

## Temperature Measurement

Transmitters for mounting in sensor head

### SITRANS TH320 (HART)

#### Overview



- 2-wire temperature transmitter with HART communication interface
- Mounting in the connection head of the temperature sensor
- Universal input for virtually any type of temperature sensor
- HART 7

#### Benefits

- Compact design
- Flexible mounting and center hole allow you to select your preferred type of installation
- Electrical isolation
- Test terminals for ammeter
- Diagnostics LED (green/red)
- Input monitoring  
Wire break and short-circuit
- Self-monitoring
- Configuration status stored in EEPROM
- SIL2/3 (with order note C20)
- Expanded diagnostic functions, such as slave pointer, operating hours counter, etc.
- Special characteristic
- Electromagnetic compatibility according to DIN EN 61326 and NE21

#### Application

SITRANS TH320 transmitters can be used in all sectors. Due to their compact size they can be installed in the connection head type B (DIN 43729) or larger. The following sensors/signal sources can be connected over their universal input module:

- Resistance thermometer (2-wire, 3-wire, 4-wire connection)
- Thermocouples
- Linear resistance, potentiometer and DC voltage sources

With HART communication interface:

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

Transmitters of the "intrinsically safe or Zone 2 increased safety" type of protection can be installed in hazardous areas. The device meets the requirements of the EU Directive 2014/34/EU (ATEX), the FM and CSA regulations as well as other national approvals.

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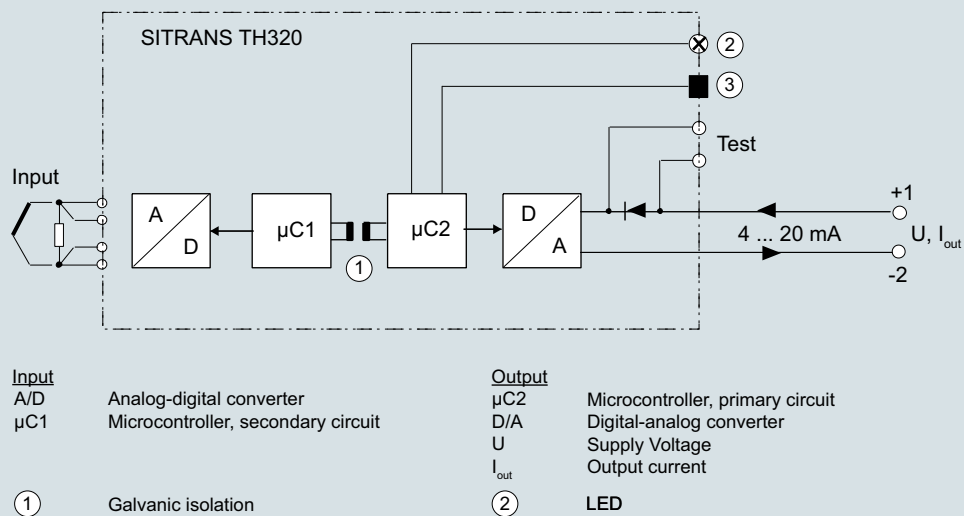
#### Function

With HART communication interface:

- The SITRANS TH320 is configured via HART. The configuration can be carried out using a handheld communicator or, more conveniently, with a HART modem and the SIMATIC PDM configuration software. The configuration data is then permanently stored in the non-volatile memory (EEPROM).

After correct connection of input and supply voltage, the transmitter outputs a temperature-linear output signal and the diagnostics LED is green. In case of external errors, e.g. sensor short circuit or interruption, the LED flashes red; an internal error is indicated by a permanent red light.

An ammeter can be connected at any time for checking and plausibility via the test terminals. The output current can be read without any interruption, or even without opening the current loop.



SITRANS TH320 function block diagram

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#### Technical specifications

##### General

Supply voltage <sup>1) 2)</sup>	
• Without explosion protection (non-Ex)	7.5 ... 48 V DC
• with explosion protection (Ex i)	7.5 ... 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	$(V_{\text{supply}} - 37 \text{ V})/23 \text{ mA}$
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	Open circuits or software
Warming-up time	< 5 min
Starting time	< 2.75 s
Programming	HART
Signal-to-noise ratio	> 60 dB
Long-term stability	Better than: <ul style="list-style-type: none"> <li>• ± 0.05% of measuring span/year</li> <li>• ± 0.18% of measuring span/5 years</li> </ul>
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
	<b>Note</b>
	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)	≤ 2000 ms

##### Thermocouples (TC)

##### 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

##### Note

The short-circuited fault detection only applies to the CJC input.

- Fault detection time (TC)
- Fault detection time, external CJC (for 3-wire and 4-wire)

##### Linear resistance

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

##### Potentiometers

Input range	0 ... 100 kΩ
Minimum measuring span	25 Ω
Type of connection	3-wire or 4-wire
Line resistance per wire	Max. 50 Ω
Input current	< 0.15 mA
Effect of the line resistance (with 4-wire and 5-wire connections)	< 0.002 Ω/Ω
Cable, wire-wire capacity	
• R > 400 Ω	Max. 30 nF
• R ≤ 400 Ω	Max. 50 nF

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Fault detection, programmable	None, short-circuited, defective, short-circuited or defective <b>Note</b> 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.
Detection limit for short-circuited input	15 Ω
Fault detection time, wiper arm (no short-circuit detection)	≤ 75 ms (typically 70 ms)
Fault detection time, element	≤ 2000 ms
Fault detection time (for 4-wire and 5-wire)	≤ 2000 ms
<b>Voltage input</b>	
Measuring range	
• Unipolar	-100 ... 1700 mV
• Bipolar	-800 ... +800 mV
Minimum measuring span	2.5 mV
Input resistance	10 MΩ
Cable, wire-wire capacity	
• Input range: -100 ... 1700 mV	Max. 30 nF
• Input range: -20 ... 100 mV	Max. 50 nF
Fault detection, programmable	None, defective
Fault detection time	≤ 75 ms (typically 70 ms)
<b>Output and HART communication</b>	
Normal range, programmable	3.8 ... 20.5 mA/20.5 ... 3.8 mA
Extended range (output limits), programmable	3.5 ... 23 mA/23 ... 3.5 mA
Programmable input/output limits	
• Fault current	Enable/disable
• Fault current setting	3.5 ... 23 mA
Update time	10 ms
Load (with current output)	≤ (V <sub>Supply</sub> - 7.5)/0.023 Ω
Load stability	< 0.01% of meas. span/100 Ω (measuring span = currently selected range)
Input fault detection, programmable (detection of input short circuits is ignored with TC and voltage inputs)	3.5 ... 23 mA
NAMUR NE43 Upscale	> 21 mA
NAMUR NE43 Downscale	< 3.6 mA
HART protocol versions	HART 7
<b>Measuring accuracy</b>	
Input accuracy	See "Input accuracy" table
Output accuracy	See "Output accuracy" table
<b>Rated conditions</b>	
Ambient temperature (operation)	
• Standard	-50 ... +85 °C (-58 ... +185 °F)
• SIL	-40 ... +80 °C (-40 ... +176 °F)
Storage temperature	-50 ... +85 °C (-58 ... +185 °F)
Calibration temperature	24 °C ±1.0 °C (75.2 °F ±1.8 °F)
Relative humidity	< 99% (no condensation)
Degree of protection	
• Enclosure of the transmitter	IP68
• Terminals	IP00

