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Overview

Our field devices for heavy industrial use

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

The temperature transmitter SITRANS TF works where others feel uncomfortable.

Benefits

- Universal use
  - as transmitter for resistance thermometer, thermocouple element, Ω or mV signal
  - as field indicator for any 4 to 20 mA signals
- Local sensing of measured values over digital display
- Rugged two-chamber enclosure in die-cast aluminium or stainless steel
- Degree of protection IP66/67
- Test terminals for direct read-out of the output signal without breaking the current loop
- Can be mounted elsewhere if the measuring point
  - is hard to access,
  - is subject to high temperatures,
  - is subject to vibrations from the system,
  - or if you want to avoid long neck tubes and/or protective tubes.
- Can be mounted directly on American-design sensors
- Wide range of approvals for use in potentially explosive atmospheres. "Intrinsically safe, non-sparking and flameproof" type of protections, for Europe and USA.
- SIL2 (with Order code C20), SIL2/3 (with C23)

Application

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

Function

Configuration

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

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

Mode of operation

Mode of operation of SITRANS TF as temperature transmitter

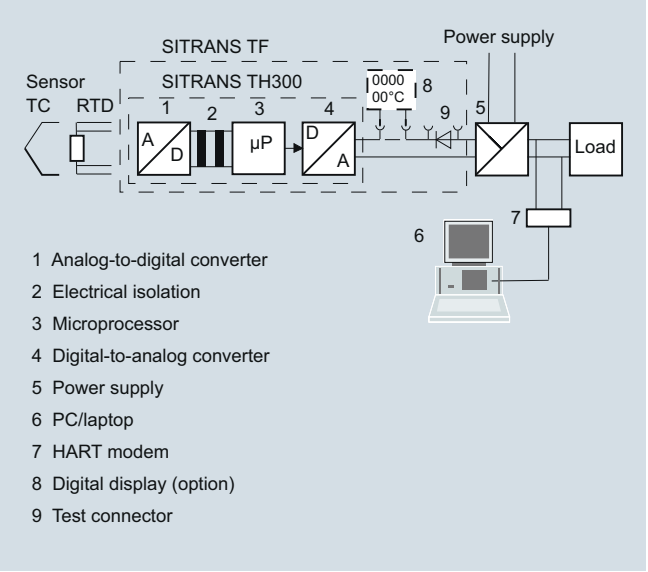
The sensor signal, whether resistance thermometer, thermocouple element or Ω or mV signal, is amplified and linearized. Sensor and output side are electrically isolated. An internal cold junction is integrated for measurements with thermocouple elements.

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

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

Mode of operation of SITRANS TF as field indicator

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



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

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Technical specifications

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

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Output	
Output signal	4 ... 20 mA, 2-wire
Communication with SITRANS TH300	acc. to HART Rev. 5.9
Digital display	
Digital display (optional)	In current loop
Display	Max. 5 digits
Digit height	9 mm (0.35 inch)
Display range	-99 999 ... + 99 999
Units	any (max. 5 char.)
Setting: Zero point, full-scale value and unit	with 3 buttons
Load voltage	2.1 V
Measuring accuracy	
Digital measuring errors	See table "Digital measuring errors"
Reference conditions	
• Auxiliary power	24 V ± 1 %
• Load	500 Ω
• Ambient temperature	23 °C (73.4 °F)
• Warming-up time	> 5 min
Error in the analog output (digital/analog converter)	< 0.025 % of span
Error due to internal cold junction	< 0.5 °C (0.9 °F)
Influence of ambient temperature	
• Analog measuring error	0.02 % of span/10 °C (18 °F)
• Digital measuring errors	
- with resistance thermometers	0.06 °C (0.11 °F)/10°C (18 °F)
- with thermocouples	0.6 °C (1.1 °F)/10°C (18 °F)
Auxiliary power effect	< 0.001 % of span/V
Effect of load impedance	< 0.002 % of span/100 Ω
Long-term drift	
• In the first month	< 0.02 % of span
• After one year	< 0.3 % of span
• After 5 years	< 0.4 % of span
Conditions of use	
Ambient conditions	
Storage temperature	-40 ... +85 °C (-40 ... +185 °F)
Condensation	Permissible
Electromagnetic compatibility	According to EN 61326 and NAMUR NE21
Degree of protection to EN 60529	IP66/67
Construction	
Weight	Approx. 1.5 kg (3.3 lb) without options
Dimensions	See "Dimensional drawings"
Enclosure material	Die-cast aluminum, low in copper, GD-AlSi 12 or stainless steel, polyester-based lacquer, stainless steel rating plate
Electrical connection, sensor connection	Screw terminals, cable inlet via M20 x 1.5 or ½-14 NPT screwed gland
Mounting bracket (optional)	Steel, galvanized and chrome-plated or stainless steel

