

## Temperature measurement

Temperature transmitters

Field transmitters/field indicator

### SITRANS TF320 (HART, universal)

#### Overview



SITRANS TF320 in dual chamber enclosure



SITRANS TF320 in single chamber enclosure

- 2-wire temperature transmitter with and without HART communication interface
- Universal input for virtually any type of temperature sensor
- Can be configured via PC, HART 7 or optional local operation

#### Benefits

- Universally applicable as a temperature transmitter with galvanic isolation for:
  - Resistance thermometer (2-wire, 3-wire, 4-wire connection)
  - Thermocouples
  - Linear resistances, potentiometer and DC voltage sources
- Local operation of the temperature transmitter via display (single chamber enclosure) or control keys accessible from outside (dual chamber enclosure)
- Rugged single or dual chamber enclosure made of die-cast aluminum or stainless steel 316L
- Electronic compartment isolated (watertight) from terminal compartment in dual chamber enclosure
- Degree of protection IP66/67/68 (1.5 m/2 h)
- Electromagnetic compatibility according to DIN EN 61326 and NE21
- Test terminals for direct read-out of the output signal without breaking the current loop
- Remote installation option:
  - Measuring point is difficult to access
  - Measuring point is subjected to high temperatures
  - Measuring point is subjected to vibration through plant
  - Long neck pipes and thermowells must be avoided
- Mounted directly on sensors
- Temperature transmitters of the "intrinsically safe protection type, increased safety for zone 2, flameproof and dust-protected" type of protection can be installed in hazardous areas. The transmitter meets the requirements of the EU Directive 2014/34/EU (ATEX), the FM and CSA regulations as well as other national approvals, e.g. EACEx, NEPSI, KCs, Inmetro.
- SIL2/3 (with order note C20)

#### Application

SITRANS TF320 can be used everywhere where temperatures need to be measured under particularly adverse conditions and where a user-friendly 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 substances. 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 7 permits parameterization using a PC or HART communicator (hand-held communicator). The SIMATIC PDM makes it easy.

For the SITRANS TF320 without HART functionality, parameters are assigned with the PC. A special modem and the software tool SIPROM T are available for this purpose.

The optional local operation on the device gives you the possibility to configure the device's most important functions very quickly.

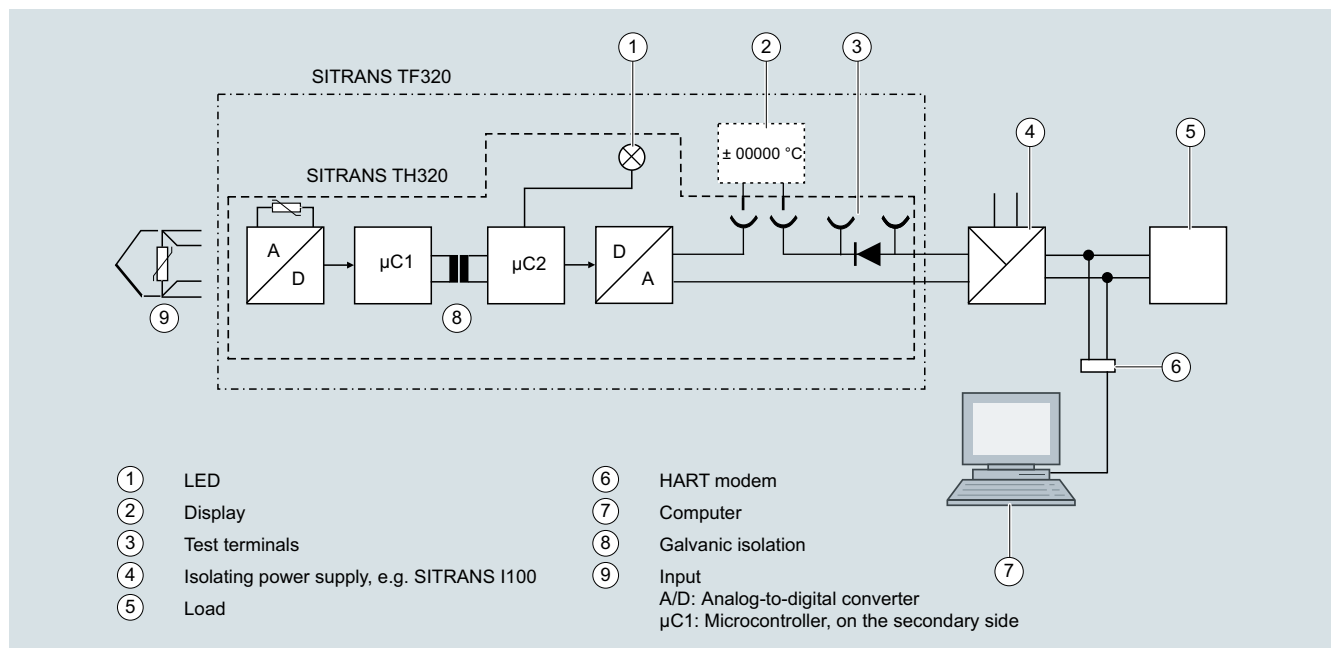
### Principle of operation

#### SITRANS TF320 as temperature transmitter

The input signal, whether resistance thermometer (RTD), thermocouple (TC),  $\Omega$  or mV signal, is amplified and linearized. Input and output side are galvanically isolated. An internal cold junction is integrated for measurements with thermocouples.

The device outputs a temperature-linear direct current from 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 TF320 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.



Function block diagram SITRANS TF320 with integrated SITRANS TH320

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#### Technical specifications

##### General

Supply voltage <sup>1) 2)</sup>	
• Without explosion protection (non-Ex)	10.5 ... 48 V DC
• with explosion protection (Ex i)	10.5 ... 30 V DC
Additional minimum supply voltage when using test terminals	0.8 V
Maximum power loss	≤ 850 mW
Minimum load resistance at supply voltage > 37 V	(V <sub>supply</sub> - 37 V)/23 mA
Insulation voltage, test/operation	
• Without explosion protection (non-Ex)	2.5 kV AC/55 V AC
• with explosion protection (Ex i)	2.5 kV AC/42 V AC
Polarity protection	All inputs and outputs
Write protection	Wire jumper (transmitter), switch (on display) or software
Warm-up time	< 5 min
Starting time	< 2.75 s
Programming	SIPROM T and HART
Signal-to-noise ratio	> 60 dB
Long-term stability	Better than: • ± 0.05% of measuring span/year • ± 0.18% of measuring span/5 years
Response time	4 ... 20 mA: ≤ 55 ms HART: ≤ 75 ms (typically 70 ms)
Programmable damping	0 ... 60 s
Signal dynamic	
• Input	24 bit
• Output	18 bit
Influence of change in supply voltage	< 0.005% of measuring span/V DC

##### Input

###### Resistance thermometer (RTD)

Input type	
• Pt10 ... 10000	<ul style="list-style-type: none"> <li>• IEC 60751</li> <li>• JIS C 1604-8</li> <li>• GOST 6651_2009</li> <li>• Callendar-Van Dusen</li> </ul>
• Ni10 ... 10000	<ul style="list-style-type: none"> <li>• DIN 43760-1987</li> <li>• GOST 6651-2009/OIML R84:2003</li> </ul>
• Cu5 ... 1000	<ul style="list-style-type: none"> <li>• Edison Copper Winding No. 15</li> <li>• GOST 6651-2009/OIML R84:2003</li> </ul>
Type of connection	2-wire, 3-wire or 4-wire
Line resistance per wire	Max. 50 Ω
Input current	< 0.15 mA
Effect of the line resistance (with 3-wire and 4-wire connections)	< 0.002 Ω/Ω
Cable, wire-wire capacity	
• Pt1000, Pt10000 (IEC 60751 and JIS C 1604-8)	Max. 30 nF
• All other input types	Max. 50 nF
Fault detection, programmable	None, short-circuited, defective, short-circuited or defective

##### Note

When the low limit for the configured input type is below the constant detection limit for short-circuited inputs, the detection of short circuits is disabled regardless of the configuration of the fault detection.

Detection limit for short-circuited input	15 Ω
Fault detection time (RTD)	≤ 75 ms (typically 70 ms)
Fault detection time (for 3-wire and 4-wire)	≤ 2 000 ms
<u>Thermocouples (TC)</u>	
Input type	
• B	IEC 60584-1
• E	IEC 60584-1
• J	IEC 60584-1
• K	IEC 60584-1
• L	DIN 43710
• Lr	GOST 3044-84
• N	IEC 60584-1
• R	IEC 60584-1
• S	IEC 60584-1
• T	IEC 60584-1
• U	DIN 43710
• W3	ASTM E988-96
• W5	ASTM E988-96
• LR	GOST 3044-84
Cold junction compensation (CJC)	Constant, internal or external over Pt100 or Ni100 RTD
• Temperature range internal CJC	-50 ... +100 °C (-58 ... +212 °F)
• Connection external CJC	2-wire or 3-wire
• External CJC, line resistance per wire (for 3-wire and 4-wire connections)	50 Ω
• Effect of the line resistance (with 3-wire and 4-wire connections)	< 0.002 Ω/Ω
• Input current external CJC	< 0.15 mA
• Temperature range external CJC	-50 ... +135 °C (-58 ... +275 °F)
• Cable, wire-wire capacity	Max. 50 nF
• Total line resistance	Max. 10 kΩ
• Fault detection, programmable	None, short-circuited, defective, short-circuited or defective
<b>Note</b>	
The short-circuited fault detection only applies to the CJC input.	
• Fault detection time (TC)	≤ 75 ms (typically 70 ms)
• Fault detection time, external CJC (for 3-wire and 4-wire)	≤ 2 000 ms
<u>Linear resistance</u>	
Input range	0 ... 100 kΩ
Minimum measuring span	25 Ω
Type of connection	2-wire, 3-wire or 4-wire
Line resistance per wire	Max. 50 Ω
Input current	< 0.15 mA
Effect of the line resistance (with 3-wire and 4-wire connections)	< 0.002 Ω/Ω
Cable, wire-wire capacity	
• R > 400 Ω	Max. 30 nF
• R ≤ 400 Ω	Max. 50 nF
Fault detection, programmable	None, defective

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<b>Potentiometers</b>		<b>Rated conditions</b>	
Input range	10 Ω ... 100 kΩ	Ambient temperature	-50 ... +85 °C (-58 ... +185 °F)
Minimum measuring span	25 Ω	<ul style="list-style-type: none"> <li>Without local operation in single chamber enclosure</li> <li>With local operation</li> <li>For transmitters with functional safety</li> </ul>	-40 ... +85 °C (-40 ... +185 °F) -40 ... +80 °C (-40 ... +176 °F)
Type of connection	2-wire, 3-wire or 4-wire	Storage temperature	-50 ... +85 °C (-58 ... +185 °F)
Line resistance per wire	Max. 50 Ω	Reference temperature for sensor calibration	24 °C ±1.0 °C (75.2 °F ±1.8 °F)
Input current	< 0.15 mA	Relative humidity	< 99% (no condensation)
Effect of the line resistance (with 4-wire and 5-wire connections)	< 0.002 Ω/Ω	Degree of protection	
Cable, wire-wire capacity		<ul style="list-style-type: none"> <li>Temperature transmitter enclosure</li> <li>Terminals</li> </ul>	IP66/IP67/IP68 IP00
<ul style="list-style-type: none"> <li>R &gt; 400 Ω</li> <li>R ≤ 400 Ω</li> </ul>	Max. 30 nF Max. 50 nF	<b>Mechanical construction</b>	
Fault detection, programmable	None, short-circuited, defective, short-circuited or defective	Weight	
<b>Note</b>		<ul style="list-style-type: none"> <li>Single chamber enclosure</li> <li>Dual chamber enclosure</li> </ul>	0.85 kg (1.87 lb) <ul style="list-style-type: none"> <li>Aluminum: 1.3 kg (2.87 lb)</li> <li>Stainless steel: 3.3 kg (7.28 lb)</li> </ul>
When the configured potentiometer size is below the constant detection limit for short-circuited inputs, the detection of short circuits is disabled regardless of the configuration of the fault detection.		Maximum core cross-section	
Detection limit for short-circuited input	15 Ω	<ul style="list-style-type: none"> <li>Single chamber enclosure</li> <li>Dual chamber enclosure</li> </ul>	1.5 mm <sup>2</sup> (AWG 16) 2.5 mm <sup>2</sup> (AWG 14)
Fault detection time, wiper arm (no short-circuit detection)	≤ 75 ms (typically 70 ms)	Tightening torque for clamping screws	0.5 ... 0.6 Nm
Fault detection time, element	≤ 2 000 ms	Vibrations	IEC 60068-2-6 ± 1.6 mm (0.07 inch) ± 4 g
Fault detection time (for 4-wire and 5-wire)	≤ 2 000 ms	<b>Certificates and approvals</b>	
<b>Supply voltage</b>		<b>Explosion protection ATEX/IECEX and others</b>	
Measuring range		Certificates <sup>3)</sup>	
<ul style="list-style-type: none"> <li>Unipolar</li> <li>Bipolar</li> </ul>	-100 ... 1700 mV -800 ... +800 mV	IECEX DEK 19.0069X DEKRA 19ATEX0106 X (Category 1) DEKRA 19ATEX0107 X (Category 3)	
Minimum measuring span	2.5 mV	"Intrinsic safety ia/ib" type of protection	
Input resistance	10 MΩ	<ul style="list-style-type: none"> <li>ATEX</li> <li>IECEX and others</li> <li>EACEx</li> </ul>	
Cable, wire-wire capacity		"Intrinsic safety ic" type of protection	
<ul style="list-style-type: none"> <li>Input range: -100 ... 1700 mV</li> <li>Input range: -20 ... 100 mV</li> </ul>	Max. 30 nF Max. 50 nF	<ul style="list-style-type: none"> <li>ATEX</li> <li>IECEX and others</li> <li>EACEx</li> </ul>	
Fault detection, programmable	None, defective	"Non-sparking/increased safety nA/ec" type of protection	
Fault detection time	≤ 75 ms (typically 70 ms)	<ul style="list-style-type: none"> <li>ATEX</li> <li>IECEX and others</li> <li>EACEx</li> <li>"Flameproof enclosure db" type of protection</li> <li>ATEX</li> <li>IECEX and others</li> <li>EACEx</li> <li>"Protection by enclosure tb" type of protection</li> <li>ATEX</li> <li>IECEX and others</li> <li>EACEx</li> </ul>	
<b>Output and HART communication</b>		For use in Zone 0, 1, 2	
Normal range, programmable	3.8 ... 20.5 mA/20.5 ... 3.8 mA	II 1 G Ex ia IIC T6 ... T4 Ga II 2(1) G Ex ib [ia Ga] IIC T6 ... T4 Gb	
Extended range (output limits), programmable	3.5 ... 23 mA/23 ... 3.5 mA	Ex ia IIC T6 ... T4 Ga Ex ib [ia Ga] IIC T6 ... T4 Gb Ex ia IIC T6 ... T4 Ga Ex ib [ia Ga] IIC T6 ... T4 Gb	
Programmable input/output limits		For use in Zones 2	
<ul style="list-style-type: none"> <li>Fault current</li> <li>Fault current setting</li> </ul>	Enable/disable 3.5 ... 23 mA	<ul style="list-style-type: none"> <li>ATEX</li> <li>IECEX and others</li> <li>EACEx</li> </ul>	
Update time	10 ms	For use in Zones 2	
Load (with current output)	≤ (V <sub>Supply</sub> - 10.5)/0.023 Ω	<ul style="list-style-type: none"> <li>ATEX</li> <li>IECEX and others</li> <li>EACEx</li> <li>"Flameproof enclosure db" type of protection</li> <li>ATEX</li> <li>IECEX and others</li> <li>EACEx</li> <li>"Protection by enclosure tb" type of protection</li> <li>ATEX</li> <li>IECEX and others</li> <li>EACEx</li> </ul>	
Load stability	< 0.01% of measuring span/100 Ω (measuring span = currently selected range)	II 2 G Ex nA IIC T6 ... T4 Gc II 2 G Ex ec IIC T6 ... T4 Gc Ex nA IIC T6 ... T4 Gc Ex ec IIC T6 ... T4 Gc 2Ex nA IIC T6 ... T4 Gc	
Input fault detection, programmable (detection of input short circuits is ignored with TC and voltage inputs)	3.5 ... 23 mA	For use in Zone 1	
NAMUR NE43 Upscale	> 21 mA	II 2 G Ex db IIC T6 ... T4 Gb Ex db IIC T6 ... T4 Gb 1Ex d IIC T6 ... T4 Gb X	
NAMUR NE43 Downscale	< 3.6 mA	For use in Zone 21	
HART protocol versions	HART 7	II 2 D Ex tb IIC T100°C Db Ex tb IIC T100°C Db Ex tb IIC T100°C Db X	
<b>Measuring accuracy</b>			
Input accuracy	See "Input accuracy" table		
Output accuracy	See "Output accuracy" table		

