pointing device and printer (recommended)
PC operating system	MS-DOS V 5.0 upwards, MS-Windows V 3.1 upwards
SIMATIC PDM for SITRANS TK-H	see Chapter 9
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.x

Factory setting (transmitter):

- Pt100 (IEC 751) with three-wire circuit
- Measuring range: 0 ... 100 °C
- Output with sensor breakage: 23 mA

Technical specifications (continued)

Digital measuring errors

Resistance-based sensors

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

Resistance thermometer

Input	Measured range	Min. measured span	Digital accuracy
	°C (°F)	°C (°F)	°C (°F)
Pt25 ... Pt500	-200 ... +850 (-328 ... +1562)	10 (18)	0.1 (0.18)
Pt501 ... Pt1000 IEC	-200 ... +350 (-328 ... +662)	10 (18)	0.1 (0.18)
Ni25 ... Ni1000	-50 ... +250 (-58 ... +482)	10 (18)	0.1 (0.18)
Cu25 ... Cu1000	-50 ... +250 (-58 ... +482)	10 (18)	0.1 (0.18)

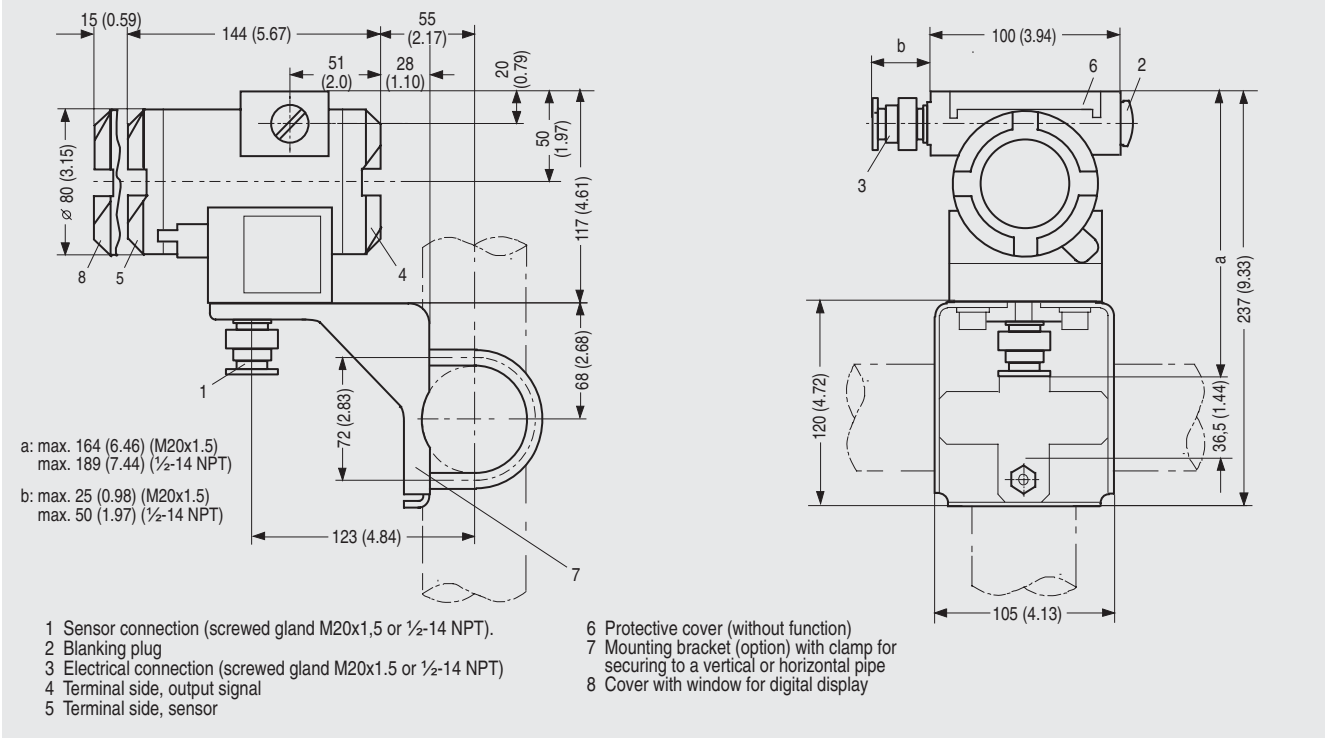
Voltage source

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

Thermocouple elements

Input	Measured range	Min. measured span	Digital accuracy
	°C (°F)	°C (°F)	°C (°F)
Type B	+500 ... +1820 (+932 ... +3308)	50 (90)	2 (3.6)
Type C	0 ... +2300 (+32 ... +4172)	100 (180)	2 (3.6)
Type D	0 ... +2300 (+32 ... +4172)	100 (180)	2 (3.6)
Type E	-250 ... +900 (-418 ... +1652)	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	0 ... +1750 (+32 ... +3182)	100 (180)	2 (3.6)
Type S	0 ... +1750 (+32 ... +3182)	100 (180)	2 (3.6)
Type T	-220 ... +400 (-364 ... +752)	40 (72)	1 (1.8)
Type U	-200 ... +600 (-328 ... +1112)	50 (90)	1 (1.8)

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)

SITRANS T transmitter for field mounting / field indicators

SITRANS TF
two-wire system

Selection and ordering data	Order No.						
Temperature transmitter in field housing	**7NG313**	**-**					
Two-wire system 4 ... 20 mA, with electrical isolation, with instruction manual							
Integrated transmitter							
• SITRANS TK, programmable							
- without Ex protection			**1**	**0**			
- with EEx ia			**1**	**1**			
- total device SITRANS TF EEx d [1]			**1**	**4**			
- total device SITRANS TF according to FM (XP, DIP, NI, S) [1]			**1**	**5**			
• SITRANS TK-H, communication capability according to HART V 5.x							
- without Ex protection			**2**	**0**			
- with EEx ia			**2**	**1**			
- total device SITRANS TF EEx d [1]			**2**	**4**			
- total device SITRANS TF according to FM (XP, DIP, NI, S) [1]			**2**	**5**			
SITRANS TF field indicator with instruction manual	**7NG313**	**-**					
• without Ex protection			**0**	**0**	**1**		
• with EEx ia			**0**	**1**	**1**		
• total device SITRANS TF EEx d [1]			**0**	**4**	**1**		
• total device SITRANS TF according to FM (XP, DIP, NI, S) [1]			**0**	**5**	**1**		
Housing							
• die-cast aluminium				**A**			
• stainless steel precision casting				**E**			
Connections/cable inlet							
• screwed glands M20x1.5				**B**			
• screwed gland s 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	**Order code**						
Please add "-**Z**" to Order No. and specify Order code(s) and plain text.							
Inscription on measuring-point label							
• measuring range (max. 27 characters)	**Y22**						
• meas. point description (max. 16 char.)	**Y23**						
• measuring-point text (max. 27 charac.)	**Y24**						
Customer-specific setting of operating data	**Y01**						

Power supply units see "SITRANS I supply units and input isolators".

[1] Without cable gland.

Accessories		Order No.
SIPROM TK parameterization software for SITRANS TK German/English/French	▶	**7NG3190-8KB**
Modem for SITRANS TK	▶	**7NG3190-6KB**
Instruction Manual SITRANS TF German/English (included in delivery)		**A5E00046014**
SIMATIC PDM parameterization software also for SITRANS TK-H		**see Chapter 9**
HART modem		
• with RS232 interface	▶ D)	**7MF4997-1DA**
• with USB interface	▶ D)	**7MF4997-1DB**
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**

D) Subject to export regulations AL:N, ECCN: EAR99H.

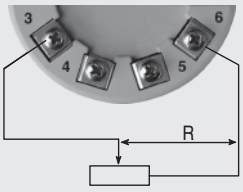
▶ Available ex stock.

Power supply units see "SITRANS I supply units and input isolators".

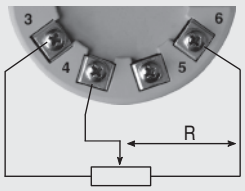
[1] Upgrading of devices with Ex protection is not possible

Schematics

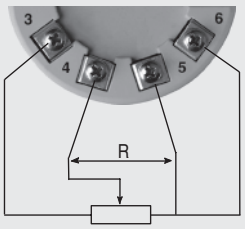
Potentiometer



No compensation[1])

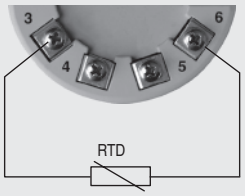


Three-wire compensation for transfer resistance[2])

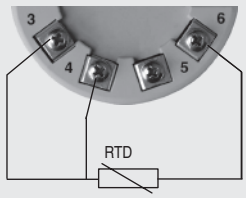


Four-wire compensation for line and transfer resistance[2])

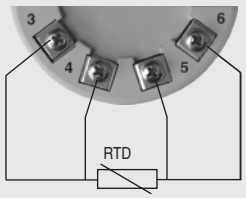
Resistance-thermometer



No line compensation[1])

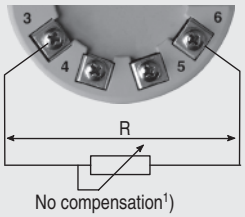


Three-wire line compensation

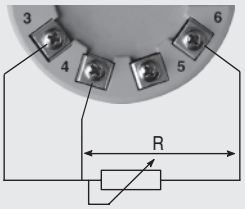


Four-wire line compensation

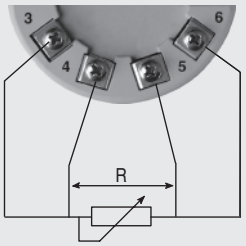
Resistance



No compensation[1])

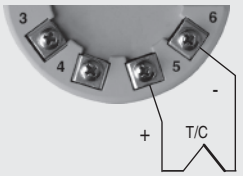


Three-wire line compensation

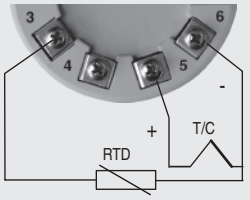


Four-wire line compensation

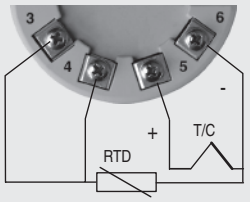
Thermo couple



Internal cold junction compensation (CJC)

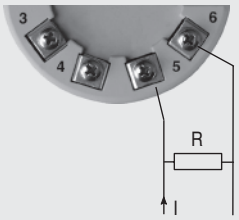


External CJC
No line compensation[1])

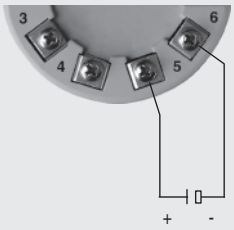


External CJC
Three-wire line compensation

Current measurement



Voltage measurement



Note:
Line resistance (per wire in the case of 3 or 4-wire connections)
T > 600 °C (> 1112 °F): max. 10 Ω
T < 600 °C (< 1112 °F): max. 30 Ω

[1]) Line resistance for compensation is programmable.
[2]) Resistance between start of resistance and sliding contact.

Sensor connection assignment

SITRANS T transmitter for field mounting

SITRANS TF2
with temperature sensor

Overview

The temperature transmitter SITRANS TF2 integrates three elements in one device:

- a Pt100 resistance thermometer in a stainless steel protective tube,
- a stainless steel housing with a high degree of protection, and
- a built-in transmitter with LCD and three keys for parameterization.

It is used to indicate and monitor the temperature measured at the point of installation.

The SITRANS TF2 is available in an axial and a radial version.

Benefits

- Robust stainless steel housing with two connection versions
- High measuring accuracy
- Precise display with a resolution of $^1/_{100}$ °C in the highest measuring range
- Measuring ranges from -50 to +200 °C (-58 ... +392 °F) parameterizable
- Customer-specific lengths and materials possible for the protective tube
- Stainless steel protective tube with high resistance to chemicals
- Signaling of limit violation in the LCD as well as with a red LED

Application

The SITRANS TF2 is used for indicating and monitoring a temperature variable at the point of installation. Applications are all process engineering branches, e.g.:

- Chemical industry
- Energy industry
- Long-distance heating
- Water supply
- Sewage works
- Food industry
- Steelworks and the cement industry
- Pharmaceutical industry
- Biotechnology

Design

The SITRANS TF2 has a stainless steel housing (diam. 80 mm) with protective glass. The stainless steel protective tube with screw socket contains the temperature sensor Pt100. By using stainless steel for the protective tube it displays high chemical resistance, which means that the temperature sensor is well protected against external effects

The protective tube is supplied as standard in lengths of 170 mm or 260 mm; a customer-specific version is also possible. Similarly, the protective tube can be supplied in the material of the customer's choice.

At the rear of the housing is the electrical connection for the voltage supply using a current loop of 4 to 20 mA. The connection is made with plug connectors to EN 175301-803A.

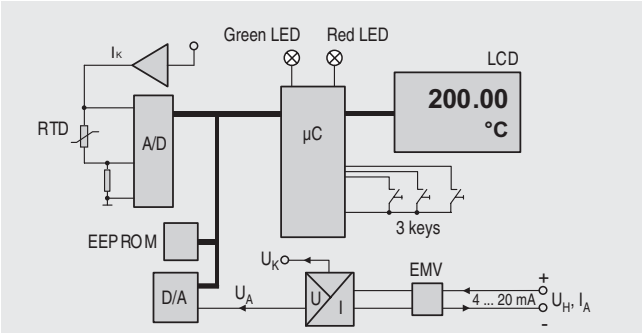
At the front of the housing is the 5-digit display behind a glass cover. Underneath the display are the 3 keys for parameterizing the SITRANS TF2. Above the display are a green and a red LED for indicating the operating status.

The SITRANS TF2 is available in two versions (see "Dimension drawings"):

- In the radial version (type A) the display is fitted in parallel with the protective tube. The display can be rotated by up to ±120° relative to the protective tube.
- In the axial version (type B) the display is at right angles to the protective tube. The display can be rotated by 360° relative to the protective tube.

Function

Mode of operation



3 keys	Configuring of parameters
A/D	Analog-to-digital converter
D/A	Digital-to-analog converter
EEPROM	Memory for all parameters
EMC	Output stage with protective components
I_A	Current output
I_K	Constant-current source
LCD	Display of measured values with dimension
Green LED	Display of normal mode
Red LED	Display of error messages or limit violation
RTD	Pt100 resistance thermometer
U_H	Power supply
µC	Microcontroller for computing functions ond monitoring

The outside lying temperature sensor Pt100 is supplied with current from the constant current course I_K. A temperature-related voltage drop is thus created over the sensor.

The voltage drop is converted on the analog/digital converter (A/D) into a digital signal.

In the microcontroller (µC) the digital signal is linearized and evaluated in accordance with the data saved in the EEPROM. The processed data are shown in the display.

In addition the values are converted on the digital/analog converter (D/A) and the voltage/current transformer (U/I) into a temperature-linear current signal I_A (4 to 20 mA).

Display

Display

The SITRANS TF2 has a 5-digit display behind a glass cover. The following data are shown on the display:

- measured temperature
- unit (°C, °F, °R or K and mA or %)
- limit violation, indicated by LED and arrow symbols in the display

Settings

The SITRANS TF2 is set using the 3 input keys behind the glass cover underneath the display.

The key "M" is used to selected the operating mode. Following modes of operation are available:

- Measured value
- Password
- Unit of measurement
- Start of scale and end
- Upper and lower limit value
- Offset
- Output current calibration
- Upper and lower current saturation limit
- Electrical damping

The other two keys are used to set the values in the individual operating modes.

Monitoring

Two LED indicators are fitted above the display to monitor the set range and the status:

- The green LED signals that the measured temperature lies within the set limits.
- The red LED lights up when the measured temperature lies outside the set limits and when there is an error.

Technical specifications

Measuring principle	
Resistance thermometer	Pt100 class B acc. to DIN IEC 751
Input	
Measured variable	Temperature
Max. measuring range	-50 °C ... +200 °C (-58 ... +392 °F)
Min. measured span	50 K (90 °F)
Output	
Output signal	4 ... 20 mA, 2-wire
Lower current limit	min. 3.6 mA
Upper current limit	max. 23 mA
Output protected against	reversed polarity, overvoltage and short-circuiting
max. load	$(U_H - 12\ V) / 0.023\ A$
Voltage measurement	Temperature-linear
Measuring accuracy	
Error in measurement at 23 °C ± 5 K (73.4 ± 9 °F)	< ± (0.45 K + 0.2% of full-scale value in K + 1 digit in K) (< ± (0.81 °F + 0.2% of full-scale value in °F + 1 digit in °F)
Measuring cycle time	≤ 100 ms
Temperature effect	< ± 0.15%/10 K (< ± 0.15%/18 °F)
Power supply effect	< ±0,01% of full-scale value / V
Vibration influence	< ±0.05%/g to 500 Hz in all directions (to IEC 68-2-64)

Rated conditions	
Ambient conditions	
Ambient temperature	-25 ... +85 °C (-13 ... +185 °F)
Temperature range for best readability	-10 ... +70 °C (14 ... 158 °F)
Storage temperature	-40 ... +85 °C (-40 ... +185 °F)
Degree of protection	IP65 to EN 60529
Electromagnetic compatibility	EN 61326/A2 Appendix A (2001)
Displays and controls	
Display	LCD, max. 5 digits, digit height 9 mm (0.354 inch)
Resolution at max. measuring range	0.01 °C (0.01 °F)
Decimal point	Freely parameterizable
Limit values	Freely parameterizable
Limit violation display	Red LED and message on LCD (↑ symbol /↓ symbol in case of limit violation in upward / downward direction)
Parameterization	With 3 keys
Units	mA or % or Ω or physical variable: °C, °F, °R, K
Damping	Between 0.1 and 100 s (increment: 0.1 s) freely parameterizable
Design	
Weight	≈ 0.7 kg (≈ 1.54 lb)
Non-wetted parts materials	
• Field housing	Diam. 80 mm (diam. 3.15 inch), stainless steel, mat. No. 1.4016
• Cover	Stainless steel, mat. No. 14016 with glass
Wetted parts materials	
• Protective tube	To DIN 43772 form 8 (March 2000), diam. 14 x 1.5 mm (diam. 0.55 x 0.06 inch)
- Material	Stainless steel (mat. No. 1.4571/316Ti)
• Protective tube screw socket	G½B to DIN 3852-2 form A or ½"-14 NPT
- Material	Stainless steel (mat. No. 1.4571/316Ti)
Measuring insert	Length to fit the ordered protective tube, stainless steel
Connection of display to the protective tube	radial (type A), can be swiveled by max. ±120° (α)
	axial (type B), can be swiveled by max. ± 360°
Length of the protective tube(U_1)	see Ordering data
Electrical connection	Using 2-pole plug connector made of plastic with M16x1.5-cable entry to EN 175301-803A or ½"-14 NPT
Power supply	
Terminal voltage on temperature transmitter (U_H)	12 ... 30 V DC
Operating limits	
Pressure	max. 40 bar (580 psi)

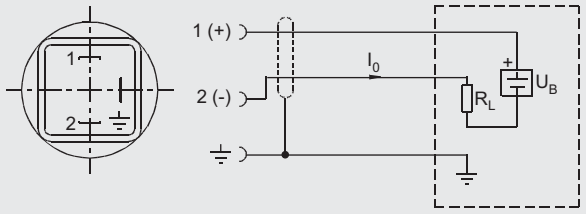
SITRANS T transmitter for field mounting

SITRANS TF2
with temperature sensor

Selection and ordering data	Order No.	Order code
Temperature transmitter SITRANS TF2, field device Temperature transmitter with LCD in stainless steel housing, degree of protection IP65, stainless steel protective tube, resistance thermometer with Pt100 sensor, measuring range -50 ... +200 °C (-58 ... +392 °F), local parameterization, output signal 4 ... 20 mA	7NG3140-	
	■■■■0	
Display / cable entry		
• Radial version (type A), parallel to protective tube / M16x1.5 ▶	1	
• Axial version (type B), at right angles to protective tube / M16x1.5	2	
• Radial version (type A), parallel to protective tube / ½"-NPT	3	
• Axial version (type B), at right angles to protective tube / ½"-NPT	4	
Process connection		
• Connection shank G½B ▶	A	
• Connection shank ½"-14 NPT	B	
• Other version (on request) add Order Code and plain text: connection shank: ...	Z	J 1 Y
Length of the protective tube (U_1)		
• 170 mm (6.70 inch) ▶	A	
• 260 mm (10.24 inch) ▶	B	
• 4.5" (114 mm)	K	
• 7.5" (190 mm)	P	
• 10.5" (266 mm)	T	
• Other version (on request) add Order Code and plain text: length: ...	Z	K 1 Y
Material of the protective tube		
• Stainless steel (mat. No. 1.4571/316Ti) ▶	0	
• Other version (on request) add Order Code and plain text: mat. No.: ...	9	L 1 Y

▶ Available ex stock

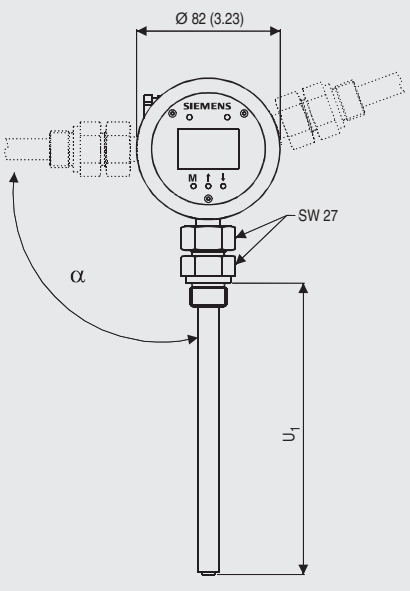
Schematics



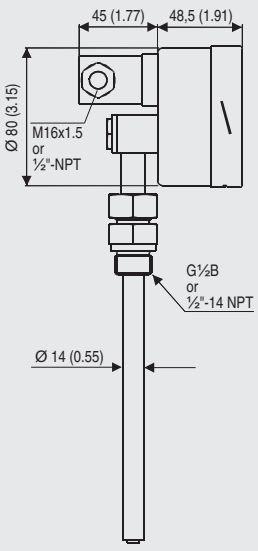
U_B Power supply
R_L Load
I_0 Output current

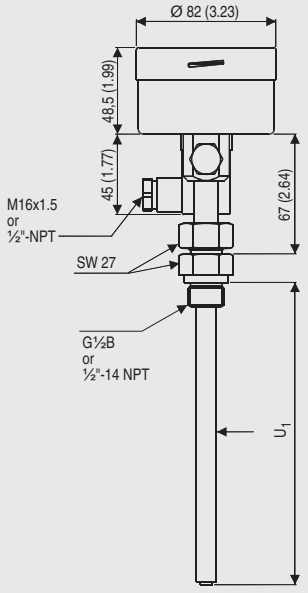
SITRANS TF2, connection diagram

Dimensional drawings



Type A





Type B

SITRANS TF2, dimensions in mm (inches)

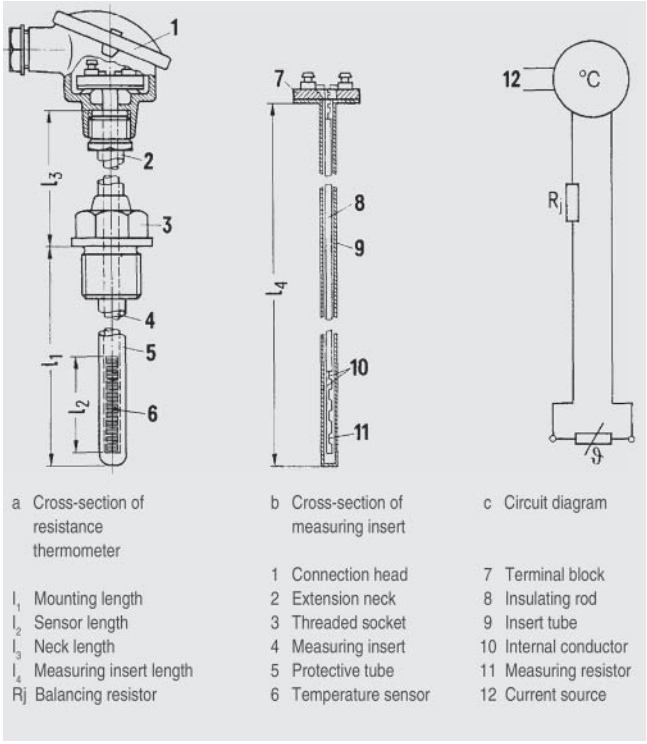
Design

A resistance thermometer comprises

- The measuring resistor (metal; platinum, Pt or nickel, Ni) and
- The mounting and connection parts required in each case.