Auxiliary power	
Without digital display	11 ... 35 V DC (30 V for Ex ib; 32 V for Ex ic and Ex nA)
With digital display	13.1 ... 5 V DC (30 V for Ex ib; 32 V for Ex ic and Ex nA)
Electrically isolated	Between input and output
• Test voltage	U_{eff} = 1 kV, 50 Hz, 1 min
Certificates and approvals	
Explosion protection ATEX	
• "Intrinsic safety" type of protection	with digital display: II 2 (1) G Ex ib [ia Ga] IIC T4 Gb II 2 G Ex ib IIC T4 Gb II 1D Ex ia IIIC T100 °C Da without digital display: II 2 (1) G Ex ib [ia Ga] IIC T6 Gb II 2 G Ex ib IIC T6 Gb II 1D Ex ia IIIC T100 °C Da
- EC type test certificate	ZELM 11 ATEX 0471 X
• "Operating equipment that is non-ignitable and has limited energy for zone 2" type of protection	II 3 G Ex ic IIC T6/T4 Gc II 3 G Ex nA IIC T6/T4 Gc II 3 G Ex nA [ic] IIC T6/T4 Gc
- EC type test certificate	ZELM 11 ATEX 0471 X
• "Flame-proof enclosure" type of protection	II 2 G Ex d IIC T6/T5 Gb II 2 D Ex tb IIIC T100 °C Db
- EC type test certificate	ZELM 11 ATEX 0472 X
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 = 60 °C (140 °F), Type 4X • DIP/II, III/1/EFG/T5 Ta = 85 °C (185 °F), T6 Ta = 60 °C (140 °F), Type 4X • NI/I/2/ABCD/T5 Ta = 85 °C (185 °F), T6 Ta = 60 °C (140 °F), Type 4X • S/II, III/2/FG/T5 Ta = 85 °C (185 °F), T6 Ta = 60 °C (140 °F), Type 4X
Other certificates	IECEx, EAC Ex(GOST), INMETRO, NEPSI, KOSHA
Hardware and software requirements	
• For the parameterization software SIPROM T for SITRANS TF with TH200	
- Personal computer	PC with CD-ROM drive and USB
- PC operating system	Windows 98, NT, 2000, XP, 7 and Win 8
• For the parameterization software SIMATIC PDM for SITRANS TH300	See chapter 8 "Software", "SIMATIC PDM"
Communication	
Load for HART connection	230 ... 1100 Ω
• Two-core shielded	≤ 3.0 km (1.86 mi)
• Multi-core shielded	≤ 1.5 km (0.93 mi)
Protocol	HART protocol, version 5.9

Factory setting (transmitter):

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

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Digital measuring errors

Resistance thermometer

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

Resistance-based sensors

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

Thermocouples

Input	Measuring range	Min. measured span		Digital accuracy	
	°C / (°F)	°C	(°F)	°C	(°F)
Type B	100 ... 1820 (212 ... 3308)	100	(180)	2[1]	(3.6)[1]
Type C (W5)	0 ... 2300 (32 ... 4172)	100	(180)	2	(3.6)
Type D (W3)	0 ... 2300 (32 ... 4172)	100	(180)	1[2]	(1.8)[2]
Type E	-200 ... +1000 (-328 ... +1832)	50	(90)	1	(1.8)
Type J	-210 ... +1200 (-346 ... +2192)	50	(90)	1	(1.8)
Type K	-200 ... +1370 (-328 ... +2498)	50	(90)	1	(1.8)
Type L	-200 ... +900 (-328 ... +1652)	50	(90)	1	(1.8)
Type N	-200 ... +1300 (-328 ... +2372)	50	(90)	1	(1.8)
Type R	-50 ... +1760 (-58 ... +3200)	100	(180)	2	(3.6)
Type S	-50 ... +1760 (-58 ... +3200)	100	(180)	2	(3.6)
Type T	-20 ... +400 (-328 ... +752)	40	(72)	1	(1.8)
Type U	-200 ... +600 (-328 ... +1112)	50	(90)	2	(3.6)

[1] The digital accuracy in the range 0 to 300 °C (32 to 572 °F) is 3 °C (5.4 °F).

[2] The digital accuracy in the range 1750 to 2300 °C (3182 to 4172 °F) is 2 °C (3.6 °F).

mV sensor

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

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

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

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

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Selection and Ordering data — Article No.

Temperature transmitter in field housing Two-wire system 4 ... 20 mA, with electrical isolation, with documentation on MiniDVD	↗	**7NG313**	**-**					
↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.								
Integrated transmitter								
SITRANS TH200, programmable								
• Without Ex protection				**5**	**0**			
• With Ex ia				**5**	**1**			
• With Ex nAL for zone 2				**5**	**2**			
• Total device SITRANS TF Ex d[1]				**5**	**4**			
• Total device SITRANS TF according to FM (XP, DIP, NI, S)[1]				**5**	**5**			
SITRANS TH300, communication capability according to HART V 5.9								
• Without Ex-protection				**6**	**0**			
• With Ex ia				**6**	**1**			
• With Ex nAL for zone 2				**6**	**2**			
• Total device SITRANS TF Ex d[1]				**6**	**4**			
• Total device SITRANS TF according to FM (XP, DIP, NI, S)[1]				**6**	**5**			
Enclosure								
Die-cast aluminium						**A**		
Stainless steel precision casting						**E**		
Connections/cable inlet								
Screwed glands M20x1.5							**B**	
Screwed glands ½-14 NPT							**C**	
Digital indicator								
Without								**0**
With								**1**
Mounting bracket and securing parts								
Without								**0**
Made of steel								**1**
Made of stainless steel								**2**