<b>Design</b>	
Weight	50 g (0.11 lb)
Maximum cable cross-section	1 × 1.5 mm <sup>2</sup> (stranded wire)
Tightening torque for clamping screws	0.4 Nm
Vibrations	IEC 60068-2-6
• 2 ... 25 Hz	± 1.6 mm (0.07 inch)
• 25 ... 100 Hz	± 4 g
<b>Certificates and approvals</b>	
<u>Explosion protection ATEX/IECEX and others</u>	
Certificates <sup>3)</sup>	DEKRA 17ATEX0116 X IECEX DEK 17.0054X A5E43700604A-2018X
"Intrinsic safety ia/ib" type of protection	For use in Zone 0, 1, 2, 20, 21, 22
• ATEX	II 1 G Ex ia IIC T6 ... T4 Ga II 2(1) G Ex ib [ia Ga] IIC T6 ... T4 Gb II 1 D Ex ia IIIC Da I M1 Ex ia I Ma
• IECEX and others	Ex ia IIC T6 ... T4 Ga Ex ib [ia Ga] IIC T6 ... T4 Gb Ex ia IIIC Da Ex ia I Ma
"Intrinsic safety ic" type of protection	For use in Zones 2 and 22
• ATEX	II 2 G Ex ic IIC T6...T4 Gc II 2 D Ex ic IIIC Dc
• IECEX and others	Ex ic IIC T6 ... T4 Gc Ex ic IIIC Dc
"Non-sparking/increased safety nA/ec" type of protection	For use in Zones 2 and 22
• ATEX	II 2 G Ex nA IIC T6...T4 Gc II 2 G Ex ec IIC T6...T4 Gc
• IECEX and others	Ex nA IIC T6 ... T4 Gc Ex ec IIC T6 ... T4 Gc
<u>Explosion protection CSA /FM for Canada and USA</u>	
Certificates	CSA 1861385 FM18CA0024 FM18US0046
"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 incensive field wiring NIFW" type of protection	NIFW, CL I, Div 2, GP ABCD T6 ... T4
"Non incensive 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

1) Note that the minimum supply voltage must correspond to the value measured at the terminals of the SITRANS TH320.  
All external voltage drops must be taken into consideration.

2) Protect the device from overvoltage with the help of a suitable power supply or suitable overvoltage protection equipment.

3) Additional available certificates are listed on the Internet at <http://www.siemens.com/processinstrumentation/certificates>

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#### 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 ... +1562)	0.003851 (0.002139)	10 (50)
	JIS C 1604-8	-200 ... +649 (-328 ... +1200)	0.003916 (0.002176)	10 (50)
	GOST 6651_2009	-200 ... +850 (-328 ... +1562)	0.003910 (0.002172)	10 (50)
	Callendar-Van Dusen	-200 ... +850 (-328 ... +1562)	-	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 ... +1200 (-212 ... +2192)	50 (122)
K	IEC 60584-1	-180 ... +1372 (-356 ... +2502)	50 (122)
L	DIN 43710	-200 ... +900 (-392 ... +1652)	50 (122)
Lr	GOST 3044-84	-200 ... +800 (-392 ... +1472)	50 (122)
N	IEC 60584-1	-180 ... +1300 (-356 ... +2372)	50 (122)
R	IEC 60584-1	-50 ... +1760 (-122 ... +3200)	100 (212)
S	IEC 60584-1	-50 ... +1760 (-122 ... +3200)	100 (212)
T	IEC 60584-1	-200 ... +400 (-392 ... +752)	50 (122)
U	DIN 43710	-200 ... +600 (-392 ... +1112)	50 (122)
W3	ASTM E988-96	0 ... 2300 (32 ... 4172)	100 (212)
W5	ASTM E988-96	0 ... 2300 (32 ... 4172)	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	≤ ±0.8 °C (1.44 °F)	≤ ±0.020 °C/°C (°F/°F)
Pt20	≤ ±0.4 °C (0.72 °F)	≤ ±0.010 °C/°C (°F/°F)
Pt50	≤ ±0.16 °C (0.288 °F)	≤ ±0.004 °C/°C (°F/°F)
Pt100	≤ ±0.04 °C (0.072 °F)	≤ ±0.002 °C/°C (°F/°F)
Pt200	≤ ±0.08 °C (0.144 °F)	≤ ±0.002 °C/°C (°F/°F)
Pt500	$T_{\max.} < 180 \text{ °C (356 °F)} = \leq \pm 0.08 \text{ °C (0.144 °F)}$ $T_{\max.} < 180 \text{ °C (356 °F)} = \leq \pm 0.16 \text{ °C (0.288 °F)}$	≤ ±0.002 °C/°C (°F/°F)
Pt1000	≤ ±0.08 °C (0.144 °F)	≤ ±0.002 °C/°C (°F/°F)
Pt2000	$T_{\max.} < 300 \text{ °C (572 °F)} = \leq \pm 0.08 \text{ °C (0.144 °F)}$ $T_{\max.} < 300 \text{ °C (572 °F)} = \leq \pm 0.4 \text{ °C (0.72 °F)}$	≤ ±0.002 °C/°C (°F/°F)
Pt10000	≤ ±0.16 °C (0.288 °F)	≤ ±0.002 °C/°C (°F/°F)
Pt x	Largest tolerance of neighboring points	Largest temperature coefficient of neighboring points
Ni10	≤ ±1.6 °C (2.88 °F)	≤ ±0.020 °C/°C (°F/°F)
Ni20	≤ ±0.8 °C (1.44 °F)	≤ ±0.010 °C/°C (°F/°F)
Ni50	≤ ±0.32 °C (0.576 °F)	≤ ±0.004 °C/°C (°F/°F)
Ni100	≤ ±0.16 °C (0.288 °F)	≤ ±0.002 °C/°C (°F/°F)
Ni120	≤ ±0.16 °C (0.288 °F)	≤ ±0.002 °C/°C (°F/°F)
Ni200	≤ ±0.16 °C (0.288 °F)	≤ ±0.002 °C/°C (°F/°F)
Ni500	≤ ±0.16 °C (0.288 °F)	≤ ±0.002 °C/°C (°F/°F)
Ni1000	≤ ±0.16 °C (0.288 °F)	≤ ±0.002 °C/°C (°F/°F)
Ni2000	≤ ±0.16 °C (0.288 °F)	≤ ±0.002 °C/°C (°F/°F)