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Explosion protection CSA/FM for Canada and USA

Certificates	FMxxCAxxxx FMxxUSxxxx
"Intrinsic safety ia" type of protection	IS, CL I, Div 1, GP ABCD, T6 ... T4 Ex ia IIC T6 ... T4 Ga AEx ia IIC T6 ... T4 Ga or: Ex ib [ia Ga] IIC T6...T4 Gb AEx ib [ia Ga] IIC T6...T4 Gb
"Non incandive field wiring NIFW" type of protection	NIFW, CL I, Div 2, GP ABCD T6 ... T4
"Non incandive NI" type of protection	NI, CL I, Div 2, GP ABCD T6...T4 Ex nA IIC T6 ... T4 Gc AEx nA IIC T6 ... T4 Gc
"Explosion-proof XP" type of protection	XP/ CL I / DIV1 / GP ABCD / T6...T4 CL I / Zn1 / AEx/Ex d IIC T6...T4 Gb
"Dust-protected DIP" type of protection	DIP/ CL II, III / DIV 1 / GP EFG / T6...T4 Zn21 / AEx/Ex tb IIC T100°C Gb

- Note that the minimum supply voltage must correspond to the value measured at the terminals of the SITRANS TF320.  
All external voltage drops must be taken into consideration.
- Protect the device from overvoltage with the help of a suitable power supply or suitable overvoltage protection equipment.
- Additional available certificates are listed on the Internet at <http://www.siemens.com/processinstrumentation/certificates>

### Measuring ranges/Minimum measuring span

#### RTD

Input type	Standard	Measuring range in °C (°F)	$\alpha_0$ in °C <sup>-1</sup> (°F <sup>-1</sup> )	Minimum measuring span in °C (°F)
<b>Pt10 ... 10000</b>	IEC 60751	-200 ... +850 (-328 ... +1 562)	0.003851 (0.002139)	10 (50)
	JIS C 1604-8	-200 ... +649 (-328 ... +1 200)	0.003916 (0.002176)	10 (50)
	GOST 6651_2009	-200 ... +850 (-328 ... +1 562)	0.003910 (0.002172)	10 (50)
	Callendar-Van Dusen	-200 ... +850 (-328 ... +1 562)	-	10 (50)
<b>Ni10 ... 10000</b>	DIN 43760-1987	-60 ... +250 (-76 ... +482)	0.006180 (0.003433)	10 (50)
	GOST 6651-2009/OIML R84:2003	-60 ... +180 (-76 ... +356)	0.006170 (0.003428)	10 (50)
<b>Cu5 ... 1000</b>	Edison Copper Winding No. 15	-200 ... +260 (-328 ... +500)	0.004270 (0.002372)	100 (212)
	GOST 6651-2009/OIML R84:2003	-180 ... +200 (-292 ... +392)	0.004280 (0.002378)	100 (212)
	GOST 6651-94	-50 ... +200 (-58 ... +392)	0.004260 (0.002367)	100 (212)

#### TC

Input type	Standard	Measuring range in °C (°F)	Minimum measuring span in °C (°F)
B	IEC 60584-1	0 (85) ... 1 820 (32 (185) ... 3 308)	100 (212)
E	IEC 60584-1	-200 ... +1 000 (-392 ... +1 832)	50 (122)
J	IEC 60584-1	-100 ... +1 200 (-212 ... +2 192)	50 (122)
K	IEC 60584-1	-180 ... +1 372 (-356 ... +2 502)	50 (122)
L	DIN 43710	-200 ... +900 (-392 ... +1 652)	50 (122)
Lr	GOST 3044-84	-200 ... +800 (-392 ... +1 472)	50 (122)
N	IEC 60584-1	-180 ... +1 300 (-356 ... +2 372)	50 (122)
R	IEC 60584-1	-50 ... +1 760 (-122 ... +3 200)	100 (212)
S	IEC 60584-1	-50 ... +1 760 (-122 ... +3 200)	100 (212)
T	IEC 60584-1	-200 ... +400 (-392 ... +752)	50 (122)
U	DIN 43710	-200 ... +600 (-392 ... +1 112)	50 (122)
W3	ASTM E988-96	0 ... 2 300 (32 ... 4 172)	100 (212)
W5	ASTM E988-96	0 ... 2 300 (32 ... 4 172)	100 (212)
LR	GOST 3044-84	-200 ... +800 (-392 ... +1472)	50 (122)

### Input accuracy

#### Basic values

Input type	Basic accuracy	Temperature coefficient <sup>1)</sup>
<b>RTD</b>		
Pt10	$\leq \pm 0.8 \text{ }^\circ\text{C}$ (1.44 °F)	$\leq \pm 0.020 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Pt20	$\leq \pm 0.4 \text{ }^\circ\text{C}$ (0.72 °F)	$\leq \pm 0.010 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Pt50	$\leq \pm 0.16 \text{ }^\circ\text{C}$ (0.288 °F)	$\leq \pm 0.004 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Pt100	$\leq \pm 0.04 \text{ }^\circ\text{C}$ (0.072 °F)	$\leq \pm 0.002 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Pt200	$\leq \pm 0.08 \text{ }^\circ\text{C}$ (0.144 °F)	$\leq \pm 0.002 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Pt500	$T_{\text{max.}} < 180 \text{ }^\circ\text{C}$ (356 °F) $\leq \pm 0.08 \text{ }^\circ\text{C}$ (0.144 °F) $T_{\text{max.}} > 180 \text{ }^\circ\text{C}$ (356 °F) $\leq \pm 0.16 \text{ }^\circ\text{C}$ (0.288 °F)	$\leq \pm 0.002 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Pt1000	$\leq \pm 0.08 \text{ }^\circ\text{C}$ (0.144 °F)	$\leq \pm 0.002 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Pt2000	$T_{\text{max.}} < 300 \text{ }^\circ\text{C}$ (572 °F) $\leq \pm 0.08 \text{ }^\circ\text{C}$ (0.144 °F) $T_{\text{max.}} > 300 \text{ }^\circ\text{C}$ (572 °F) $\leq \pm 0.4 \text{ }^\circ\text{C}$ (0.72 °F)	$\leq \pm 0.002 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Pt10000	$\leq \pm 0.16 \text{ }^\circ\text{C}$ (0.288 °F)	$\leq \pm 0.002 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Pt x	Largest tolerance of neighboring points	Largest temperature coefficient of neighboring points
Ni10	$\leq \pm 1.6 \text{ }^\circ\text{C}$ (2.88 °F)	$\leq \pm 0.020 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Ni20	$\leq \pm 0.8 \text{ }^\circ\text{C}$ (1.44 °F)	$\leq \pm 0.010 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Ni50	$\leq \pm 0.32 \text{ }^\circ\text{C}$ (0.576 °F)	$\leq \pm 0.004 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Ni100	$\leq \pm 0.16 \text{ }^\circ\text{C}$ (0.288 °F)	$\leq \pm 0.002 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Ni120	$\leq \pm 0.16 \text{ }^\circ\text{C}$ (0.288 °F)	$\leq \pm 0.002 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Ni200	$\leq \pm 0.16 \text{ }^\circ\text{C}$ (0.288 °F)	$\leq \pm 0.002 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Ni500	$\leq \pm 0.16 \text{ }^\circ\text{C}$ (0.288 °F)	$\leq \pm 0.002 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Ni1000	$\leq \pm 0.16 \text{ }^\circ\text{C}$ (0.288 °F)	$\leq \pm 0.002 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Ni2000	$\leq \pm 0.16 \text{ }^\circ\text{C}$ (0.288 °F)	$\leq \pm 0.002 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Ni10000	$\leq \pm 0.32 \text{ }^\circ\text{C}$ (0.576 °F)	$\leq \pm 0.002 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Ni x	Largest tolerance of neighboring points	Largest temperature coefficient of neighboring points
Cu5	$\leq \pm 1.6 \text{ }^\circ\text{C}$ (2.88 °F)	$\leq \pm 0.040 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Cu10	$\leq \pm 0.8 \text{ }^\circ\text{C}$ (1.44 °F)	$\leq \pm 0.020 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Cu20	$\leq \pm 0.4 \text{ }^\circ\text{C}$ (0.72 °F)	$\leq \pm 0.010 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Cu50	$\leq \pm 0.16 \text{ }^\circ\text{C}$ (0.288 °F)	$\leq \pm 0.004 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Cu100	$\leq \pm 0.08 \text{ }^\circ\text{C}$ (0.144 °F)	$\leq \pm 0.002 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Cu200	$\leq \pm 0.08 \text{ }^\circ\text{C}$ (0.144 °F)	$\leq \pm 0.002 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Cu500	$\leq \pm 0.16 \text{ }^\circ\text{C}$ (0.288 °F)	$\leq \pm 0.002 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Cu1000	$\leq \pm 0.08 \text{ }^\circ\text{C}$ (0.144 °F)	$\leq \pm 0.002 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Cu x	Largest tolerance of neighboring points	Largest temperature coefficient of neighboring points
<b>Linear resistance</b>		
0 ... 400 $\Omega$	$\leq \pm 40 \text{ m}\Omega$	$\leq \pm 2 \text{ m}\Omega/^\circ\text{C}$ (1.11 $\text{m}\Omega/^\circ\text{F}$ )
0 ... 100 $\text{k}\Omega$	$\leq \pm 4 \text{ }\Omega$	$\leq \pm 0.2 \text{ }\Omega/^\circ\text{C}$ (0.11 $\Omega/^\circ\text{F}$ )
<b>Potentiometers</b>		
0 ... 100%	$< 0.05\%$	$< \pm 0.005\%$
<b>Supply voltage</b>		
mV: -20 ... 100 mV	$\leq \pm 5 \text{ }\mu\text{V}$	$\leq \pm 0.2 \text{ }\mu\text{V}/^\circ\text{C}$ (0.11 $\mu\text{V}/^\circ\text{F}$ )
mV: -100 ... 1700 mV	$\leq \pm 0.1 \text{ mV}$	$\leq \pm 36 \text{ }\mu\text{V}/^\circ\text{C}$ (20 $\mu\text{V}/^\circ\text{F}$ )
mV: $\pm 800 \text{ mV}$	$\leq \pm 0.1 \text{ mV}$	$\leq \pm 32 \text{ }\mu\text{V}/^\circ\text{C}$ (17.8 $\mu\text{V}/^\circ\text{F}$ )
<b>TC</b>		
E	$\leq \pm 0.2 \text{ }^\circ\text{C}$ (0.36 °F)	$\leq \pm 0.025 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
J	$\leq \pm 0.25 \text{ }^\circ\text{C}$ (0.45 °F)	$\leq \pm 0.025 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
K	$\leq \pm 0.25 \text{ }^\circ\text{C}$ (0.45 °F)	$\leq \pm 0.025 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
L	$\leq \pm 0.35 \text{ }^\circ\text{C}$ (0.63 °F)	$\leq \pm 0.025 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
N	$\leq \pm 0.4 \text{ }^\circ\text{C}$ (0.72 °F)	$\leq \pm 0.025 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
T	$\leq \pm 0.25 \text{ }^\circ\text{C}$ (0.45 °F)	$\leq \pm 0.025 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
U	$< 0 \text{ }^\circ\text{C}$ (32 °F) $\leq \pm 0.8 \text{ }^\circ\text{C}$ (1.44 °F) $\geq 0 \text{ }^\circ\text{C}$ (32 °F) $\leq \pm 0.4 \text{ }^\circ\text{C}$ (0.72 °F)	$\leq \pm 0.025 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Lr	$\leq \pm 0.2 \text{ }^\circ\text{C}$ (0.36 °F)	$\leq \pm 0.1 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
R	$< 200 \text{ }^\circ\text{C}$ (392 °F) $\leq \pm 0.5 \text{ }^\circ\text{C}$ (0.9 °F) $\geq 200 \text{ }^\circ\text{C}$ (392 °F) $\leq \pm 1 \text{ }^\circ\text{C}$ (1.8 °F)	$\leq \pm 0.1 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
S	$< 200 \text{ }^\circ\text{C}$ (392 °F) $\leq \pm 0.5 \text{ }^\circ\text{C}$ (0.9 °F) $\geq 200 \text{ }^\circ\text{C}$ (392 °F) $\leq \pm 1 \text{ }^\circ\text{C}$ (1.8 °F)	$\leq \pm 0.1 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)

## Temperature measurement

Temperature transmitters

Field transmitters/field indicator

### SITRANS TF320 (HART, universal)

Input type	Basic accuracy	Temperature coefficient <sup>1)</sup>
W3	$\leq \pm 0.6 \text{ }^\circ\text{C}$ (1.08 °F)	$\leq \pm 0.1 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
W5	$\leq \pm 0.4 \text{ }^\circ\text{C}$ (0.72 °F)	$\leq \pm 0.1 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
B <sup>2)</sup>	$\leq \pm 1 \text{ }^\circ\text{C}$ (1.8 °F)	$\leq \pm 0.1 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
B <sup>3)</sup>	$\leq \pm 3 \text{ }^\circ\text{C}$ (5.4 °F)	$\leq \pm 0.1 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
B <sup>4)</sup>	$\leq \pm 8 \text{ }^\circ\text{C}$ (14.4 °F)	$\leq \pm 0.8 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
B <sup>5)</sup>	Not specified	Not specified
CJC (internal)	$< \pm 0.5 \text{ }^\circ\text{C}$ (0.9 °F)	Included in basic accuracy
CJC (external)	$\leq \pm 0.08 \text{ }^\circ\text{C}$ (0.144 °F)	$\leq \pm 0.002 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)

<sup>1)</sup> Temperature coefficients correspond to the specified values or 0.002% of the input span, depending on which value is greater.