Further designs Please add "**-Z**" to Article No. and specify Order code(s) and plain text.	Order code
Test protocol (5 measuring points)	**C11**
Functional safety SIL2	**C20**
Functional safety SIL2/3	**C23**
Explosion protection	
• Explosion protection Ex ia to INMETRO (Brazil) (only with 7NG313.-1....)	**E25**
• Explosion protection Ex d to INMETRO (Brazil) (only with 7NG313.-4....)	**E26**
• Explosion protection Ex nA to INMETRO (Brazil) (only with 7NG313.-2...)	**E27**
• Explosion protection Ex i to NEPSI (China) (only with 7NG313.-1...)	**E55**
• Explosion protection Ex d to NEPSI (China) (only with 7NG313.-4....)	**E56**
• Explosion protection Ex nA to NEPSI (China) (only with 7NG313.-2...)	**E57**
• Explosion protection Ex d to KOSHA (Korea) (only with 7NG313.-4...)	**E70**
• Two coats of lacquer on casing and cover (PU on epoxy)	**G10**
• Transient protection	**J01**
• Cable gland CAPRI 1/2 NPT ADE 4F, nickle-plated brass (CAPRI 848694 and 810634) included	**D57**
• Cable gland 1/2 NPT ADE 1F, cable diam. 6 ... 12 (CAPRI 818694 and 810534) included	**D58**
• Cable gland 1/2 NPT ADE 4F, stainless steel (CAPRI 848699 and 810634) included	**D59**
• Cable gland 1/2 NPT ADE 1F, cable diam. 4 ... 8.5 (CAPRI 818674 and 810534) included	**D60**

Selection and Ordering data — Order code

Customer-specific programming Add "**-Z**" to Article No. and specify Order code(s)	
Measuring range to be set Specify in plain text (max. 5 digits): Y01: ... to ... °C, °F	**Y01**[2]
Measuring point no. (TAG), max. 8 characters	**Y17**[3]
Meas. point descriptor, max. 16 characters	**Y23**[4]
Meas. point message, max. 32 characters	**Y24**[4]
Only inscription on measuring point label: specify in plain text: Measuring range	**Y22**[4]
Pt100 (IEC) 2-wire, R_L = 0 Ω	**U02**[5]
Pt100 (IEC) 3-wire	**U03**[5]
Pt100 (IEC) 4-wire	**U04**[5]
Thermocouple type B	**U20**[5][6]
Thermocouple type C (W5)	**U21**[5][6]
Thermocouple type D (W3)	**U22**[5][6]
Thermocouple type E	**U23**[5][6]
Thermocouple type J	**U24**[5][6]
Thermocouple type K	**U25**[5][6]
Thermocouple type L	**U26**[5][6]
Thermocouple type N	**U27**[5][6]
Thermocouple type R	**U28**[5][6]
Thermocouple type S	**U29**[5][6]
Thermocouple type T	**U30**[5][6]
Thermocouple type U	**U31**[5][6]
With TC: CJC external (Pt100, 3-wire)	**U41**
With TC: CJC external with fixed value, specify in plain text	**Y50**
Special differing customer-specific programming, specify in plain text	**Y09**[7]
Fail-safe value 3.6 mA (instead of 22.8 mA)	**U36**[3]

Supply units see Chapter "Supplementary Components".

1) Without cable gland.
2) For customer-specific programming for RTD and TC, the start value and the end value of the required measuring span must be specified here.
3) For this selection, Y01 or Y09 must also be selected.
4) If only Y22, Y23 or Y24 are ordered and the label only has to be on the tag plate, Y01 does not have to be specified.
5) For this selection, Y01 must also be selected.
6) Internal cold junction compensation is selected as the default for TC.
7) For customer-specific programming, for example mV and ohm, the start value and the end value of the required measuring span and the unit must be entered here.

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

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

► Available ex stock.

Supply units see Chapter "Supplementary Components".

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

Ordering example 1:
7NG3135-0AB11-Z Y01+Y23+U03
Y01: -10 ... +100 °C
Y23: TICA1234HEAT

Ordering example 2:
7NG3136-0AC11-Z Y01+Y23+Y24+U25
Y01: -10 ... +100 °C
Y23: TICA 1234 ABC
Y24: HEATING BOILER 56789

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

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Selection and Ordering data — Article No.

SITRANS TF field indicator for 4 ... 20 mA signals, with documentation on MiniDVD	↗	**7NG3130-**				
↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.						
Without Ex-protection			**0**		**1**	
With Ex ia			**1**		**1**	
With Ex nAL for zone 2			**2**		**1**	
Total device SITRANS TF Ex d[1]			**4**		**1**	
Total device SITRANS TF according to FM (XP, DIP, NI, S)[1]			**5**		**1**	
Enclosure						
Die-cast aluminium				**A**		
Stainless steel precision casting				**E**		
Connections/cable inlet						
Screwed glands M20x1.5					**B**	
Screwed glands ½-14 NPT					**C**	
Digital indicator						
With					**1**	
Mounting bracket and securing parts						
Without						**0**
Made of steel						**1**
Made of stainless steel						**2**

Further designs Please add "**-Z**" to Article No. and specify Order code(s) and plain text.	Order code
Test protocol (5 measuring points)	**C11**
Explosion protection	
• Explosion protection Ex ia to INMETRO (Brazil) (only with 7NG313.-1....)	**E25**
• Explosion protection Ex d to INMETRO (Brazil) (only with 7NG313.-4....)	**E26**
• Explosion protection Ex nA to INMETRO (Brazil) (only with 7NG313.-2...)	**E27**
• Explosion protection Ex i to NEPSI (China) (only with 7NG313.-1...)	**E55**
• Explosion protection Ex d to NEPSI (China) (only with 7NG313.-4....)	**E56**
• Explosion protection Ex nA to NEPSI (China) (only with 7NG313.-2...)	**E57**
• Explosion protection Ex d to KOSHA (Korea) (only with 7NG313.-4...)	**E70**
• Two coats of lacquer on casing and cover (PU on epoxy)	**G10**
• Transient protection	**J01**
• Cable gland CAPRI 1/2 NPT ADE 4F, nickle-plated brass (CAPRI 848694 and 810634) included	**D57**
• Cable gland 1/2 NPT ADE 1F, cable diam. 6 ... 12 (CAPRI 818694 and 810534) included	**D58**
• Cable gland 1/2 NPT ADE 4F, stainless steel (CAPRI 848699 and 810634) included	**D59**
• Cable gland 1/2 NPT ADE 1F, cable diam. 4 ... 8.5 (CAPRI 818674 and 810534) included	**D60**