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Input type	Basic accuracy	Temperature coefficient <sup>1)</sup>
Ni10000	≤ ±0.32 °C (0.576 °F)	≤ ±0.002 °C/°C (°F/°F)
Ni x	Largest tolerance of neighboring points	Largest temperature coefficient of neighboring points
Cu5	≤ ±1.6 °C (2.88 °F)	≤ ±0.040 °C/°C (°F/°F)
Cu10	≤ ±0.8 °C (1.44 °F)	≤ ±0.020 °C/°C (°F/°F)
Cu20	≤ ±0.4 °C (0.72 °F)	≤ ±0.010 °C/°C (°F/°F)
Cu50	≤ ±0.16 °C (0.288 °F)	≤ ±0.004 °C/°C (°F/°F)
Cu100	≤ ±0.08 °C (0.144 °F)	≤ ±0.002 °C/°C (°F/°F)
Cu200	≤ ±0.08 °C (0.144 °F)	≤ ±0.002 °C/°C (°F/°F)
Cu500	≤ ±0.16 °C (0.288 °F)	≤ ±0.002 °C/°C (°F/°F)
Cu1000	≤ ±0.08 °C (0.144 °F)	≤ ±0.002 °C/°C (°F/°F)
Cu x	Largest tolerance of neighboring points	Largest temperature coefficient of neighboring points
<b>Linear resistance</b>		
0 ... 400 Ω	≤ ±40 mΩ	≤ ±2 mΩ/°C (1.11 mΩ/°F)
0 ... 100 kΩ	≤ ±4 Ω	≤ ±0.2 Ω/°C (0.11 Ω/°F)
<b>Potentiometers</b>		
0 ... 100%	< 0.05%	< ± 0.005%
<b>Voltage input</b>		
mV: -20 ... 100 mV	≤ ±5 μV	≤ ±0.2 μV/°C (0.11 μV/°F)
mV: -100 ... 1700 mV	≤ ±0.1 mV	≤ ±36 μV/°C (20 μV/°F)
mV: ± 800 mV	≤ ±0.1 mV	≤ ±32 μV/°C (17.8 μV/°F)
<b>TC</b>		
E	≤ ±0.2 °C (0.36 °F)	≤ ±0.025 °C/°C (°F/°F)
J	≤ ±0.25 °C (0.45 °F)	≤ ±0.025 °C/°C (°F/°F)
K	≤ ±0.25 °C (0.45 °F)	≤ ±0.025 °C/°C (°F/°F)
L	≤ ±0.35 °C (0.63 °F)	≤ ±0.025 °C/°C (°F/°F)
N	≤ ±0.4 °C (0.72 °F)	≤ ±0.025 °C/°C (°F/°F)
T	≤ ±0.25 °C (0.45 °F)	≤ ±0.025 °C/°C (°F/°F)
U	< 0 °C (32 °F) ≤ ±0.8 °C (1.44 °F) ≥ 0 °C (32 °F) ≤ ±0.4 °C (0.72 °F)	≤ ±0.025 °C/°C (°F/°F)
Lr	≤ ±0.2 °C (0.36 °F)	≤ ±0.1 °C/°C (°F/°F)
R	< 200 °C (392 °F) ≤ ±0.5 °C (0.9 °F) ≥ 200 °C (392 °F) ≤ ±1 °C (1.8 °F)	≤ ±0.1 °C/°C (°F/°F)
S	< 200 °C (392 °F) ≤ ±0.5 °C (0.9 °F) ≥ 200 °C (392 °F) ≤ ±1 °C (1.8 °F)	≤ ±0.1 °C/°C (°F/°F)
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)

<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 °C (752 °F)

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

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

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

#### Output accuracy

Output type	Basic accuracy	Temperature coefficient
Analog output	≤ ±1.6 μA (0.01% of the full output span)	≤ ±0.48 μA/K (≤ ±0.003% of the full output span/K)

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#### Selection and ordering data

	Article No.	Options	Order code
<b>Temperature transmitter</b> SITRANS TH320 with 1 input	<b>7NG031</b>	Add <b>"-Z"</b> to article no. and specify order code.	
<a href="#">Click on the Article no. for the online configuration in the PIA Life Cycle Portal.</a>		<b>Certificates for functional safety</b>	
		Functional safety SIL2/3 (IEC 61508)	<b>C20</b>
<b>Communication</b>		<b>Special features of enclosure/packaging</b>	
With HART	<b>0</b>	Without labeling of the measuring range on the TAG label	<b>D41</b>
<b>Primary value output</b>		Jumper plug set on device for write protection	<b>D81</b>
Input 1	<b>0</b>	Jumper plug set on device for fault current > 21 mA (instead of < 3.6 mA) (only non-SIL)	<b>D82</b>
<b>Input 1, type</b>		<b>Input 1: TC</b>	
RTD		Type C W5	<b>V01</b>
<ul style="list-style-type: none"> <li>Pt100 (IEC), 3-wire</li> <li>Pt100 (IEC), 4-wire</li> <li>Pt1000 (IEC), 3-wire</li> <li>Pt1000 (IEC), 4-wire</li> </ul>	<b>B</b> <b>C</b> <b>D</b> <b>E</b>	Type D W3	<b>V02</b>
TC		Type U	<b>V03</b>
<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>	<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>	Type Lr	<b>V04</b>
Potentiometer, 4-wire	<b>R</b>	<b>Input 1: RTD</b>	
<b>Input 1, type customer-specific</b>		Pt x (IEC), 3-wire, define RTD factor x in option Y21	<b>V61</b>
Define customer-specific input configurations in V options	<b>Y</b>	Pt x (IEC), 4-wire, define RTD factor x in option Y21	<b>V62</b>
<b>Input 2, type</b>		Pt x (JIS C1604-81), 3-wire, define RTD factor x in option Y21	<b>V64</b>
Without input 2	<b>A</b>	Pt x (JIS C1604-81), 4-wire, define RTD factor x in option Y21	<b>V65</b>
<b>CJC configuration for TC</b>		Pt x (GOST 6651-2009), 3-wire, define RTD factor x in option Y21	<b>V67</b>
Without CJC	<b>0</b>	Pt x (GOST 6651-2009), 4-wire, define RTD factor x in option Y21	<b>V68</b>
Internal CJC	<b>1</b>	Ni x (DIN 43760-87), 3-wire, define RTD factor x in option Y21	<b>V70</b>
External CJC Pt100 (IEC), 2-wire, define line resistance value in option Y53	<b>2</b>	Ni x (DIN 43760-87), 4-wire, define RTD factor x in option Y21	<b>V71</b>
External CJC Pt100 (IEC), 3-wire	<b>3</b>	Ni x (GOST 6651-2009), 3-wire, define RTD factor x in option Y21	<b>V73</b>
External CJC Ni100 (DIN), 2-wire, define line resistance value in option Y53	<b>5</b>	Ni x (GOST 6651-2009), 4-wire, define RTD factor x in option Y21	<b>V74</b>
External CJC Ni100 (DIN), 3-wire	<b>6</b>	Cu x (ECW-15), 3-wire, define RTD factor x in option Y21	<b>V76</b>
<b>Materials not in contact with media</b>		Cu x (ECW-15), 4-wire, define RTD factor x in option Y21	<b>V77</b>
None	<b>0</b>	Cu x (GOST 6651-94), 2-wire, define line resistance value in option Y51 and RTD factor x in option Y21	<b>V78</b>
<b>Type of protection</b>		Cu x (GOST 6651-94), 3-wire, define RTD factor x in option Y21	<b>V79</b>
General safety (non-Ex); CE, RCM, FM, CSA, KCC	<b>A</b>	Cu x (GOST 6651-94), 4-wire, define RTD factor x in option Y21	<b>V80</b>
Ex i, Ex nA (ec) (Zone)/IS, NIFW, NI (Division); ATEX, IECEx, CSA, FM, NEPSI	<b>N</b>	Cu x (GOST 6651-2009), 3-wire, define RTD factor x in option Y21	<b>V82</b>
<b>Electrical connection/cable entry</b>		Cu x (GOST 6651-2009), 4-wire, define RTD factor x in option Y21	<b>V83</b>
None	<b>A</b>		
<b>Local HMI</b>			
Without display	<b>0</b>		