<sup>2)</sup> Accuracy of the specification range  $> 400 \text{ }^\circ\text{C}$  (752 °F)

<sup>3)</sup> Accuracy of the specification range  $> 160 \text{ }^\circ\text{C}$  (320 °F)  $< 400 \text{ }^\circ\text{C}$  (752 °F)

<sup>4)</sup> Accuracy of the specification range  $> 85 \text{ }^\circ\text{C}$  (185 °F)  $< 160 \text{ }^\circ\text{C}$  (320 °F)

<sup>5)</sup> Accuracy of the specification range  $< 85 \text{ }^\circ\text{C}$  (185 °F)

### Output accuracy

Output type	Basic accuracy	Temperature coefficient
Analog output	$\leq \pm 1.6 \text{ } \mu\text{A}$ (0.01% of the full output span)	$\leq \pm 0.48 \text{ } \mu\text{A/K}$ ( $\leq \pm 0.003\%$ of the full output span/K)

#### Selection and ordering data

##### Single chamber enclosure

	Article No.	Options	Order Code
<b>SITRANS TF320 Temperature transmitter with single chamber enclosure for wall or pipe mounting, one configurable input and a galvanically isolated 2-wire output.</b> <a href="#">Click on the Article No. for the online configuration in the PIA Life Cycle Portal.</a>	<b>7NG034</b> 	Append <b>"Z"</b> to Article No., add order code and, if applicable, free text.	
<b>Communication</b> With HART (4 ... 20 mA) Without HART (4 ... 20 mA)	0 7	<b>Cable gland included</b> Plastic Metal Stainless steel Stainless steel 316L/1.4404 CMP, for XP devices CAPRI ADE 4F, CuZn, cable inner diameter 7 ... 12 mm, cable outer diameter 10 ... 16 mm CAPRI ADE 4F, stainless steel, cable inner diameter 7 ... 12 mm, cable outer diameter 10 ... 16 mm	A00 A01 A02 A03 A10 A11 A12
<b>Primary value output</b> Input 1	0	<b>Mounting cable glands/plugs</b> Cable gland mounted Device plug for output, mounted right	A97 A98
<b>Input 1, type</b> RTD <ul style="list-style-type: none"> <li>Pt100 (IEC 60751), 3-wire</li> <li>Pt100 (IEC 60751), 4-wire</li> <li>Pt1000 (IEC 60751), 3-wire</li> <li>Pt1000 (IEC 60751), 4-wire</li> </ul> TC <ul style="list-style-type: none"> <li>Type B</li> <li>Type E</li> <li>Type J</li> <li>Type K</li> <li>Type L</li> <li>Type N</li> <li>Type R</li> <li>Type S</li> <li>Type T</li> </ul> Potentiometer, 4-wire	B C D E F G H J K L N P Q R	<b>Device options</b> Degree of protection IP66 / IP68 (not for device plugs M12 and Han)	D30
<b>Input 2, type</b> Without input 2	A	<b>General approval without Ex approval</b> Worldwide (CE, RCM) except EAC, FM, KCC	E00
<b>CJC configuration for TC</b> None CJC Internal CJC External CJC RTD Pt100 (IEC 60751), 3-wire External CJC RTD Ni100 (DIN 43760-87), 3-wire	0 1 3 6	<b>Explosion protection certificates</b> ATEX (Europe) and IECEx (world)	E47
<b>Material of non-wetted parts</b> Die-cast aluminum enclosure	1	<b>Mounting system (only single chamber enclosures)</b> Pipe mounting kit for single chamber enclosure, stainless steel 316L Wall mounting kit for single chamber enclosure, stainless steel 316L	H06 H07
<b>Type of protection (Ex)</b> General purpose Intrinsic safety (Ex i) / Non-incendive field wiring (NIFW) Flameproof enclosure (Ex d) / Explosion proof (XP) Dust ignition protection by enclosure zone 21/22 (Ex t) / Dust ignition proof (DIP) / Increased safety zone 2 (Ex ec) / Non-incendive (NI) Flameproof enclosure (Ex d) / Intrinsic safety (Ex i) / Dust ignition protection by enclosure zone 21/22 (Ex t) / Increased safety zone 2 (Ex ec)	A B C L S		
<b>Electrical connection/cable entries</b> 2x M20 x 1.5 2x ½" NPT	F M		
<b>Local operation</b> Without local operation Local operation (closed lid) Local operation (lid with glass window)	0 1 2		



## Temperature measurement

Temperature transmitters

Field transmitters/field indicator

### SITRANS TF320 (HART, universal)

#### Selection and ordering data

##### Dual chamber enclosure

	Article No.	Options	Order Code
<b>SITRANS TF320 Temperature transmitter with dual chamber enclosure for wall or pipe mounting, one configurable input and a galvanically isolated 2-wire output.</b> ↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.	<b>7NG035</b> 	Append <b>"-Z"</b> to Article No., add order code and, if applicable, free text.	
<b>Communication</b> With HART (4 ... 20 mA) Without HART (4 ... 20 mA)	<b>0</b> <b>7</b>	<b>Cable gland included</b> Plastic Metal Stainless steel Stainless steel 316L/1.4404 CMP, for XP devices CAPRI ADE 4F, CuZn, cable inner diameter 7 ... 12 mm, cable outer diameter 10 ... 16 mm CAPRI ADE 4F, stainless steel, cable inner diameter 7 ... 12 mm, cable outer diameter 10 ... 16 mm	<b>A00</b> <b>A01</b> <b>A02</b> <b>A03</b> <b>A10</b> <b>A11</b> <b>A12</b>
<b>Primary value output</b> Input 1	<b>0</b>	<b>Mounting cable glands/plugs</b> Cable gland mounted Device plug for output, mounted right	<b>A97</b> <b>A98</b>
<b>Input 1, type</b> RTD <ul style="list-style-type: none"> <li>Pt100 (IEC 60751), 3-wire</li> <li>Pt100 (IEC 60751), 4-wire</li> <li>Pt1000 (IEC 60751), 3-wire</li> <li>Pt1000 (IEC 60751), 4-wire</li> </ul> TC <ul style="list-style-type: none"> <li>Type B</li> <li>Type E</li> <li>Type J</li> <li>Type K</li> <li>Type L</li> <li>Type N</li> <li>Type R</li> <li>Type S</li> <li>Type T</li> </ul> Potentiometer, 4-wire	<b>B</b> <b>C</b> <b>D</b> <b>E</b> <b>F</b> <b>G</b> <b>H</b> <b>J</b> <b>K</b> <b>L</b> <b>N</b> <b>P</b> <b>Q</b> <b>R</b>	<b>Device options</b> Double layer coating (epoxy resin and polyurethane) 120 µm of enclosure and lid Degree of protection IP66 / IP68 (not for device plugs M12 and Han) Stainless steel Ex plate 1.4404/316L	<b>D20</b> <b>D30</b> <b>D42</b>
<b>Input 2, type</b> Without input 2	<b>A</b>	<b>General approval without Ex approval</b> Worldwide (CE, RCM) except EAC, FM, KCC	<b>E00</b>
<b>CJC configuration for TC</b> Without CJC Internal CJC External CJC RTD Pt100 (IEC 60751), 3-wire External CJC RTD Ni100 (DIN 43760-87), 3-wire	<b>0</b> <b>1</b> <b>3</b> <b>6</b>	<b>Explosion protection certificates</b> ATEX (Europe) and IECEx (world)	<b>E47</b>
<b>Material of non-wetted parts</b> Die-cast aluminum enclosure Enclosure made of stainless steel precision casting CF3M/1.4409 (similar to 316L)	<b>1</b> <b>2</b>	<b>Mounting brackets (only dual chamber enclosure)</b> Wall/pipe mounting bracket for dual chamber enclosure, steel Wall/pipe mounting bracket for dual chamber enclosure, stainless steel 304 Wall/pipe mounting bracket for dual chamber enclosure, stainless steel 316L	<b>H01</b> <b>H02</b> <b>H03</b>
<b>Type of protection (Ex)</b> General purpose Intrinsic safety (Ex i) / Non-incendive field wiring (NIFW) Flameproof enclosure (Ex d) / Explosion proof (XP) Dust ignition protection by enclosure zone 21/22 (Ex t) / Dust ignition proof (DIP) / Increased safety zone 2 (Ex ec) / Non-incendive (NI) Flameproof enclosure (Ex d) / Intrinsic safety (Ex i) / Dust ignition protection by enclosure zone 21/22 (Ex t) / Increased safety zone 2 (Ex ec)	<b>A</b> <b>B</b> <b>C</b> <b>L</b> <b>S</b>		
<b>Electrical connection/cable entries</b> 2x M20 x 1.5 2x ½" NPT	<b>F</b> <b>M</b>		
<b>Local operation</b> Without local operation Local operation (closed lid) Local operation (lid with glass window)	<b>0</b> <b>1</b> <b>2</b>		

### Accessories

	Article No.
Additional accessories for assembly, connection and transmitter configuration, see page 2/251.	
<b>Modems</b>	
Modem with USB interface and SIPROM T software	<b>7NG3092-8KN</b>
HART modem with USB interface	<b>7MF4997-1DB</b>
<b>Thread adapter</b>	
Thread adapter M20x1.5 (male thread) to ½-14 NPT (female thread)	<b>7MP1990-0BA00</b>
Thread adapter M20x1.5 (male thread) to G½ (female thread)	<b>7MP1990-0BB00</b>
<b>Local operation</b>	
Local operation for temperature transmitter in dual chamber enclosure	<b>7MF7902-1AD</b>
Mounting system for local operation 7MF7902-1AD in single chamber enclosure	<b>7MF7902-1AS</b>
<b>Mounting brackets (only dual chamber enclosure)</b>	
Wall/pipe mounting bracket for dual chamber enclosure, steel, 5/16-24UNF	<b>7MF7900-1AB</b>
Wall/pipe mounting bracket for dual chamber enclosure, steel, M8	<b>7MF7900-1AC</b>
Wall/pipe mounting bracket for dual chamber enclosure, stainless steel 316L, 5/16-24UNF	<b>7MF7900-1AH</b>
Wall/pipe mounting bracket for dual chamber enclosure, stainless steel 316L, M8	<b>7MF7900-1AJ</b>
<b>Mounting system (only single chamber enclosures)</b>	
Pipe mounting kit for single chamber enclosure, stainless steel 316L	<b>7MF7900-1AK</b>
Wall mounting kit for single chamber enclosure, stainless steel 316L	<b>7MF7900-1AL</b>
<b>Cable gland</b>	
Cable gland, gray, non-Ex, M20	<b>7MF7906-1AB</b>
Cable gland, gray, non-Ex, NPT	<b>7MF7906-1BB</b>
Cable gland, metal, non-Ex, NPT	<b>7MF7906-1BD</b>
Cable gland, metal, non-Ex, M20	<b>7MF7906-1AD</b>
Cable gland, metal, Ex-d, NPT	<b>7MF7906-1BE</b>
Cable gland, metal, Ex-d, M20	<b>7MF7906-1AE</b>
Cable gland, 316L, non-Ex, NPT	<b>7MF7906-1BH</b>
Cable gland, 316L, non-Ex, M20	<b>7MF7906-1AH</b>
Cable gland, 316L, Ex-d, NPT	<b>7MF7906-1BJ</b>
Cable gland, 316L, Ex-d, M20	<b>7MF7906-1AJ</b>
Cable gland, E1FX Tri-Star ½-14 NPT, CMP	<b>7MF7906-1NE</b>
Cable gland, ½ NPT Capri ADE 4F cpl., CuZn	<b>7MF7906-1PE</b>
Cable gland, ½ NPT Capri ADE 4F cpl., stainless steel	<b>7MF7906-1PJ</b>

	Article No.
<b>Plug and cable socket</b>	
Plug Han 7D, plastic, straight	<b>7MF7906-2AB</b>
Plug Han 7D, plastic, angled	<b>7MF7906-2AC</b>
Plug Han 7D, metal, straight, blue	<b>7MF7906-2AQ</b>
Plug Han 7D, metal, straight, grey	<b>7MF7906-2AN</b>
Plug Han 7D, metal, angled, blue	<b>7MF7906-2AR</b>
Plug Han 7D, metal, angled, grey	<b>7MF7906-2AP</b>
Plug Han 8D, plastic, straight	<b>7MF7906-2EB</b>
Plug Han 8D, plastic, angled	<b>7MF7906-2EC</b>
Plug Han 8D, metal, straight, blue	<b>7MF7906-2EQ</b>
Plug Han 8D, metal, straight, grey	<b>7MF7906-2EN</b>
Plug Han 8D, metal, angled, blue	<b>7MF7906-2ER</b>
Plug Han 8D, metal, angled, grey	<b>7MF7906-2EP</b>
Cable socket, plastic, for plug Han 7D	<b>7MF7906-2BB</b>
Cable socket, plastic, for plug Han 8D	<b>7MF7906-2FB</b>
Cable socket, metal, for Han 7D blue	<b>7MF7906-2BQ</b>
Cable socket, metal, for Han 8D blue	<b>7MF7906-2FQ</b>
Cable socket, metal, for Han 7D grey	<b>7MF7906-2BN</b>
Cable socket, metal, for Han 8D grey	<b>7MF7906-2FN</b>
Plug M12 with cable socket, stainless steel	<b>7MF7906-3AB</b>
<b>Overvoltage protection</b>	
Overvoltage protection up to 20 kV, M20	<b>7MF7906-3AC</b>
Overvoltage protection up to 20 kV, NPT	<b>7MF7906-3AD</b>
<b>Lid</b>	
Closed lid aluminum, painted 2x, without glass window, with seal NBR	<b>7MF7901-1BB</b>
Closed lid aluminum, painted 2x, without glass window, with seal FVMQ	<b>7MF7901-1BC</b>
Lid aluminum 2x coated, with glass window, with seal NBR	<b>7MF7901-1BG</b>
Lid aluminum 2x coated, with glass window, with seal FVMQ	<b>7MF7901-1BH</b>
Closed lid stainless steel precision casting, without glass window, with seal NBR	<b>7MF7901-2AB</b>
Closed lid stainless steel precision casting, without glass window, with seal FVMQ	<b>7MF7901-2AC</b>
Lid stainless steel precision casting, with glass window, with seal NBR	<b>7MF7901-2AG</b>
Lid stainless steel precision casting, with glass window, with seal FVMQ	<b>7MF7901-2AH</b>