In the standard version, the measuring resistors are embedded in ceramic. In the case of special vibration resistance requirements, the Pt measuring resistors are double-wound and fused into glass.

- Measuring resistors of class B are supplied. A range of resistors of class A or 1/3 to 1/10 class B is available on request.
- Single and double resistance thermometers are available.



Components and circuitry of a resistance thermometer

To protect the measuring resistor for industrial measurements and to enable easy replacement, it is fixed in a measuring insert (4) which in turn is fitted in a protective tube (5). The measuring insert is spring-mounted in the connection head (1) of the protective tube using two screws. The internal conductor (10) in the measuring insert connects the measuring resistor (11) to the terminals on the terminal block.

Depending on the measuring range and the accuracy required, the thermometers are connected in two-wire, three-wire or four-wire systems to the output devices.

The measuring inserts are therefore available with two, three or four internal conductors. If the resistance of the internal conductor is negligibly small, measuring inserts with only two internal conductors can be used for the three-wire and four-wire systems.

Exact balancing of the internal conductor under operating conditions is only possible with three conductors. If the resistance of the internal conductor is greater than 0.2 Ω, its magnitude is indicated on the mounting flange of the measuring insert.

Function

Measuring resistor

Measuring resistors	Measuring resistors are suitable for temperatures from
Made of platinum	-200 ... +850 °C (-328 ... +1562 °F)
Made of nickel	-60 ... +150 °C (-76 ... 302 °F), briefly up to 180 °C (356 °F)

The measuring resistor changes with the temperature in accordance with a certain reproducible series of calibration data (see the table "Calibration data for platinum measuring resistors (to DIN EN 60751)“ under "Technical data“).

The changes in resistance are transmitted as changes in voltage to indicators, recorders or controllers directly via copper wires or via transmitters. The type of measuring circuit depends on the instrument to be connected and the required measuring range. The measuring resistors are balanced at 0 °C (32 °F) to 100 Ω ± 0.12 Ω . The calibration values of the resistors (i.e. the dependence of the resistor on the temperature) and the permissible deviations are specified in DIN EN 60751 (IEC 751) (see the table "Error limits according to DIN EN 60751“ under "Technical Specifications“).
Measuring resistors of class B are supplied. A range of resistors of class A or 1/3 to 1/10 class B is available on request.

Measuring principle of the resistance temperature measurement

The thermometer is heated up by the thermometer current compared to the material to be measured. The heating-up error thus produced increases with the square of the thermometer current and linearly with the resistance of the measuring resistor. Apart from the magnitude of the thermometer current, the error depends on the design of the thermometer and on the heat transfer between the protective tube and the medium. A high measuring power is required for output instruments operating according to the deflection method. To keep the heating-up error within permissible limits, the thermometer current should not be greater than 10 mA in this case.

When measuring the temperature of gases with very small flow velocities, a considerably greater heating-up error occurs than in measurements with very fast gases or liquids. The heating-up error is negligibly small with high flow velocities.

Protection fitting/protective tubes

Suitable protective fittings are used for installation in pipelines, tanks etc. depending on the mechanical or chemical requirements.
The materials for the protective tubes or combinations of different protective tube materials must be carefully selected in order to meet the requirements due to static pressure, flow and temperature Furthermore, the indication response should be as fast as possible.

Installation examples with the suitable protective tube materials can be found under "Technical data" in the table "Installation examples and material of protective tubes".

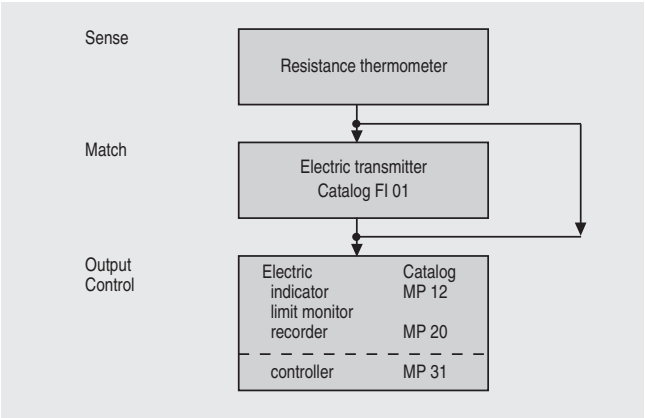
The type of installation of the protective tubes depends on the application. The protective tubes are screwed into the pipelines in the case of operating pressures up to approx. 90 bar. Tapered protective tubes which can be welded in are available for higher pressures. Thermometers for measuring furnace temperatures are fixed using flanges.

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.

Technical description

Integration

Instrument combination for measuring and controlling temperature



Instrument combination with resistance thermometer as sensor

Installation examples and materials of protective tubes

Measuring point	Max. operating temp. °C (°F)	Protective tube material name	No.
A. Steam power plants			
Water and steam lines (Screw-in and welding-type thermometers)	300 (572)	Bronze Sn Bz 6 (only for water)	2.1020
	400 (752)	St 35.8	1.0305
	540 (1004)	13 CrMo 44	1.7335
	570 (1058)	10 CrMo 9 10	1.7380
Flue gas	550 (1022)	St 35.8, enamelled	1.0305
Pulverized coal/air mixture line	100 (212)	St 35.8 (with baffle rod)	1.0305
Water treatment	30 (86)	X 6 CrNiTi 18 10 or X 6 CrNiMoTi 17 122	1.4541 1.4571
B. Paper mills			
In paper pulp (cylindrical paper mills, hand-made paper, refiner)	60 (140)	X 6 CrNiMoTi 17 122	1.4571
C. Pulp production		For all tanks with internal lining: only flange-type thermometers	
1. Sulfite pulp			
Boiling acid in vat, peetz tank and acid tower	150 (302)	X 6 CrNiMoTi 17 122	1.4571
Hypochlorite tower, alkali tower	40 (104)	X 6 CrNiMoTi 17 122	1.4571
Sulphite lye evaporation, heat exchanger, preheater and lye collecting tank	140 (284)	X 6 CrNiMoTi 17 122	1.4571
2. Sulfate pulp			
Vat, lye heater	In vat 180 (356) otherwise 80 (176)	X 6 CrNiTi 18 10 or X 6 CrNiMoTi Ti 17 122	1.4541 1.4571
Black, green and white lye tanks			
Cellulose multiple-stage bleaching (moist chloric gases present)	40 (104)	Hastelloy C (59 Ni; 16 Mo; 15,5 Cr; 5,5 Fe; 3,8 W) or X 6 CrNiMoTi 17 122 with Ti protective sleeve	1.4571
Sulfate lye evaporation, heat exchanger, preheater and lye collecting tank	140 (284)	X 6 CrNiMoTi 17 122	1.4571
D. Dye works			
Jigger, automatic yarn skein dying machine	110 (230)	X 6 CrNiMoTi 17 122	1.4571
E. Food and drink industries			
1. Breweries			
Brewing water	80 (176)	Bronze Sn Bz 6 or X 6 CrNiTi 18 10	2.1020
Mash			
• Hot wort	100 (212)	Bronze or X 6 CrNiTi 18 10	1.4541
• Cold wort	4 (39,2)	X 6 CrNiTi 18 10	1.4541
2. Sugar factories			
Salt removal in sugar juice	100 (212)	X 6 CrNiTi 18 10	1.4541
3. Cereals production			
Salt removal in whey	20 (68)	X 6 CrNiTi 18 10	1.4541
4. Malt houses			
Steeping water	100 (212)	Bronze Sn Bz 6	2.1020
5. Yeast production			
Yeast cooling	4 (39,2)	X 6 CrNiTi 18 10	1.4541
Yeast fermentation	33 (91,4)	X 6 CrNiMoTi 17 122	1.4571

F. Chemical and petrochemical industries

Corrosion-resistant steel, material Nos. 1.4541 and 1.4571, can be used for many applications. The numerous substances to be measured in these industrial branches render it sometimes difficult to recommend suitable protective tube materials. If required, please contact our representatives in these cases.

Technical specifications

Calibration data for platinum measuring resistors (to DIN EN 60751)

°C	(°F)	Ω
-200	(-328)	18.52
-180	(-292)	27.10
-160	(-256)	35.34
-140	(-220)	43.88
-120	(-184)	52.11
-100	(-148)	60.26
-80	(-112)	68.33
-60	(-76)	76.33
-40	(-40)	84.27
-30	(-22)	88.22
-20	(-4)	92.16
-10	(14)	96.09
0	(32)	100.00
10	(50)	103.90
20	(68)	107.79
30	(86)	111.67
40	(104)	115.54
50	(122)	119.40
60	(140)	123.24
80	(176)	130.90
100	(212)	138.51
120	(248)	146.07
140	(284)	153.58
160	(320)	161.05
180	(356)	168.48
200	(392)	175.86
220	(428)	183.19
240	(464)	190.47
260	(500)	197.71
280	(536)	204.90
300	(572)	212.05
320	(608)	219.15
340	(644)	226.21
360	(680)	233.21
380	(716)	240.18
400	(752)	247.09
420	(788)	253.96
440	(824)	260.78
460	(860)	267.56
480	(896)	274.29
500	(932)	280.98
520	(968)	287.62
540	(1004)	294.21
560	(1040)	300.75
580	(1076)	307.25
600	(1112)	313.71
620	(1148)	320.12
640	(1184)	326.48
660	(1220)	332.79
700	(1292)	345.28
750	(1382)	360.64
800	(1472)	375.70
850	(1562)	390.48

Error limits acc. to DIN EN 60 751

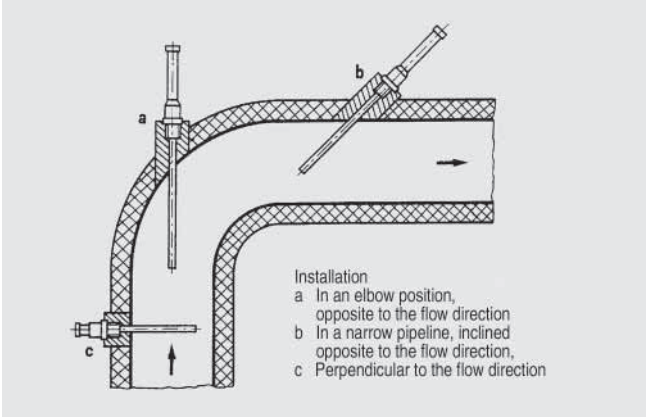
The resistance thermometers are divided into two classes according to their error limits:

Class	Error limits in °C
A	0,15 + 0,002 $\|t\|$ [1]
B	0,3 + 0,005 $\|t\|$

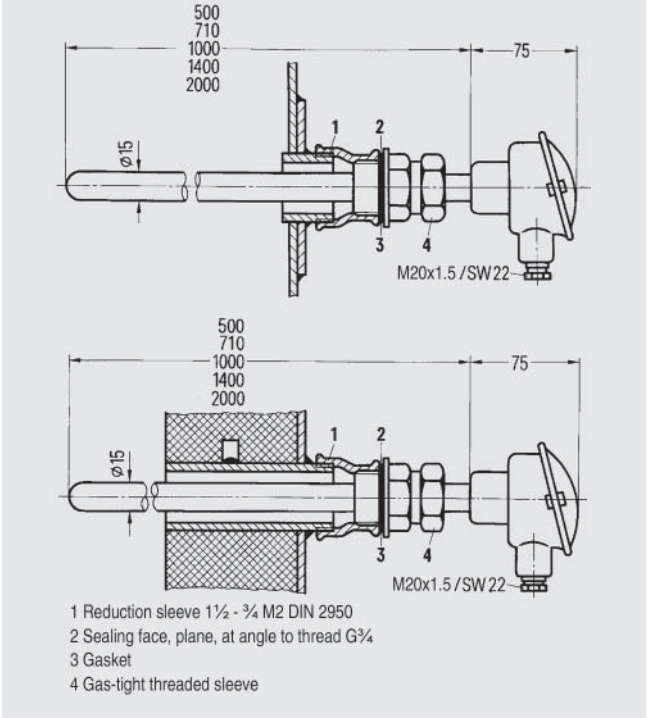
1) $\|t\|$ is the numerical value of the temperature in °C without consideration of the sign

Integration

Protective tubes in a pipeline



Flue gas resistance thermometer

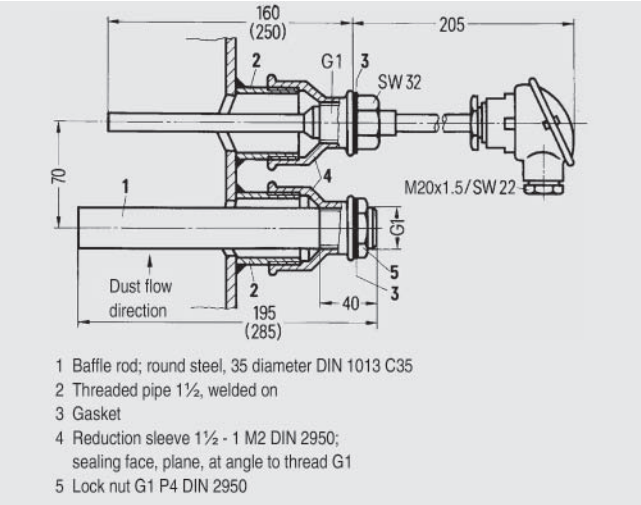


Fitted in a sheet-metal duct (top) and a flue gas duct (bottom)

3

Protective tubes, installation

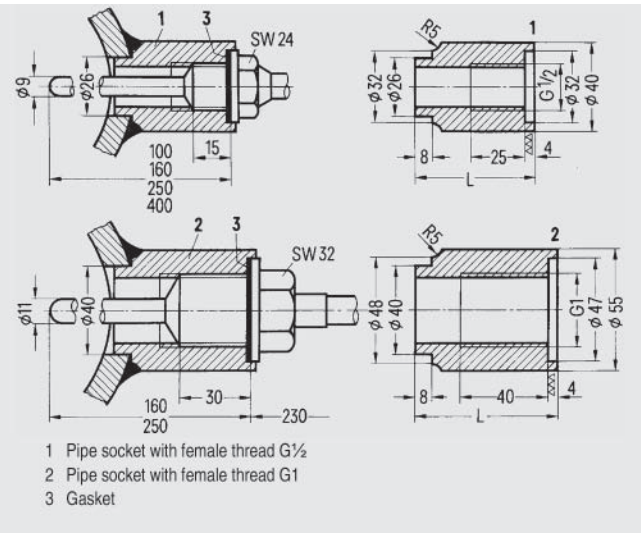
Screw-in resistance thermometer



1 Baffle rod; round steel, 35 diameter DIN 1013 C35
2 Threaded pipe 1½, welded on
3 Gasket
4 Reduction sleeve 1½ - 1 M2 DIN 2950; sealing face, plane, at angle to thread G1
5 Lock nut G1 P4 DIN 2950

In a pulverized coal line, with baffle rod

Welding-type protective tubes, mounted

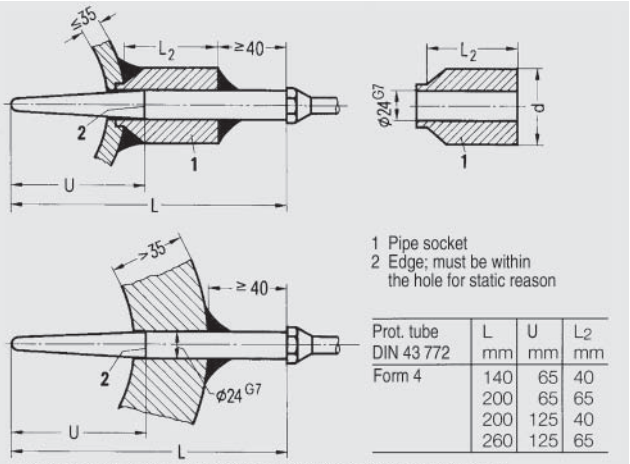


1 Pipe socket with female thread G½
2 Pipe socket with female thread G1
3 Gasket

At top for low-pressure, with screw socket G½; at bottom for high-pressure, with screw socket G1

It must be possible to weld the pipe coupling and pipeline. Material according to data provided by pipeline or vessel manufacturer.

Welding-type protective tubes, mounted



1 Pipe socket
2 Edge; must be within the hole for static reason

Prot. tube DIN 43 772	L mm	U mm	L_2 mm
Form 4	140	65	40
	200	65	65
	200	125	40
	260	125	65

It must be possible to weld the pipe coupling, pipeline and protective tube.
Materials according to data provided by pipeline or vessel manufacturer.

Top: Wall thickness ≤ 35 mm; mounting using welded coupling; bottom: Wall thickness > 35 mm

Overview

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

SITRANS TK-L

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

SITRANS TK

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

SITRANS TK-H

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

SITRANS T3K PA

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

Note:

- SITRANS TK/TK-H can be fitted instead of the terminal block or in the high hinged cover.
- SITRANS T3K PA can only be fitted in the high hinged cover of the connection head.

Selection and Ordering Data

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

Transmitter to be fitted	Order Code
To order the sensor with a built-in temperature transmitter, add "**-Z**" to the Order No. of the sensor, and supplement by the following Order code:	
• SITRANS TK-L	
- without Ex	**K00**
- EEx ia IIC and EEx n for zone 2	**K02**
• SITRANS TK	
- without Ex	**K10**
- EEx n for zone 2	**K11**
- ATEX (EEx ia) and FM (IS, I, NI)	**K12**
• SITRANS TK-H	
- without Ex	**K20**
- EEx n for zone 2	**K21**
- ATEX (EEx ia) and FM (IS, I, NI)	**K22**
• SITRANS T3K PA	
- without Ex	**K30**
- EEx ia IIC (ATEX)	**K31**
- intrinsic safety (FM)	**K33**
Customer-specific setting of the built-in transmitter (specify settings in plain text)	**Y11**

Resistance thermometers

Questionnaire for temperature sensors (resistance thermometers or thermocouples)

General information

Customer: .....

Address: .....

Contact partner: .....

Purchasing dept.: ..... Tel.: .....

Sales dept.: ..... Tel.: .....

Process dept.: ..... Tel.: .....

Inquiry: .....

Quotation: .....

Place and date: .....

Operating conditions

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

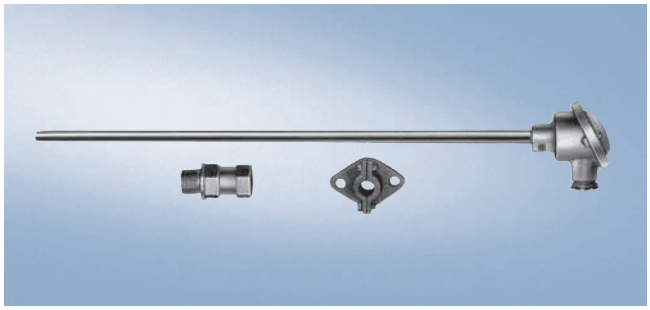
4.3. Other: .....
   .....

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

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

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

Overview



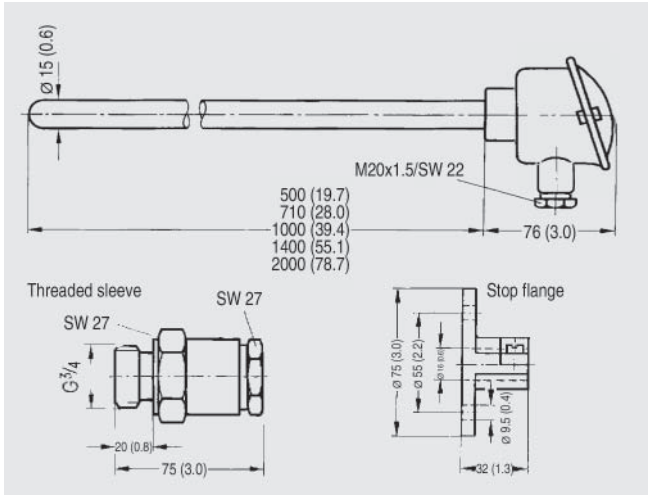
The flue gas resistance thermometer with connection head is suitable for the temperature range from -50 to +600 °C (-58 to +1112 °F) and can also be supplied with a built-in temperature transmitter.

Please order mounting flange or threaded sleeve separately.

Technical specifications

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

Dimensional drawings



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

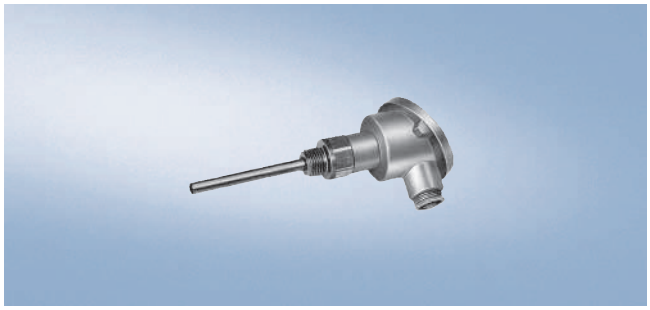
Selection and ordering data		Order No.
Flue gas resistance thermometer		
Measuring resistor (winding) embedded in ceramic 1 Pt100 measuring resistor, three-wire circuit		
Mounting length/ mm (inch):	Weight/ kg (lb):	
• 500 (19.7)	0.9 (1.98)	7MC1000-1BA2
• 710 (28.0)	1.1 (2.43)	7MC1000-2BA2
• 1000 (39.4)	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 Order No. and specify Order code(s) and plain text.		**Order code**
• Different design (mounting length, protective tube material etc.), specify in plain text.		**Y01**
• TAG plate made of stainless steel specify TAG No. in plain text		**Y15**
• Calibration carried out at one point, specify desired temperature in plain text (order equivalent number of times for several calibration points).		**Y33**
Accessories		
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, see "Temperature transmitters for installation in the connection head" (page 3/41).