## Temperature Measurement

### Transmitters for mounting in sensor head

SITRANS TH320 (HART)

#### Selection and ordering data

Customer-specific device settings	Order code
Add <b>"-Z"</b> to article no., specify order code and plain text or drop-down list selection.	
Measuring range setting temperature input: Start of scale value (max. 5 characters), full scale value (max. 5 characters), unit (°C, °F, °Ra, K)	<b>Y01</b>
Plant designation (TAG, device parameters, max. 32 characters)	<b>Y15</b>
Measuring point message (device message and device parameters, max. 32 characters)	<b>Y16</b>
Input 1: RTD factor; e.g. factor "200" = Pt200	<b>Y21</b>

Accessories	Article No.
Further accessories for assembly, connection and transmitter configuration, see page 2/238.	
<b>HART modem</b> With USB interface	<b>7MF4997-1DB</b>
<b>SIMATIC PDM parameterization software</b>	See Catalog FI 01 section 8
<b>DIN rail adapter for temperature transmitter for head mounting</b> (Quantity delivered: 5 units)	<b>7NG3092-8KA</b>
<b>Connecting cable</b> 4-wire, 200 mm, for input connection with temperature transformers for head mounting in the high hinged cover (set with 5 units)	<b>7NG3092-8KC</b>

#### Ordering example

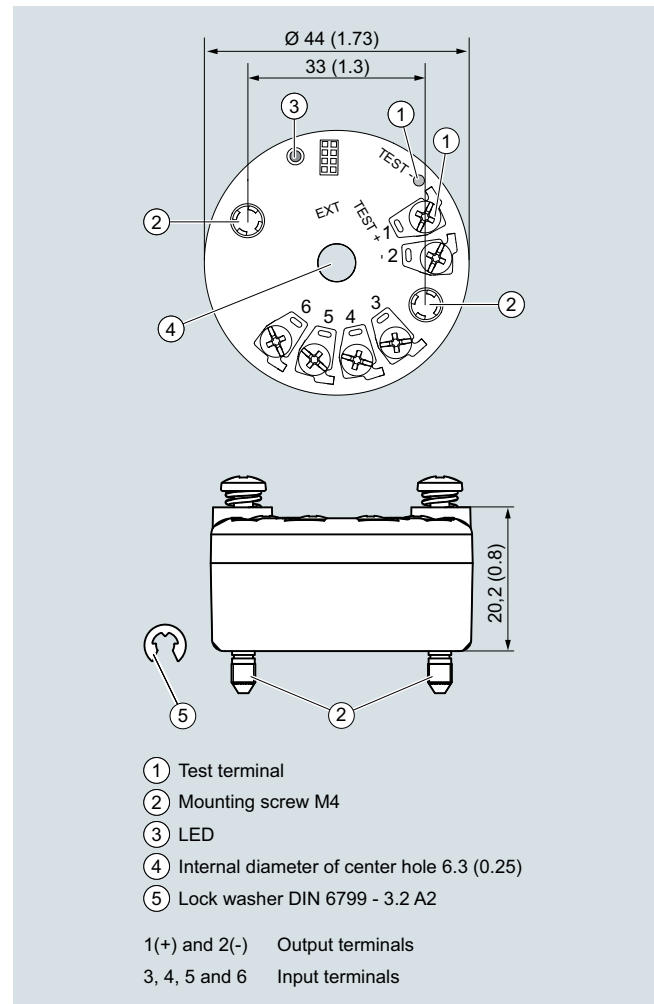
7NG0310-0BA00-0AA0-Z Y01

Y01: -10 ... +100 °C

#### Factory setting

- Pt100 (IEC 60751) with 3-wire system
- Measuring range: 0 ... 100 °C (32 ... 212 °F)
- Fault current
  - Device error: < 3.6 mA
  - 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

#### Dimensional drawings



SITRANS TH320, dimensions and pin assignment, dimensions in mm (inch)