Selection and Ordering data — Order code

Customer-specific programming Add "**-Z**" to Article No. and specify Order code(s)	
Measuring range to be set Specify in plain text (max. 5 digits): Y01: ... to ... °C, °F	**Y01**[2]
Only inscription on TAG plate: specify in plain text: Measuring range	**Y22**[3]
Only inscription on TAG plate: Measuring point descriptor, max. 16 characters	**Y23**[3]
Only inscription on TAG plate: Measuring point message, max. 27 characters	**Y24**[3]
Special differing customer-specific programming, specify in plain text	**Y09**[4]

Supply units see Chapter "Supplementary Components".

1) Without cable gland.

2) For customer-specific programming for RTD and TC, the start value and the end value of the required measuring span must be specified here.

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

4) For customer-specific programming, for example mV and ohm, the start value and the end value of the required measuring span and the unit must be entered here.

Selection and Ordering data — Article No.

Accessories		
MiniDVD for temperature measuring instruments with documentation in German, English, French, Spanish, Italian and Portuguese, and parameterization software SIPROM T (included in delivery with SITRANS TF)	►	**A5E00364512**
Mounting bracket and securing parts		
Made of steel for 7NG313.-..B..		**7MF4997-1AC**
Made of steel for 7NG313.-..C..		**7MF4997-1AB**
Made of stainless steel for 7NG313.-..B..	►	**7MF4997-1AJ**
Made of stainless steel for 7NG313.-..C..		**7MF4997-1AH**
Digital indicator[1]		**7MF4997-1BS**
Connection board		**A5E02226423**

► Available ex stock.

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

Ordering example 1:

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

Ordering example 2:

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

Factory setting (field indicator):

4 ... 20 mA

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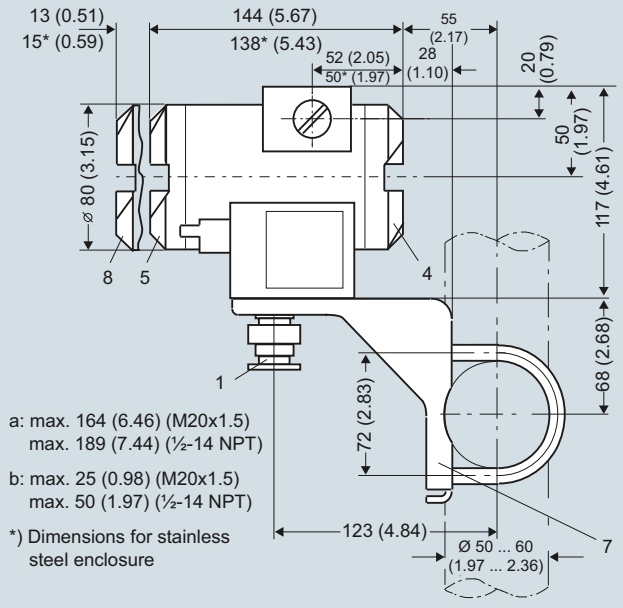
2

Dimensional drawings



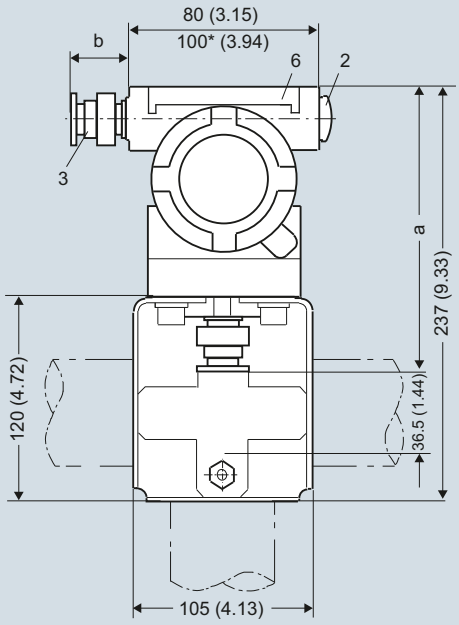
1 Sensor connection (screwed gland M20x1.5 or ½-14 NPT)

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)

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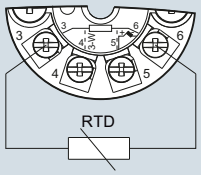
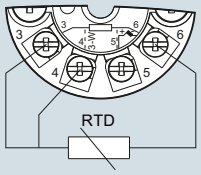
Schematics

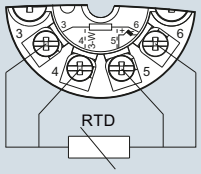
Resistance thermometer



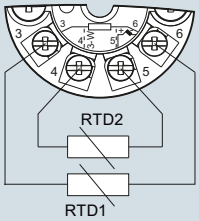
Two-wire system [1)]



Three-wire system

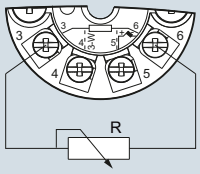


Four-wire system

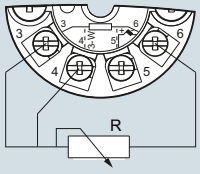


Generation of average value / difference [1)]