Individual parts: Measuring inserts, see "Accessories".

Low-pressure screw-in resistance thermometers with connection head, without neck tube

Overview

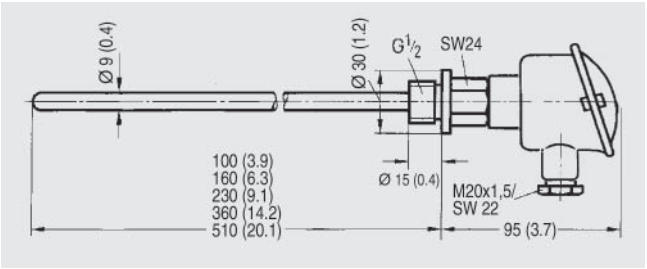


The low-pressure screw-in resistance thermometer with connection head (no neck tube) is suitable for the temperature range from -50 to +400 °C (-58 to +752 °F) and can also be supplied with a built-in temperature transmitter.

Technical specifications

Design	According to DIN 43765: Screw-in thermometer
Protective tube	
• Form	Similar to 2G, DIN 43772; cylindrical, 9 mm (0.35 inch) diameter, wall thickness 1 mm (0.04 inch)
• Loading capacity	to 20 bar (290.1 psi) (loading capacity dependent on material, temperature, flow rate, mounting length etc., see DIN 43772 for details)
Screw socket	G½; suitable is gasket 21 x 26, similar to form C or D, DIN 7603
Measuring insert	Replaceable, with measuring insert tube (6 mm diameter (0.24 inch) made of stainless steel; terminal block with clamping springs
Response times (to VDI/VDE 3 522)	
• In water with flow velocity v = 0.4 m/s (1.31 ft/s)	$t_{0.5}$ = 25 s, $t_{0.9}$ = 75 s
• In air with flow velocity v = 1 m/s (3.28 ft/s)	$t_{0.5}$ = 2 min, $t_{0.9}$ = 6.3 min
Explosion protection	II 1/2G EEx ia IIC T4/T6

Dimensional drawings



Low-pressure screw-in resistance thermometer with connection head, without neck tube, dimensions in mm (inches)

Selection and ordering data — Order No.

Low-pressure screw-in resistance thermometer with connection head, without neck tube

Protective tube and screw socket
X 6 CrNiMoTi 17 122, mat. No. 1.4571
Protective tube to DIN 43,772,
form: similar to 2G
Measuring resistors embedded in ceramic, one Pt100 measuring resistor: three-wire circuit, Two Pt100 measuring resistors: two-wire circuit

Measuring insert not explosion protected

One Pt100 measuring resistor,

Mounting length U_1/ mm (inch):	Weight/ kg (lb):	
• 100 (3.9)	0.6 (1.32)	7MC1006-1DA1
• 160 (6.3)	0.7 (1.54)	7MC1006-2DA1
• 230 (9.1)	0.8 (1.76)	7MC1006-3DA1
• 360 (14.2)	0.9 (1.98)	7MC1006-4DA1
• 510 (20.1)	1.0 (2.20)	7MC1006-5DA1

Two Pt100 measuring resistors

Mounting length U_1/ mm (inch):	Weight/ kg (lb):	
• 100 (3.9)	0.6 (1.32)	7MC1006-1DB1
• 160 (6.3)	0.71 (1.57)	7MC1006-2DB1
• 230 (9.1)	0.81 (1.79)	7MC1006-3DB1
• 360 (14.2)	0.91 (2.01)	7MC1006-4DB1
• 510 (20.1)	1.01 (2.23)	7MC1006-5DB1

Measuring insert with explosion protection

One Pt100 measuring resistor

Mounting length U_1/ mm (inch):	Weight/ kg (lb):	
• 100 (3.9)	0.6 (1.32)	7MC1006-1DE1
• 160 (6.3)	0.7 (1.54)	7MC1006-2DE1
• 230 (9.1)	0.8 (1.76)	7MC1006-3DE1
• 360 (14.2)	0.9 (1.98)	7MC1006-4DE1
• 510 (20.1)	1.0 (2.20)	7MC1006-5DE1

Two Pt100 measuring resistors

Mounting length U_1/ mm (inch):	Weight/ kg (lb):	
• 100 (3.9)	0.6 (1.32)	7MC1006-1DF1
• 160 (6.3)	0.71 (1.57)	7MC1006-2DF1
• 230 (9.1)	0.81 (1.79)	7MC1006-3DF1
• 360 (14.2)	0.91 (2.01)	7MC1006-4DF1
• 510 (20.1)	1.01 (2.23)	7MC1006-5DF1

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
• made of stainless steel, with 1 cable inlet and screw cover	7

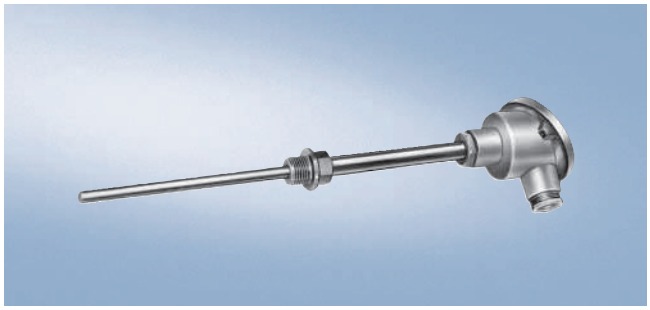
Further designs Please add "**-Z**" to Order No. and specify Order code(s) and plain text.	**Order code**
• Different design (mounting length, protective tube material etc.), specify in plain text.	Y01
• TAG plate made of stainless steel specify TAG No. in plain text	Y15
• Calibration carried out at one point, specify desired temperature in plain text (order equivalent number of times for several calibration points).	Y33

To order a temperature transmitter installed in the connection head, see "Temperature transmitters for installation in the connection head" (page 3/41).

Individual parts: Measuring inserts and connection heads, see "Accessories".

Low-pressure resistance thermometers with connection head and neck tube

Overview

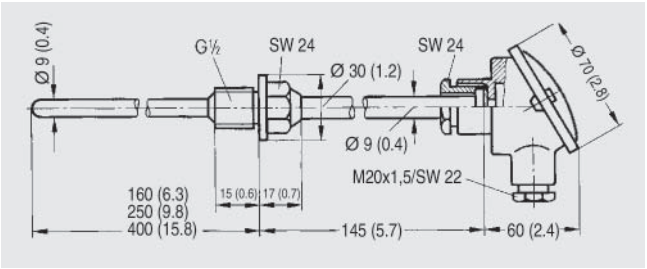


The low-pressure screw-in resistance thermometer with connection head and neck tube is suitable for the temperature range from -50 to +600 °C (-58 to +1112 °F) and can also be supplied with a built-in temperature transmitter.

Technical specifications

Design	According to DIN 43765: Screw-in thermometer
Protective tube	
• Form	2G, DIN 43772; cylindrical, 9 mm (0.35 inch) diameter, wall thickness 1 mm (0.04 inch)
• Loading capacity	to 20 bar (290.1 psi) (loading capacity dependent on material, temperature, flow rate, mounting length etc., see DIN 43772 for details)
Screw socket	G½; suitable is gasket 21 x 26, similar to form C or D, DIN 7603
Measuring insert	Replaceable, with measuring insert tube (6 mm diameter (0.24 inch) made of stainless steel; terminal block with clamping springs
Response times (to VDI/VDE 3 522)	
• In water with flow velocity v = 0.4 m/s (1.31 ft/s)	$t_{0.5}$ = 25 s, $t_{0.9}$ = 75 s
• In air with flow velocity v = 1 m/s (3.28 ft/s)	$t_{0.5}$ = 2 min, $t_{0.9}$ = 6.3 min
Explosion protection	II 1/2G EEx ia IIC T4/T6

Dimensional drawings



Low-pressure screw-in resistance thermometer with neck tube, dimensions in mm (inches)

Selection and ordering data — Order No.

Low-pressure screw-in resistance thermometer with connection head and neck tube

Protective tube and screw socket X 6 CrNiMoTi 17 122, mat. No. 1.4571
Protective tube to DIN 43772, form: 2G
Measuring resistors embedded in ceramic, one Pt100 measuring resistor: three-wire circuit, Two Pt100 measuring resistors: two-wire circuit

Measuring insert not explosion protected

One Pt100 measuring resistor

Mounting length U_1/ mm (inch):	Weight/ kg (lb):	
• 160 (6.3)	0.8 (1.76)	7MC1007-5DA1
• 250 (9.84)	0.9 (1.98)	7MC1007-6DA1
• 400 (15.7)	1.0 (2.20)	7MC1007-7DA1

Two Pt100 measuring resistors

Mounting length U_1/ mm (inch):	Weight/ kg (lb):	
• 160 (6.3)	0.9 (1.98)	7MC1007-5DB1
• 250 (9.84)	1.0 (2.20)	7MC1007-6DB1
• 400 (15.7)	1.1 (2.43)	7MC1007-7DB1

Measuring insert with explosion protection

One Pt100 measuring resistor

Mounting length U_1/ mm (inch):	Weight/ kg (lb):	
• 160 (6.3)	0.8 (1.76)	7MC1007-5DE1
• 250 (9.84)	0.9 (1.98)	7MC1007-6DE1
• 400 (15.7)	1.0 (2.20)	7MC1007-7DE1

Two Pt100 measuring resistors

Mounting length U_1/ mm (inch):	Weight/ kg (lb):	
• 160 (6.3)	0.9 (1.98)	7MC1007-5DF1
• 250 (9.84)	1.0 (2.20)	7MC1007-6DF1
• 400 (15.7)	1.1 (2.43)	7MC1007-7DF1

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
• made of stainless steel, with 1 cable inlet and screw cover	7

Further designs — **Order code**

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

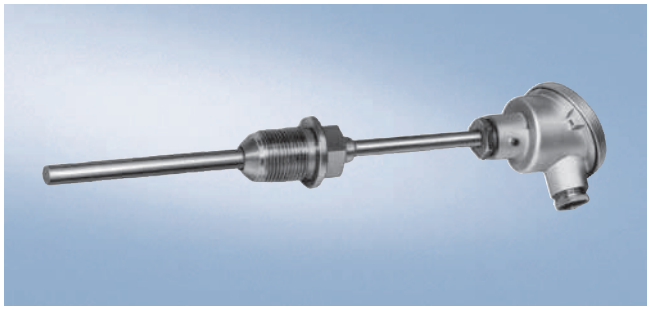
• Different design (mounting length, protective tube material etc.), specify in plain text.	Y01
• TAG plate made of stainless steel specify TAG No. in plain text	Y15
• Calibration carried out at one point, specify desired temperature in plain text (order equivalent number of times for several calibration points).	Y33

To order a temperature transmitter installed in the connection head, see "Temperature transmitters for installation in the connection head" (page 3/41).

Individual parts: Measuring inserts and connection heads, see "Accessories".

High-pressure screw-in resistance thermometer

Overview

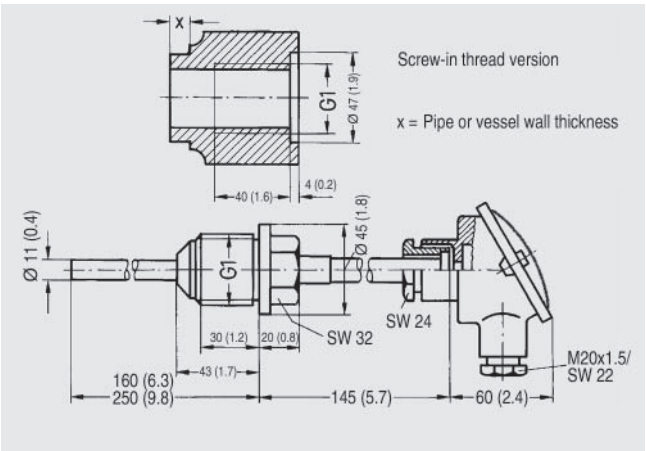


The high-pressure screw-in resistance thermometer with connection head and neck tube is suitable for the temperature range from -50 to +600 °C (-58 to +1112 °F) and can also be supplied with a built-in temperature transmitter.

Technical specifications

Design	According to DIN 43765: Screw-in thermometer
Protective tube	
• Form	2G, DIN 43772; cylindrical, 11 mm (0.43 inch) diameter, wall thickness 2 mm (0.08 inch)
• Loading capacity	to 50 bar (725.2 psi) (loading capacity dependent on material, temperature, flow rate, mounting length etc., see DIN 43772 for details)
Screw socket	G1; suitable is gasket 33 x 39, similar to form C or D, DIN 7603
Measuring insert	Replaceable, with measuring insert tube (6 mm diameter (0.24 inch) made of stainless steel; terminal block with clamping springs
Response times (to VDI/VDE 3 522)	
• In water with flow velocity v = 0.4 m/s (1.31 ft/s)	$t_{0.5}$ = 32 s, $t_{0.9}$ = 96 s
• In air with flow velocity v = 1 m/s (3.28 ft/s)	$t_{0.5}$ = 2.2 min, $t_{0.9}$ = 6.8 min

Dimensional drawings



High-pressure screw-in resistance thermometer with neck tube, dimensions in mm (inches)

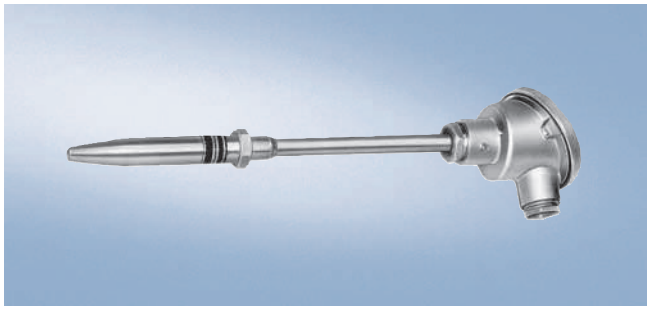
Selection and ordering data		Order No.
High-pressure screw-in resistance thermometer with connection head and neck tube		
Protective tube and screw socket X 6 CrNiMoTi 17 122, mat. No. 1.4571 Protective tube to DIN 43772, form: 2G		
One Pt100 measuring resistor		
embedded in ceramic, three-wire circuit		
Mounting length U_1/ mm (inch):	Weight/ kg (lb):	
• 160 (6.3)	0.83 (1.83)	7MC1008-6DA1 ■
• 250 (9.84)	0.93 (2.05)	7MC1008-7DA1 ■
Two Pt100 measuring resistors		
embedded in ceramic, two-wire circuit		
Mounting length U_1/ mm (inch):	Weight/ kg (lb):	
• 160 (6.3)	0.86 (1.20)	7MC1008-6DB1 ■
• 250 (9.84)	0.94 (2.07)	7MC1008-7DB1 ■
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
• made of stainless steel, with 1 cable inlet and screw cover		7
Further designs Please add "**-Z**" to Order No. and specify Order code(s) and plain text.		**Order code**
• Different design (mounting length, protective tube material etc.), specify in plain text.		**Y01**
• TAG plate made of stainless steel specify TAG No. in plain text		**Y15**
• Calibration carried out at one point, specify desired temperature in plain text (order equivalent number of times for several calibration points).		**Y33**

To order a temperature transmitter installed in the connection head, see "Temperature transmitters for installation in the connection head" (page 3/41).

Individual parts: Measuring inserts and connection heads, see "Accessories".

3

Overview

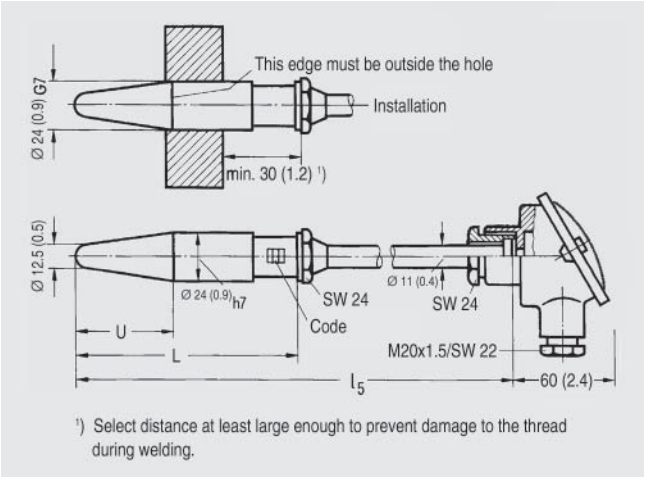


The high-pressure welding type resistance thermometer with connection head and neck tube is suitable for the temperature range from -50 to 540 or 550 °C (-58 to 1004 or 1022 °F) and can also be supplied with a built-in temperature transmitter.

Technical specifications

Design	According to DIN 43767: Welding-type thermometer
Protective tube	
• Form	4, DIN 43772; tapered, for welding in; with female thread M18 x 1.5 for neck tube
• Loading capacity	to 450 bar (6527 psi) (loading capacity dependent on material, temperature, flow rate, mounting length etc., see DIN 43772 for details)
Neck tube	Stainless steel, unscrewable
Measuring insert	Replaceable, with measuring insert tube made of stainless steel; terminal block with clamping springs
Response times (to VDI/VDE 3 522)	
• In water with flow velocity v = 0.4 m/s (1.31 ft/s)	$t_{0.5}$ = 25 s, $t_{0.9}$ = 80 s
Explosion protection	II 1/2G EEx ia IIC T4/T6

Dimensional drawings



High-pressure welding-type resistance thermometer with connection head and neck tube, dimensions in mm (inches)

Selection and Ordering data

Order No.

High-pressure welding-type resistance thermometer

Measuring resistor: Winding embedded in ceramic, protective tube to DIN 43772, form 4

1 Pt100 measuring resistor/three-wire circuit

• Measuring insert not explosion protected	
- max. 540 °C (1004 °F), protective tube 13 CrMo 44, mat. No. 1.7335	7MC1010-■GA2■
- max. 550 °C (1022 °F), protective tube X 6 CrNiMoTi 17 122, mat. No. 1.4571	7MC1010-■FA2■
• Measuring insert with explosion protection	
- max. 550 °C (1022 °F), protective tube X 6 CrNiMoTi 17 122, mat. No. 1.4571	7MC1010-■FE2■

2 Pt100 measuring resistors/two-wire circuit

• Measuring insert not explosion protected	
- max. 540 °C (1004 °F), protective tube 13 CrMo 44, mat. No. 1.7335	7MC1010-■GB2■
- max. 550 °C (1022 °F), protective tube X 6 CrNiMoTi 17 122, mat. No. 1.4571	7MC1010-■FB2■
• Measuring insert with explosion protection	
- max. 550 °C (1022 °F), protective tube X 6 CrNiMoTi 17 122, mat. No. 1.4571	7MC1010-■FF2■

Mounting length U	Protective tube length L	Total length without connection head l_5	Weight with one/two measuring resistors	
mm (inch)	mm (inch)	mm (inch)	kg (lb)	
65 (2.6)	140 (5.5)	305 (12.0)	0.78 (1.7)/ 0.79 (1.7)	1
		365 (14.4)	0.82 (1.8)/ 0.83 (1.8)	2
		395 (15.6)	0.85 (1.9)/ 0.86 (1.9)	3
	200 (7.9)	365 (14.4)	0.95 (2.1)/ 0.96 (2.1)	4
		395 (15.6)	0.98 (2.2)/ 1.00 (2.2)	5
125 (4.9)	200 (7.9)	365 (14.4)	0.95 (2.1)/ 0.96 (2.1)	6
		395 (15.6)	0.98 (2.2)/ 1.00 (2.2	7
	260 (10.2)	395 (15.6)	1.15 (2.5)/ 1.20 (2.7)	8

Connection head, form B

• made of cast light alloy, with 1 cable bushing and	
- screw cover	1
- standard hinged cover	4
- high hinged cover	6
• made of stainless steel, with 1 cable bushing and screw cover	7

Further designs

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

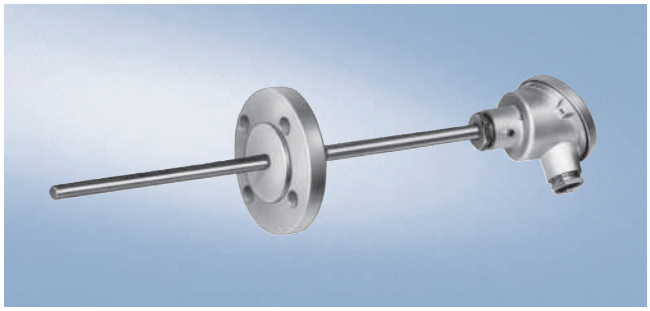
	Order code
• Different design (mounting length, protective tube material etc.), specify in plain text.	Y01
• TAG plate made of stainless steel specify TAG No. in plain text	Y15
• Calibration carried out at one point, specify desired temperature in plain text (order equivalent number of times for several calibration points).	Y33

To order a temperature transmitter installed in the connection head, see "Temperature transmitters for installation in the connection head" (page 3/41).

Individual parts: Measuring inserts and connection heads, see "Accessories".

Flange-type resistance thermometer with connection head

Overview

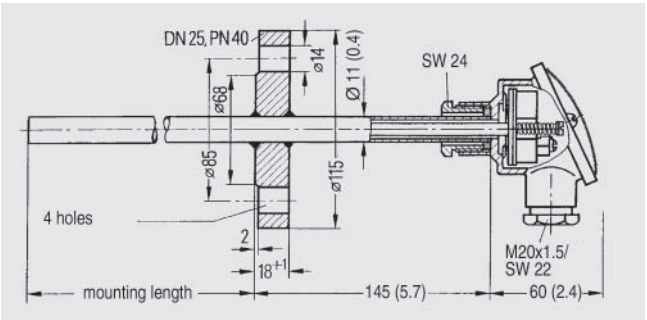


The flange-type resistance thermometer with connection head can be installed in tanks and pipelines; it is suitable for a temperature range from -50 to +600 °C (-58 to +1112 °F) and can also be supplied with a built-in temperature transmitter..