### Ordering example

SITRANS TF320 (single chamber enclosure)

7NG0340-0BA01-0AF2-Z Y01+Y17+P10

Y01: -10 ... +100 °C

Y17: TICA123

### Factory setting

- Pt100 (IEC 60751) in 3-wire connection
- Measuring range: 0 ... 100 °C (32 ... 212 °F)
- Fault current
  - Input circuit wire break: 22.8 mA
  - Input circuit short circuit: 22.4 mA
  - Input monitoring wire break and short-circuit
- No trimming of input and output (offset)
- Damping 0.0 s

## Temperature measurement

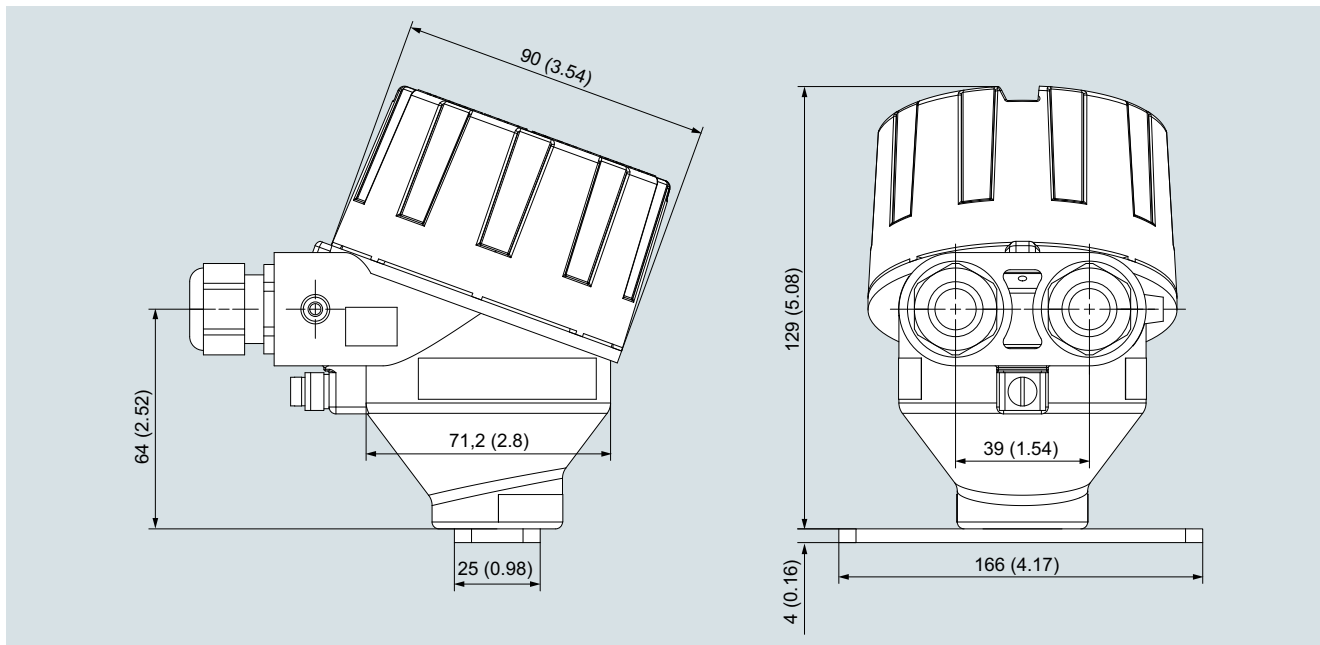
Temperature transmitters

Field transmitters/field indicator

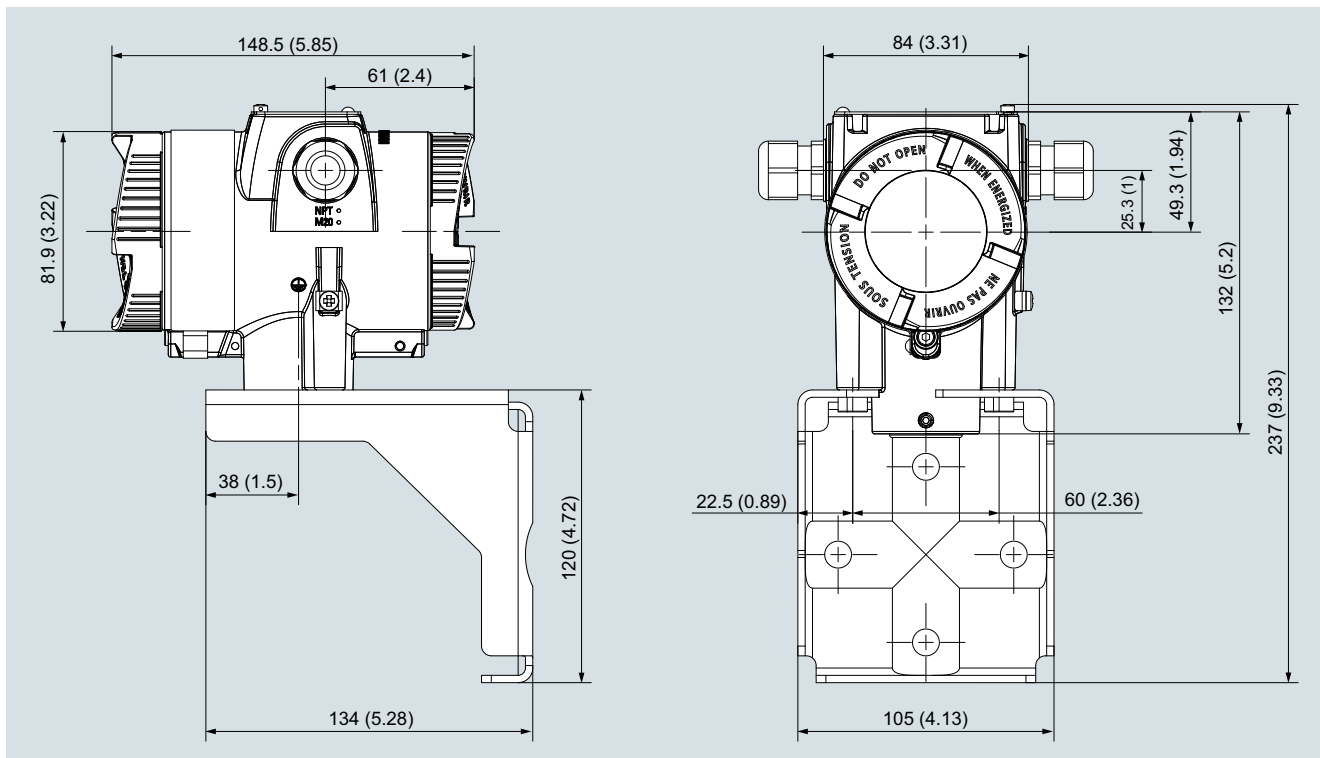
### SITRANS TF320 (HART, universal)

#### Dimensional drawings

2



SITRANS TF320, single chamber enclosure, dimensions in mm (inch)

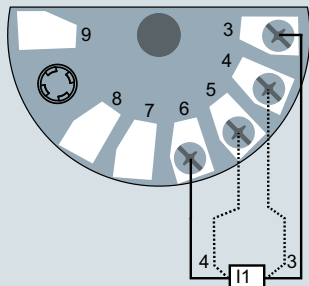


SITRANS TF320, dual chamber enclosure, dimensions in mm (inch)

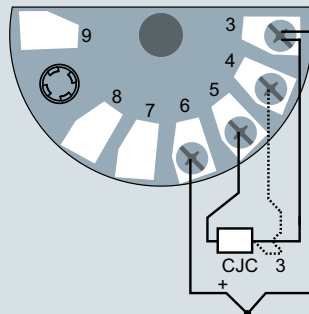
**Circuit diagrams**

**Connections**

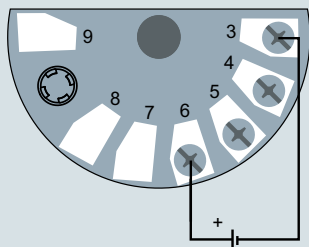
Input connection



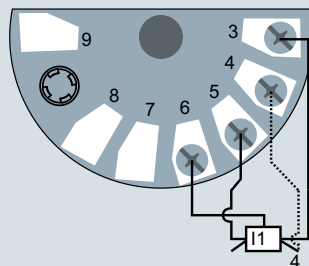
2-wire, 3-wire or 4-wire RTD or linear resistance



TC (internal CJC or external 2-wire or 3-wire CJC)



Voltage input (unipolar or bipolar)



3-wire or 4-wire potentiometer

SITRANS TF320 in single chamber enclosure (7NG034\*), input connection assignment

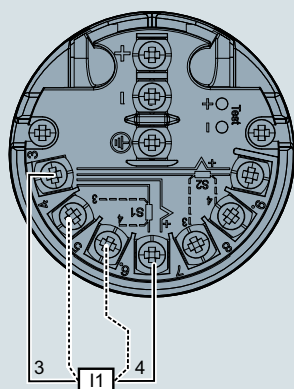
## Temperature measurement

Temperature transmitters

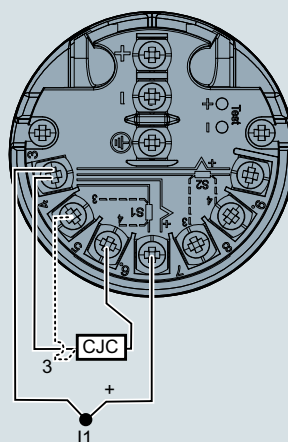
Field transmitters/field indicator

### SITRANS TF320 (HART, universal)

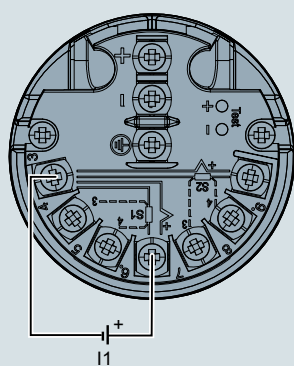
2



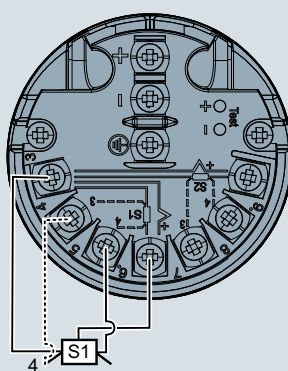
2-wire, 3-wire or 4-wire RTD or linear resistance I1: Input 1



TC (internal CJC or external 2-wire or 3-wire CJC)



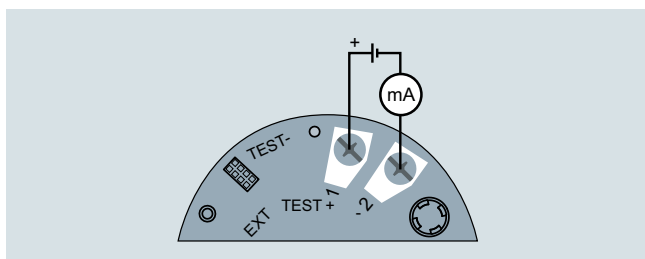
Voltage input (unipolar or bipolar)



3-wire or 4-wire potentiometer

SITRANS TF320 in dual chamber enclosure (7NG035\*), input connection assignment

#### Output connection



SITRANS TF320 in single chamber enclosure (7NG034\*), output connection assignment

#### Overview



SITRANS TF420 in dual chamber enclosure



SITRANS TF420 in single chamber enclosure

- 2-wire temperature transmitter with HART communication interface
- Universal input for virtually any type of temperature sensor
- Connection of two independent input circuits for redundant operation (high input availability)
- Input drift detection
- Can be configured via PC, HART 7 or optional local operation

#### Benefits

- Universally applicable as a temperature transmitter with galvanic isolation for:
  - Resistance thermometer (2-wire, 3-wire, 4-wire connection)
  - Thermocouples
  - Linear resistances, potentiometer and DC voltage sources
- Local operation of the temperature transmitter via display (single chamber enclosure) or control keys accessible from outside (dual chamber enclosure)
- Rugged single or dual chamber enclosure made of die-cast aluminum or stainless steel 316/316L
- Electronic compartment isolated (watertight) from terminal compartment in dual chamber enclosure
- Degree of protection IP66/67/68 (1.5 m/2 h)
- Electromagnetic compatibility according to DIN EN 61326 and NE21
- Test terminals for direct read-out of the output signal without breaking the current loop
- Remote installation option:
  - Measuring point is difficult to access
  - Measuring point is subjected to high temperatures
  - Measuring point is subjected to vibration through plant
  - Long neck pipes and thermowells must be avoided
- Mounted directly on sensors
- Temperature transmitters of the "intrinsically safe protection type, increased safety for zone 2, flameproof and dust-protected" type of protection can be installed in hazardous areas. The transmitter meets the requirements of the EU Directive 2014/34/EU (ATEX), the FM and CSA regulations as well as other national approvals, e.g. EACEx, NEPSI, KCs, Inmetro.
- SIL2/3 (with order note C20)

#### Application

SITRANS TF420 with its two sensor inputs can be used everywhere where temperatures need to be measured without interruption under particularly adverse conditions and 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 substances. The inner workings offer high measuring accuracy, universal input and a wide range of diagnostic options.

## Temperature measurement

Temperature transmitters

Field transmitters/field indicator

### SITRANS TF420 (HART, universal)

#### Function

##### Configuration

The communication capability over the HART protocol V 7 permits parameterization using a PC or HART communicator (hand-held communicator). The SIMATIC PDM makes it easy.

The optional local operation on the device gives you the possibility to configure the device's most important functions very quickly.