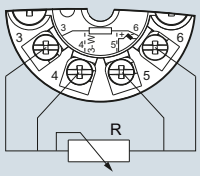
Resistance



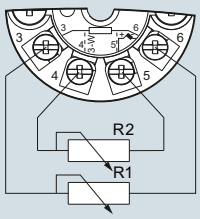
Two-wire system [1)]



Three-wire system

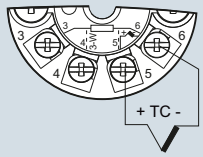


Four-wire system

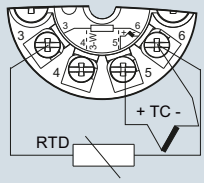


Generation of average value / difference [1)]

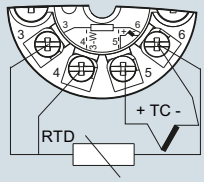
Thermocouple



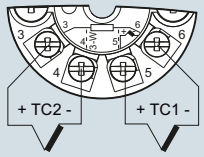
Cold junction compensation
Internal/fixed value



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



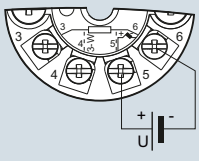
Cold junction compensation with external Pt100 in three-wire system



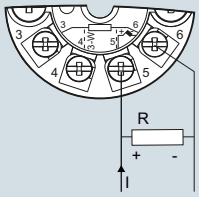
Generation of average value / difference with internal cold junction compensation

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

Voltage measurement



Current measurement



SITRANS TF, sensor connection assignment

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SITRANS TF fieldbus transmitter

2

Overview

Our field devices for heavy industrial use

- FOUNDATION fieldbus
- PROFIBUS PA

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

Benefits

- For universal use as a transmitter for resistance thermometers, thermocouple elements, Ω or mV signals
- Rugged two-chamber enclosure in die-cast aluminium or stainless steel
- Degree of protection IP66/67
- Can be mounted elsewhere if the measuring point
  - is hard to access,
  - is subject to high temperatures,
  - is subject to vibrations from the system,
  - or if you want to avoid long neck tubes and/or protective tubes.
- Can be mounted directly on American-design sensors
- Wide range of approvals for use in potentially explosive atmospheres. "Intrinsically safe, non-sparking and flameproof" type of protection, for Europe and USA

Application

The SITRANS TF can be used everywhere where temperatures need to be measured under particularly harsh conditions. Which is why users from all industries have opted for this field device.

The rugged enclosure protects the electronics. The stainless steel model is almost completely resistant to sea water and other aggressive elements.

The inner workings offer high measuring accuracy, universal input and a wide range of diagnostic options.

Function

Features

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

Transmitter with PROFIBUS PA communication

- Function blocks: 2 x analog

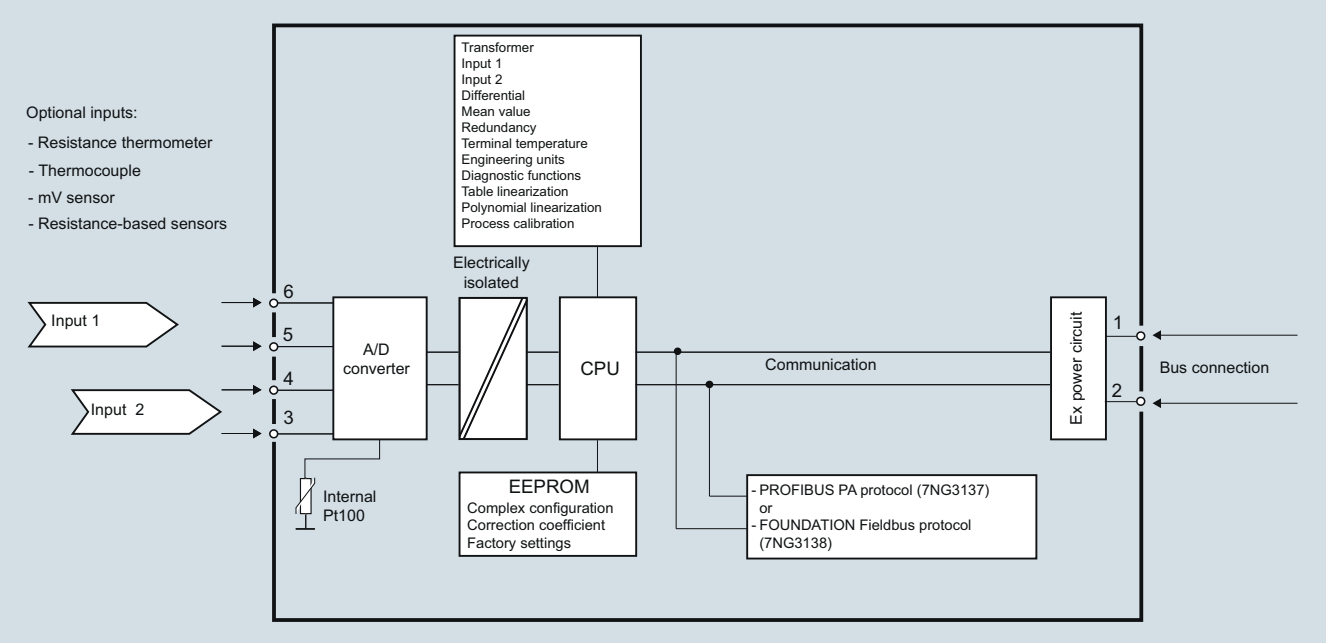
Transmitter with FOUNDATION fieldbus communication