Technical specifications

Protective tube	
• Form	2F, DIN 43772; cylindrical, 11 mm (0.43 inch) diameter, wall thickness 2 mm (0.08 inch)
• Material	X 6 CrNiMoTi 17 122, mat. No. 1.4571
• Loading capacity	to 40 bar (580 psi) (loading capacity dependent on material, temperature, flow rate, mounting length etc., see DIN 43772 for details)
Flange	Nominal diameter DN 25, nominal pressure PN 40 (ASME on request)
Measuring insert	Replaceable, with measuring insert tube (6 mm diameter (0.24 inch) made of stainless steel; terminal block with clamping springs
Response times (to VDI/VDE 3 522)	
• In water with flow velocity v = 0.4 m/s (1.31 ft/s)	$t_{0.5}$ = 32 s, $t_{0.9}$ = 96 s
• In air with flow velocity v = 1 m/s (3.28 ft/s)	$t_{0.5}$ = 2.2 min, $t_{0.9}$ = 6.8 min
Explosion protection	II 1/2G EEx ia IIC T4/T6

Dimensional drawings



Flange-type resistance thermometer with connection head, dimensions in mm (inches)

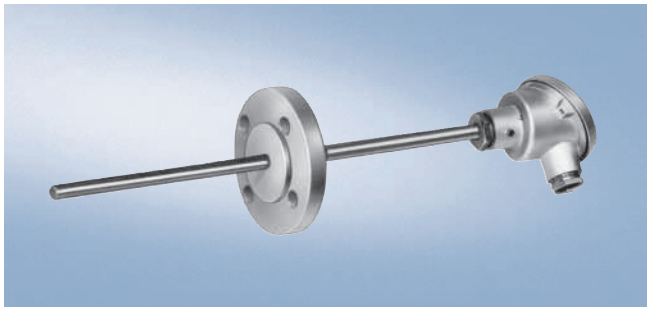
Selection and ordering data		Order No.
Flange-typeresistance thermometer With connection head		
Protective tube to DIN 43772, form: 2F one Pt100 measuring resistor: three-wire circuit, two Pt100 measuring resistors: two-wire circuit		
Measuring insert not explosion protected		
One Pt100 measuring resistor		
Mounting length/ mm (inch):	Weight/ kg (lb):	
• 160 (6.3)	1.5 (3.31)	7MC1017-1FA1
• 250 (9.84)	1.5 (3.31)	7MC1017-2FA1
Two Pt100 measuring resistors		
Mounting length/ mm (inch):	Weight/ kg (lb):	
• 160 (6.3)	1.6 (3.53)	7MC1017-1FB1
• 250 (9.84)	1.6 (3.53)	7MC1017-2FB1
Measuring insert with explosion protection		
One Pt100 measuring resistor		
Mounting length/ mm (inch):	Weight/ kg (lb):	
• 160 (6.3)	1.5 (3.31)	7MC1017-1FE1
• 250 (9.84)	1.5 (3.31)	7MC1017-2FE1
Two Pt100 measuring resistors		
Mounting length/ mm (inch):	Weight/ kg (lb):	
• 160 (6.3)	1.6 (3.53)	7MC1017-1FF1
• 250 (9.84)	1.6 (3.53)	7MC1017-2FF1
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
• made of stainless steel, with 1 cable inlet and screw cover		7
Further designs Please add "**-Z**" to Order No. and specify Order code(s) and plain text.		**Order code**
• Different design (mounting length, protective tube material etc.), specify in plain text.		**Y01**
• TAG plate made of stainless steel specify TAG No. in plain text		**Y15**
• Calibration carried out at one point, specify desired temperature in plain text (order equivalent number of times for several calibration points).		**Y33**

To order a temperature transmitter installed in the connection head, see "Temperature transmitters for installation in the connection head" (page 3/41).

Individual parts: Measuring inserts and connection heads, see "Accessories".

Flange-type resistance thermometer with reduced response time, with connection head

Overview

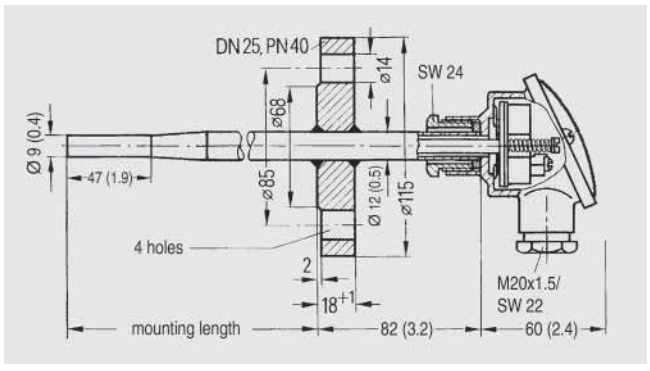


The flange-type resistance thermometer with connection head with reduced response time can be installed in tanks and pipelines; it is suitable for a temperature range from -50 to +600 °C (-58 to +1112 °F). The sensor is also available with a built-in temperature transmitter.

Technical specifications

Protective tube	
• Form	3, DIN 43772; cylindrical, 12 mm (0.47 inch) diameter, wall thickness 2.5 mm (0.1 inch), tapered towards tip; tip cylindrical over length of 47 mm (1.85 inch), 9 mm (0.35 inch) diameter, wall thickness 1.5 mm (0.06 inch)
• Material	X 6 CrNiMoTi 17 122, mat. No. 1.4571
• Loading capacity	to 40 bar (580 psi) (loading capacity dependent on material, temperature, flow rate, mounting length etc., see DIN 43772 for details)
Flange	Nominal diameter DN 25, nominal pressure PN 40 (ASME on request)
Measuring insert	Replaceable, with measuring insert tube (6 mm diameter (0.24 inch) made of stainless steel; terminal block with clamping springs
Response times (to VDI/VDE 3 522)	
• In water with flow velocity v = 0.4 m/s (1.31 ft/s)	$t_{0.5}$ = 22 s, $t_{0.9}$ = 66 s
• In air with flow velocity v = 1 m/s (3.28 ft/s)	$t_{0.5}$ = 2.1 min, $t_{0.9}$ = 6.5 min
Explosion protection	II 1/2G EEx ia IIC T4/T6

Dimensional drawings



Flange-type resistance thermometer with reduced response time; with connection head, dimensions in mm (inches)

Selection and ordering data		Order No.
Flange-type resistance thermometer with reduced response time with connection head		
Protective tube to DIN 43772, form: 3 one Pt100 measuring resistor: three-wire circuit, two Pt100 measuring resistors: two-wire circuit		
Measuring insert not explosion protected		
One Pt100 measuring resistor		
Mounting length/ mm (inch):	Weight/ kg (lb):	
• 225 (8.9)	1.5 (3.31)	7MC1041-1AA0
• 285 (11.2)	1.5 (3.31)	7MC1041-2AA0
• 345 (13.6)	1.5 (3.31)	7MC1041-3AA0
Two Pt100 measuring resistors		
Mounting length/ mm (inch):	Weight/ kg (lb):	
• 225 (8.9)	1.6 (3.53)	7MC1041-1AB0
• 285 (11.2)	1.6 (3.53)	7MC1041-2AB0
• 345 (13.6)	1.6 (3.53)	7MC1041-3AB0
Measuring insert with explosion protection		
One Pt100 measuring resistor		
Mounting length/ mm (inch):	Weight/ kg (lb):	
• 225 (8.9)	1.5 (3.31)	7MC1041-1EA0
• 285 (11.2)	1.5 (3.31)	7MC1041-2EA0
• 345 (13.6)	1.5 (3.31)	7MC1041-3EA0
Two Pt100 measuring resistors		
Mounting length/ mm (inch):	Weight/ kg (lb):	
• 225 (8.9)	1.6 (3.53)	7MC1041-1EB0
• 285 (11.2)	1.6 (3.53)	7MC1041-2EB0
• 345 (13.6)	1.6 (3.53)	7MC1041-3EB0
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
• made of stainless steel, with 1 cable inlet and screw cover		7
Further designs Please add "**-Z**" to Order No. and specify Order code(s) and plain text.		**Order code**
• Different design (mounting length, protective tube material etc.), specify in plain text.		**Y01**
• TAG plate made of stainless steel specify TAG No. in plain text		**Y15**
• Calibration carried out at one point, specify desired temperature in plain text (order equivalent number of times for several calibration points).		**Y33**

To order a temperature transmitter installed in the connection head, see "Temperature transmitters for installation in the connection head" (page 3/41).

Individual parts: Measuring inserts and connection heads, see "Accessories".

Resistance thermometers

for damp rooms

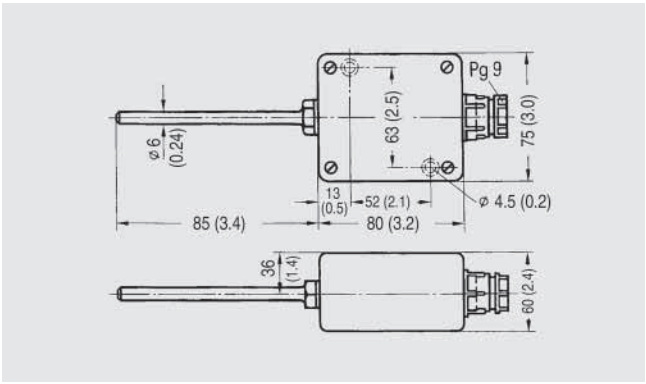
Overview

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 four-wire system, class B
Degree of protection	IP65 acc. to DIN EN 60529

Dimensional drawings



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

Selection and ordering data	Order No.
Resistance thermometer for damp rooms stainless steel protective tube	
• with one Pt100 measuring resistor 0.1 kg (0.22 kg)	**7MC1027-1AA**
• with two Pt100 measuring resistors 0.1 kg (0.22 kg)	**7MC1027-1AB**
Further designs Please add "**-Z**" to Order No. and specify Order code(s) and plain text.	**Order code**
• Different design (mounting length, protective tube material etc.), specify in plain text.	**Y01**
• TAG plate made of stainless steel specify TAG No. in plain text	**Y15**
• Calibration carried out at one point, specify desired temperature in plain text (order equivalent number of times for several calibration points).	**Y33**

To order a temperature transmitter installed in the connection head, see "Temperature transmitters for installation in the connection head" (page 3/41).

Note:

SITRANS T3K PA can only be used in a large housing. Can be ordered as special version (...-Z Y01)

Design

Components (design to DIN 43762)

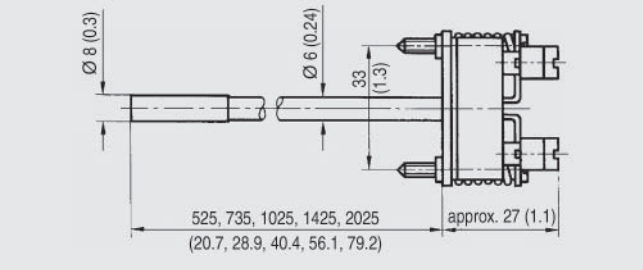
- Measuring insert with resistor,
- insert tube with retaining plate,
- terminal block with clamping springs and 2 or 3 internal conductors of Cu-Ni sheathed wire for each Pt100 measuring resistor.

The resistance of the internal conductors is stated on the measuring insert if it is greater than 0.2 Ω.

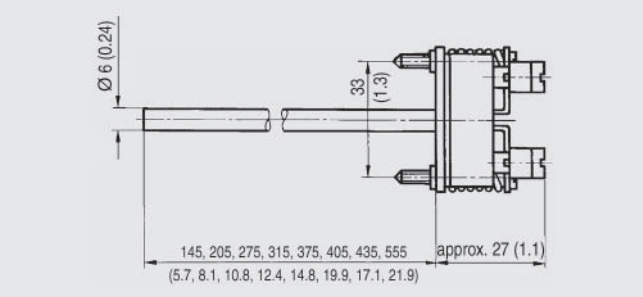
The measuring inserts have a filling of Al_2O_3 powder which surrounds the measuring resistor and the internal conductors and results in a high vibration resistance (for temperatures up to 600 °C (1112 °F). The winding is embedded in a ceramic body.

If the vibrations at the measuring location are greater than normal, the special vibration-proof measuring inserts should be used (for temperatures up to 450 °C (842 °F)). The measuring resistor is embedded in an homogeneous, fused glass body.

Dimensional drawings



Measuring insert for flue gas resistance thermometers, dimensions in mm (inches)



Measuring insert for low-pressure, high-pressure and flange-type resistance thermometers, dimensions in mm (inches)

Selection and ordering data

Order No.

Measuring insert for flue gas resistance thermometer 7MC1000

for temperatures to 600 °C (1112 °F), stainless steel measuring insert tube
Measuring resistor: Winding embedded in ceramic

Measuring insert not explosion protected

One Pt100 measuring resistor/three-wire circuit

Measuring insert length mm (inch):	Mounting length of the resistance thermometer mm (inch):	Weight kg (lb):	Order No.
• 525 (20.7)	500 (19.7)	0.22 (0.49)	**7MC1900-1EA**
• 735 (28.9)	710 (28.0)	0.27 (0.60)	**7MC1900-2EA**
• 1025 (40.4)	1000 (39.4)	0.32 (0.71)	**7MC1900-3EA**
• 1425 (56.1)	1400 (55.1)	0.42 (0.93)	**7MC1900-4EA**
• 2025 (79.7)	2000 (78.7)	0.62 (1.37)	**7MC1900-5EA**

Selection and ordering data

Order No.

Measuring insert for low-pressure, high-pressure and flange-type resistance thermometers

Measuring resistor: Winding embedded in ceramic (max. 600 °C (1112 °F))

Measuring insert not explosion protected

One Pt100 measuring resistor/three-wire circuit

Measuring insert length	Screw-in thermometer without neck tube, 7MC1006	Screw-in thermometer with neck tube, 7MC1007 and 7MC1008	Screw-in thermometer 7MC1010	Flange-type thermometer 7MC1017	Flange-type thermometer 7MC1041	Weight	Order No.
	Mounting length	Mounting length	Total length without connection head	Mounting length	Mounting length		
mm (inch)	mm (inch)	mm (inch)	mm (inch)	mm (inch)	mm (inch)	kg (lb)	
• 145 (5.7)	100 (3.9)	–	–	–	–	0.15 (0.33)	**7MC1910-1JA**
• 205 (8.1)	160 (6.3)	–	–	–	–	0.16 (0.35)	**7MC1910-2JA**
• 275 (10.8)	230 (9.1)	–	–	–	–	0.17 (0.37)	**7MC1910-3JA**
• 315 (12.4)	–	160 (6.3)	305 (12.0)	160 (6.3)	225 (8.9)	0.18 (0.40)	**7MC1910-4JA**
• 375 (14.8)	–	–	365 (14.4)	–	285 (11.2)	0.19 (0.42)	**7MC1910-5JA**
• 405 (15.9)	360 (14.2)	250 (9.8)	395 (15.6)	250 (9.8)	–	0.20 (0.44)	**7MC1910-6JA**
• 435 (17.1)	–	–	–	–	345 (13.6)	0.20 (0.44)	**7MC1910-8JA**
• 555 (21.1)	510 (20.1)	400 (15.8)	–	–	–	0.21 (0.46)	**7MC1910-7JA**

Accessories
Measuring inserts, not explosion protected

Selection and ordering data — Order No.

Measuring insert for low-pressure, high-pressure and flange-type resistance thermometers
Measuring resistor: Winding embedded in ceramic (max. 600 °C (1112 °F))

Two Pt100 measuring resistors/three-wire circuit

Measuring insert length	Screw-in thermometer without neck tube, 7MC1006	Screw-in thermometer with neck tube, 7MC1007 and 7MC1008	Screw-in thermometer 7MC1010	Flange-type thermometer 7MC1017	Flange-type thermometer 7MC1041	Weight	Order No.
	Mounting length	Mounting length	Total length without connection head	Mounting length	Mounting length		
mm (inch)	mm (inch)	mm (inch)	mm (inch)	mm (inch)	mm (inch)	kg (lb)	
• 145 (5.7)	100 (3.9)	–	–	–	–	0.15 (0.33)	**7MC1910-1JB**
• 205 (8.1)	160 (6.3)	–	–	–	–	0.16 (0.35)	**7MC1910-2JB**
• 275 (10.8)	230 (9.1)	–	–	–	–	0.17 (0.37)	**7MC1910-3JB**
• 315 (12.4)	–	160 (6.3)	305 (12.0)	160 (6.3)	225 (8.9)	0.18 (0.40)	**7MC1910-4JB**
• 375 (14.8)	–	–	365 (14.4)	–	285 (11.2)	0.19 (0.42)	**7MC1910-5JB**
• 405 (15.9)	360 (14.2)	250 (9.8)	395 (15.6)	250 (9.8)	–	0.20 (0.44)	**7MC1910-6JB**
• 435 (17.1)	–	–	–	–	345 (13.6)	0.20 (0.44)	**7MC1910-8JB**
• 555 (21.1)	510 (20.1)	400 (15.8)	–	–	–	0.21 (0.46)	**7MC1910-7JB**

Further measuring inserts on request.

Overview

An explosion protected measuring insert is suitable for installation in a protective fitting and for connection to a certified intrinsically-safe circuit of category "ia" or "ib".

The measuring insert may only be used if the protective fitting has the degree of protection IP20 according to DIN 40050.

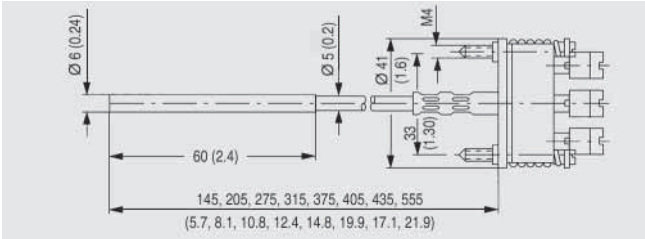
Design

The measuring resistor is fitted in a 60 mm (2.36 inch) long stainless steel sleeve with an outer diameter of 6 mm (0.24 inch). The sleeve and the sheath of the supply cable are welded. The sheath of the supply cable is also made of stainless steel, and its outer diameter is 5 mm (0.2 inch).
The conductors are made of special copper and are embedded in highly compacted magnesium oxide powder. The connection points between the measuring resistor and the conductors are additionally isolated. The conductors are potted in the terminal base.
The rating plate is located underneath the retaining plate.

Technical specifications

Measuring temperature	-200 ... +450 °C (-328 ... +842 °F) The temperature depends on the maximum measuring current which can flow in the connected measuring circuit if an error occurs.
Resistance of internal conductor	Per measuring circuit, i.e. for both conductors of the two-wire system: 0.17 Ω/m measuring insert
Resistance of measuring insert	≥ 1000 MΩ at room temperature
Outer diameter of sleeve	6 mm (0.24 inch)
Explosion protection	II 2G EEx ia IIC T4/T6

Dimensional drawings



Explosion protected measuring insert for resistance thermometers, dimensions in mm (inches)

Selection and ordering data

Measuring insert for low-pressure, high-pressure and flange-type resistance thermometers
Stainless steel measuring insert
Measuring resistor: Winding embedded in ceramic (max. 450 °C (842 °F))
Outer diameter of sleeve: 6 mm (0.24 inch)

Measuring insert with explosion protection

One Pt100 measuring resistor/three-wire circuit

Measuring insert length	Screw-in thermometer without neck tube, 7MC1006	Screw-in thermometer with neck tube, 7MC1007	Screw-in thermometer 7MC1010	Flange-type thermometer 7MC1017	Flange-type thermometer 7MC1041	Weight	Order No.
	Mounting length	Mounting length	Total length without connection head	Mounting length	Mounting length		
mm (inch)	mm (inch)	mm (inch)	mm (inch)	mm (inch)	mm (inch)	kg (lb)	
• 145 (5.7)	100 (3.9)	–	–	–	–	0.15 (0.33)	**7MC1913-1AA22**
• 205 (8.1)	160 (6.3)	–	–	–	–	0.16 (0.35)	**7MC1913-2AA22**
• 275 (10.8)	230 (9.1)	–	–	–	–	0.17 (0.37)	**7MC1913-3AA22**
• 315 (12.4)	–	160 (6.3)	305 (12.0)	160 (6.3)	225 (8.9)	0.18 (0.40)	**7MC1913-4AA22**
• 375 (14.8)	–	–	365 (14.4)	–	285 (11.2)	0.19 (0.42)	**7MC1913-5AA22**
• 405 (15.9)	360 (14.2)	250 (9.8)	395 (15.6)	250 (9.8)	–	0.20 (0.44)	**7MC1913-6AA22**
• 435 (17.1)	–	–	–	–	345 (13.6)	0.20 (0.44)	**7MC1913-7AA22**
• 555 (21.1)	510 (20.1)	400 (15.8)	–	–	–	0.21 (0.46)	**7MC1913-8AA22**

Two Pt100 measuring resistors/two-wire circuit

Measuring insert length	Screw-in thermometer without neck tube, 7MC1006	Screw-in thermometer with neck tube, 7MC1007	Screw-in thermometer 7MC1010	Flange-type thermometer 7MC1017	Flange-type thermometer 7MC1041	Weight	Order No.
	Mounting length	Mounting length	Total length without connection head	Mounting length	Mounting length		
mm (inch)	mm (inch)	mm (inch)	mm (inch)	mm (inch)	mm (inch)	kg (lb)	
• 145 (5.7)	100 (3.9)	–	–	–	–	0.15 (0.33)	**7MC1913-1AB22**
• 205 (8.1)	160 (6.3)	–	–	–	–	0.16 (0.35)	**7MC1913-2AB22**
• 275 (10.8)	230 (9.1)	–	–	–	–	0.17 (0.37)	**7MC1913-3AB22**
• 315 (12.4)	–	160 (6.3)	305 (12.0)	160 (6.3)	225 (8.9)	0.18 (0.40)	**7MC1913-4AB22**
• 375 (14.8)	–	–	365 (14.4)	–	285 (11.2)	0.19 (0.42)	**7MC1913-5AB22**
• 405 (15.9)	360 (14.2)	250 (9.8)	395 (15.6)	250 (9.8)	–	0.20 (0.44)	**7MC1913-6AB22**
• 435 (17.1)	–	–	–	–	345 (13.6)	0.20 (0.44)	**7MC1913-7AB22**
• 555 (21.1)	510 (20.1)	400 (15.8)	–	–	–	0.21 (0.46)	**7MC1913-8AB22**

Further measuring inserts on request.