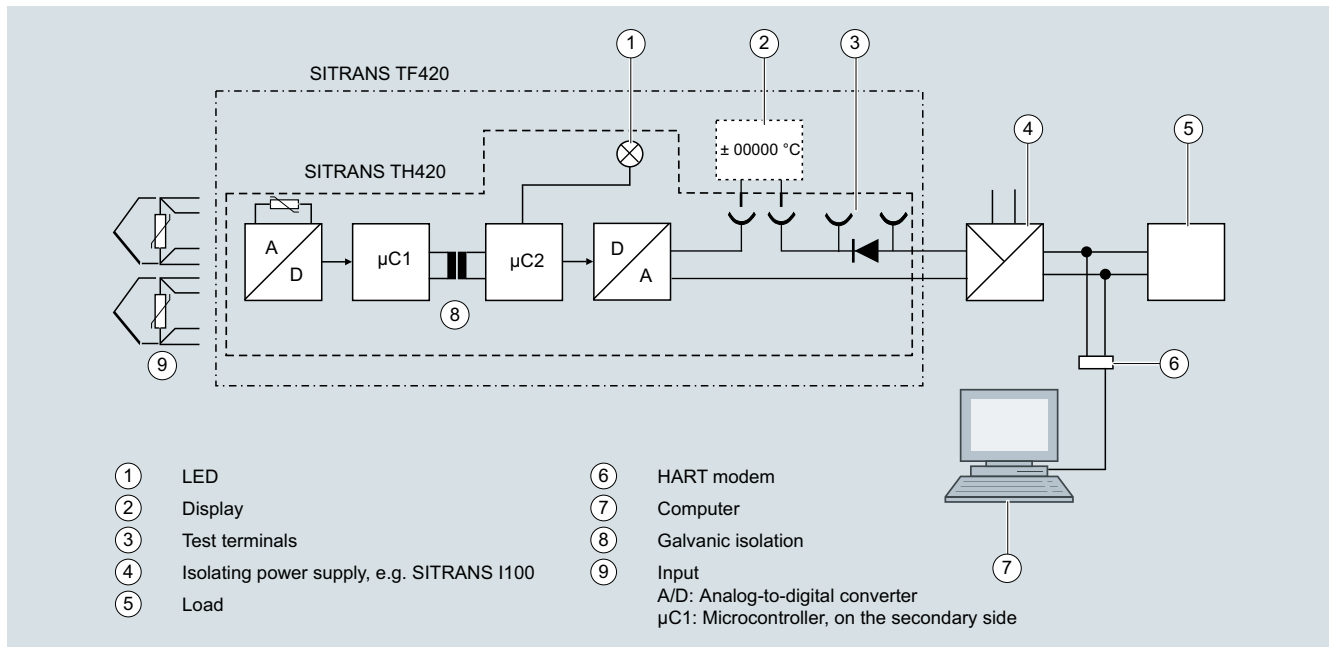
##### Principle of operation

###### SITRANS TF420 as temperature transmitter

Two sensor signals, whether resistance thermometers (RTD), thermocouples (TC),  $\Omega$  or mV signals, are amplified and linearized. Input and output side are galvanically isolated. An internal cold junction is integrated for measurements with thermocouples.

The device outputs a temperature-linear direct current from 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 TF420 automatically detects when a sensor should be interrupted or is indicating a short-circuit. If the back-up functionality has been selected in the primary value display, the SITRANS TF420 automatically switches to the 2nd input without interrupting the measured value; e.g. primary value input 1 with input 2 as backup. The practical test terminals allow direct measurement of 4 to 20 mA signals over an ammeter without interrupting the output current loop.



Function block diagram SITRANS TF420 with integrated SITRANS TH420

## Technical specifications

### General

Supply voltage <sup>1) 2)</sup>	
• Without explosion protection (non-Ex)	10.5 ... 48 V DC
• with explosion protection (Ex i)	10.5 ... 30 V DC
Additional minimum supply voltage when using test terminals	0.8 V
Maximum power loss	≤ 850 mW
Minimum load resistance at supply voltage > 37 V	(V <sub>supply</sub> - 37 V)/23 mA
Insulation voltage, test/operation	
• Without explosion protection (non-Ex)	2.5 kV AC/55 V AC
• with explosion protection (Ex i)	2.5 kV AC/42 V AC
Polarity protection	All inputs and outputs
Write protection	Wire jumper (transmitter), switch (on display) or software
Warm-up time	< 5 min
Starting time	< 2.75 s
Programming	HART
Signal-to-noise ratio	> 60 dB
Long-term stability	Better than: • ± 0.05% of measuring span/year • ± 0.18% of measuring span/5 years
Response time	4 ... 20 mA: ≤ 55 ms HART: ≤ 75 ms (typically 70 ms)
Programmable damping	0 ... 60 s
Signal dynamic	
• Input	24 bit
• Output	18 bit
Influence of change in supply voltage	< 0.005% of measuring span/V DC

### Input

#### Resistance thermometer (RTD)

Input type	
• Pt10 ... 10000	<ul style="list-style-type: none"> <li>• IEC 60751</li> <li>• JIS C 1604-8</li> <li>• GOST 6651_2009</li> <li>• Callendar-Van Dusen</li> </ul>
• Ni10 ... 10000	<ul style="list-style-type: none"> <li>• DIN 43760-1987</li> <li>• GOST 6651-2009/OIML R84:2003</li> </ul>
• Cu5 ... 1000	<ul style="list-style-type: none"> <li>• Edison Copper Winding No. 15</li> <li>• GOST 6651-2009/OIML R84:2003</li> </ul>
Type of connection	2-wire, 3-wire or 4-wire
Line resistance per wire	Max. 50 Ω
Input current	< 0.15 mA
Effect of the line resistance (with 3-wire and 4-wire connections)	< 0.002 Ω/Ω
Cable, wire-wire capacity	
• Pt1000, Pt10000 (IEC 60751 and JIS C 1604-8)	Max. 30 nF
• All other input types	Max. 50 nF
Fault detection, programmable	None, short-circuited, defective, short-circuited or defective

#### Note

When the low limit for the configured input type is below the constant detection limit for short-circuited inputs, the detection of short circuits is disabled regardless of the configuration of the fault detection.

Detection limit for short-circuited input	15 Ω
Fault detection time (RTD)	≤ 75 ms (typically 70 ms)
Fault detection time (for 3-wire and 4-wire)	≤ 2 000 ms
<u>Thermocouples (TC)</u>	
Input type	
• B	IEC 60584-1
• E	IEC 60584-1
• J	IEC 60584-1
• K	IEC 60584-1
• L	DIN 43710
• Lr	GOST 3044-84
• N	IEC 60584-1
• R	IEC 60584-1
• S	IEC 60584-1
• T	IEC 60584-1
• U	DIN 43710
• W3	ASTM E988-96
• W5	ASTM E988-96
• LR	GOST 3044-84
Cold junction compensation (CJC)	Constant, internal or external over Pt100 or Ni100 RTD
• Temperature range internal CJC	-50 ... +100 °C (-58 ... +212 °F)
• Connection external CJC	2-wire or 3-wire
• External CJC, line resistance per wire (for 3-wire and 4-wire connections)	50 Ω
• Effect of the line resistance (with 3-wire and 4-wire connections)	< 0.002 Ω/Ω
• Input current external CJC	< 0.15 mA
• Temperature range external CJC	-50 ... +135 °C (-58 ... +275 °F)
• Cable, wire-wire capacity	Max. 50 nF
• Total line resistance	Max. 10 kΩ
• Fault detection, programmable	None, short-circuited, defective, short-circuited or defective
<b>Note</b>	
The short-circuited fault detection only applies to the CJC input.	
• Fault detection time (TC)	≤ 75 ms (typically 70 ms)
• Fault detection time, external CJC (for 3-wire and 4-wire)	≤ 2 000 ms
<u>Linear resistance</u>	
Input range	10 Ω ... 100 kΩ
Minimum measuring span	25 Ω
Type of connection	2-wire, 3-wire or 4-wire
Line resistance per wire	Max. 50 Ω
Input current	< 0.15 mA
Effect of the line resistance (with 3-wire and 4-wire connections)	< 0.002 Ω/Ω
Cable, wire-wire capacity	
• R > 400 Ω	Max. 30 nF
• R ≤ 400 Ω	Max. 50 nF
Fault detection, programmable	None, defective



## Temperature measurement

### Temperature transmitters

#### Field transmitters/field indicator

#### SITRANS TF420 (HART, universal)

<b>Potentiometers</b>		<b>Rated conditions</b>	
Input range	0 ... 100 k $\Omega$	Ambient temperature	-50 ... +85 °C (-58 ... +185 °F)
Minimum measuring span	25 $\Omega$	<ul style="list-style-type: none"> <li>Without local operation in single chamber enclosure</li> </ul>	-40 ... +85 °C (-40 ... +185 °F)
Type of connection	2-wire, 3-wire or 4-wire	<ul style="list-style-type: none"> <li>With local operation</li> <li>For transmitters with functional safety</li> </ul>	-40 ... +80 °C (-40 ... +176 °F)
Line resistance per wire	Max. 50 $\Omega$	Storage temperature	-50 ... +85 °C (-58 ... +185 °F)
Input current	< 0.15 mA	Reference temperature for sensor calibration	24 °C $\pm$ 1.0 °C (75.2 °F $\pm$ 1.8 °F)
Effect of the line resistance (with 4-wire and 5-wire connections)	< 0.002 $\Omega/\Omega$	Relative humidity	< 99% (no condensation)
Cable, wire-wire capacity		Degree of protection	
<ul style="list-style-type: none"> <li>R &gt; 400 <math>\Omega</math></li> <li>R <math>\leq</math> 400 <math>\Omega</math></li> </ul>	Max. 30 nF Max. 50 nF	<ul style="list-style-type: none"> <li>Temperature transmitter enclosure</li> <li>Terminals</li> </ul>	IP66/IP67/IP68 IP00
Fault detection, programmable	None, short-circuited, defective, short-circuited or defective	<b>Mechanical construction</b>	
<b>Note</b>		Weight	
When the configured potentiometer size is below the constant detection limit for short-circuited inputs, the detection of short circuits is disabled regardless of the configuration of the fault detection.		<ul style="list-style-type: none"> <li>Single chamber enclosure</li> <li>Dual chamber enclosure</li> </ul>	0.85 kg (1.87 lb) <ul style="list-style-type: none"> <li>Aluminum: 1.3 kg (2.87 lb)</li> <li>Stainless steel: 3.3 kg (7.28 lb)</li> </ul>
Detection limit for short-circuited input	15 $\Omega$	Maximum core cross-section	
Fault detection time, wiper arm (no short-circuit detection)	$\leq$ 75 ms (typically 70 ms)	<ul style="list-style-type: none"> <li>Single chamber enclosure</li> <li>Dual chamber enclosure</li> </ul>	1.5 mm <sup>2</sup> (AWG 16) 2.5 mm <sup>2</sup> (AWG 14)
Fault detection time, element	$\leq$ 2 000 ms	Tightening torque for clamping screws	0.5 ... 0.6 Nm
Fault detection time (for 4-wire and 5-wire)	$\leq$ 2 000 ms	Vibrations	IEC 60068-2-6 $\pm$ 1.6 mm (0.07 inch) $\pm$ 4 g
<b>Supply voltage</b>		<b>Certificates and approvals</b>	
Measuring range		<u>Explosion protection ATEX/IECEX and others</u>	
<ul style="list-style-type: none"> <li>Unipolar</li> <li>Bipolar</li> </ul>	-100 ... 1700 mV -800 ... +800 mV	Certificates <sup>3)</sup>	
Minimum measuring span	2.5 mV	IECEX DEK 19.0069X DEKRA 19ATEX0106 X (Category 1) DEKRA 19ATEX0107 X (Category 3)	
Input resistance	10 M $\Omega$	"Intrinsic safety ia/ib" type of protection	
Cable, wire-wire capacity		For use in Zone 0, 1, 2	
<ul style="list-style-type: none"> <li>Input range: -100 ... 1700 mV</li> <li>Input range: -20 ... 100 mV</li> </ul>	Max. 30 nF Max. 50 nF	<ul style="list-style-type: none"> <li>ATEX</li> </ul>	
Fault detection, programmable	None, defective	<ul style="list-style-type: none"> <li>IECEX and others</li> </ul>	
Fault detection time	$\leq$ 75 ms (typically 70 ms)	<ul style="list-style-type: none"> <li>EACEx</li> </ul>	
<b>Output and HART communication</b>		"Intrinsic safety ic" type of protection	
Normal range, programmable	3.8 ... 20.5 mA/20.5 ... 3.8 mA	For use in Zones 2	
Extended range (output limits), programmable	3.5 ... 23 mA/23 ... 3.5 mA	<ul style="list-style-type: none"> <li>ATEX</li> <li>IECEX and others</li> <li>EACEx</li> </ul>	
Programmable input/output limits		"Non-sparking/increased safety nA/ec" type of protection	
<ul style="list-style-type: none"> <li>Fault current</li> <li>Fault current setting</li> </ul>	Enable/disable 3.5 ... 23 mA	For use in Zones 2	
Update time	10 ms	<ul style="list-style-type: none"> <li>ATEX</li> </ul>	
Load (with current output)	$\leq$ (V <sub>Supply</sub> - 10.5)/0.023 $\Omega$	<ul style="list-style-type: none"> <li>IECEX and others</li> </ul>	
Load stability	< 0.01% of measuring span/100 $\Omega$ (measuring span = currently selected range)	<ul style="list-style-type: none"> <li>EACEx</li> <li>"Flameproof enclosure db" type of protection</li> </ul>	
Input fault detection, programmable (detection of input short circuits is ignored with TC and voltage inputs)	3.5 ... 23 mA	<ul style="list-style-type: none"> <li>ATEX</li> <li>IECEX and others</li> <li>EACEx</li> </ul>	
NAMUR NE43 Upscale	> 21 mA	<ul style="list-style-type: none"> <li>"Protection by enclosure tb" type of protection</li> </ul>	
NAMUR NE43 Downscale	< 3.6 mA	<ul style="list-style-type: none"> <li>ATEX</li> <li>IECEX and others</li> <li>EACEx</li> </ul>	
HART protocol versions	HART 7	<ul style="list-style-type: none"> <li>ATEX</li> <li>IECEX and others</li> <li>EACEx</li> </ul>	
<b>Measuring accuracy</b>		<ul style="list-style-type: none"> <li>ATEX</li> <li>IECEX and others</li> <li>EACEx</li> </ul>	
Input accuracy	See "Input accuracy" table	<ul style="list-style-type: none"> <li>ATEX</li> <li>IECEX and others</li> <li>EACEx</li> </ul>	
Output accuracy	See "Output accuracy" table	<ul style="list-style-type: none"> <li>ATEX</li> <li>IECEX and others</li> <li>EACEx</li> </ul>	