## Temperature Measurement

Transmitters for mounting in sensor head

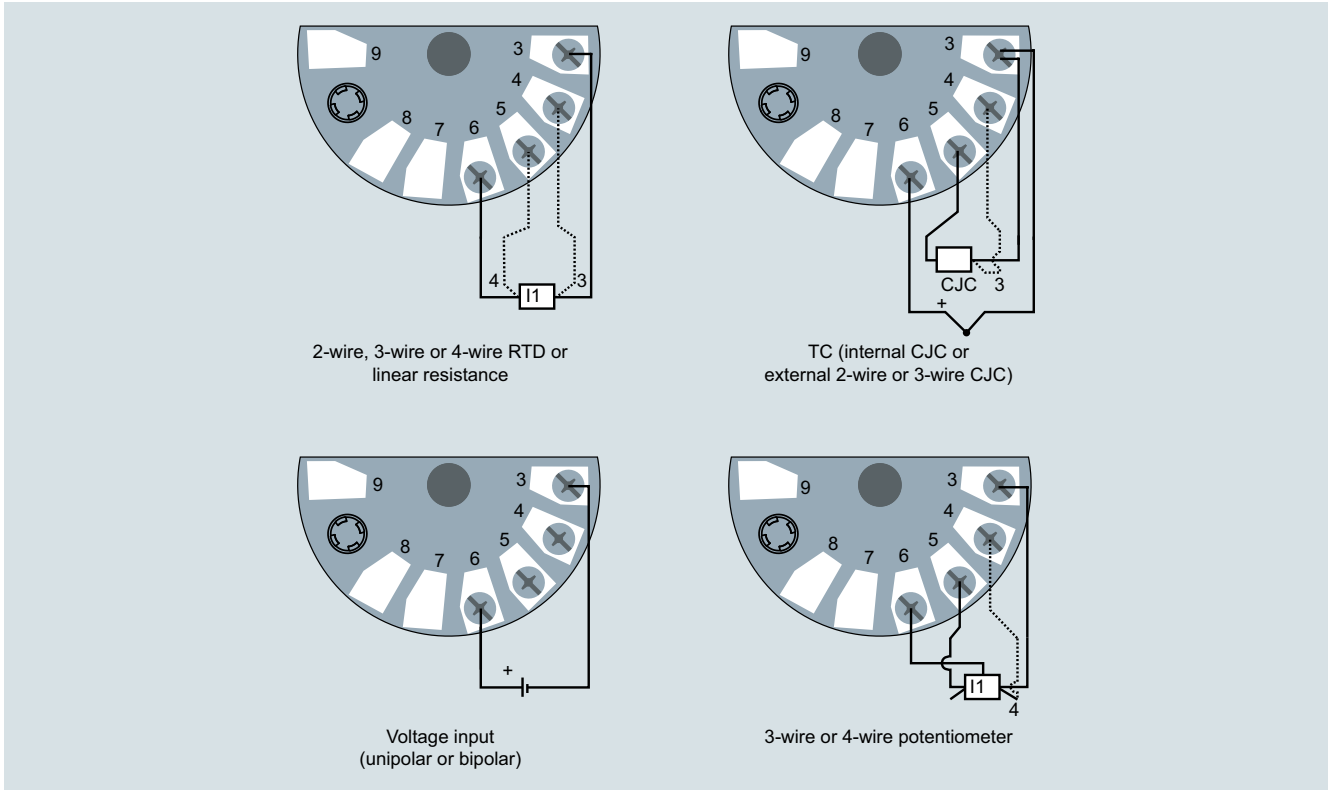
### SITRANS TH320 (HART)

#### Circuit diagrams

##### Connections

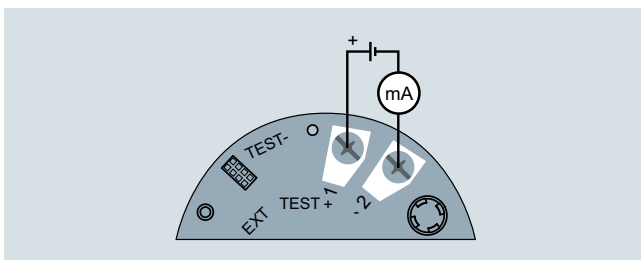
##### Input connection

2



SITRANS TH320, input connection assignment

##### Output connection



SITRANS TH320, output connection assignment

## Temperature Measurement

### Transmitters for mounting in sensor head

SITRANS TH420 (HART)

#### Overview



- 2-wire temperature transmitter with HART communication interface
- Mounting in the connection head of the temperature sensor
- Universal input for virtually any type of temperature sensor
- Connection of two independent input circuits for redundant operation (high input availability)
- Input drift detection
- Configurable over HART

#### Benefits

- Compact design
- Connection of two independent input circuits for redundant operation (high input availability)
- Flexible mounting and center hole allow you to select your preferred type of installation
- Electrical isolation
- Test terminals for ammeter
- Diagnostics LED (green/red)
- Input monitoring wire break, short circuit and drift
- Self-monitoring
- Configuration status stored in EEPROM
- SIL2/3 (with order note C20)
- Expanded diagnostic functions, such as slave pointer, operating hours counter, etc.
- Special characteristic
- Electromagnetic compatibility according to DIN EN 61326 and NE21

#### Application

The SITRANS TH420 transmitter with two inputs can be used in all sectors. Its compact size means that it can be installed in connection heads of type B (DIN 43729) or larger. Due to its universal input module, the following sensors and signal sources can be connected in redundant operation (high input availability):

- 2 resistance thermometers (2-wire, 3-wire, 4-wire connection)
- 2 thermocouples
- 2 linear resistors, potentiometer and DC voltage sources

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

The dual input mode also supports drift detection of the inputs, whereby maintenance intervals can be more easily planned.

Transmitters of the "intrinsically safe or Zone 2 increased safety" type of protection can be installed in hazardous areas. The device meets the requirements of the EU Directive 2014/34/EU (ATEX), the FM and CSA regulations as well as other national approvals.

## Temperature Measurement

Transmitters for mounting in sensor head

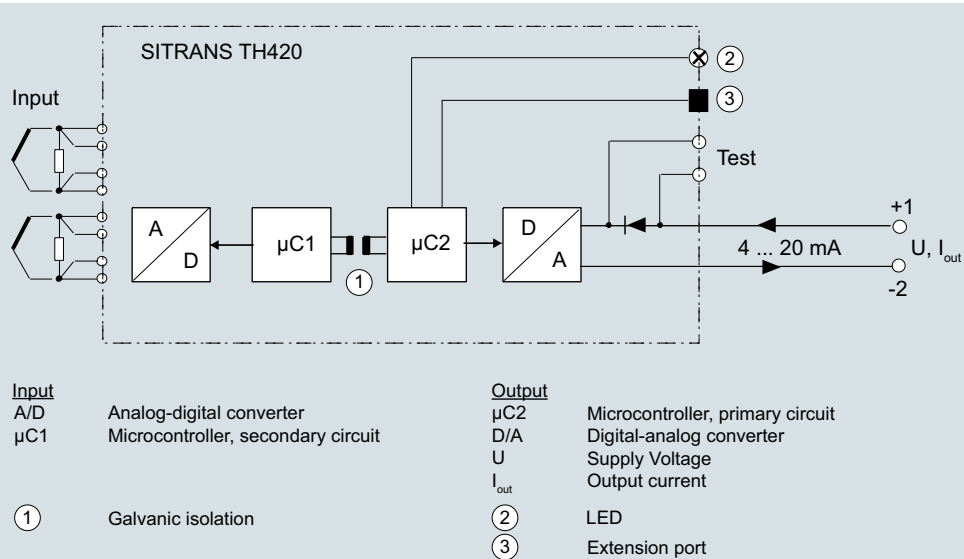
### SITRANS TH420 (HART)

#### Function

The SITRANS TH420 is configured via HART. The configuration can be carried out using a handheld communicator or, more conveniently, with a HART modem and the SIMATIC PDM configuration software. The configuration data is then permanently stored in the non-volatile memory (EEPROM).