Accessories
Welding-type protective tube, neck tube

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)

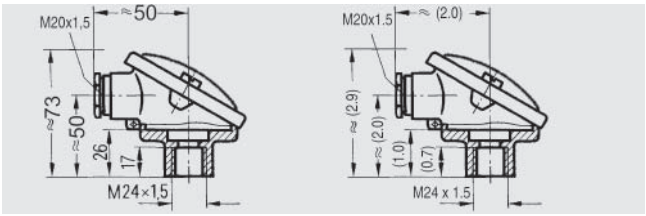
Neck tube

Neck tube for high-pressure screw-in resistance thermometer

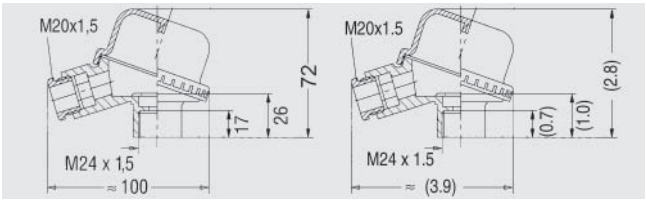
- Made of stainless steel, mat. No. 1.4571
- With threads at both ends
- For measuring insert tube with 6 mm (0.24 inch) OD

Dimensional drawings

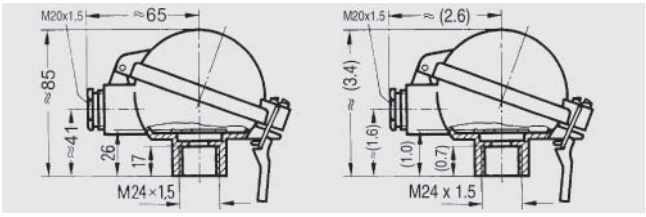
Connection heads for low and high-pressure resistance thermometers, flue gas and flange-type resistance thermometers



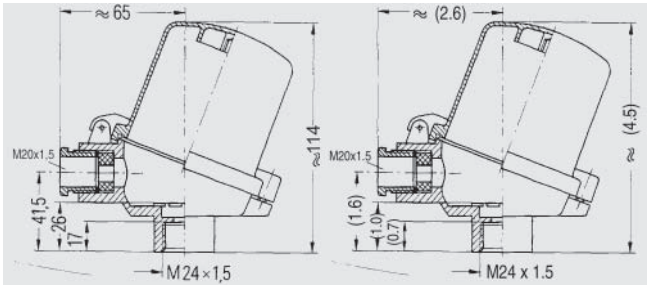
Connection head, form B, degree of protection IP54, made of cast light alloy, with screw cover, dimensions in mm (inches)



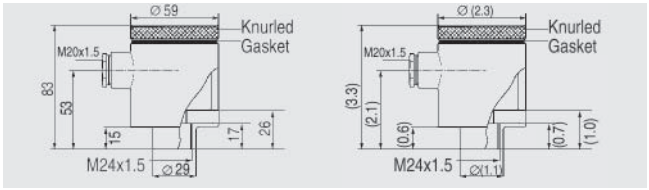
Connection head, form B, degree of protection IP54, made of plastic, with screw cover, dimensions in mm (inches)



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			Order No.
Welding protective tube for high-pressure resistance thermometers according to DIN 43767, without neck tube, without connection head			
tapered shank with cylindrical welding stub, for measuring insert tube with 6 mm (0.24 inch) OD; female thread M18 x 1.5 (including steel screw plug)			
Up to 540 °C (1004 °F) **Protective tube to DIN 43772, form 4 made of 13 CrMo 44, mat. No. 1.7335**			
Mounting length U mm (inch)	Protective tube length L mm (inch)	Weight mm (inch)	
• 65 (2.56)	140 (5.51)	0.3 (0.66)	**7MC1905-1GA**
• 65 (2.56)	200 (7.87)	0.5 (1.1)	**7MC1905-2GA**
• 125 (4.92)	200 (7.87)	0.5 (1.1)	**7MC1905-3GA**
• 125 (4.92)	260 (10.24)	0.6 (1.32)	**7MC1905-4GA**
Up to 550 °C (1022 °F) **Protective tube to DIN 43772, form 4 made of 6 CrNiMoTi 17122, mat. No. 1.4571**			
Mounting length U mm (inch)	Protective tube length L mm (inch)	Weight kg (lb)	
• 65 (2.56)	140 (5.51)	0.3 (0.66)	**7MC1905-1DA**
• 65 (2.56)	200 (7.87)	0.5 (1.1)	**7MC1905-2DA**
• 125 (4.92)	200 (7.87)	0.5 (1.1)	**7MC1905-3DA**
• 125 (4.92)	260 (10.24)	0.6 (1.32)	**7MC1905-4DA**

Selection and ordering data				Order No.
Neck tube for high-pressure screw-in resistance thermometer				
made of stainless steel, mat. No. 1.4571, with thread at both ends, for measuring insert tube with 6 mm (0.24 inch) OD				
Neck tube length mm (inch)	Total length of the resistance thermometer, without connection head mm (inch)	Protective tube length mm (inch)	Weight kg (lb)	
• 135 (5.31)	395 (15.55)	260 (10.24)	0.14 (0.31)	**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	Order No.
Connection heads for low-pressure, high-pressure, flue gas and flange-type resistance thermometers	
Connection head, form B, degree of protection IP54	
• made of cast light alloy, with screw cover and with 1 cable bushing, weight: 0.14 kg (0.31 lb)	**7MC1907-1BA**
• made of plastic, with screw cover and with 1 cable bushing, weight: 0.08 kg (0.18 lb)	**7MC1907-1BK**
Connection head, form B, degree of protection IP65	
Weight: 0.3 kg (0.66 lb)	
• made of cast light alloy, with standard hinged cover and with 1 cable bushing	**7MC1907-1BF**
• made of cast light alloy, with high hinged cover and with 1 cable bushing	**7MC1907-1BL**
Connection head, form B-VA, degree of protection IP65	
• made of stainless steel, with screw cover and with 1 cable bushing, weight: 0.65 kg (1.43 lb)	**7MC1907-1BV**
Accessories	
for connection head, form B, degree of protection IP65	
• Quick-release clamp (degree of protection of connection head reduced to IP54) 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.

Thermocouples

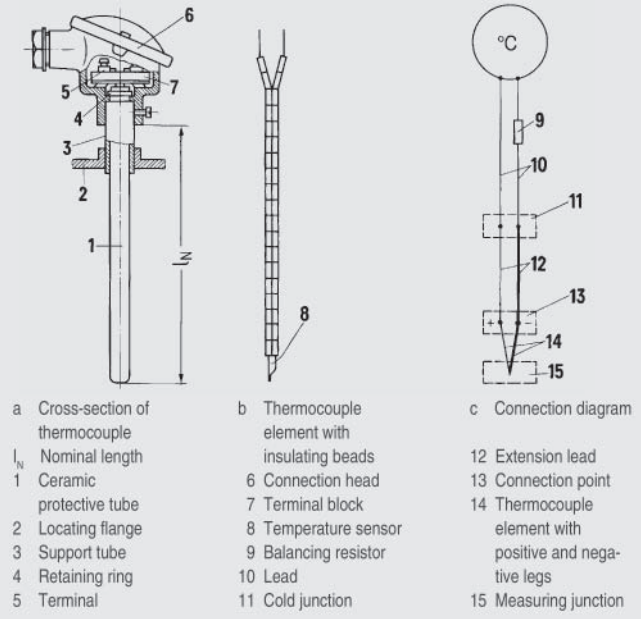
Technical description

Design

A thermocouple comprises

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

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



a Cross-section of thermocouple
l_N Nominal length
1 Ceramic protective tube
2 Locating flange
3 Support tube
4 Retaining ring
5 Terminal

b Thermocouple element with insulating beads
6 Connection head
7 Terminal block
8 Temperature sensor
9 Balancing resistor
10 Lead
11 Cold junction

c Connection diagram
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 in DIN EN 60584, Part 1, (see Technical Data, Table "Calibration data for thermoelectric voltages and error limits").

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

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

Mode of operation

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

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

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

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

The connections from the cold junction to the measuring or process instrument are made using copper leads. With energy-consuming instruments such as indicators or multipoint recorders, the complete measuring circuit (thermocouple, extension lead and copper lead) must be balanced in the operating condition using a resistor. SITRANS T transmitters and KOMPENSOGRAPH servo 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.

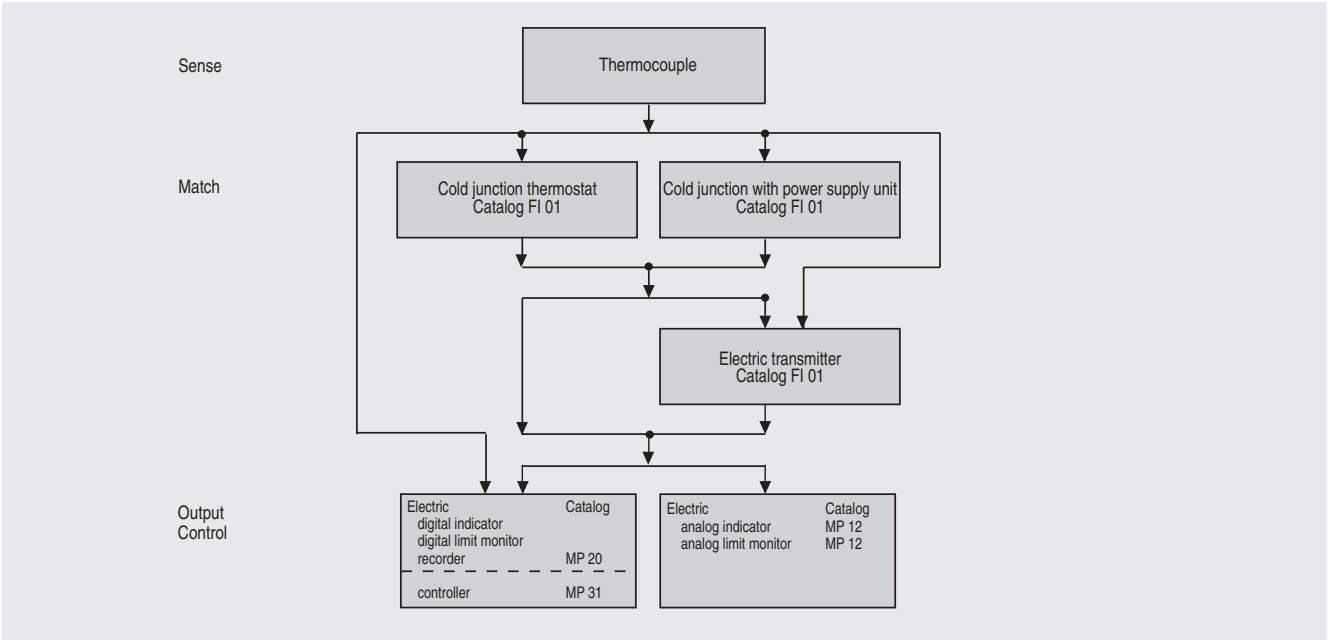
Installation examples with specification of the recommended thermocouples and protective tube materials are listed on pages "Technical Data"and "Installation Examples".

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.

Integration

Instrument combination for measuring and controlling temperature, with thermocouple element as sensor



Installation examples with specification of appropriate thermocouples and prot. tubes

Measuring point	Permissible operating temperature °C (°F)	Thermocouple	Protective tube
A. Iron and steel works			
1. Blast furnace			
Hot blast	1000 (1832)	Ni Cr/Ni	Open protective tube X 10 CrAl 24, mat. No. 1.4762, bare soldering point, cemented
Crude gas	300 (572)	Ni Cr/Ni	X 10 CrAl 24, mat. No. 1.4762, dished
2. Air preheater			
Dome	1200 (2192)	Pt 10% Rh/Pt	Outside: X 15 CrNiSi 24 19, mat. No. 1.4841, inside: KER 710
Exhaust gas	300 (572)	Ni Cr/Ni	St 35.8, mat. No. 1.0305, seamless, enamelled
3. Open-hearth furnace			
Exhaust gas ducts	600 (1112)	Ni Cr/Ni	X 10 CrAl 24, mat. No. 1.4762, dished
Checkers	1350 (2462)	Pt 10% Rh/Pt	Outside: Silicon carbide inside: KER 710
Melt (for short periods)	1600 (2912)	Pt 10% Rh/Pt	Immersion-type thermocouple element of special design
4. Soaking pit			
Furnace chamber	1350 (2462)	Pt 10% Rh/Pt	Outside: Silicon carbide inside: KER 710
Exhaust gas before or behind recuperator	1000 (1832)	Ni Cr/Ni	X 10 CrAl 24, mat. No. 1.4762, dished; installation with gas-tight screw socket
Combustion air behind recuperator	700 (1292)	Ni Cr/Ni	X 10 CrAl 24, mat. No. 1.4762, dished; installation with gas-tight screw socket
5. Pusher, rotating hearth furnace, and other types of rolling mill furnace			
Preheating zone	800 (1472)	Pt 10% Rh/Pt or Ni Cr/Ni	Outside: Silicon carbide inside: KER 710 or outside: Silicon carbide inside: KER 610
Heating zone	1250 (2282)	Pt 10% Rh/Pt	As above
Soaking zone	1350 (2462)	Pt 10% Rh/P	Outside: Silicon carbide inside: KER 710
Exhaust gas before air recuperator	900 (1652)	Ni Cr/Ni	X 10 CrAl 24, mat. No. 1.4762, dished; installation with gas-tight screw socket
Exhaust gas before and behind gas recuperator	700 (1292)	Ni Cr/Ni	As above or KER 610
Preheated air behind recuperator	700 (1292)	Ni Cr/Ni	As above

Technical description

3

Installation examples with specification of appropriate thermocouples and prot. tubes (continued)

Measuring point	Permissible operating temperature °C (°F)	Thermocouple	Protective tube
6. Annealing furnace, roller-hearth furnace			
Furnace chamber	800 (1472)	Ni Cr/Ni	X 10 CrAl 24, mat. No. 1.4762, dished
Exhaust gas duct	600 (1112)	Ni Cr/Ni	As above
7. Bell-type anneal. furn.			
Directly heated furnace	950 (1742)	Ni Cr/Ni	X 10 CrAl 24, mat. No. 1.4762, dished
Stack for tin plates	600 ... 900 (1112 ... 1652)	Ni Cr/Ni	Special design, bare thermocouple element with thermal contact plate
Stack for motor-car body sheet	700 ... 920 (1292 ... 1688)	Ni Cr/Ni	As above
Protective gas	650 (1202)	Ni Cr/Ni	Bare thermocouple element
8. Sinter belts			
(Sucking boxes)	400 (752)	Fe/Cu Ni	(Jacket thermocouple element) X 10 CrAl 24, mat. No. 1.4762
For temperature maximum computing circuit	400, 500 (752, 932)	Fe/Cu Ni	As above, with double thermocouple
9. Tinning plants			
Palm nut oil, pickling vat, tin bath	650 (1202)	Ni Cr/Ni	St 35.8, mat. No. 1.0305, seamless, enamelled
10. Zinc coating plants			
Zinc bath	480 (896)	Fe/Cu Ni	St 35.8, mat. No. 1.0305, seamless
11. Heat treatment plants			
11.1 In gases			
Tempering furnaces	550 (1022)	Ni Cr/Ni	St 35.8, mat. No. 1.0305, seamless
Annealing in oxidizing gases containing sulphur and carbon	1050 (1922)	Pt 10% Rh/Pt (Ni Cr/Ni)	Outside: X 10 CrAl 24, mat. No. 1.4762, dished inside: KER 710
	1200 (2192)	Pt 10% Rh/Pt	Outside: X 10 CrAl 24, mat. No. 1.4762, dished inside: KER 710
Annealing in reducing gases containing sulphur	1200 (2192)	Pt 10% Rh/Pt	As above
Annealing in nitrogen-containing gases poor in oxygen, also nitriding furnaces with ammonia	1200 (2192)	Pt 10% Rh/Pt	Outside: X 15 CrNiSi 24 19, mat. No. 1.4841, dished; inside: KER 710

Measuring point	Permissible operating temperature °C (°F)	Thermocouple	Protective tube
11.2 In hardening shop baths (protective tubes bored from the solid are recommended)			
Salt and nitre	550 (1022)	Ni Cr/Ni	Soft iron, mat. No. 1.1003
Cyanogen	950 (1742)	Ni Cr/Ni	Soft iron or X 15 CrNiSi 24 19, mat. No. 1.4841
Baths containing chloride	1050 (1922)	Pt 10% Rh/Pt	Outside: X 10 CrAl 24, mat. No. 1.4762, inside: KER 710
Lead baths	1200 (2192)	Pt 10% Rh/P	Outside: Chromium nickel alloy NiCr 60 15, mat. No. 2.4867, inside: KER 710; bored from the solid
Barium chloride baths	1300 (2372)	Pt 10% Rh/Pt	Outside: Chromium nickel alloy NiCr 60 15, mat. No. 2.4867, inside: KER 710;
B. Metallurgical plants (only limited life time in molten metals)			
Copper melt	1250 (2282)	Pt 10% Rh/Pt	Outside: X 10 CrSi 29, mat. No. 1.4772, bored from the solid inside: KER 710
Exhaust of copper melting furnaces	1300 (2372)	Pt 10% Rh/Pt	Outside: Silicon carbide inside: KER 710
Brass melts	900 (1652)	Ni Cr/Ni	X 10 CrAl 29, mat. No. 1.4772, bored from the solid
Aluminium melts	700 (1292)	Ni Cr/Ni	Pearlite iron GG 22, bored from the solid
Die-casting, magnesium	700 (1292)	Ni Cr/Ni	Soft iron, mat. No. 1.1003, bored from the solid
Bearing metal, lead and tin melting houses	600 (1112)	Fe/Cu Ni	St 35.8, mat. No. 1.0305, seamless, enamelled
Lead foundries	700 (1292)	Fe/Cu Ni	Chromium nickel alloy NiCr 60 15, mat. No. 2.4867, bored from the solid
Zinc foundries	480 (878)	Fe/Cu Ni	St 35.8, mat. No. 1.0305, seamless
	600 (1112)	Fe/Cu Ni	Silicon carbide
Exhaust gases of zinc melting furnaces	1300 (2372)	Pt 10% Rh/Pt	Outside: Silicon carbide inside: KER 710
C. Ceramic industry			
Ring kiln for standard bricks	800 ... 1100 (1472 ... 2012)	Ni Cr/Ni	X 10 CrAl 24, mat. No. 1.4762, dished
Ring kiln for clinkers, retort furnace, tunnel furnace, glazing kiln	1200 ... 1300 (2192 ... 2372)	Pt 10% Rh/Pt	Outside and inside: KER 710

Installation examples with specification of appropriate thermocouples and prot. tubes (continued)

Measuring point	Permissible operating temperature °C (°F)	Thermocouple	Protective tube
D. Glass industry			
1. Glass trough furnace			
Checkers of the regenerative chambers, above	1300 (2372)	Pt 10% Rh/Pt	Outside: KER 530 Inside: KER 710
Checkers of the regenerative chambers, below	600 (1112)	Ni Cr/Ni	Thermocouple porcelain
Lateral walls, roof, bottom (in drilled channels down to 50 mm below the bath)	1550 (2822) 1400 (2552)	Pt 30% Rh/ Pt 6% Rh	Outside and inside: KER 710
Leer	800 (1472)	Ni Cr/Ni	X 10 CrAl 24, mat. No. 1.4762, dished
Annealing furnace	1200 (2192)	Pt 10% Rh/Pt	KER 710
2. Pot furnace			
	1500 (2732)	Pt 30% Rh/ Pt 6% Rh	Outside and inside: KER 710
3. Gas generators			
Crude gas	750 (1382)	Ni Cr/Ni	X 10 CrAl 24, mat. No. 1.4762, dished
Rotary grate (Grate head)	180 ... 200 (356 ... 392) For short periods: 500 to 1000 (932 to 1832)	Fe/Cu Ni	Special design on request (to be manufactured on site according to specifications)
E. Cement industry Rotary kilns			
Secondary air at cooler	900 (1652)	Ni Cr/Ni	X 10 CrAl 24, mat. No. 1.4762
Hot chamber	900 (1652)	Ni Cr/Ni	X 10 CrAl 24, mat. No. 1.4762
Drying chamber	400 (752)	Fe/Cu Ni	St 35.8, mat. No. 1.0305, or similar, enamelled
F. Cellulose factories			
Sulphur combustion furnaces, pyrite burnerr	to 1500 (2732)	Pt 30% Rh/ Pt 6% Rh	Outside: Silicon carbide inside: KER 710
Behind waste heat boiler	600 (1112)	Ni Cr/Ni	X 10 CrAl 24, mat. No. 1.4762
G. Steam power parts			
Water and steam lines (screw-in and welding-type thermocouple elements)			
Screw-in thermocouple element	300 (572)	Fe/Cu Ni	Sn Bz 6 bronze, to DIN 1726 (only for air or water)
Screw-in thermocouple element	400 (752)	Fe/Cu Ni	St 35.8, mat. No. 1.0305
Screw-in thermocouple element	500 (932)	Fe/Cu Ni	113 CrMo 44, mat. No. 1.7335
Welding-type thermocouple element	540 (1004)	Fe/Cu Ni	113 CrMo 44, mat. No. 1.7335
Welding-type thermocouple element	570 (1058)	Ni Cr/Ni	10 CrMo 9 10, mat. No. 1.7380
	750 (1382)	Fe/Cu Ni (Ni Cr/Ni)	X 8 CrMoNb 16 16, mat. No. 1.4981
Flue gas	1000 (1832)	Pt 10% Rh/Pt	Megapyr, Cr Al 20 5, mat. No. 1.4767 or outside: X 10 CrAl 24, mat. No. 1.4762, inside: KER 710 St
	600 (1112)	(Ni Cr/Ni)	St 35.8, mat. No. 1.0305, enamelled
Pulverized coal/air mixture line	100 (212)	Fe/Cu Ni	St 35.8, mat. No. 1.0305, (with baffle rod)

Technical specifications

Thermocouple designations to DIN 43710 and DIN IEC EN 60584 (IEC 584) Aug. 10.96

DIN 43710, release 12.85	
Cu-CuNi	Type U
Fe-CuNi	Type L
DIN EN 60584	
Cu/Cu Ni	Type T
Fe/Cu Ni	Type J
Ni Cr/Ni	Type K
Ni Cr Si-NiSi	Type N
Pt 10% Rh/Pt	Type S
Pt 13% Rh/Pt	Type R
Pt 30% Rh/ Pt 6% Rh	Type B

Temperature transmitters for installation in the connection head

Overview

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

SITRANS TK

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

SITRANS TK-H

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

SITRANS T3K PA

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

Note:

- SITRANS TK/TK-H can be fitted instead of the terminal block (not with 7MC2000-.....) or in the high hinged cover.
- SITRANS T3K PA can only be fitted in the high hinged cover of the connection head.