Explosion protection CSA/FM for Canada and USA	
Certificates	FMxxCAxxxx FMxxUSxxxx
"Intrinsic safety ia" type of protection	IS, CL I, Div 1, GP ABCD, T6 ... T4 Ex ia IIC T6 ... T4 Ga AEx ia IIC T6 ... T4 Ga or: Ex ib [ia Ga] IIC T6...T4 Gb AEx ib [ia Ga] IIC T6...T4 Gb
"Non incandive field wiring NIFW" type of protection	NIFW, CL I, Div 2, GP ABCD T6 ... T4
"Non incandive NI" type of protection	NI, CL I, Div 2, GP ABCD T6...T4 Ex nA IIC T6 ... T4 Gc AEx nA IIC T6 ... T4 Gc
"Explosion-proof XP" type of protection	XP/ CL I / DIV1 / GP ABCD / T6...T4 CL I / Zn1 / AEx/Ex d IIC T6...T4 Gb
"Dust-protected DIP" type of protection	DIP/ CL II, III / DIV 1 / GP EFG / T6...T4 Zn21 / AEx/Ex tb IIC T100°C Gb

- Note that the minimum supply voltage must correspond to the value measured at the terminals of the SITRANS TF420.  
All external voltage drops must be taken into consideration.
- Protect the device from overvoltage with the help of a suitable power supply or suitable overvoltage protection equipment.
- Additional available certificates are listed on the Internet at <http://www.siemens.com/processinstrumentation/certificates>

### Measuring ranges/Minimum measuring span

#### RTD

Input type	Standard	Measuring range in °C (°F)	$\alpha_0$ in °C <sup>-1</sup> (°F <sup>-1</sup> )	Minimum measuring span in °C (°F)
<b>Pt10 ... 10000</b>	IEC 60751	-200 ... +850 (-328 ... +1 562)	0.003851 (0.002139)	10 (50)
	JIS C 1604-8	-200 ... +649 (-328 ... +1 200)	0.003916 (0.002176)	10 (50)
	GOST 6651_2009	-200 ... +850 (-328 ... +1 562)	0.003910 (0.002172)	10 (50)
	Callendar-Van Dusen	-200 ... +850 (-328 ... +1 562)	-	10 (50)
<b>Ni10 ... 10000</b>	DIN 43760-1987	-60 ... +250 (-76 ... +482)	0.006180 (0.003433)	10 (50)
	GOST 6651-2009/OIML R84:2003	-60 ... +180 (-76 ... +356)	0.006170 (0.003428)	10 (50)
<b>Cu5 ... 1000</b>	Edison Copper Winding No. 15	-200 ... +260 (-328 ... +500)	0.004270 (0.002372)	100 (212)
	GOST 6651-2009/OIML R84:2003	-180 ... +200 (-292 ... +392)	0.004280 (0.002378)	100 (212)
	GOST 6651-94	-50 ... +200 (-58 ... +392)	0.004260 (0.002367)	100 (212)

#### TC

Input type	Standard	Measuring range in °C (°F)	Minimum measuring span in °C (°F)
B	IEC 60584-1	0 (85) ... 1 820 (32 (185) ... 3 308)	100 (212)
E	IEC 60584-1	-200 ... +1 000 (-392 ... +1 832)	50 (122)
J	IEC 60584-1	-100 ... +1 200 (-212 ... +2 192)	50 (122)
K	IEC 60584-1	-180 ... +1 372 (-356 ... +2 502)	50 (122)
L	DIN 43710	-200 ... +900 (-392 ... +1 652)	50 (122)
Lr	GOST 3044-84	-200 ... +800 (-392 ... +1 472)	50 (122)
N	IEC 60584-1	-180 ... +1 300 (-356 ... +2 372)	50 (122)
R	IEC 60584-1	-50 ... +1 760 (-122 ... +3 200)	100 (212)
S	IEC 60584-1	-50 ... +1 760 (-122 ... +3 200)	100 (212)
T	IEC 60584-1	-200 ... +400 (-392 ... +752)	50 (122)
U	DIN 43710	-200 ... +600 (-392 ... +1 112)	50 (122)
W3	ASTM E988-96	0 ... 2 300 (32 ... 4 172)	100 (212)
W5	ASTM E988-96	0 ... 2 300 (32 ... 4 172)	100 (212)
LR	GOST 3044-84	-200 ... +800 (-392 ... +1472)	50 (122)

## Temperature measurement

Temperature transmitters

Field transmitters/field indicator

### SITRANS TF420 (HART, universal)

#### Input accuracy

##### Basic values

Input type	Basic accuracy	Temperature coefficient <sup>1)</sup>
<b>RTD</b>		
Pt10	$\leq \pm 0.8 \text{ }^\circ\text{C}$ (1.44 °F)	$\leq \pm 0.020 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Pt20	$\leq \pm 0.4 \text{ }^\circ\text{C}$ (0.72 °F)	$\leq \pm 0.010 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Pt50	$\leq \pm 0.16 \text{ }^\circ\text{C}$ (0.288 °F)	$\leq \pm 0.004 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Pt100	$\leq \pm 0.04 \text{ }^\circ\text{C}$ (0.072 °F)	$\leq \pm 0.002 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Pt200	$\leq \pm 0.08 \text{ }^\circ\text{C}$ (0.144 °F)	$\leq \pm 0.002 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Pt500	$T_{\text{max.}} < 180 \text{ }^\circ\text{C}$ (356 °F) $\leq \pm 0.08 \text{ }^\circ\text{C}$ (0.144 °F) $T_{\text{max.}} > 180 \text{ }^\circ\text{C}$ (356 °F) $\leq \pm 0.16 \text{ }^\circ\text{C}$ (0.288 °F)	$\leq \pm 0.002 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Pt1000	$\leq \pm 0.08 \text{ }^\circ\text{C}$ (0.144 °F)	$\leq \pm 0.002 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Pt2000	$T_{\text{max.}} < 300 \text{ }^\circ\text{C}$ (572 °F) $\leq \pm 0.08 \text{ }^\circ\text{C}$ (0.144 °F) $T_{\text{max.}} > 300 \text{ }^\circ\text{C}$ (572 °F) $\leq \pm 0.4 \text{ }^\circ\text{C}$ (0.72 °F)	$\leq \pm 0.002 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Pt10000	$\leq \pm 0.16 \text{ }^\circ\text{C}$ (0.288 °F)	$\leq \pm 0.002 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Pt x	Largest tolerance of neighboring points	Largest temperature coefficient of neighboring points
Ni10	$\leq \pm 1.6 \text{ }^\circ\text{C}$ (2.88 °F)	$\leq \pm 0.020 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Ni20	$\leq \pm 0.8 \text{ }^\circ\text{C}$ (1.44 °F)	$\leq \pm 0.010 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Ni50	$\leq \pm 0.32 \text{ }^\circ\text{C}$ (0.576 °F)	$\leq \pm 0.004 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Ni100	$\leq \pm 0.16 \text{ }^\circ\text{C}$ (0.288 °F)	$\leq \pm 0.002 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Ni120	$\leq \pm 0.16 \text{ }^\circ\text{C}$ (0.288 °F)	$\leq \pm 0.002 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Ni200	$\leq \pm 0.16 \text{ }^\circ\text{C}$ (0.288 °F)	$\leq \pm 0.002 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Ni500	$\leq \pm 0.16 \text{ }^\circ\text{C}$ (0.288 °F)	$\leq \pm 0.002 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Ni1000	$\leq \pm 0.16 \text{ }^\circ\text{C}$ (0.288 °F)	$\leq \pm 0.002 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Ni2000	$\leq \pm 0.16 \text{ }^\circ\text{C}$ (0.288 °F)	$\leq \pm 0.002 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Ni10000	$\leq \pm 0.32 \text{ }^\circ\text{C}$ (0.576 °F)	$\leq \pm 0.002 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Ni x	Largest tolerance of neighboring points	Largest temperature coefficient of neighboring points
Cu5	$\leq \pm 1.6 \text{ }^\circ\text{C}$ (2.88 °F)	$\leq \pm 0.040 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Cu10	$\leq \pm 0.8 \text{ }^\circ\text{C}$ (1.44 °F)	$\leq \pm 0.020 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Cu20	$\leq \pm 0.4 \text{ }^\circ\text{C}$ (0.72 °F)	$\leq \pm 0.010 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Cu50	$\leq \pm 0.16 \text{ }^\circ\text{C}$ (0.288 °F)	$\leq \pm 0.004 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Cu100	$\leq \pm 0.08 \text{ }^\circ\text{C}$ (0.144 °F)	$\leq \pm 0.002 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Cu200	$\leq \pm 0.08 \text{ }^\circ\text{C}$ (0.144 °F)	$\leq \pm 0.002 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Cu500	$\leq \pm 0.16 \text{ }^\circ\text{C}$ (0.288 °F)	$\leq \pm 0.002 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Cu1000	$\leq \pm 0.08 \text{ }^\circ\text{C}$ (0.144 °F)	$\leq \pm 0.002 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Cu x	Largest tolerance of neighboring points	Largest temperature coefficient of neighboring points
<b>Linear resistance</b>		
0 ... 400 $\Omega$	$\leq \pm 40 \text{ m}\Omega$	$\leq \pm 2 \text{ m}\Omega/^\circ\text{C}$ (1.11 m $\Omega$ /°F)
0 ... 100 k $\Omega$	$\leq \pm 4 \text{ } \Omega$	$\leq \pm 0.2 \text{ } \Omega/^\circ\text{C}$ (0.11 $\Omega$ /°F)
<b>Potentiometers</b>		
0 ... 100%	$< 0.05\%$	$< \pm 0.005\%$
<b>Supply voltage</b>		
mV: -20 ... 100 mV	$\leq \pm 5 \text{ } \mu\text{V}$	$\leq \pm 0.2 \text{ } \mu\text{V}/^\circ\text{C}$ (0.11 $\mu\text{V}$ /°F)
mV: -100 ... 1700 mV	$\leq \pm 0.1 \text{ mV}$	$\leq \pm 36 \text{ } \mu\text{V}/^\circ\text{C}$ (20 $\mu\text{V}$ /°F)
mV: $\pm 800 \text{ mV}$	$\leq \pm 0.1 \text{ mV}$	$\leq \pm 32 \text{ } \mu\text{V}/^\circ\text{C}$ (17.8 $\mu\text{V}$ /°F)
<b>TC</b>		
E	$\leq \pm 0.2 \text{ }^\circ\text{C}$ (0.36 °F)	$\leq \pm 0.025 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
J	$\leq \pm 0.25 \text{ }^\circ\text{C}$ (0.45 °F)	$\leq \pm 0.025 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
K	$\leq \pm 0.25 \text{ }^\circ\text{C}$ (0.45 °F)	$\leq \pm 0.025 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
L	$\leq \pm 0.35 \text{ }^\circ\text{C}$ (0.63 °F)	$\leq \pm 0.025 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
N	$\leq \pm 0.4 \text{ }^\circ\text{C}$ (0.72 °F)	$\leq \pm 0.025 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
T	$\leq \pm 0.25 \text{ }^\circ\text{C}$ (0.45 °F)	$\leq \pm 0.025 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
U	$< 0 \text{ }^\circ\text{C}$ (32 °F) $\leq \pm 0.8 \text{ }^\circ\text{C}$ (1.44 °F) $\geq 0 \text{ }^\circ\text{C}$ (32 °F) $\leq \pm 0.4 \text{ }^\circ\text{C}$ (0.72 °F)	$\leq \pm 0.025 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
Lr	$\leq \pm 0.2 \text{ }^\circ\text{C}$ (0.36 °F)	$\leq \pm 0.1 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
R	$< 200 \text{ }^\circ\text{C}$ (392 °F) $\leq \pm 0.5 \text{ }^\circ\text{C}$ (0.9 °F) $\geq 200 \text{ }^\circ\text{C}$ (392 °F) $\leq \pm 1 \text{ }^\circ\text{C}$ (1.8 °F)	$\leq \pm 0.1 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)
S	$< 200 \text{ }^\circ\text{C}$ (392 °F) $\leq \pm 0.5 \text{ }^\circ\text{C}$ (0.9 °F) $\geq 200 \text{ }^\circ\text{C}$ (392 °F) $\leq \pm 1 \text{ }^\circ\text{C}$ (1.8 °F)	$\leq \pm 0.1 \text{ }^\circ\text{C}/^\circ\text{C}$ (°F/°F)

## Temperature measurement

### Temperature transmitters

### Field transmitters/field indicator

#### SITRANS TF420 (HART, universal)

Input type	Basic accuracy	Temperature coefficient <sup>1)</sup>
W3	≤ ±0.6 °C (1.08 °F)	≤ ±0.1 °C/°C (°F/°F)
W5	≤ ±0.4 °C (0.72 °F)	≤ ±0.1 °C/°C (°F/°F)
B <sup>2)</sup>	≤ ±1 °C (1.8 °F)	≤ ±0.1 °C/°C (°F/°F)
B <sup>3)</sup>	≤ ±3 °C (5.4 °F)	≤ ±0.1 °C/°C (°F/°F)
B <sup>4)</sup>	≤ ±8 °C (14.4 °F)	≤ ±0.8 °C/°C (°F/°F)
B <sup>5)</sup>	Not specified	Not specified
CJC (internal)	< ±0.5 °C (0.9 °F)	Included in basic accuracy
CJC (external)	≤ ±0.08 °C (0.144 °F)	≤ ±0.002 °C/°C (°F/°F)

1) Temperature coefficients correspond to the specified values or 0.002% of the input span, depending on which value is greater.