After correct connection of input and supply voltage, the transmitter outputs a temperature-linear output signal and the diagnostics LED is green. In case of external errors, e.g. sensor short circuit or interruption, the LED flashes red; an internal error is indicated by a permanent red light.

An ammeter can be connected at any time for checking and plausibility via the test terminals. The output current can be read without any interruption, or even without opening the current loop.



SITRANS TH420, function block diagram

### Technical specifications

#### General

Supply voltage <sup>1) 2)</sup>	
• Without explosion protection (non-Ex)	7.5 ... 48 V DC
• with explosion protection (Ex i)	7.5 ... 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	$(V_{\text{supply}} - 37 \text{ V})/23 \text{ mA}$
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	Open circuits or software
Warming-up time	< 5 min
Starting time	< 2.75 s
Programming	HART
Signal-to-noise ratio	> 60 dB
Long-term stability	Better than: <ul style="list-style-type: none"> <li>± 0.05% of measuring span/year</li> <li>± 0.18% of measuring span/5 years</li> </ul>
Response time	≤ 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
	<b>Note</b>
	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)	≤ 2000 ms

#### Thermocouples (TC)

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, 3-wire or 4-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)	≤ 2000 ms

#### Linear resistance

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
Potentiometers	
Input range	0 ... 100 kΩ
Minimum measuring span	25 Ω
Type of connection	3-wire, 4-wire or 5-wire
Line resistance per wire	Max. 50 Ω
Input current	< 0.15 mA
Effect of the line resistance (with 4-wire and 5-wire connections)	< 0.002 Ω/Ω
Cable, wire-wire capacity	
• R > 400 Ω	Max. 30 nF
• R ≤ 400 Ω	Max. 50 nF

## Temperature Measurement

### Transmitters for mounting in sensor head

#### SITRANS TH420 (HART)

Fault detection, programmable	None, short-circuited, defective, short-circuited or defective
	<b>Note</b> 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.
Detection limit for short-circuited input	15 Ω
Fault detection time, wiper arm (no short-circuit detection)	≤ 75 ms (typically 70 ms)
Fault detection time, element	≤ 2000 ms
Fault detection time (for 4-wire and 5-wire)	≤ 2000 ms
<b>Voltage input</b>	
Measuring range	
• Unipolar	-100 ... 1700 mV
• Bipolar	-800 ... +800 mV
Minimum measuring span	2.5 mV
Input resistance	10 MΩ
Cable, wire-wire capacity	
• Input range: -100 ... 1700 mV	Max. 30 nF
• Input range: -20 ... 100 mV	Max. 50 nF
Fault detection, programmable	None, defective
Fault detection time	≤ 75 ms (typically 70 ms)
<b>Output and HART communication</b>	
Normal range, programmable	3.8 ... 20.5 mA/20.5 ... 3.8 mA
Extended range (output limits), programmable	3.5 ... 23 mA/23 ... 3.5 mA
Programmable input/output limits	
• Fault current	Enable/disable
• Fault current setting	3.5 ... 23 mA
Update time	10 ms
Load (with current output)	≤ (V <sub>Supply</sub> - 7.5)/0.023 Ω
Load stability	< 0.01% of meas. span/100 Ω (measuring span = currently selected range)
Input fault detection, programmable (detection of input short circuits is ignored with TC and voltage inputs)	3.5 ... 23 mA
NAMUR NE43 Upscale	> 21 mA
NAMUR NE43 Downscale	< 3.6 mA
HART protocol versions	HART 7
<b>Measuring accuracy</b>	
Input accuracy	See "Input accuracy" table
Output accuracy	See "Output accuracy" table
<b>Rated conditions</b>	
Ambient temperature (operation)	
• Standard	-50 ... +85 °C (-58 ... +185 °F)
• SIL	-40 ... +80 °C (-40 ... +176 °F)
Storage temperature	-50 ... +85 °C (-58 ... +185 °F)
Calibration temperature	24 °C ±1.0 °C (75.2 °F ±1.8 °F)
Relative humidity	< 99% (no condensation)
Degree of protection	
• Enclosure of the transmitter	IP68
• Terminals	IP00

<b>Design</b>	
Weight	50 g (0.11 lb)
Maximum cable cross-section	1 × 1.5 mm <sup>2</sup> (stranded wire)
Tightening torque for clamping screws	0.4 Nm
Vibrations	IEC 60068-2-6
• 2 ... 25 Hz	± 1.6 mm (0.07 inch)
• 25 ... 100 Hz	± 4 g
<b>Certificates and approvals</b>	
<u>Explosion protection ATEX/IECEX and others</u>	
Certificates <sup>3)</sup>	DEKRA 17ATEX0116 X IECEX DEK 17.0054X A5E43700604A-2018X
"Intrinsic safety ia/ib" type of protection	For use in Zone 0, 1, 2, 20, 21, 22
• ATEX	II 1 G Ex ia IIC T6 ... T4 Ga II 2(1) G Ex ib [ia Ga] IIC T6 ... T4 Gb II 1 D Ex ia IIIC Da I M1 Ex ia I Ma
• IECEx and others	Ex ia IIC T6 ... T4 Ga Ex ib [ia Ga] IIC T6 ... T4 Gb Ex ia IIIC Da Ex ia I Ma
"Intrinsic safety ic" type of protection	For use in Zones 2 and 22
• ATEX	II 2 G Ex ic IIC T6...T4 Gc II 2 D Ex ic IIIC Dc
• IECEx and others	Ex ic IIC T6 ... T4 Gc Ex ic IIIC Dc
"Non-sparking/increased safety nA/ec" type of protection	For use in Zones 2 and 22
• ATEX	II 2 G Ex nA IIC T6...T4 Gc II 2 G Ex ec IIC T6...T4 Gc
• IECEx and others	Ex nA IIC T6 ... T4 Gc Ex ec IIC T6 ... T4 Gc
<u>Explosion protection CSA /FM for Canada and USA</u>	
Certificates	CSA 1861385 FM18CA0024 FM18US0046
"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 incensive field wiring NIFW" type of protection	NIFW, CL I, Div 2, GP ABCD T6 ... T4
"Non incensive 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

1) Note that the minimum supply voltage must correspond to the value measured at the terminals of the SITRANS TH420.  
All external voltage drops must be taken into consideration.