Selection and Ordering Data

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

Transmitter to be fitted	Order Code
To order the sensor with a built-in temperature transmitter, add "**-Z**" to the Order No. of the sensor, and supplement by the following Order code:	
• SITRANS TK	
- without Ex	**K10**
- EEx n for zone 2	**K11**
- ATEX (EEx ia) and FM (IS, I, NI)	**K12**
• SITRANS TK-H	
- without Ex	**K20**
- EEx n for zone 2	**K21**
- ATEX (EEx ia) and FM (IS, I, NI)	**K22**
• SITRANS T3K PA	
- without Ex	**K30**
- EEx ia IIC (ATEX)	**K31**
- intrinsic safety (FM)	**K33**
Customer-specific setting of the built-in transmitter (specify settings in plain text)	**Y11**

Questionnaire for temperature sensors (resistance thermometers or thermocouples)

General information

Customer: .....

Address: .....

Contact partner: .....

Purchasing dept.: ..... Tel.: .....

Sales dept.: ..... Tel.: .....

Process dept.: ..... Tel.: .....

Inquiry: .....

Quotation: .....

Place and date: .....

Operating conditions

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

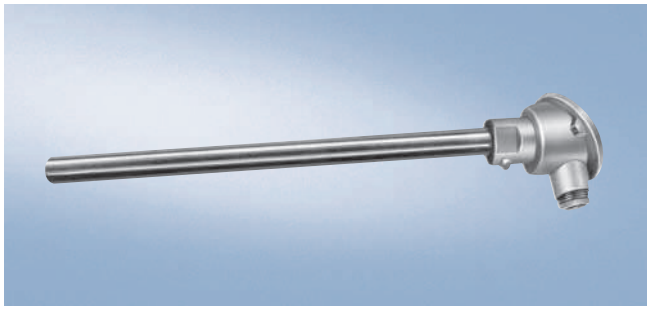
6. Accessories: .....
   .....

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

Thermocouples

Straight thermocouples to DIN 43733, with connection heads

Overview

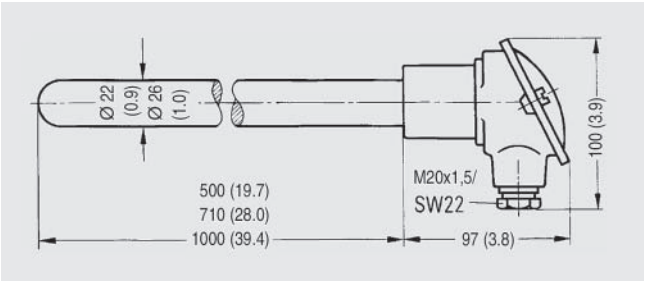


The straight thermocouple together with a metal protective tube is suitable for temperatures from 0 to 1250 °C (32 to 2282 °F) and can be supplied with a built-in temperature transmitter.

Technical specifications

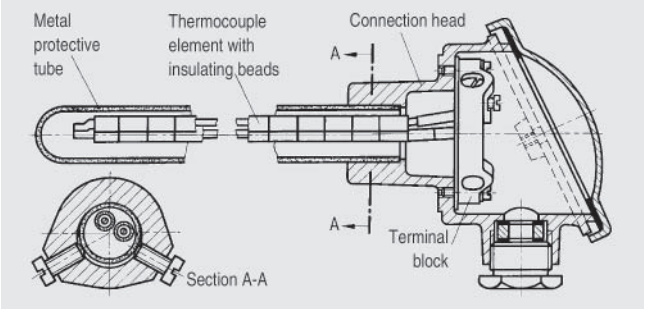
Thermocouples	Ni Cr/Ni type K
• Number	1 or 2
• Leg diameter	2 ... 3 mm (0.08 ... 0.12 inch)
• Insulation of legs	Insulating beads
Protective tube	Metal
Connection head	Form A, DIN 43729; made of cast light alloy, with one cable bushing

Dimensional drawings



Straight thermocouple, dimensions in mm (inches)

Design



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

Selection and ordering data	Order No.
Straight thermocouple with Ni Cr/Ni thermocouple (type K) with metallic protective tube	
to 1000 °C (1832 °F) **X 10 CrAl 24, mat. No. 1.4762** 22 mm Ø x 2 mm (0.87 inch x 0.079 inch) 1 thermocouple Leg diameter 2 mm (0.08 inch) Weight: 1.1 ... 2.9 kg (2.4 ... 6.4 lb) Nominal length in mm (inch):	
• 500 (19.7)	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

3

Selection and ordering data		Order No.
Straight thermocouple with Ni Cr/Ni thermocouple (type K) for temperatures to 1250 °C (2282 °F); with metallic protective tube		
Further designs Please add "-**Z**" to Order No. and specify Order code(s) and plain text.		**Order code**
• Different design (mounting length, protective tube material etc.), specify in plain text.		**Y01**
• TAG plate made of stainless steel specify TAG No. in plain text		**Y15**
• Calibration carried out at one point, specify desired temperature in plain text (order equivalent number of times for several calibration points).		**Y33**

To order a temperature transmitter installed in the connection head, see "Temperature transmitters for installation in the connection head" (page 3/60).

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

Selection and ordering data		Order No.
Metallic protective tubes for straight thermocouple elements according to DIN 43733		
X 10 CrAl 24, material No. 1.4762		
∅ 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		Order No.
Thermocouples elements for straight thermocouple according to DIN 43733		
Base-metal thermocouple with insulating beads		
Wire diameter 3 mm (0.12 inch) Ni Cr/Ni, to 1000 °C (maximal 1300 °C), (to 1832 °F (max. 2372 °F)) 0.55 ... 2.10 kg (1.21 ... 4.63 lb)		
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**

Thermocouples

Straight thermocouples
Individual parts and accessories

Connection heads

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

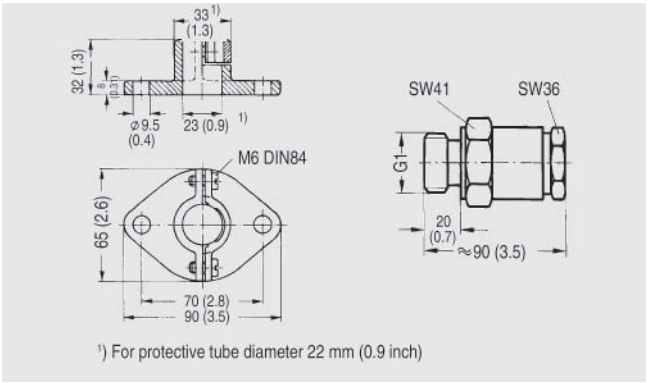
Selection and ordering data	Order No.
Connection head, form A, (without terminal block and terminals) 1 Cable inlet, degree of protection IP53, 0.35 kg (0.77 lb)	
Cast light alloy fastener, unscrewable for protective tube diameter in mm (inch) (bore = protective tube diam. +0.5 mm) (0.02 inch):	
• 22 (0.87)	**7MC2905-1AA**
• 26 (1.02)	**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)	**7MC2905-4AA**
• 26 (1.02)	**7MC2905-4BA**

Mounting accessories for connection heads

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

Selection and ordering data	Order No.
Mounting accessories	
Terminal block without terminals for base-metal thermocouples; 0.06 kg (0.13 lb)	**7MC2998-1AA**
Terminal for base-metal thermocouples; 0.01 kg (0.02 lb)	**7MC2998-1BA**
Set of gaskets (100 off) for the connection head cover; 0.01 kg (0.02 lb)	**7MC2998-1CA**
Set of washers (100 off) for the terminal block; 0.01 kg (0.02 lb)	**7MC2998-1CB**
Mounting flange, adjustable; made of GTW	
• for protective tube outer diameters 22 mm (0.87 inch); 0.35 kg (0.77 lb)	**7MC2998-2CB**
• for protective tube outer diameters 26 mm (1.02 inch); 0.32 kg (0.71 lb)	**7MC2998-2CC**
Threaded sleeve Gas-tight up to 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**	**7MC2998-2DB**
• for protective tube outer diameters 26 mm (1.02 inch), **G1**	**7MC2998-2DC**

Dimensional drawings



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

Jacket thermocouples with extension lead

Overview

The jacket thermocouple with extension lead is suitable for a temperature range from 0 to 700, 1000 or 1100 °C (32 to 1292, 1832 or 2012 °F); a temperature of 80 to 260 °C (176 to 500 °F) is permissible for the extension lead.

Technical specifications

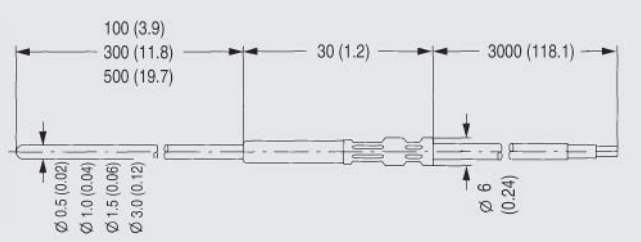
Thermocouple	Ni Cr/Ni, type K, one off
Jacket	
• Form	Outer diameter 0.5, 1.0, 1.5 or 3 mm (0.02, 0.04, 0.06 or 0.12 inch)
• Minimum bending radius	fünffacher Außendurchmesser
• Material	Inconel; NiCr 15 Fe, mat. No. 2.4816

Extension lead

- Number of conductors: 2
- Conductor cross-section: 0.22 mm^2 (0.00034 $inch^2$)
- Length: 3 m (9.84 ft)

Type	Max. temperature °C (°F)	Conductor material	Insulation single	Insulation common
L2SS	180 (356)	Ni Cr/Ni	Silicon	Silicon
L2KK	80 (176)	Ni Cr/Ni	PVC	PVC
L2TGD	260 (500)	Ni Cr/Ni	PTFE	Glass-filament and external stainless steel braiding

Dimensional drawings



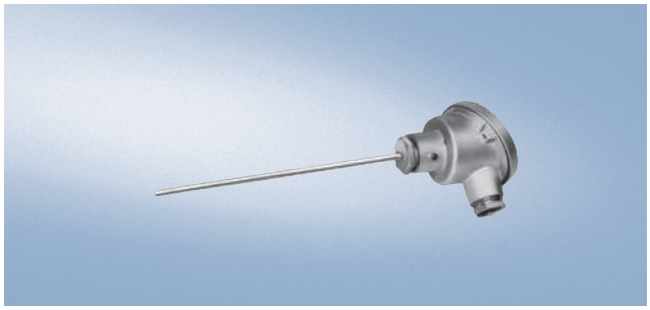
Jacket thermocouple with extension lead, dimensions in mm (inches)

Selection and ordering data	Order No.
Jacket thermocouple element with extension lead	
Maximum temperature of medium 700 °C (1292 °F), jacket outer diameter 0.5 mm (0.02 inch)	
Extension lead type L2KK	
Nominal length in mm (inch):	
• 300 (11.8)	**7MC2027-2BA10**
Maximum temperature of medium 1000 °C (1832 °F), jacket outer diameter 1 mm (0.04 inch)	
Extension lead type L2SS	
Nominal length in mm (inch):	
• 100 (3.94)	**7MC2027-1AA20**
• 300 (11.8)	**7MC2027-2AA20**
• 500 (19.7)	**7MC2027-3AA20**
Extension lead type L2KK	
Nominal length in mm (inch):	
• 100 (3.94)	**7MC2027-1BA20**
• 300 (11.8)	**7MC2027-2BA20**
• 500 (19.7)	**7MC2027-3BA20**
Maximum temperature of medium 1100 °C (2012 °F), jacket outer diameter 1.5 mm (0.06 inch)	
Extension lead type L2SS	
Nominal length in mm (inch):	
• 100 (3.94)	**7MC2027-1AA30**
• 300 (11.8)	**7MC2027-2AA30**
• 500 (19.7)	**7MC2027-3AA30**
Extension lead type L2KK	
Nominal length in mm (inch):	
• 100 (3.94)	**7MC2027-1BA30**
• 300 (11.8)	**7MC2027-2BA30**
• 500 (19.7)	**7MC2027-3BA30**
Jacket outer diameter 3.0 mm (0.12 inch)	
Extension lead type L2SS	
Nominal length in mm (inch):	
• 100 (3.94)	**7MC2027-1AA40**
• 300 (11.8)	**7MC2027-2AA40**
• 500 (19.7)	**7MC2027-3AA40**
Extension lead type L2KK	
Nominal length in mm (inch):	
• 100 (3.94)	**7MC2027-1BA40**
• 300 (11.8)	**7MC2027-2BA40**
• 500 (19.7)	**7MC2027-3BA40**
Extension lead type L2TGD	
Nominal length in mm (inch):	
• 100 (3.94)	**7MC2027-1CA40**
• 300 (11.8)	**7MC2027-2CA40**
• 500 (19.7)	**7MC2027-3CA40**
Further designs Please add "**-Z**" to Order No., and specify Order code(s) and plain text.	**Order code**
• Different design (mounting length, protective tube material etc.), specify in plain text.	**Y01**
• TAG plate made of stainless steel specify TAG No. in plain text	**Y15**
• Calibration carried out at one point, specify desired temperature in plain text (order equivalent number of times for several calibration points).	**Y33**

Thermocouples

Jacket thermocouples with connection head, form B

Overview



The jacket thermocouple with connection head, form B is suitable for the temperature range from 0 to 800 or 1,100 °C (32 to 1472 or 2012 °F) and can also be supplied with a built-in temperature transmitter.

Technical specifications

Jacket thermocouple with connection head, form B

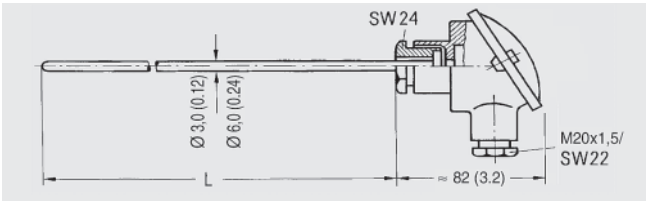
Thermocouple	Fe/Cu Ni, Fe-CuNi or Ni Cr/Ni	
Jacket	Measuring junction insulated from base of jacket	
• Material	X 6 CrNiTi 18 10, mat. No. 1.4541	Inconel
• Temperature	Up to 800 °C (1472 °F)	Up to 1100 °C (2012 °F)
Connection head	Form B to DIN 43729	
• Material	Cast light alloy	
• Temperature	-30 ... +100 °C (-22 ... +212 °F) is permissible	
• Cable inlet	For cables up to 15 mm (0.59 inch) diameter	
• Terminal block	Without clamping springs	

Thermocouple

- Insulation resistance between conductors and jacket: ≥ 1000 MΩ/m at 20 °C (≥ 305 MΩ/ft at 68 °F)
- Minimum bending radius: 5 x outer diameter of jacket
- Leak resistance of measuring junction: Tested at 40 bar (580 psi)

Thermocouple	Jacket		No. of thermocouples	Thermocouple wire diameter	Resistance (for double conductor)
	Outer diameter	Wall thickness			
	mm (inch)	mm (inch)		mm (inch)	Ω/m (Ω/ft)
Fe/Cu Ni (type J) and Fe-CuNi (type L)	3.0 (0.12)	0.42 (0.017)	1	0.54 (0.02)	2.7 (8.9)
		0.42 (0.017)	2	0.48 (0.02)	3.5 (11.5)
	6.0 (0.24)	0.55 (0.022)	1	1.07 (0.04)	0.66 (2.2)
		0.89 (0.035)	2	0.81 (0.03)	1.14 (3.7)
Ni Cr/Ni (type K)	3.0 (0.12)	0.42 (0.017)	1	0.54 (0.02)	4.3 (14.1)
		0.42 (0.017)	2	0.48 (0.02)	5.5 (18.0)
	6.0 (0.24)	0.55 (0.022)	1	1.07 (0.04)	1.12 (3.7)
		0.89 (0.035)	2	0.81 (0.03)	1.94 (6.4)

Dimensional drawings



Jacket thermocouple with connection head, form B, made of cast light alloy, dimensions in mm (inches)

Selection and ordering data	Order No.
Jacket thermocouple element with connection head, form B	
Fe/Cu Ni type J thermocouple	
Jacket made of X 6 CrNiTi 18 10, material No. 1.4541, temperature up to 800 °C (1472 °F)	
1 thermocouple	
Jacket outer diameter/mm (inch):	
• 3.0 (0.12)	**7MC2021-2CE-Z**
• 6.0 (0.24)	**7MC2021-4CE-Z**
2 thermocouples	
Jacket outer diameter/mm (inch):	
• 3.0 (0.12)	**7MC2021-2CF-Z**
• 6.0 (0.24)	**7MC2021-4CF-Z**
Fe/Cu Ni type L thermocouple	
Jacket made of X 6 CrNiTi 18 10, material No. 1.4541, temperature up to 800 °C (1472 °F)	
1 thermocouple	
Jacket outer diameter/mm (inch):	
• 3.0 (0.12)	**7MC2021-2CA-Z**
• 6.0 (0.24)	**7MC2021-4CA-Z**
2 thermocouples	
Jacket outer diameter/mm (inch):	
• 3.0 (0.12)	**7MC2021-2CB-Z**
• 6.0 (0.24)	**7MC2021-4CB-Z**
Ni Cr/Ni type K thermocouple	
Jacket made of Inconel, temperature up to 1,100 °C (2012 °F)	
1 thermocouple	
Jacket outer diameter/mm (inch):	
• 3.0 (0.12)	**7MC2021-2LC-Z**
• 6.0 (0.24)	**7MC2021-4LC-Z**
2 thermocouples	
Jacket outer diameter/mm (inch):	
• 3.0 (0.12)	**7MC2021-2LD-Z**
• 6.0 (0.24)	**7MC2021-4LD-Z**
Further designs Please specify Order code(s) and plain text.	**Order code**
• Length L in m (ft)	
- 0.25 (0.82)	**A01**
- 1 (3.28)	**A02**
- 5 (16.4)	**A03**
- 10 (32.8)	**A04**
• Different design (mounting length, protective tube material etc.), specify in plain text.	**Y01**
• TAG plate made of stainless steel specify TAG No. in plain text	**Y15**
• Calibration carried out at one point, specify desired temperature in plain text (order equivalent number of times for several calibration points).	**Y33**

To order a temp. transmitter installed in the connection head, see "Temp. transm. for installation in the connection head" (page 3/60).

Note: SITRANS T3K PA can only be used in a connection head with high hinged cover. Can be ordered als special version (...-Z Y01).

Example of ordering:

The following is required:
- Jacket thermocouple element
  jacket made of X 6 CrNiTi 18 10; outer diameter 3.0 mm (0.12 inch);
  - with 1 Fe/Cu Ni thermocouple, type J; nominal length 5 m (16.4 ft)

Order as follows:

1 jacket thermocouple **7MC2021-2CE-Z A03**

Jacket thermocouple with socket

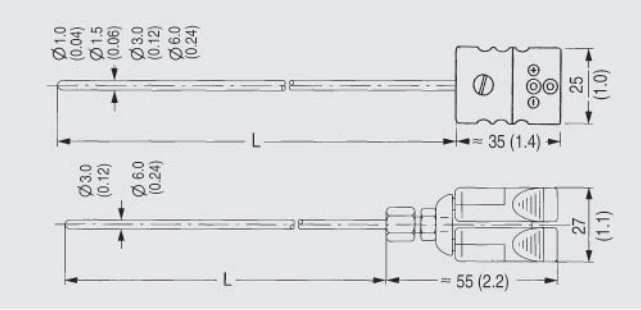
Overview

The sensor is suitable for a temperature range from 0 to 800, 1000 or 1100 °C (32 to 1472, 1832 or 2012 °F); a maximum temperature of 130 °C (266 °F) is permissible for the plug connection.

Technical specifications

Thermocouple	Ni Cr/Ni	
Jacket		
• Material	X 6 CrNiTi 18 10, mat. No. 1.4541	Inconel, NiCr 15 Fe, mat. No. 2.4816
• Temperature	Up to 800 °C (1472 °F)	Up to 1100 °C (2012 °F)
Coupling socket		
• Housing	Made of polyamide	
• Contact	Made of temperature-resistant material	
• Coupling plug	See "Jacket thermocouples", "Individual parts"; incorrect connection impossible	

Dimensional drawings



Jacket thermocouple with socket; at top with one thermocouple, at bottom with two thermocouples; dimensions in mm (inches)

Selection and ordering data		Order No.
Jacket thermocouple element with coupling socket		
Ni Cr/Ni type K thermocouple		
Jacket material No. 1.4541		
Temperature of medium 800 °C (1472 °F)		
1 thermocouple		
Jacket outer dia./ mm (inch):	Length *L*/m (ft):	
• 3.0 (0.12)	0.3 (0.98)	**7MC2028-1AC31**
• 3.0 (0.12)	0.5 (1.64)	**7MC2028-2AC31**
2 thermocouples		
Jacket outer dia./ mm (inch):	Length *L*/m (ft):	
• 3.0 (0.12)	0.3 (0.98)	**7MC2028-1AD31**
• 3.0 (0.12)	0.5 (1.64)	**7MC2028-2AD31**
• 6.0 (0.24)	0.3 (0.98)	**7MC2028-1AD41**
• 6.0 (0.24)	0.5 (1.64)	**7MC2028-2AD41**
Jacket material No. 2.4816		
Temperature of medium 1000 °C (1832 °F)		
1 thermocouple		
Jacket outer diameter/mm (inch):	Length *L*/m (ft):	
• 1.0 (0.04)	0.3 (0.98)	**7MC2028-1AC12**
• 1.0 (0.04)	0.5 (1.64)	**7MC2028-2AC12**
Jacket material No. 2.4816		
Temperature of medium 1100 °C (2012 °F)		
1 thermocouple		
Jacket outer dia./ mm (inch):	Length *L*/m (ft):	
• 1.5 (0.06)	0.3 (0.98)	**7MC2028-1AC22**
• 1.5 (0.06)	0.5 (1.64)	**7MC2028-2AC22**
• 3.0 (0.12)	0.3 (0.98)	**7MC2028-1AC32**
• 3.0 (0.12)	0.5 (1.64)	**7MC2028-2AC32**
• 6.0 (0.24)	0.3 (0.98)	**7MC2028-1AC42**
• 6.0 (0.24)	0.5 (1.64)	**7MC2028-2AC42**
2 thermocouples		
Jacket outer dia./ mm (inch):	Length *L*/m (ft):	
• 3.0 (0.12)	0.3 (0.98)	**7MC2028-1AD32**
• 3.0 (0.12)	0.5 (1.64)	**7MC2028-2AD32**
• 6.0 (0.24)	0.3 (0.98)	**7MC2028-1AD42**
• 6.0 (0.24)	0.5 (1.64)	**7MC2028-2AD42**
Further designs Please add "-**Z**" to Order No. and specify Order code(s) and plain text.		**Order code**
• Different design (mounting length, protective tube material etc.), specify in plain text.		**Y01**
• TAG plate made of stainless steel specify TAG No. in plain text		**Y15**
• Calibration carried out at one point, specify desired temperature in plain text (order equivalent number of times for several calibration points).		**Y33**

Different designs (mounting length, protective tube material etc.) on request: Add Order code "**Y01**" and specify in plain text.