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

Mode of operation

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

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



SITRANS TF with TH400, function diagram

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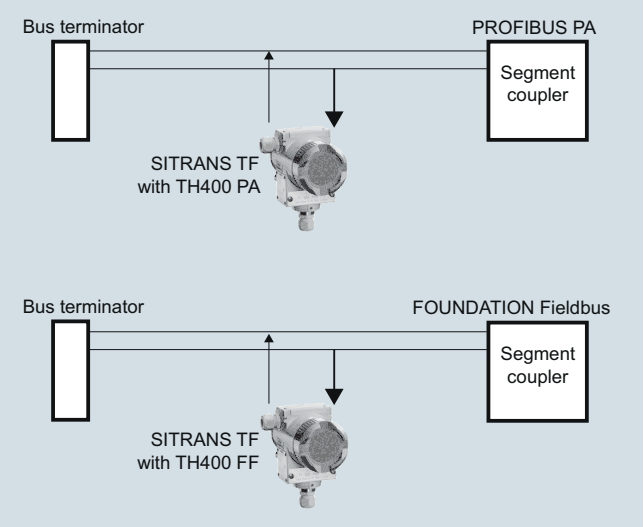
System communication



SITRANS TF with TH400, communication interface

Technical specifications

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

Measuring accuracy

Accuracy is defined as the higher value of general values and basic values.

General values

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

Basic values

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

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

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SITRANS TF fieldbus transmitter

Conditions of use	
Ambient conditions	
Permissible ambient temperature	-40 ... +85 °C (-40 ... +185 °F)
Permissible storage temperature	-40 ... +85 °C (-40 ... +185 °F)
Relative humidity	≤ 98 %, with condensation
Insulation resistance	
• Test voltage	500 V AC for 60 s
• Continuous operation	50 V AC/75 V DC
Electromagnetic compatibility	
NAMUR	NE21
EMC 2004/108/EC Emission and Noise Immunity	EN 61326-1, EN 61326-2-5
Construction	
Weight	Approx. 1.5 kg (3.3 lb) without options
Dimensions	See "Dimensional drawings"
Enclosure materials	• Die-cast aluminum, low in copper, GD-AlSi 12 or stainless steel • Polyester-based lacquer for GD AlSi 12 enclosure • Stainless steel rating plate
Electrical connection, sensor connection	• screw terminals • Cable inlet via M20 x 1.5 or ½ -14 NPT screwed gland • Bus connection with M12 plug (optional)
Mounting bracket (optional)	Steel, galvanized and chrome-plated or stainless steel
Degree of protection	IP66/67 to EN 60529
Auxiliary power	
Power supply	
• Standard, Ex "d", Ex "nA", Ex "nL", XP, NI	10.0 ... 32 V DC
• Ex "ia", Ex "ib"	10.0 ... 30 V DC
• In FISCO/FNICO installations	10.0 ... 17.5 V DC
Power consumption	< 11 mA
Max. increase in power consumption in the event of a fault	< 7 mA

Certificates and approvals	
Explosion protection ATEX	
EC type test certificate	ZELM 11 ATEX 0471 X
• Type of protection "intrinsic safety i" (version: 7NG313x-1xxxx)	II 2 (1) G Ex ib [ia Ga] IIC T6 Gb II 2 G Ex ib IIC T6 Gb II 1D Ex ia IIIC T100 °C Da
Conformity statement	ZELM 11 ATEX 0471 X
• "Operating equipment that is non-ignitable and has limited energy" type of protection (version: 7NG313x-2xxxx)	II 3 G Ex ic IIC T6/T4 Gc II 3 G Ex nA IIC T6/T4 Gc II 3 G Ex nA [ic] IIC T6/T4 Gc
EC type test certificate	ZELM 11 ATEX 0472 X
• "Flame-proof enclosure" type of protection (version: 7NG313x-4xxxx)	II 2 G Ex d IIC T6/T5 Gb II 2 D Ex tb IIIC T100 °C Db
Explosion protection: FM for USA	
• FM approval	FM 3017742
• Type of protection XP, DIP, NI and S (version 7NG313x-5xxxx)	XP / I / 1 / BCD / T5,T6; Type 4X DIP / II, III / 1 / EFG / T5,T6; Type 4X NI / I / 2 / ABCD / T5,T6; Type 4X S / II, III / 2 / FG T5,T6; Type 4X
Other certificates	EAC Ex(GOST), INMETRO, NEPSI, KOSHA
Communication	
Parameterization interface	
• PROFIBUS PA connection	
- Protocol	A&D profile, Version 3.0
- Protocol	EN 50170 Volume 2
- Address (for delivery)	126
- Function blocks	2 x analog
• FOUNDATION fieldbus connection	
- Protocol	FF protocol
- Protocol	FF design specifications
- Functionality	Basic or LAS
- Version	ITK 4.6
- Function blocks	2 x analog and 1 x PID
Factory setting	
for SITRANS TH400 PA	
Sensor	Pt100 (IEC)
Type of connection	3-wire circuit
Unit	°C
Failure mode	Last valid value
Filter time	0 s
PA address	126
PROFIBUS Ident No.	Manufacturer-specific
for SITRANS TH400 FF	
Sensor	Pt100 (IEC)
Type of connection	3-wire circuit
Unit	°C
Failure mode	Last valid value
Filter time	0 s
Node address	22