2) Accuracy of the specification range > 400 °C (752 °F)

3) Accuracy of the specification range > 160 °C (320 °F) < 400 °C (752 °F)

4) Accuracy of the specification range > 85 °C (185 °F) < 160 °C (320 °F)

5) Accuracy of the specification range < 85 °C (185 °F)

#### Output accuracy

Output type	Basic accuracy	Temperature coefficient
Average value measurement	Average of accuracy of input 1 and input 2	Average of temperature coefficient of input 1 and input 2
Differential measurement	Sum of accuracy of input 1 and input 2	Sum of temperature coefficient of input 1 and input 2
Analog output	≤ ±1.6 μA (0.01% of the full output span)	≤ ±0.48 μA/K (≤ ±0.003% of the full output span/K)

## Temperature measurement

Temperature transmitters

Field transmitters/field indicator

### SITRANS TF420 (HART, universal)

#### Selection and ordering data

##### Single chamber enclosure

	Article No.
<b>SITRANS TF420 Temperature transmitter with single chamber enclosure for wall or pipe mounting, two separately configurable inputs and a galvanically isolated 2-wire output.</b>	<b>7NG044</b>
Click on the Article No. for the online configuration in the PIA Life Cycle Portal.	
<b>Communication</b>	
With HART (4 ... 20 mA)	0
<b>Primary value output</b>	
Input 1	0
Input 1, input 2 as redundancy (hot backup)	1
Input 2, input 1 as redundancy (hot backup)	2
Average input 1 and input 2, both as redundancy (hot backup)	3
Minimum input 1 and input 2, both as redundancy (hot backup)	4
Maximum input 1 and input 2, both as redundancy (hot backup)	5
Difference input 1 - input 2	6
Difference input 2 - input 1	7
Absolute difference	8
<b>Input 1, type</b>	
RTD	
• Pt100 (IEC 60751), 3-wire	B
• Pt100 (IEC 60751), 4-wire	C
• Pt1000 (IEC 60751), 3-wire	D
• Pt1000 (IEC 60751), 4-wire	E
TC	
• Type B	F
• Type E	G
• Type J	H
• Type K	J
• Type L	K
• Type N	L
• Type R	N
• Type S	P
• Type T	Q
Potentiometer, 4-wire	R
RTD	
• Pt100 (IEC 60751), 3-wire	B
• Pt100 (IEC 60751), 4-wire	C
• Pt1000 (IEC 60751), 3-wire	D
• Pt1000 (IEC 60751), 4-wire	E
TC	
• Type B	F
• Type E	G
• Type J	H
• Type K	J
• Type L	K
• Type N	L
• Type R	N
• Type S	P
• Type T	Q
Potentiometer, 4-wire	R

	Article No.
<b>SITRANS TF420 Temperature transmitter with single chamber enclosure for wall or pipe mounting, two separately configurable inputs and a galvanically isolated 2-wire output.</b>	<b>7NG044</b>
Click on the Article No. for the online configuration in the PIA Life Cycle Portal.	
<b>CJC configuration for TC</b>	
Input 1: None CJC; Input 2: No CJC	0
Input 1: Internal CJC; Input 2: Internal CJC	1
Input 1: External CJC; input 2: External CJC; define type in option Jxx	2
Input 1: External CJC; define type in option Jxx; input 2: Internal CJC	3
Input 1: Internal CJC; Input 2: External CJC; define type in option Jxx	4
Input 1: Internal CJC; Input 2: No CJC	5
Input 1: External CJC (define type in option Jxx); input 2: No CJC	6
<b>Material of non-wetted parts</b>	
Die-cast aluminum enclosure	1
<b>Type of protection (Ex)</b>	
General purpose	A
Intrinsic safety (Ex i) / Non-incendive field wiring (NIFW)	B
Flameproof enclosure (Ex d) / Explosion proof (XP)	C
Dust ignition protection by enclosure zone 21/22 (Ex t) / Dust ignition proof (DIP) / Increased safety zone 2 (Ex ec) / Non-incendive (NI)	L
Flameproof enclosure (Ex d) / Intrinsic safety (Ex i) / Dust ignition protection by enclosure zone 21/22 (Ex t) / Increased safety zone 2 (Ex ec)	S
<b>Electrical connection/cable entries</b>	
2x M20 x 1.5	F
2x ½" NPT	M
<b>Local operation</b>	
Without local operation	0
Local operation (closed lid)	1
Local operation (lid with glass window)	2

Options	Order Code
Append <b>"-Z"</b> to Article No., add order code and, if applicable, free text.	
<b>Cable gland included</b>	
Plastic	<b>A00</b>
Metal	<b>A01</b>
Stainless steel	<b>A02</b>
Stainless steel 316L/1.4404	<b>A03</b>
CMP, for XP devices	<b>A10</b>
CAPRI ADE 4F, CuZn, cable inner diameter 7 ... 12 mm, cable outer diameter 10 ... 16 mm	<b>A11</b>
CAPRI ADE 4F, stainless steel, cable inner diameter 7 ... 12 mm, cable outer diameter 10 ... 16 mm	<b>A12</b>
<b>Mounting cable glands/plugs</b>	
Cable gland mounted	<b>A97</b>
Device plug for output, mounted right	<b>A98</b>
<b>Device options</b>	
Degree of protection IP66 / IP68 (not for device plugs M12 and Han)	<b>D30</b>
<b>General approval without Ex approval</b>	
Worldwide (CE, RCM) except EAC, FM, KCC	<b>E00</b>
<b>Explosion protection certificates</b>	
ATEX (Europe) and IECEx (world)	<b>E47</b>
<b>Mounting system (only single chamber enclosures)</b>	
Pipe mounting kit for single chamber enclosure, stainless steel 316L	<b>H06</b>
Wall mounting kit for single chamber enclosure, stainless steel 316L	<b>H07</b>

## Temperature measurement

Temperature transmitters

Field transmitters/field indicator

### SITRANS TF420 (HART, universal)

#### Selection and ordering data

##### Dual chamber enclosure

	Article No.		Article No.
<b>SITRANS TF420 Temperature transmitter with dual chamber enclosure for wall or pipe mounting, two separately configurable inputs and a galvanically isolated 2-wire output.</b> ↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.	7NG045	<b>SITRANS TF420 Temperature transmitter with dual chamber enclosure for wall or pipe mounting, two separately configurable inputs and a galvanically isolated 2-wire output.</b> <b>CJC configuration for TC</b>	7NG045
<b>Communication</b> With HART (4 ... 20 mA)	0	Input 1: None CJC; Input 2: No CJC	0
<b>Primary value output</b>		Input 1: Internal CJC; Input 2: Internal CJC	1
Input 1	0	Input 1: External CJC; input 2: External CJC; define type in option Jxx	2
Input 1, input 2 as redundancy (hot backup)	1	Input 1: External CJC; define type in option Jxx; input 2: Internal CJC	3
Input 2, input 1 as redundancy (hot backup)	2	Input 1: Internal CJC; Input 2: External CJC; define type in option Jxx	4
Average input 1 and input 2, both as redundancy (hot backup)	3	Input 1: Internal CJC; Input 2: No CJC	5
Minimum input 1 and input 2, both as redundancy (hot backup)	4	Input 1: External CJC (define type in option Jxx); input 2: No CJC	6
Maximum input 1 and input 2, both as redundancy (hot backup)	5	<b>Material of non-wetted parts</b>	
Difference input 1 - input 2	6	Die-cast aluminum enclosure	1
Difference input 2 - input 1	7	Enclosure made of stainless steel precision casting CF3M/1.4409 (similar to 316L)	2
Absolute difference	8	<b>Type of protection (Ex)</b>	
<b>Input 1, type</b>		General purpose (non-Ex)	A
RTD		Intrinsic safety (Ex i) / Non-incendive field wiring (NIFW)	B
• Pt100 (IEC 60751), 3-wire	B	Flameproof enclosure (Ex d) / Explosion proof (XP)	C
• Pt100 (IEC 60751), 4-wire	C	Dust ignition protection by enclosure zone 21/22 (Ex t) / Dust ignition proof (DIP) / Increased safety zone 2 (Ex ec) / Non-incendive (NI)	L
• Pt1000 (IEC 60751), 3-wire	D	Flameproof enclosure (Ex d) / Intrinsic safety (Ex i) / Dust ignition protection by enclosure zone 21/22 (Ex t) / Increased safety zone 2 (Ex ec)	S
• Pt1000 (IEC 60751), 4-wire	E	<b>Electrical connection/cable entries</b>	
TC		2x M20 x 1.5	F
• Type B	F	2x ½" NPT	M
• Type E	G	<b>Local operation</b>	
• Type J	H	Without local operation	0
• Type K	J	Local operation (closed lid)	1
• Type L	K	Local operation (lid with glass window)	2
• Type N	L		
• Type R	N		
• Type S	P		
• Type T	Q		
Potentiometer, 4-wire	R		
<b>Input 2, type</b>			
Without input 2	A		
RTD			
• Pt100 (IEC 60751), 3-wire	B		
• Pt100 (IEC 60751), 4-wire	C		
• Pt1000 (IEC 60751), 3-wire	D		
• Pt1000 (IEC 60751), 4-wire	E		
TC			
• Type B	F		
• Type E	G		
• Type J	H		
• Type K	J		
• Type L	K		
• Type N	L		
• Type R	N		
• Type S	P		
• Type T	Q		
Potentiometer, 4-wire	R		

Options	Order Code
Append <b>"-Z"</b> to Article No., add order code and, if applicable, free text.	
<b>Cable gland included</b>	
Plastic	<b>A00</b>
Metal	<b>A01</b>
Stainless steel	<b>A02</b>
Stainless steel 316L/1.4404	<b>A03</b>
CMP, for XP devices	<b>A10</b>
CAPRI ADE 4F, CuZn, cable inner diameter 7 ... 12 mm, cable outer diameter 10 ... 16 mm	<b>A11</b>
CAPRI ADE 4F, stainless steel, cable inner diameter 7 ... 12 mm, cable outer diameter 10 ... 16 mm	<b>A12</b>
<b>Cable gland accessories</b>	
Dual hole insert included	<b>A20</b>
<b>Mounting cable glands/plugs</b>	
Cable gland mounted	<b>A97</b>
Device plug for output, mounted right	<b>A98</b>
<b>Device options</b>	
Double layer coating (epoxy resin and polyurethane) 120 µm of enclosure and lid	<b>D20</b>
Degree of protection IP66 / IP68 (not for device plugs M12 and Han)	<b>D30</b>
Stainless steel Ex plate 1.4404/316L	<b>D42</b>
<b>General approval without Ex approval</b>	
Worldwide (CE, RCM) except EAC, FM, KCC	<b>E00</b>
<b>Explosion protection certificates</b>	
ATEX (Europe) and IECEx (world)	<b>E47</b>
<b>Mounting brackets (only dual chamber enclosure)</b>	
Wall/pipe mounting bracket for dual chamber enclosure, steel	<b>H01</b>
Wall/pipe mounting bracket for dual chamber enclosure, stainless steel 304	<b>H02</b>
Wall/pipe mounting bracket for dual chamber enclosure, stainless steel 316L	<b>H03</b>

Accessories	Article No.
Additional accessories for assembly, connection and transmitter configuration, see page 2/251.	
<b>Modems</b>	
Modem with USB interface and SIPROM T software	<b>7NG3092-8KN</b>
HART modem with USB interface	<b>7MF4997-1DB</b>
<b>Thread adapter</b>	
Thread adapter M20x1.5 (male thread) to ½-14 NPT (female thread)	<b>7MP1990-0BA00</b>
Thread adapter M20x1.5 (male thread) to G½ (female thread)	<b>7MP1990-0BB00</b>
<b>Local operation</b>	
Local operation for temperature transmitter in dual chamber enclosure	<b>7MF7902-1AD</b>
Mounting system for local operation 7MF7902-1AD in single chamber enclosure	<b>7MF7902-1AS</b>
<b>Mounting brackets (only dual chamber enclosure)</b>	
Wall/pipe mounting bracket for dual chamber enclosure, steel, 5/16-24UNF	<b>7MF7900-1AB</b>
Wall/pipe mounting bracket for dual chamber enclosure, steel, M8	<b>7MF7900-1AC</b>
Wall/pipe mounting bracket for dual chamber enclosure, stainless steel 316L, 5/16-24UNF	<b>7MF7900-1AH</b>
Wall/pipe mounting bracket for dual chamber enclosure, stainless steel 316L, M8	<b>7MF7900-1AJ</b>
<b>Mounting system (only single chamber enclosures)</b>	
Pipe mounting kit for single chamber enclosure, stainless steel 316L	<b>7MF7900-1AK</b>
Wall mounting kit for single chamber enclosure, stainless steel 316L	<b>7MF7900-1AL</b>
<b>Cable gland</b>	
Cable gland, gray, non-Ex, M20	<b>7MF7906-1AB</b>
Cable gland, gray, non-Ex, NPT	<b>7MF7906-1BB</b>
Cable gland, metal, non-Ex, NPT	<b>7MF7906-1BD</b>
Cable gland, metal, non-Ex, M20	<b>7MF7906-1AD</b>
Cable gland, metal, Ex-d, NPT	<b>7MF7906-1BE</b>
Cable gland, metal, Ex-d, M20	<b>7MF7906-1AE</b>
Cable gland, 316L, non-Ex, NPT	<b>7MF7906-1BH</b>
Cable gland, 316L, non-Ex, M20	<b>7MF7906-1AH</b>
Cable gland, 316L, Ex-d, NPT	<b>7MF7906-1BJ</b>
Cable gland, 316L, Ex-d, M20	<b>7MF7906-1AJ</b>
Cable gland, E1FX Tri-Star 1/2-14NPT, CMP	<b>7MF7906-1NE</b>
Cable gland, ½ NPT Capri ADE 4F cpl., CuZn	<b>7MF7906-1PE</b>
Cable gland, ½ NPT Capri ADE 4F cpl., stainless steel	<b>7MF7906-1PJ</b>
Dual hole gasket for 2 cables in cable gland	<b>7MF7906-1WN</b>



## Temperature measurement

Temperature transmitters

Field transmitters/field indicator

### SITRANS TF420 (HART, universal)

2

	Article No.
<b>Plug and cable socket</b>	
Plug Han 7D, plastic, straight	<b>7MF7906-2AB</b>
Plug Han 7D, plastic, angled	<b>7MF7906-2AC</b>
Plug Han 7D, metal, straight, blue	<b>7MF7906-2AQ</b>
Plug Han 7D, metal, straight, grey	<b>7MF7906-2AN</b>
Plug Han 7D, metal, angled, blue	<b>7MF7906-2AR</b>
Plug Han 7D, metal, angled, grey	<b>7MF7906-2AP</b>
Plug Han 8D, plastic, straight	<b>7MF7906-2EB</b>
Plug Han 8D, plastic, angled	<b>7MF7906-2EC</b>
Plug Han 8D, metal, straight, blue	<b>7MF7906-2EQ</b>
Plug Han 8D, metal, straight, grey	<b>7MF7906-2EN</b>
Plug Han 8D, metal, angled, blue	<b>7MF7906-2ER</b>
Plug Han 8D, metal, angled, grey	<b>7MF7906-2EP</b>
Cable socket, plastic, for plug Han 7D	<b>7MF7906-2BB</b>
Cable socket, plastic, for plug Han 8D	<b>7MF7906-2FB</b>
Cable socket, metal, for Han 7D blue	<b>7MF7906-2BQ</b>
Cable socket, metal, for Han 8D blue	<b>7MF7906-2FQ</b>
Cable socket, metal, for Han 7D grey	<b>7MF7906-2BN</b>
Cable socket, metal, for Han 8D grey	<b>7MF7906-2FN</b>
Plug M12 with cable socket, stainless steel	<b>7MF7906-3AB</b>
<b>Overvoltage protection</b>	
Overvoltage protection up to 20 kV, M20	<b>7MF7906-3AC</b>
Overvoltage protection up to 20 kV, NPT	<b>7MF7906-3AD</b>
<b>Lid</b>	
Closed lid aluminum, painted 2x, without glass window, with seal NBR	<b>7MF7901-1BB</b>
Closed lid aluminum, painted 2x, without glass window, with seal FVMQ	<b>7MF7901-1BC</b>
Lid aluminum 2x coated, with glass window, with seal NBR	<b>7MF7901-1BG</b>
Lid aluminum 2x coated, with glass window, with seal FVMQ	<b>7MF7901-1BH</b>
Closed lid stainless steel precision casting, without glass window, with seal NBR	<b>7MF7901-2AB</b>
Closed lid stainless steel precision casting, without glass window, with seal FVMQ	<b>7MF7901-2AC</b>
Lid stainless steel precision casting, with glass window, with seal NBR	<b>7MF7901-2AG</b>
Lid stainless steel precision casting, with glass window, with seal FVMQ	<b>7MF7901-2AH</b>