(Please order coupling plug separately (see "Individual parts"))

Thermocouples

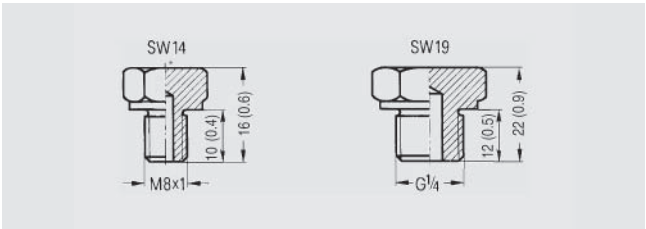
Individual parts

Selection and ordering data	Order No.
Extension lead for jacket thermocouple with coupling socket (7MC2028); twisted cores for Ni Cr/Ni thermocouple, color code: green	
Outer diameter 4 mm (0.16 inch) PVC isolation Number of conductors and cross-section: 2 x 0.22 mm² (2 x 0.00034 inch²) Temperature range -20 ... +80 °C (-4 ... +176 °F)	**7MC2921-1AC-Z**
Outer diameter 4 mm (0.16 inch) Silicone-silicone isolation Number of conductors and cross-section: 2 x 0.22 mm² (2 x 0.00034 inch²) Silicone-silicone isolation Temperature range -40 ... +180 °C (-40 ... +356 °F)	**7MC2921-2AC-Z**
Outer diameter 6 mm (0.24 inch) PVC isolation Number of conductors and cross-section: 4 x 0.22 mm² (2 x 0.00034 inch²) Temperature range -20 ... +80 °C (-4 ... +176 °F)	**7MC2921-3AC-Z**
Outer diameter 6 mm (0.24 inch) Silicone-silicone isolation Number of conductors and cross-section: 4 x 0.22 mm² (2 x 0.00034 inch²) Temperature range -40 ... +180 °C (-40 ... +356 °F)	**7MC2921-4AC-Z**
Further designs Please specify Order code(s) and plain text.	**Order code**
• Length of extension lead in m (ft)	
- 0.25 (0.82)	**A01**
- 1 (3.28)	**A02**
- 5 (16.4)	**A03**
- 10 (32.8)	**A04**

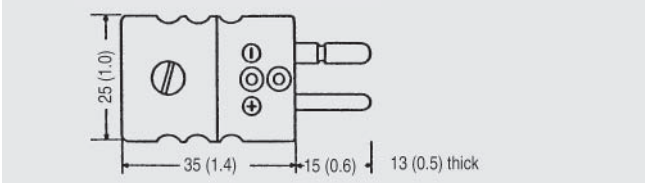
Other individual parts

- Screw nipple
- Compression joint
- Coupling socket
- Coupling plug

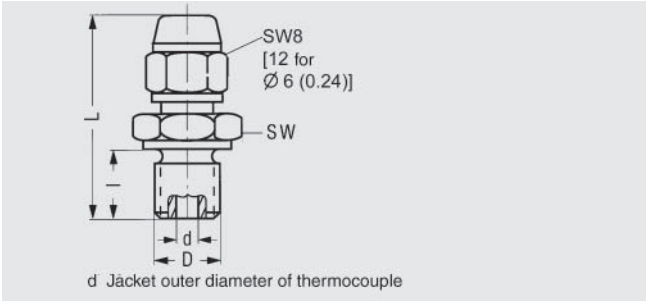
Dimensional drawings



Screw nipple with M8 x 1 thread (left) or G¼ (right), dimensions in mm (inches)



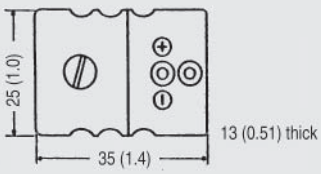
Coupling plug, dimensions in mm (inches)



d Jäcket outer diameter of thermocouple

d	D	l	L	SW
mm (inch)		mm (inch)	mm (inch)	
1,5 (0.06)	M8x1	8 (0.3)	32 (1.3)	12
3,0 (0.12)	M8x1	8 (0.3)	32 (1.3)	12
6,0 (0.24)	G¼	10 (0.4)	48 (1.9)	19

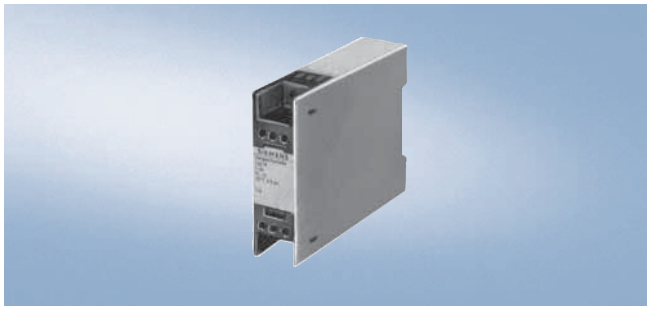
Compression joint with M8 x 1 or G¼ thread dimensions in mm (inches)



Coupling socket, dimensions in mm (inches)

Selection and ordering data	Order No.
Screw nipple for soldering jacket thermocouple elements The screw nipple has a centering hole and must be drilled according to the outer diameter of the jacket thermocouple element. The thermocouple must be protected from excessive heat when soldering (e.g. by blowing with air).	
• with M8 x 1 thread, for jacket outer diameter up to 3.0 mm (0.12 inch); 0.01 kg (0.02 lb)	**7MC2922-1EA**
• with G¼ thread, for all jacket outer diameters listed in the catalog, 0.02 kg (0.04 lb)	**7MC2922-1FB**
Compression joint, gas-tight Temperature up to 350 °C (662 °F) Pressure-tight up to 80 bar (1160 psi) Subsequent release and movement is not possible, material X6 CrNi Mo Ti 17–122, material No 1.4571; tapered ring like compression joint	
• Thread M8 x 1; 0.03 kg (0.06 lb)	
- jacket outer diameter 1.5 mm (0.06 inch)	**7MC2922-3AA**
- jacket outer diameter 3.0 mm (0.12 inch)	**7MC2922-3BA**
• Thread G¼; 0.04 kg (0.08 lb)	
- jacket outer diameter 6 mm (0.24 inch)	**7MC2922-3DB**
Coupling socket of jacket thermocouple 7MC2028 (one per element); for Ni Cr/Ni thermocouple element, type K; 0.05 kg (0.11 lb)	**7MC2922-4BB**
Coupling plug matching the jacket thermocouple 7MC2028 with socket; one plug is required per thermocouple element; for Ni Cr/Ni thermocouple, type K; 0.05 kg (0.11 lb)	**7MC2922-4BD**

Overview



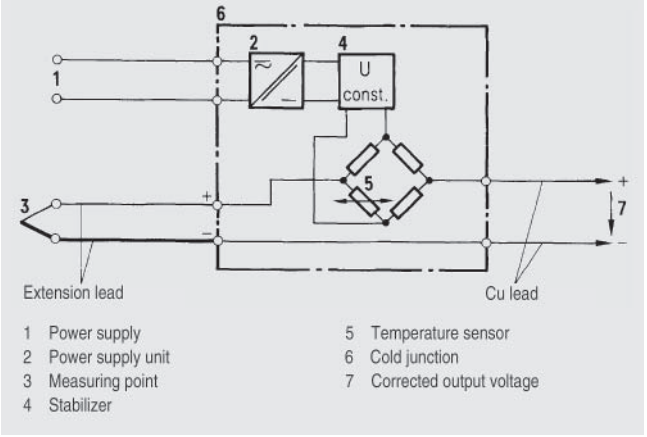
The cold junction is suitable for a thermocouple element of type J, K, L, R, S, T or U. A correction circuit is fitted which compensates the influence of changes in the cold junction temperature. The device can be mounted on a rail.
Note: positioning of the cold junction in the vicinity of the measuring point saves expensive extension leads.

Design

The cold junction has a terminal housing made of plastic which is suitable for mounting on a standard rail DIN EN 50022-35 x 7.5.
The sensor for the cold junction temperature is positioned directly on the terminals for the extension lead. The device is matched to the type of thermocouple using built-in function plugs and adjusted according to the reference temperature. The built-in power supply unit provides the cold junction with power.

Function

Mode of operation



Function diagram of cold junction

The power supply (1) stabilized in constant-voltage transformer (4) the feeds a bridge containing a precision temperature sensor (5) in one of its branches. The resistance of the temperature sensor changes with the temperature of the terminals, and thus also the diagonal voltage of the bridge. The bridge is designed according to the characteristic of the respective thermocouple element.

Technical specifications

Signal input	For thermocouple elements acc. to DIN IEC 584 and DIN 43710
Ref. temperature	0 or 20 °C (32 or 68 °F)
Error limits	0.5 K (0.9 °F)
Temperature error	<0.1 K / 10 K change (0.18°F/18 °F)

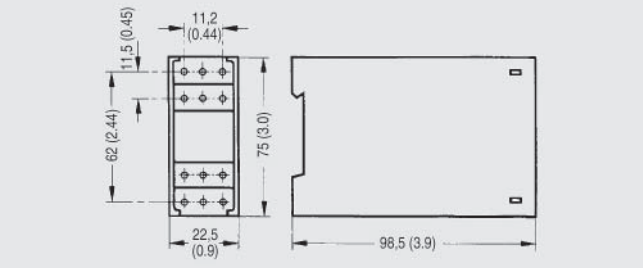
Accessories
Cold junction with built-in power supply unit

Power supply	47 ... 63 Hz, 220 V, 110 V or 24 V AC, - 25%, + 33%	24 V DC, - 25%, + 33%
• Power consumption	Approx. 0.1 VA	0.1 W
• Residual ripple	–	< 10%
Permissible ambient temperature	-10 ... +65 °C (14 ... 149 °F)	
Permissible storage temperature	-30 ... +80 °C (-22 ... +176 °F)	
Degree of protection	DIN 40050	
• Housing	IP40	
• Terminals	IP20	
Weight	Approx. 0.1 kg (0.22 lb)	

Selection and ordering data		Order No.
Cold junction with built-in power supply unit, for rail mounting		**M7216 6 -** ■■■■■
Power supply		
220 V AC		**B 1**
110 V AC		**B 2**
24 V AC		**B 3**
24 V DC		**B 4**
Connection to thermocouple element		
Fe-CuNi	Type L	**1**
Fe/Cu Ni	Type J	**2**
Ni Cr/Ni	Type K	**3**
Pt10% Rh/Pt	Type S	**4**
Pt 13% Rh/Pt	Type R	**5**
Cu-CuNi	Type U	**6**
Cu/Cu Ni	Type T	**7**
Ref. temperature		
0 °C (32 °F)		**0 0**
20 °C (68 °F)		**2 0**

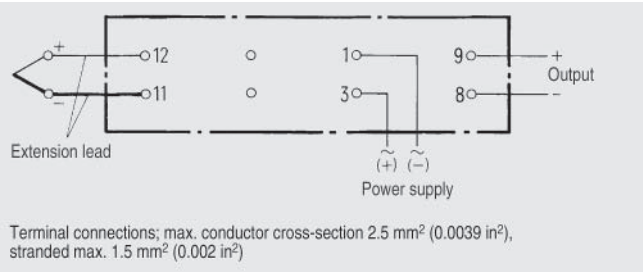
Caution! Compensation of changes in the cold junction temperature should not be carried out for Pt 30% Rh/Pt 6% Rh thermocouple elements. The extension leads should be routed to a position where a temperature between –10 and +60 °C (14 to 140 °F) exists.

Dimensional drawings



Cold conjunction, dimensions in mm (inches)

Schematics

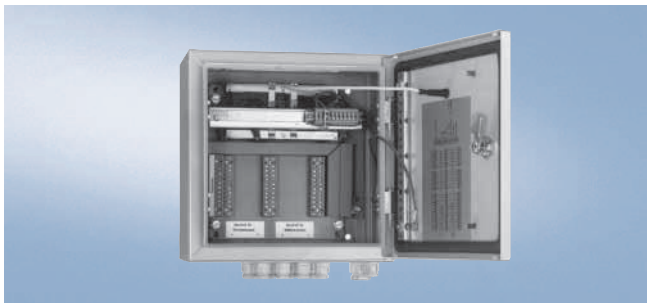


Terminal connections; max. conductor cross-section 2.5 mm² (0.0039 in²), stranded max. 1.5 mm² (0.002 in²)

Connection diagram of cold junction

Accessories - Cold junction thermostat (for 6 or 12 measuring points)

Overview



The cold junction thermostat is used to keep the cold junction temperature constant when measuring temperature using thermocouples.

Design

The cold junction thermostat consists of an aluminium block in which 6 or 12 reference elements are fitted, a controller, a heater and a power supply unit. The aluminium block, controller, heater and power supply unit are arranged in two blocks potted in synthetic resin. In this manner, uniform temperature distribution and protection against external effects are ensured. The cast blocks are fitted to the base plate using metal brackets, thus ensuring high resistance to vibration.

The device has a red lamp visible on the outside of the door to permit checking of the temperature in the aluminium block (thermostat). It is also possible to fit

- a Pt100 resistance thermometer or
- an electronic monitoring unit with relay output whose NC contact opens if there is a fault.

The cold junction thermostat has a sheet-steel housing.

Function

The temperature of the aluminium block is held constant at a reference temperature of 50, 60 or 70 °C (122, 140 or 158 °F) by an electronic two-step controller with low hysteresis.
With a constant cold junction temperature, the difference between the voltage of the measuring element and that of the reference element is a measure of the temperature at the measuring point. The thermocouples are electrically isolated from one another and from the power supply.

Technical specifications

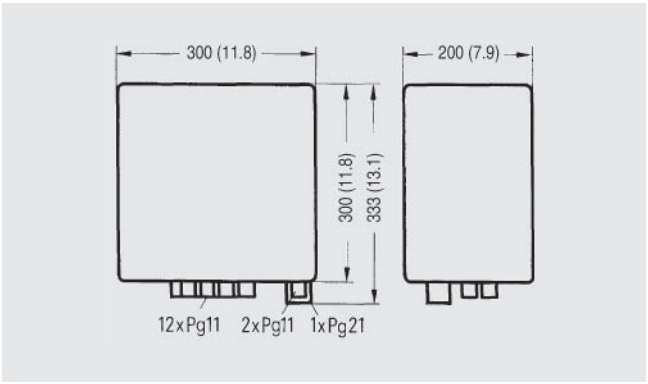
Number of measuring points	6 or 12		
Ref. temperature	50, 60 or 70 °C (122, 140 or 158 °F)		
• Error limits	0.5 °C (0.9 °F)		
Effect of ambient temperature	0.2 °C / 10 K (0.36 °F/18 °F) temperature change		
Error limits of control	0.05 °C (0.09 °F)		
Permissible ambient temperature	-20 ... +45 °C (-4 ... +113 °F)		
Power supply (depending on version) 48 ... 63 Hz, 24, 110 or 220 VAC ± 15%,	Warm-up time		
• Approx. 30 VA	Approx. 10 min		
• 24 V DC, approx. 30 W	Approx. 10 min		
• 24 V DC, approx. 17 W	Approx. 20 min		
Degree of protection	IP54 to DIN 40050		
Resistance to vibration	Frequency	Acceleration	Test period
	5 ... 55 Hz	1 g, constant	4 min
	30 Hz	10 g	1 min
Weight	Approx. 9.5 kg (20.9 lb)		

Selection and ordering data — Order No.

Cold junction thermostat — 7MC2933-

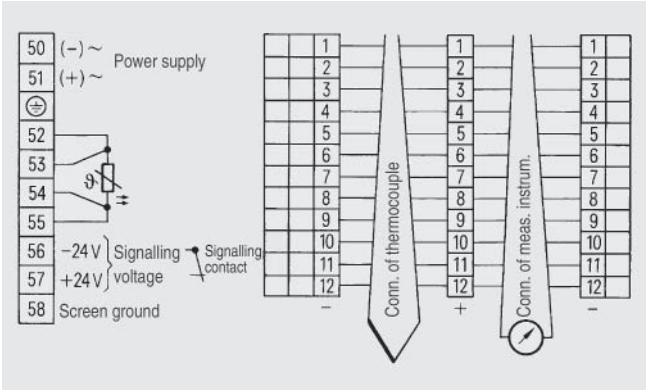
Ref. temperature		
50 °C (112 °F)		1
60 °C (140 °F)		2
70 °C (158 °F)		3
Thermocouple		
Fe-CuNi	Type L	A
Ni Cr/Ni	Type K	B
Pt 10% Rh/Pt	Type S	C
Cu-CuNi	Type U	D
Number of cold junctions		
6		A
12		B
Power supply		
220 V AC		1
110 V AC		2
24 V AC		3
24 V DC, 30 W		4
24 V DC, 17 W		5
Temperature control		
without		0
with resistance thermometer		1
with electronic monitoring unit		2

Dimensional drawings



Cold junction thermostat 7MC2933, dimensions in mm (inches)

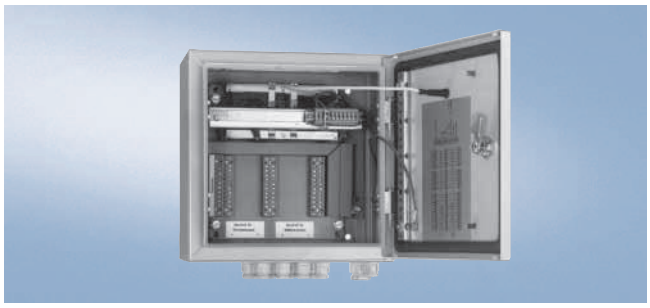
Schematics



Cold junction thermostat 7MC2933, connection diagram

Accessories - Cold junction thermostat (for 12 or 24 measuring points)

Overview



The cold junction thermostat is used to keep the cold junction temperature constant when measuring temperature using thermocouples.

Design

The cold junction thermostat consists of an aluminium block in which 12 or 24 reference elements are fitted, a controller, a heater and a power supply unit.
The aluminium block, controller, heater and power supply unit are designed as crystal modules. In this manner, uniform temperature distribution and protection against external effects are ensured.
A Pt100 resistance thermometer or an electronic monitoring unit with relay output or 24 V DC output are fitted to permit checking of the temperature in the aluminium block (thermostat). The monitoring unit is triggered when the maximum or minimum temperature of the cold junction block is violated or if the power supply fails.
A signalling lamp "Operation" is present in the door.
The cold junction thermostat has a sheet-steel housing.

Function

The temperature of the aluminium block is held constant at a reference temperature of 50, 60 or 70 °C (122, 140 or 158 °F) by an electronic two-step controller with low hysteresis.
With a constant cold junction temperature, the difference between the voltage of the measuring element and that of the reference element is a measure of the temperature at the measuring point. The thermocouples are electrically isolated from one another and from the power supply.

Technical specifications

Number of measuring points	12 or 24
Ref. temperature	50, 60 or 70 °C (122, 140 or 158 °F)
• Error limits	0.5 K (0.9 °F)
Permissible ambient temperature with ref. temperature:	
• 50 °C (122 °F)	-20 ... +45 °C (-4 ... +113 °F)
• 60 or 70 °C (32 or 158 °F)	-20 ... +65 °C (-4 ... +149 °F)
Effect of ambient temperature	0.2 K (0.36 °F) per 10 K (1.8 °F) temperature change
Error limits of temperature control	0.05 K (0.09 °F)
Monitoring circuit	
• Upper switching point	≤ Ref. temperature + 5 K (9 °F)
• Lower switching point	≤ Ref. temperature – 5 K (-9 °F)
Signalling relais	NC contact opens in case of error
• Switching capacity	Max. 10 VA (max. 240 V AC, max. 0.5 A)
Power supply	47 ... 63 Hz, 24, 110 or 220 V AC ± 15%, approx. 30 VA; 24 V DC ± 10%, approx. 30 W
Warm-up time	Approx. 10 min
Degree of protection	IP55 to DIN 40050
Weight	Approx. 13 kg (28.7 lb)

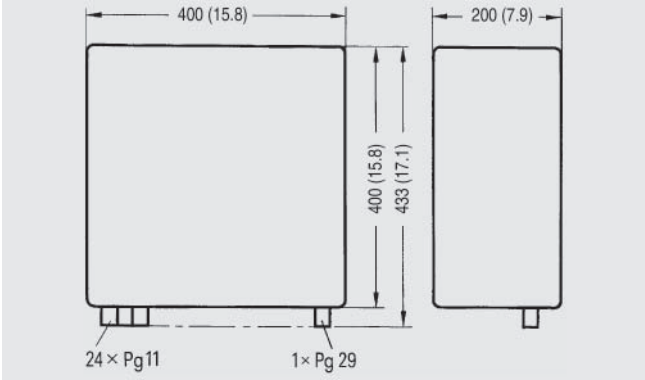
Selection and ordering data

Order No.