2) Protect the device from overvoltage with the help of a suitable power supply or suitable overvoltage protection equipment.

3) 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 ... +1562)	0.003851 (0.002139)	10 (50)
	JIS C 1604-8	-200 ... +649 (-328 ... +1200)	0.003916 (0.002176)	10 (50)
	GOST 6651_2009	-200 ... +850 (-328 ... +1562)	0.003910 (0.002172)	10 (50)
	Callendar-Van Dusen	-200 ... +850 (-328 ... +1562)	-	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 ... +1200 (-212 ... +2192)	50 (122)
K	IEC 60584-1	-180 ... +1372 (-356 ... +2502)	50 (122)
L	DIN 43710	-200 ... +900 (-392 ... +1652)	50 (122)
Lr	GOST 3044-84	-200 ... +800 (-392 ... +1472)	50 (122)
N	IEC 60584-1	-180 ... +1300 (-356 ... +2372)	50 (122)
R	IEC 60584-1	-50 ... +1760 (-122 ... +3200)	100 (212)
S	IEC 60584-1	-50 ... +1760 (-122 ... +3200)	100 (212)
T	IEC 60584-1	-200 ... +400 (-392 ... +752)	50 (122)
U	DIN 43710	-200 ... +600 (-392 ... +1112)	50 (122)
W3	ASTM E988-96	0 ... 2300 (32 ... 4172)	100 (212)
W5	ASTM E988-96	0 ... 2300 (32 ... 4172)	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	≤ ±0.8 °C (1.44 °F)	≤ ±0.020 °C/°C (°F/°F)
Pt20	≤ ±0.4 °C (0.72 °F)	≤ ±0.010 °C/°C (°F/°F)
Pt50	≤ ±0.16 °C (0.288 °F)	≤ ±0.004 °C/°C (°F/°F)
Pt100	≤ ±0.04 °C (0.072 °F)	≤ ±0.002 °C/°C (°F/°F)
Pt200	≤ ±0.08 °C (0.144 °F)	≤ ±0.002 °C/°C (°F/°F)
Pt500	$T_{\max.} < 180 \text{ °C (356 °F)} = \leq \pm 0.08 \text{ °C (0.144 °F)}$ $T_{\max.} < 180 \text{ °C (356 °F)} = \leq \pm 0.16 \text{ °C (0.288 °F)}$	≤ ±0.002 °C/°C (°F/°F)
Pt1000	≤ ±0.08 °C (0.144 °F)	≤ ±0.002 °C/°C (°F/°F)
Pt2000	$T_{\max.} < 300 \text{ °C (572 °F)} = \leq \pm 0.08 \text{ °C (0.144 °F)}$ $T_{\max.} < 300 \text{ °C (572 °F)} = \leq \pm 0.4 \text{ °C (0.72 °F)}$	≤ ±0.002 °C/°C (°F/°F)
Pt10000	≤ ±0.16 °C (0.288 °F)	≤ ±0.002 °C/°C (°F/°F)
Pt x	Largest tolerance of neighboring points	Largest temperature coefficient of neighboring points
Ni10	≤ ±1.6 °C (2.88 °F)	≤ ±0.020 °C/°C (°F/°F)
Ni20	≤ ±0.8 °C (1.44 °F)	≤ ±0.010 °C/°C (°F/°F)
Ni50	≤ ±0.32 °C (0.576 °F)	≤ ±0.004 °C/°C (°F/°F)
Ni100	≤ ±0.16 °C (0.288 °F)	≤ ±0.002 °C/°C (°F/°F)
Ni120	≤ ±0.16 °C (0.288 °F)	≤ ±0.002 °C/°C (°F/°F)
Ni200	≤ ±0.16 °C (0.288 °F)	≤ ±0.002 °C/°C (°F/°F)
Ni500	≤ ±0.16 °C (0.288 °F)	≤ ±0.002 °C/°C (°F/°F)
Ni1000	≤ ±0.16 °C (0.288 °F)	≤ ±0.002 °C/°C (°F/°F)
Ni2000	≤ ±0.16 °C (0.288 °F)	≤ ±0.002 °C/°C (°F/°F)