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Selection and Ordering data	Article No.
Temperature transmitter in field enclosure ↗ with fieldbus communication and electrical isolation, with documentation on MiniDVD ↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.	**7 N G 3 1 3 ■ - ■ ■ ■ 0 ■**
Integrated transmitter	
SITRANS TH400 with PROFIBUS PA	
• Without Ex protection	**7 0**
• With Ex ia (ATEX)	**7 1**
• With Ex nAL for zone 2 (ATEX)	**7 2**
• Total device SITRANS TF Ex d[1]	**7 4**
• Total device SITRANS TF according to FM (XP, DIP, NI, S)[1]	**7 5**
SITRANS TH400, with FOUNDATION fieldbus	
• Without Ex protection	**8 0**
• With Ex ia (ATEX)	**8 1**
• With Ex nAL for zone 2 (ATEX)	**8 2**
• Total device SITRANS TF Ex d[1]	**8 4**
• Total device SITRANS TF according to FM (XP, DIP, NI, S)[1]	**8 5**
Enclosure	
Die-cast aluminium	**A**
Stainless steel precision casting	**E**
Connections/cable inlet	
Screwed glands M20x1.5	**B**
Screwed gland s ½-14 NPT	**C**
Mounting bracket and fastening parts	
None	**0**
Made of steel	**1**
Stainless steel	**2**
Further designs Please add "**-Z**" to Article No. and specify Order code(s) and plain text.	Order code
Test report (5 measuring points)	**C11**
Bus connection	
• M12 plug (metal), without mating connector	**M00**[2]
• M12 plug (metal), with mating connector	**M01**[2]
Explosion protection	
• Explosion protection Ex ia to INMETRO (Brazil) (only with 7NG313.-1....)	**E25**
• Explosion protection Ex d to INMETRO (Brazil) (only with 7NG313.-4....)	**E26**
• Explosion protection Ex nA to INMETRO (Brazil) (only with 7NG313.-2...)	**E27**
• Explosion protection Ex i to NEPSI (China) (only with 7NG313.-1...)	**E55**
• Explosion protection Ex d to NEPSI (China) (only with 7NG313.-4....)	**E56**
• Explosion protection Ex nA to NEPSI (China) (only with 7NG313.-2...)	**E57**
• Explosion protection Ex d to KOSHA (Korea) (only with 7NG313.-4...)	**E70**
• Two coats of lacquer on casing and cover (PU on epoxy)	**G10**
• Transient protection	**J01**
• Cable gland CAPRI 1/2 NPT ADE 4F, nickle-plated brass (CAPRI 848694 and 810634) included	**D57**
• Cable gland 1/2 NPT ADE 1F, cable diam. 6 ... 12 (CAPRI 818694 and 810534) included	**D58**
• Cable gland 1/2 NPT ADE 4F, stainless steel (CAPRI 848699 and 810634) included	**D59**
• Cable gland 1/2 NPT ADE 1F, cable diam. 4 ... 8.5 (CAPRI 818674 and 810534) included	**D60**

Selection and Ordering data	Order code.
Customer-specific programming Add "**-Z**" to Article No. and specify Order code(s)	
Measuring range to be set Specify in plain text (max. 5 digits): Y01: ... to ... °C, °F	**Y01**[3]
Meas. point no. (TAG), max. 32 characters	**Y15**[4]
Meas. point descriptor, max. 32 characters	**Y23**[4]
Meas. point message, max. 32 characters	**Y24**[5]
Bus address, specify in plain text	**Y25**[4]
Pt100 (IEC) 2-wire, R_L = 0 Ω	**U02**[6]
Pt100 (IEC) 3-wire	**U03**[6]
Pt100 (IEC) 4-wire	**U04**[6]
Thermocouple type B	**U20**[6][7]
Thermocouple type C (W5)	**U21**[6][7]
Thermocouple type D (W3)	**U22**[6][7]
Thermocouple type E	**U23**[6][7]
Thermocouple type J	**U24**[6][7]
Thermocouple type K	**U25**[6][7]
Thermocouple type L	**U26**[6][7]
Thermocouple type N	**U27**[6][7]
Thermocouple type R	**U28**[6][7]
Thermocouple type S	**U29**[6][7]
Thermocouple type T	**U30**[6][7]
Thermocouple type U	**U31**[6][7]
With TC: CJC: external (Pt100, 3-wire)	**U41**
With TC: CJC: external with fixed value, specify in plain text	**Y50**
Special differing customer-specific programming, specify in plain text	**Y09**[8]

1) Without cable gland

2) Not available for explosion protection Ex d or XP.

3) For customer-specific programming for RTD and TC, the start value and the end value of the required measuring span must be specified here.

4) If only Y15, Y23 or Y25 are ordered and the label only has to be on the tag plate, Y01 does not have to be specified.

5) For this selection, Y01 or Y09 must also be selected.

6) For this selection, Y01 must also be selected.

7) Internal cold junction compensation is selected as the default for TC.

8) For customer-specific programming, for example mV and ohm, the start value and the end value of the required measuring span and the unit must be entered here.

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

► Available ex stock.