7MC2930 - ■■■■■

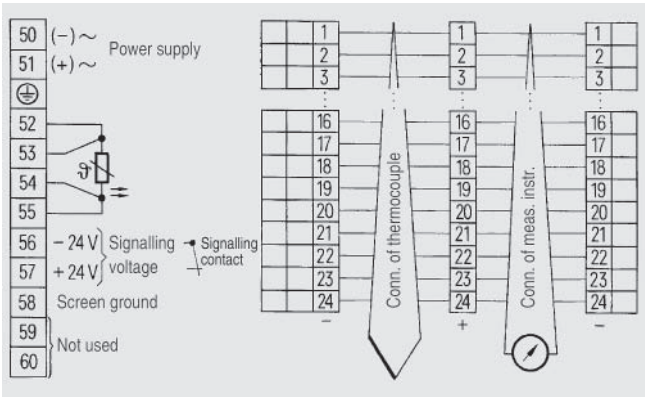
Ref. temperature		
50 °C (112 °F)		1
60 °C (140 °F)		2
70 °C (158 °F)		3
Thermocouple		
Fe-CuNi	Type L	A
Ni Cr/Ni	Type K	B
Pt10% Rh/Pt	Type S	C
Cu-CuNi	Type U	D
Number of cold junctions		
12		A
24		B
Power supply		
220 V AC		1
110 V AC		2
24 V AC		3
24 V DC		4
Temperature control		
with resistance thermometer; electronic monitoring of the temperature		
• in the thermostat		
- with relay output		1
- without 24 V DC output		2

Dimensional drawings



Cold junction thermostat 7MC2930, dimensions in mm (inches)

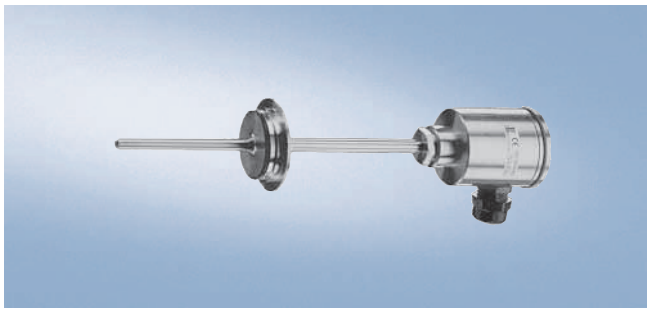
Schematics



Cold junction thermostat 7MC2930, connection diagram

Resistance thermometers for installation in pipelines and tanks

Overview



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

Design

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

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

Technical specifications

Design	Replaceable measuring insert with connection head and protection fitting
Connection head	Either: • Field housing, screw cover, stainless steel 1.4301, IP67 • Form B, cover with 2 slotted screws, aluminium, IP54, standard • Form B, screw cover, plastic, IP54 (BK) • Form B, hinged cover with slotted screws, aluminium, IP65 (BUZ) • Form B, hinged cover with quick-release, aluminium, IP65 (BUS) • Form B, high hinged cover with slotted screw, aluminium, IP65 (BUZH)
Protective tube	Stainless steel 1.4404/316L 6 or 9 mm (0.24 or 0.35 inch) diam., optionally with tapered tip, see Selection and Ordering data for mounting length U1
Measuring insert	Stainless steel, replaceable Pt100 measuring resistor to DIN 43762 Rigid design or as jacket element (mineral-insulated, flexible, increased vibration resistance)
Accuracy of measuring resistor	Class A according to DIN EN 60751
Integration of transmitter	Suitable Pt100 transmitters for head mounting can be fitted in the connection head, see Selection and Ordering data
Process connections	• DIN 11851 with slotted union nut • Clamp connection to DIN 32676 • Clamp connection to ISO 2852 • Varivent • Neumo BioControl • Spherical welding-type sleeve cyl./sph. 30 x 40 mm (1.18 x 1.57 inch) • Aseptic connections The gasket is not included in the standard scope of delivery! Further process connections on request. Process connection material: Stainless steel 1.4404/316L
Surface properties	
• Standard	Surface roughness Ra < 1.5 µm (5.9×10^{-5} inch)
• Hygiene	Surface roughness Ra < 0.8 µm (3.1×10^{-5} inch)
• Welded seam	< 1.5 µm (5.9×10^{-5} inch)

Resistance thermometers for installation in pipelines and tanks

Selection and ordering data	Order No.	Order code
Pt100 resistance thermometer for food, pharmaceuticals and biotechnology	7MC8005-0 - 0	
Connection head		
• Form B, cast light alloy, screw cover, IP54, cable gland [1]	1	
• Form B, plastic, screw cover, IP54, cable gland [1]	2	
• Form BUZ, cast light alloy, screw cover, IP65, cable gland [1]	3	
• Form BUZH, cast light alloy, high hinged cover, IP 65, cable gland	4	
• Field housing made of stainless steel 1.4301, IP67, cable gland [1]	5	
• Special version: (add Order code and plain text)	9	H1Y
Process connection, material 1.4404/316L		
• Milk pipe union to DIN 11851 with slotted union nut and nominal diameter/pressure		
- DN 25 / PN 40	AA	
- DN 32 / PN 40	AB	
- DN 40 / PN 40	AC	
- DN 50 / PN 25	AD	
• Clamp connection to DIN 32676		
- DN 25 / PN 16	EA	
- DN 40 / PN 16	EC	
- DN 50 / PN 16	ED	
• Clamp connection to ISO 2852		
- 1" / PN 16	FK	
- 1½" / PN 16	FL	
- 2" / PN 16	FM	
• Varivent connection (Tuchenhagen)		
- D = 50 mm (1.97 inch), for Varivent housing DN 25 and DN 1"	KU	
- D = 68 mm (2.68 inch), for Varivent housing DN 40 ... DN 125 and 1½" ... 6"	KV	
• Welding piece (sphere diameter 30 x 40 mm (1.2 x 1.6 inch) long)	LA	
• Special version: Type of screwed gland and nominal diameter (add Order code and plain text)	ZA	J1Y
Protective tube / **Measuring insert**		
• Ø F1=6 mm (0.24 inch) / Ø 3/3.2 mm, (0.12/0.13 inch) miner. insul.	1	
• Ø F1=9 mm (0.35 inch) / Ø 6 mm (0.24 inch)	2	
• Ø F1=9 mm (0.35 inch) / Ø 6 mm (0.24 inch) miner. insul.	3	
• Ø F1=9 mm (0.35 inch) tapered tip F3=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	L1Y

Selection and ordering data	Order No.	Order code
Pt100 resistance thermometer for food, pharmaceuticals and biotechnology	7MC8005-0 - 0	
Neck tube length M		
• 80 mm (3.15 inch)	1	
• 145 mm (5.71 inch)	2	
• Special version: (add Order code and plain text)	9	N1Y
Mounting length U1		
• 15 mm (0.59 inch)	B	
• 35 mm (1.38 inch)	C	
• 50 mm (1.97 inch)	D	
• 100 mm (3.94 inch)	E	
• 160 mm (6.30 inch)	F	
• 250 mm (9.84 inch)	G	
• 400 mm (15.75 inch)	H	
• Special version: (add Order code and plain text)	Z	P1Y
Sensor		
Thin-film technology: measuring range -50 ... +400 °C (-58 ... +752 °F)		
• 1 x Pt100, class A, three-wire	F	
• 2 x Pt100, class A, three-wire	G	
• 1 x Pt100, class A, four-wire	H	
• Special version: (add Order code and plain text)	Z	Q1Y
Further designs Add "**-Z**" to Order No. and add Order code.	**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 10204-3.1B	C18	
- Material certificate to EN 10204-3.1	C19	
• Specify special version in plain text	Y01	
• TAG plate made of stainless steel specify TAG No. in plain text	Y15	
• Test report (at 0, 50 and 100%) specify measuring range in plain text	Y33	

To order a temperature transmitter installed in the connection head, see "Temperature transmitters for installation in the connection head" (page 3/41).

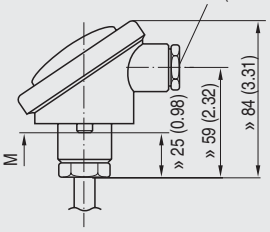
[1] Not suitable for installation of the SITRANS T3K PA.

Resistance thermometers for installation in pipelines and tanks

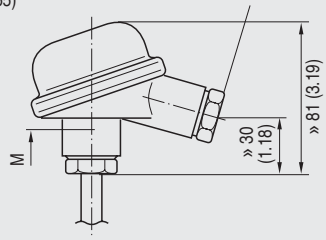
Dimensional drawings

Connection heads

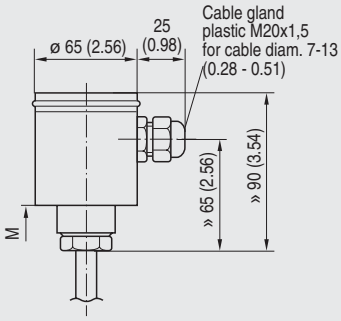
Form B, cover with 2 slotted screws, aluminium, IP 54



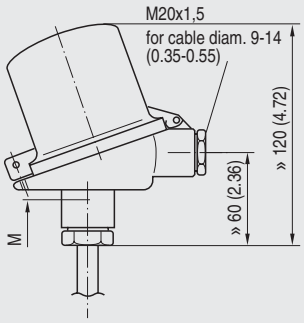
Form B, screw cover, plastic, IP 54 (BK)



Field housing, screw cover, stainless steel 1.4301, IP 67



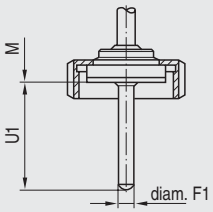
Form B, high hinged cover with slotted screw, aluminium, IP 65 (BUZH)



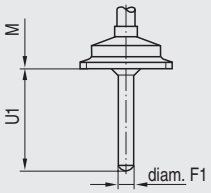
Neck tube length M up to sealing face

Process connections

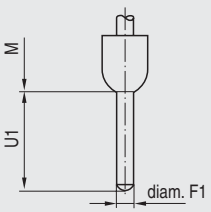
Tapered nipple with slotted nut DIN 11 851 or aseptic to DIN 11 864 DN 25 to 50 (1" to 2½")



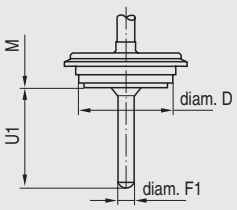
Clamp connection to DIN 32 676 or ISO 2852 DN 25 to 50 (1" to 2½")



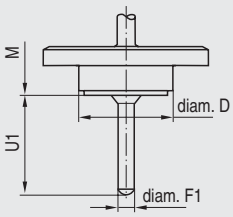
Spherical welding-type sleeve Sphere 30 x 40 mm (1.18 x 1.57 in)



Varivent connection
D 50 for Varivent housing DN 25 and 1"
D 68 for Varivent housing DN 40 to DN 125 and 1½" to 6"



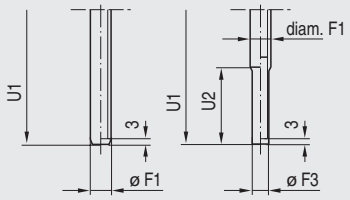
Neuma BioControl
Size 25 D-30.5 diam.
Size 50 D-50 diam.
Size 65 D-68 diam.



Protective tube based on DIN 43 772

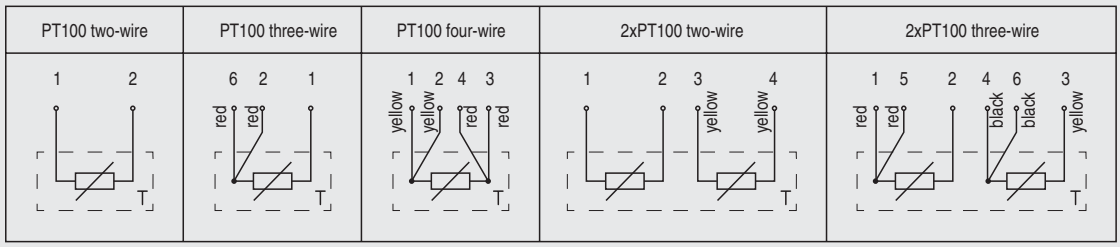
Form 2

Similiar to form 3 tapered tip



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

Schematics



Connection diagram

Overview

The temperature sensor with pipe collar is used for temperature monitoring, particularly for sterile applications in the food and pharmaceutical industries.

Temperature measurement is possible following simple, fast assembly on any existing pipeline system. It is not necessary to interrupt the pipeline or to carry out welding. Assembly on the pipeline is simply carried out by adapting the two halves of the collar.

The device can be optionally supplied with an integral transmitter.

Function

Features

- Temperature measurement free of dead space
- Can be retrofitted onto existing pipelines
- Matches all common nominal pipe diameters
- Optimum temperature measurement using metallic pressing system
- Insulating collar made of temperature-resistant plastic, easy to clean
- Measuring range -20 to +200 °C (-4 to +392 °F)
- Replaceable Pt100 measuring insert; thus no changes in measuring setup
- Calibration possible
- Transmitter can be integrated (4 to 20 mA or PROFIBUS PA)

Mode of operation

The temperature measurement is carried out using a Pt100 measuring element. An integral metallic pressing system guarantees optimum heat transfer between the pipeline and Pt100. The measuring insert is protected by an insulating sleeve made of temperature-resistant plastic.

The complete Pt100 unit can be easily dismounted at any time for calibration; it is not necessary to disconnect the cables from the sensor.

The temperature sensor with pipe collar is available with all standard DIN connection heads.

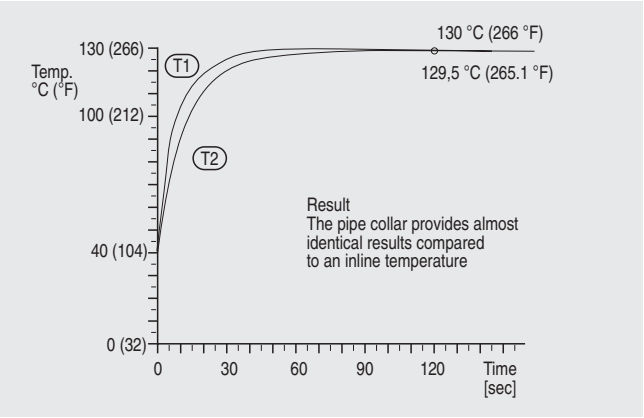
Response time / accuracy

Application example

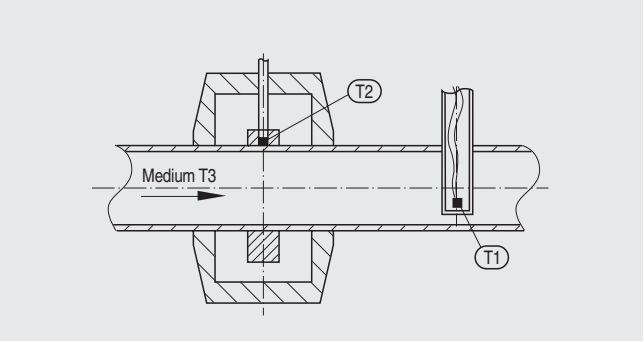
Measured medium: Steam

T1: Conventional welding-type protective tube form 2 acc. to DIN 43772 (pipe 9 x 1mm (0.35 to 0.04 inch))

T2: Pipe collar for tube OD 25.4 mm (1.0 inch) acc. to BS 4825 with measuring insert (fast response)



Results with steam as measured medium



Schematic representation

The result for the actual temperature of the medium T3 depends on several parameters:

- Heat transfer of temperature sensor/pipe
- Conductivity of medium
- Flow velocity
- Pipe wall thickness
- Pipe material
- Ambient temperature

Installation and operating instructions

Assembly of the two halves of the pipe collar to the pipe is carried out simply and rapidly by connection of the two M6 hexagon screws. Any positioning is possible, but the Pt100 measurement should preferably be made "underneath" the pipeline to achieve an optimum result.

Following mounting on the pipeline, the complete Pt100 housing unit can be dismounted on site by loosening a clamping screw. It is not necessary to disconnect the cable during the usual calibration procedures.

Resistance thermometer with clamp-on system

3

Technical specifications

Design with connection head	Measuring insert in connection head with neck tube as one unit for insertion into pipe collar. All standard DIN connection heads are available, see Selection and Ordering data
Pipe collar	Temperature-resistant plastic for range: • -20 ... +160 °C (-4 ... +320 °F), material PVDF • -20 ... +200 °C (-4 ... +392 °F), material PEEK
Neck tube	Material: Stainless steel 1.4571
Measuring insert	The replaceable measuring insert is designed as a fast-response jacket element of 3 mm diameter. It guarantees optimum heat transfer from the jacket pipe to the Pt100 measuring element (see "Response time / accuracy" under "Function" for reference measurement with measuring insert). Commercially available measuring inserts can also be used as alternatives.
Measuring resistor	Pt100 acc. to DIN EN 60751 Class A in three-wire design, ceramic
Integration of transmitter	Suitable Pt100 transmitters for head mounting can be fitted in the connection head, see Selection and Ordering data
Nominal pipe diameters	Matches all standard nominal pipe diameters acc. to DIN 11850 series 2. Adaptation of the pipe collar is possible for pipes acc. to DIN 2463, ISO 1127 series 1, 2 and 3 and pipes to BS 4825 Part 1 O.D.Tubing. The design of the pipe collar takes into account the usual tolerances for pipe outer diameters acc. to EN ISO 1127 D3 and D4, and acc. to ASTM-A213/A450, ASTM-A249/A450 and ASTM-A269. Deviating tolerances must be specified. See Selection and Ordering data for dimensions.
Pressing system	Guarantees optimum heat transfer between outer wall of pipe and PT100, material: Stainless steel
Weights	Design with light alloy connection head: Form B
• DN 10	Approx. 0.4 kg (0.88 lb)
• DN 15	Approx. 0.5 kg (1.10 lb)
• DN 20	Approx. 0.6 kg (1.32 lb)
• DN 25	Approx. 0.7 kg (1.54 lb)
• DN 32	Approx. 0.8 kg (1.76 lb)
• DN 40	Approx. 0.8 kg (1.76 lb)
• DN 50	Approx. 0.9 kg (1.98 lb)
• DN 65	Approx. 0.9 kg (1.98 lb)
• DN 80	Approx. 1.0 kg (2.20 lb)
• DN 100	Approx. 1.5 kg (3.31 lb)
Response time / accuracy	see "Response time / accuracy" under "Function" for reference measurement with mesauring insert

Selection and ordering data

	Order No.	Order code
Pipe collar Pt100 thermometer	7MC8015-	
Stainless steel pressing system	■■■00-■A■0	■■■
Connection head		
• Form B, cast light alloy, screw cover, IP54, cable gland[1]	1	
• Form B, plastic, screw cover, IP54, cable gland[1]	2	
• Form BUZ, cast light alloy, hinged cover, IP65, cable gland[1]	3	
• Form BUZH, cast light alloy, high hinged cover, IP 65, cable gland	4	
• Field housing made of stainless steel 1.4301, IP67, cable gland[1]	5	
• without, with M12 plug (without mating connector)	6	
• Special version (add Order Code and plain text)	9	H1Y
Collar material		
• PVDF, -20 ... +160 °C (-4 ... +320 °F)	B	
• PEEK, -20 ... +200 °C (-4 ... +392 °F)	C	
Nominal diameter for pipes acc. to DIN 11850 Series 2		
Nom. diam. / Outer pipe diameter		
• DN 10 / 13 mm (0.51 inch)	A	
• DN 15 / 19 mm (0.75 inch)	B	
• DN 20 / 23 mm (0.91 inch)	C	
• DN 25 / 29 mm (1.14 inch)	D	
• DN 32 / 35 mm (1.38 inch)	E	
• DN 40 / 41 mm (1.61 inch)	F	
• DN 50 / 53 mm (2.09 inch)	G	
• DN 65 / 70 mm (2.76 inch)	H	
• DN 80 / 85 mm (3.35 inch)	J	
• DN 100 / 104 mm (4.09 inch)	K	
• Special version: Nominal diameter (add Order Code and plain text)	Z	K1Y
Neck tube length		
• 60 mm	1	
• Special version (add Order Code and plain text)	9	N1Y
Sensor		
Ceramic type, fast response		
• 1 x Pt100, class A, three-wire	F	
• 2 x Pt100, class A, three-wire	G	
• Special version (add Order Code and plain text)	Z	Q1Y
Further versions	**Order Code**	
Add "-**Z**" to Order No. and Order Code.		
• Specify special version in plain text	**Y01**	
• TAG plate made of stainless steel specify TAG No. in plain text	**Y15**	
• Test report (at 0, 50 and 100%) specify measuring range in plain text	**Y33**	

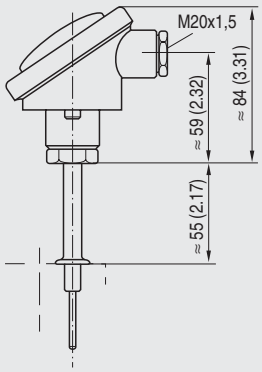
To order a temperature transmitter installed in the connection head, see "Temperature transmitters for installation in the connection head" (Page 3/41).

[1] Not suitable for installation of the SITRANS T3K PA.

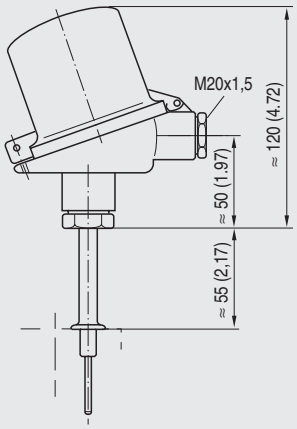
Dimensional drawings

Connection heads

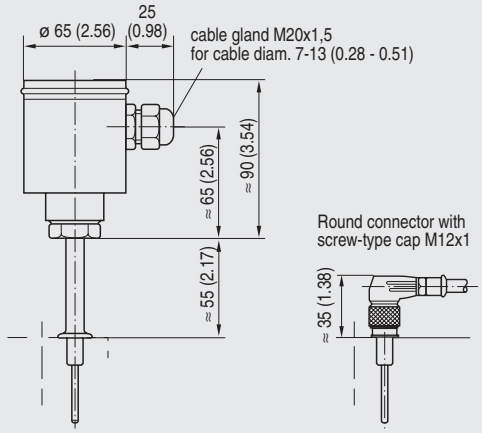
Connection head form B
aluminium



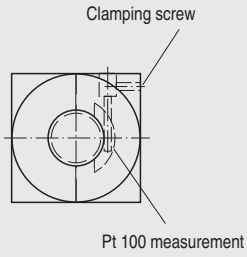
Connection head form BUZH
aluminium

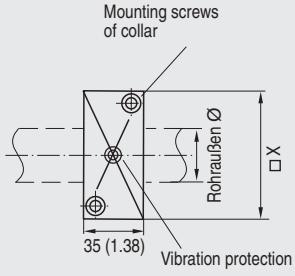


Connection head, field housing
stainless steel 1.4305



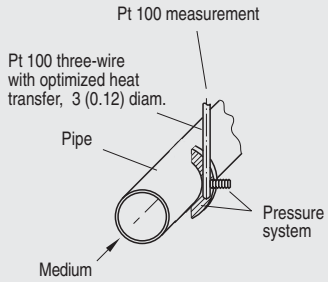
Pipe collar





□ X	Pipe OD
60 (2.36)	10 ... 20 (0.39 ... 0.79)
70 (2.76)	21 ... 29 (0.83 ... 1.14)
80 (3.15)	30 ... 39 (1.18 ... 1,54)
90 (3.54)	40 ... 49 (1.57 ... 1.93)
100 (3.94)	50 ... 59 (1.97 ... 2.32)
115 (4.53)	60 ... 74 (2.36 ... 2.91)
130 (5.12)	75 ... 85 (2.95 ... 3.35)
140 (5.51)	86 ... 98 (3.39 ... 3.86)
150 (5.91)	99 ... 109 (3.90 ... 4.29)

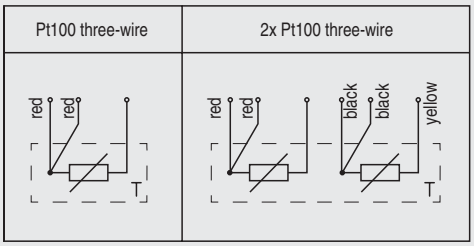
Pressure system



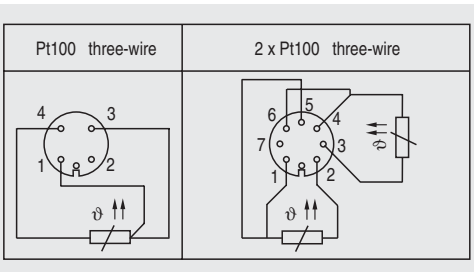
Connection heads/pipe collar/pressing system, dimensions in mm (inches)

Resistance thermometer with clamp-on system

Schematics



Connection diagram connection head



Connection diagram round connector M12, 4-/8-pin