### Ordering example

SITRANS TF420 (single chamber enclosure)

7NG0450-0BA02-OAF2-Z Y01+Y17+P10

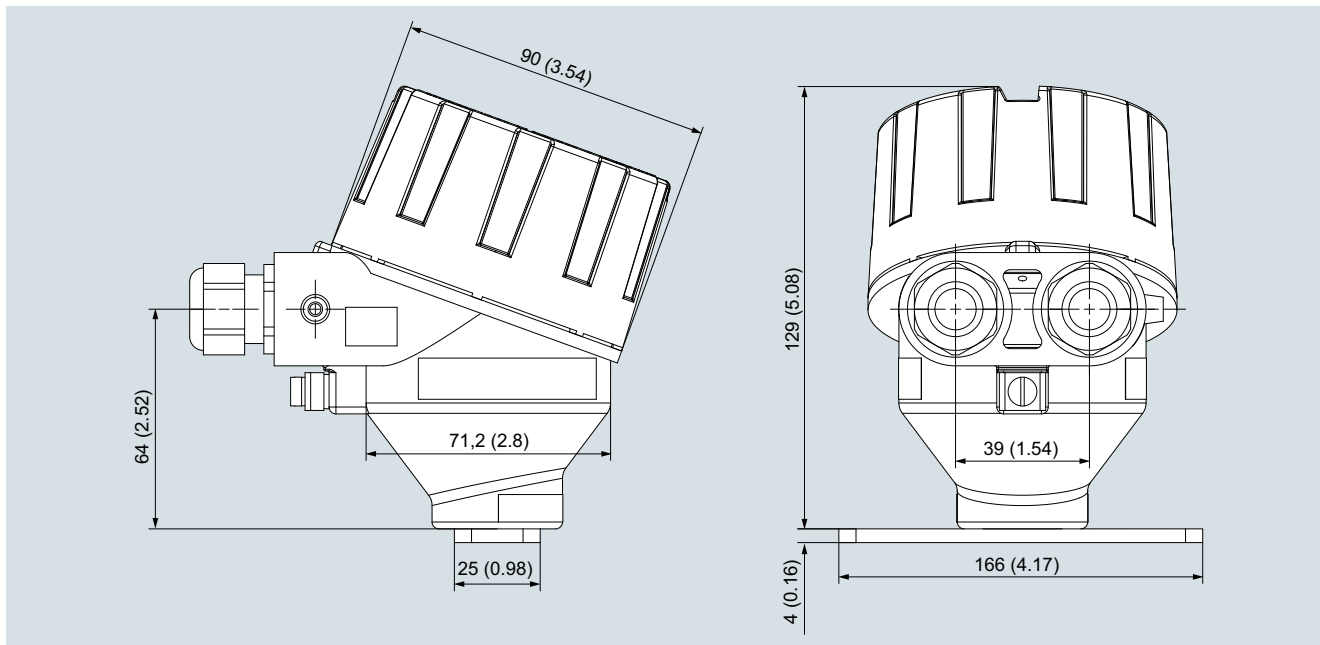
Y01: -10 ... +100 °C (32 ... 212 °F)

Y17: TICA123

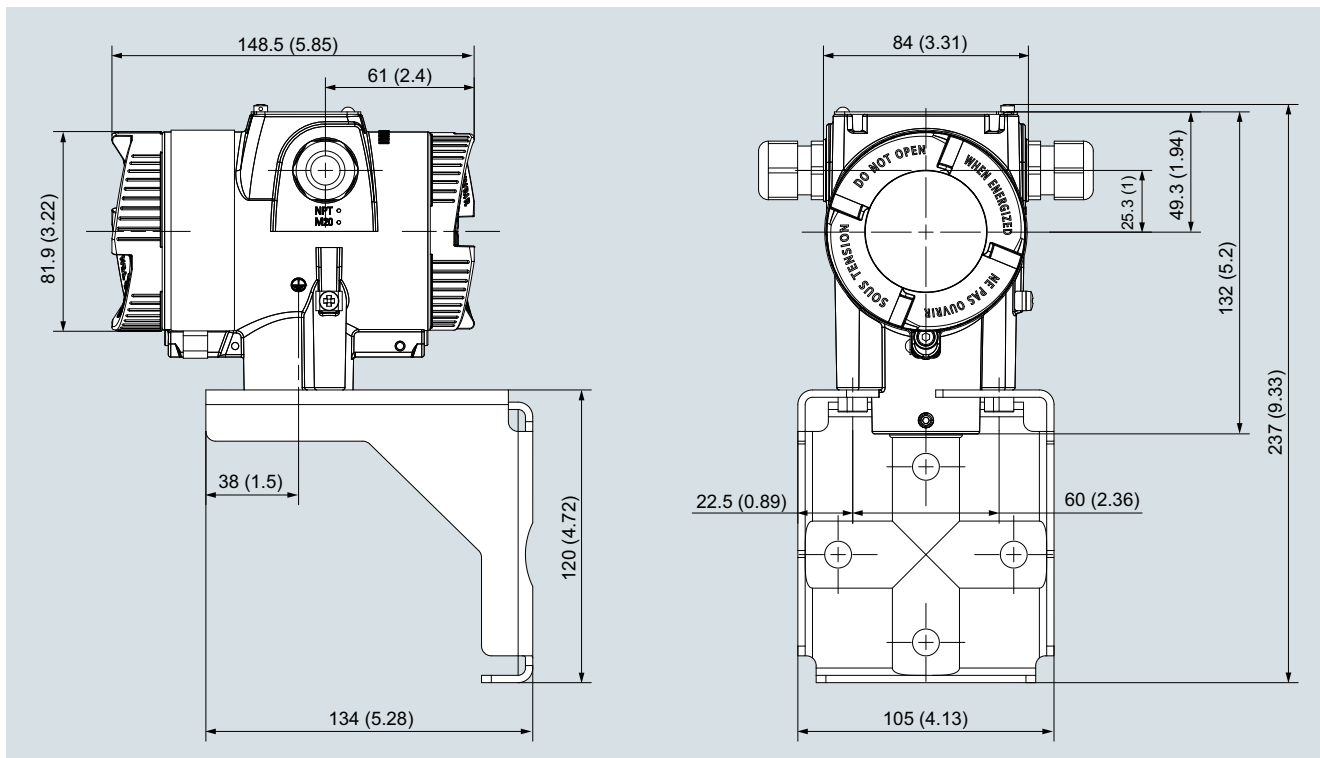
### Factory setting

- Input 1: Pt100 (IEC 751); 3-wire connection
- Input 2: not configured (inactive)
- Measuring range: 0 ... 100 °C (32 ... 212 °F)
- Fault current
  - Input circuit wire break: 22.8 mA
  - Input circuit short circuit: 22.4 mA
  - Input circuit drift: 22 mA (active when input 2 is active)
  - Input monitoring wire break and short-circuit
- No trimming of input and output (offset)
- Damping 0.0 s

**Dimensional drawings**



SITRANS TF420, single chamber enclosure, dimensions in mm (inch)



SITRANS TF420, dual chamber enclosure, dimensions in mm (inch)

## Temperature measurement

Temperature transmitters

Field transmitters/field indicator

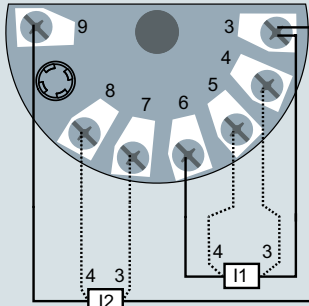
SITRANS TF420 (HART, universal)

### Circuit diagrams

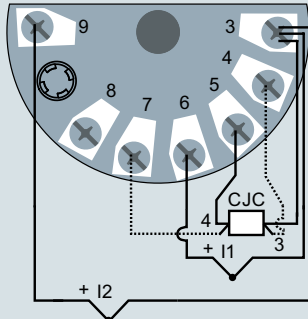
#### Connections

##### Input connection

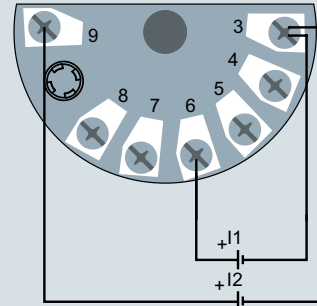
2



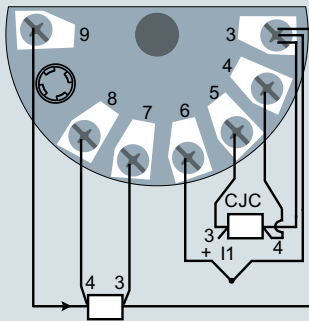
Input 1 and/or input 2:  
2-wire, 3-wire or 4-wire RTD or  
linear resistance



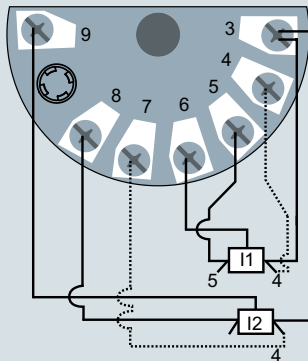
Input 1 and/or input 2:  
TC (internal CJC or  
external 2-wire, 3-wire or  
4-wire CJC)



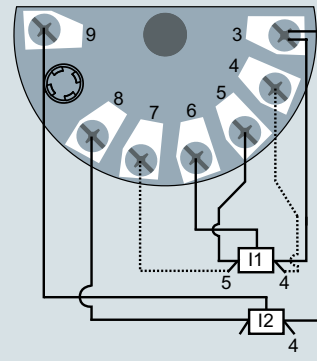
Input 1 and/or input 2:  
Voltage input  
(unipolar or bipolar)



Input 1: TC (internal CJC or  
external 2-wire or 3-wire CJC)  
Input 2: 2-wire, 3-wire or 4-wire RTD

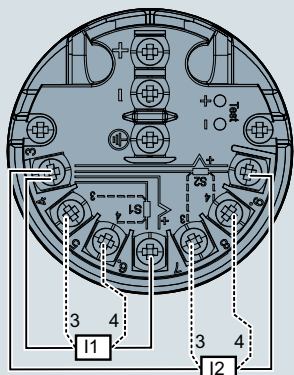


Input 1 and/or Input 2:  
3-wire or 4-wire potentiometer

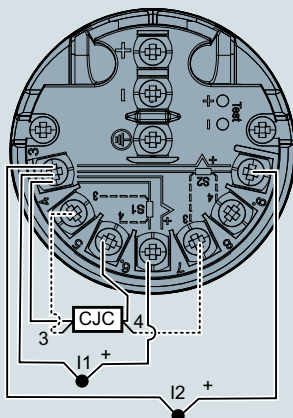


Input 1: 5-wire potentiometer  
Input 2: 3-wire potentiometer

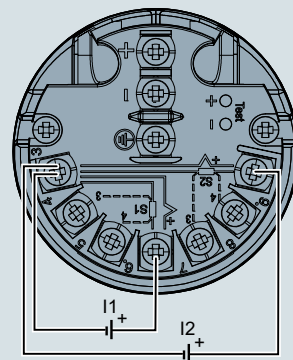
SITRANS TF420 in single chamber enclosure (7NG044\*), input connection assignment



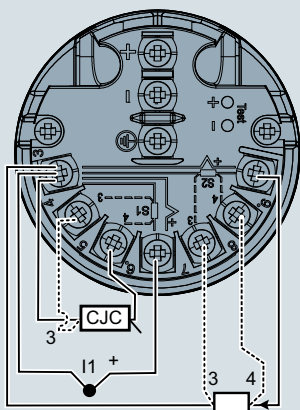
Input 1 (I1) and/or input 2 (I2):  
 2-wire, 3-wire or 4-wire RTD or  
 linear resistance



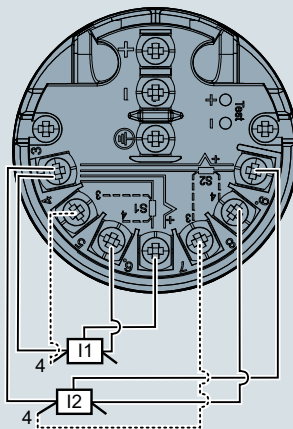
Input 1 (I1) and/or input 2 (I2):  
 TC (internal CJC or  
 external 2-wire, 3-wire or  
 4-wire CJC)



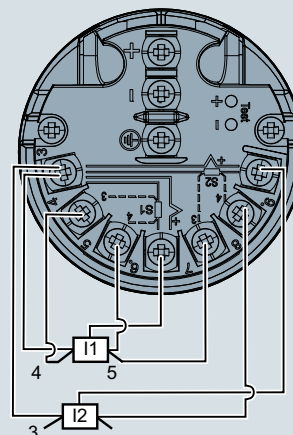
Input 1 (I1) and/or input 2 (I2):  
 Voltage input  
 (unipolar or bipolar)



Input 1: TC (internal CJC or  
 external 2-wire or 3-wire CJC)  
 Input 2: 2-wire, 3-wire or 4-wire RTD



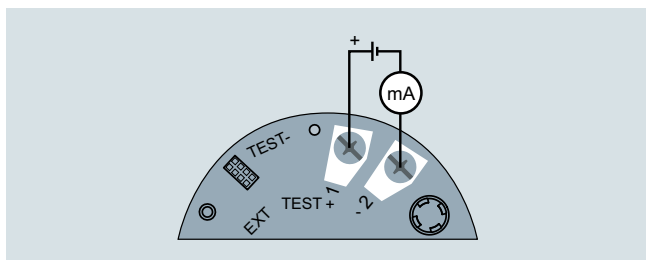
Input 1 (I1) and/or input 2 (I2):  
 3-wire or 4-wire potentiometer



Input 1 (I1): 5-wire potentiometer  
 Input 2 (I2): 3-wire potentiometer

SITRANS TF420 in dual chamber enclosure (7NG045\*), input connection assignment

Output connection



SITRANS TF420 in single chamber enclosure (7NG044\*), output connection assignment