Ordering example 1:

7NG3137-0AB01-Z Y01+Y15+Y25+U03
Y01: -10 ... +100 °C
Y15: TICA1234HEAT
Y25: 33

Ordering example 2:

7NG3137-0AC01-Z Y01+Y15+Y25+U25
Y01: -10 ... +100 °C
Y15: TICA 1234 ABC 5678
Y25: 35

Factory setting:

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

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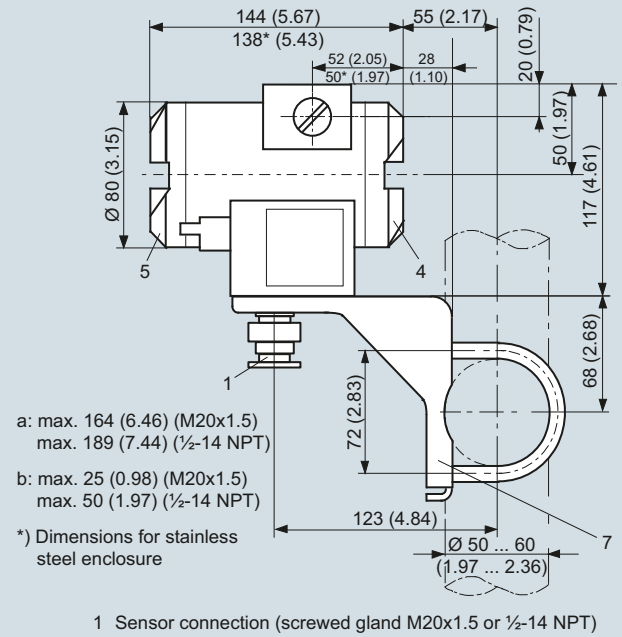
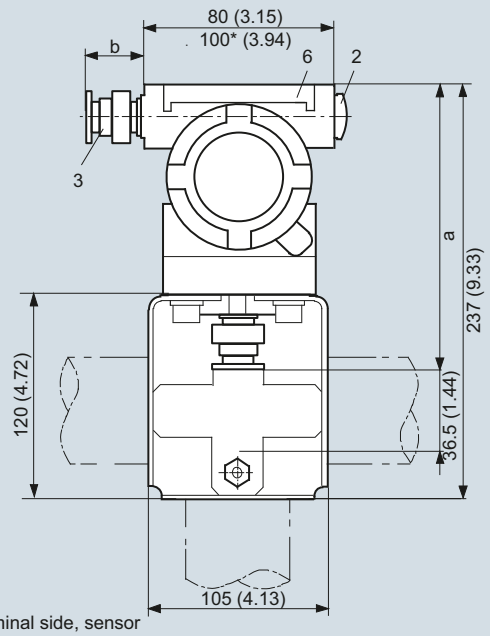
Dimensional drawings



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



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

SITRANS TF with TH400, dimensions in mm (inches)

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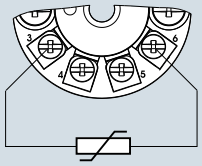
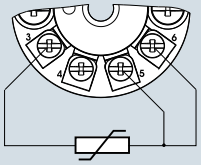
Schematics

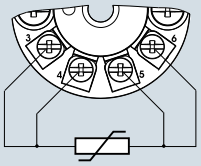
Resistance thermometer



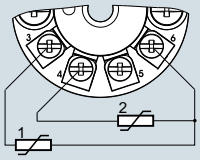
Two-wire system [1)]



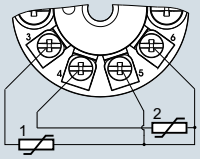
Three-wire system



Four-wire system

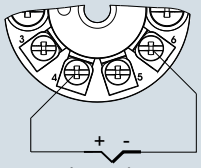


Mean-value/differential or redundancy generation
2 x two-wire system [1)]

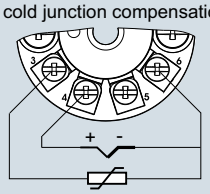


Mean-value/differential or redundancy generation
1 sensor in two-wire system [1)]
1 sensor in three-wire system

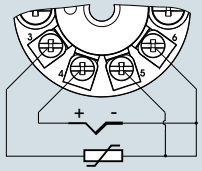
Thermocouple



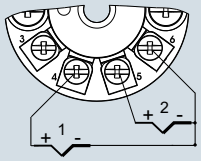
Internal
cold junction compensation



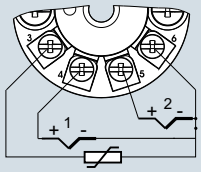
Cold junction compensation
with external Pt100 in two-wire system [1)]



Cold junction compensation
with external Pt100 in three-wire system

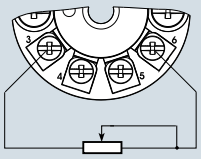


Mean value, differential or redundancy generation with internal cold junction compensation

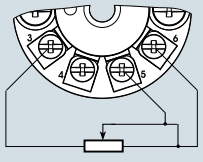


Mean value, differential or redundancy generation and cold junction compensation with internal Pt100 in two-wire system [1)]

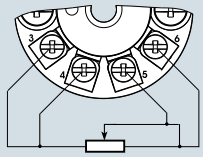
Resistance



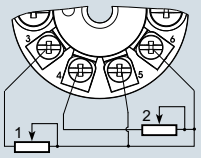
Two-wire system [1)]



Three-wire system

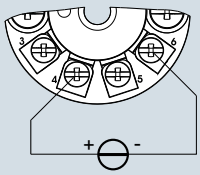


Four-wire system

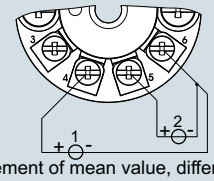


Mean value, differential or redundancy generation
1 resistor in two-wire system [1)]
1 resistor in three-wire system

Voltage measurement



One voltage source



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

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

SITRANS TF with TH400, sensor connection assignment