## Temperature Measurement

Transmitters for mounting in sensor head

### SITRANS TH420 (HART)

Input type	Basic accuracy	Temperature coefficient <sup>1)</sup>
Ni10000	$\leq \pm 0.32$ °C (0.576 °F)	$\leq \pm 0.002$ °C/°C (°F/°F)
Ni x	Largest tolerance of neighboring points	Largest temperature coefficient of neighboring points
Cu5	$\leq \pm 1.6$ °C (2.88 °F)	$\leq \pm 0.040$ °C/°C (°F/°F)
Cu10	$\leq \pm 0.8$ °C (1.44 °F)	$\leq \pm 0.020$ °C/°C (°F/°F)
Cu20	$\leq \pm 0.4$ °C (0.72 °F)	$\leq \pm 0.010$ °C/°C (°F/°F)
Cu50	$\leq \pm 0.16$ °C (0.288 °F)	$\leq \pm 0.004$ °C/°C (°F/°F)
Cu100	$\leq \pm 0.08$ °C (0.144 °F)	$\leq \pm 0.002$ °C/°C (°F/°F)
Cu200	$\leq \pm 0.08$ °C (0.144 °F)	$\leq \pm 0.002$ °C/°C (°F/°F)
Cu500	$\leq \pm 0.16$ °C (0.288 °F)	$\leq \pm 0.002$ °C/°C (°F/°F)
Cu1000	$\leq \pm 0.08$ °C (0.144 °F)	$\leq \pm 0.002$ °C/°C (°F/°F)
Cu x	Largest tolerance of neighboring points	Largest temperature coefficient of neighboring points
<b>Linear resistance</b>		
0 ... 400 Ω	$\leq \pm 40$ mΩ	$\leq \pm 2$ mΩ/°C (1.11 mΩ/°F)
0 ... 100 kΩ	$\leq \pm 4$ Ω	$\leq \pm 0.2$ Ω/°C (0.11 Ω/°F)
<b>Potentiometers</b>		
0 ... 100%	< 0.05%	< $\pm 0.005\%$
<b>Voltage input</b>		
mV: -20 ... 100 mV	$\leq \pm 5$ μV	$\leq \pm 0.2$ μV/°C (0.11 μV/°F)
mV: -100 ... 1700 mV	$\leq \pm 0.1$ mV	$\leq \pm 36$ μV/°C (20 μV/°F)
mV: $\pm 800$ mV	$\leq \pm 0.1$ mV	$\leq \pm 32$ μV/°C (17.8 μV/°F)
<b>TC</b>		
E	$\leq \pm 0.2$ °C (0.36 °F)	$\leq \pm 0.025$ °C/°C (°F/°F)
J	$\leq \pm 0.25$ °C (0.45 °F)	$\leq \pm 0.025$ °C/°C (°F/°F)
K	$\leq \pm 0.25$ °C (0.45 °F)	$\leq \pm 0.025$ °C/°C (°F/°F)
L	$\leq \pm 0.35$ °C (0.63 °F)	$\leq \pm 0.025$ °C/°C (°F/°F)
N	$\leq \pm 0.4$ °C (0.72 °F)	$\leq \pm 0.025$ °C/°C (°F/°F)
T	$\leq \pm 0.25$ °C (0.45 °F)	$\leq \pm 0.025$ °C/°C (°F/°F)
U	< 0 °C (32 °F) $\leq \pm 0.8$ °C (1.44 °F) ≥ 0 °C (32 °F) $\leq \pm 0.4$ °C (0.72 °F)	$\leq \pm 0.025$ °C/°C (°F/°F)
Lr	$\leq \pm 0.2$ °C (0.36 °F)	$\leq \pm 0.1$ °C/°C (°F/°F)
R	< 200 °C (392 °F) $\leq \pm 0.5$ °C (0.9 °F) ≥ 200 °C (392 °F) $\leq \pm 1$ °C (1.8 °F)	$\leq \pm 0.1$ °C/°C (°F/°F)
S	< 200 °C (392 °F) $\leq \pm 0.5$ °C (0.9 °F) ≥ 200 °C (392 °F) $\leq \pm 1$ °C (1.8 °F)	$\leq \pm 0.1$ °C/°C (°F/°F)
W3	$\leq \pm 0.6$ °C (1.08 °F)	$\leq \pm 0.1$ °C/°C (°F/°F)
W5	$\leq \pm 0.4$ °C (0.72 °F)	$\leq \pm 0.1$ °C/°C (°F/°F)
B <sup>2)</sup>	$\leq \pm 1$ °C (1.8 °F)	$\leq \pm 0.1$ °C/°C (°F/°F)
B <sup>3)</sup>	$\leq \pm 3$ °C (5.4 °F)	$\leq \pm 0.1$ °C/°C (°F/°F)
B <sup>4)</sup>	$\leq \pm 8$ °C (14.4 °F)	$\leq \pm 0.8$ °C/°C (°F/°F)
B <sup>5)</sup>	Not specified	Not specified
CJC (internal)	$\leq \pm 0.5$ °C (0.9 °F)	Included in basic accuracy
CJC (external)	$\leq \pm 0.08$ °C (0.144 °F)	$\leq \pm 0.002$ °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	$\leq \pm 1.6$ μA (0.01% of the full output span)	$\leq \pm 0.48$ μA/K ( $\leq \pm 0.003\%$ of the full output span/K)

# Temperature Measurement

## Transmitters for mounting in sensor head

SITRANS TH420 (HART)

### Selection and ordering data

	Article No.	
Temperature transmitter SITRANS TH420 with 2 inputs	7NG041	Order code
	- - - - - 0	
Click on the Article no. for the online configuration in the PIA Life Cycle Portal.		
<b>Communication</b>		
With HART	0	
<b>Primary value output</b>		
Input 1	0	
Input 1, input 2 as redundancy	1	
Input 2, input 1 as redundancy	2	
Average input 1 and input 2, both as redundancy	3	
Minimum input 1 and input 2, both as redundancy	4	
Maximum input 1 and input 2, both as redundancy	5	
Difference input 1 - input 2	6	
Difference input 2 - input 1	7	
Absolute difference	8	
<b>Primary value output, customer-specific</b>		
Minimum input 1 and input 2, without redundancy	9	H 1 A
Maximum input 1 and input 2, without redundancy	9	H 1 B
Average input 1 and input 2, without redundancy	9	H 1 C
Input 2	9	H 1 D
<b>Input 1, type</b>		
RTD		
• Pt100 (IEC), 3-wire	B	
• Pt100 (IEC), 4-wire	C	
• Pt1000 (IEC), 3-wire	D	
• Pt1000 (IEC), 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	
<b>Input 1, type customer-specific</b>		
Define customer-specific input configurations in V options	Y	

	Article No.	
Temperature transmitter SITRANS TH420 with 2 inputs	7NG041	Order code
	- - - - - 0	
<b>Input 2, type</b>		
Without input 2	A	
RTD		
• Pt100 (IEC), 3-wire	B	
• Pt100 (IEC), 4-wire	C	
• Pt1000 (IEC), 3-wire	D	
• Pt1000 (IEC), 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	
<b>Input 2, type customer-specific</b>		
Define customer-specific input configurations in W options	Y	
<b>CJC configuration for TC</b>		
Input 1: no 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>Materials not in contact with media</b>		
None	0	
<b>Type of protection</b>		
General safety (non-Ex); CE, RCM, FM, CSA, KCC	A	
Ex i, Ex nA (ec) (Zone)/IS, NIFW, NI (Division); ATEX, IECEx, CSA, FM, NEPSI	N	
<b>Electrical connection/cable entry</b>		
None	A	
<b>Local HMI</b>		
Without display	0	

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## Temperature Measurement

### Transmitters for mounting in sensor head

#### SITRANS TH420 (HART)

#### Selection and ordering data

Options	Order code
Add "-Z" to article no. and specify order code.	
<b>Certificates for functional safety</b>	
Functional safety SIL2/3 (IEC 61508)	<b>C20</b>
<b>Special features of enclosure/packaging</b>	
Without labeling of the measuring range on the TAG label	<b>D41</b>
Jumper plug set on device for write protection	<b>D81</b>
Jumper plug set on device for fault current > 21 mA (instead of < 3.6 mA) (only non-SIL)	<b>D82</b>
<b>External CJC types</b>	
Pt100, IEC 60751, 3-wire	<b>J02</b>
Pt100, IEC 60751, 4-wire	<b>J03</b>
Ni100, DIN 43760-87, 3-wire	<b>J05</b>
Ni100, DIN 43760-87, 4-wire	<b>J06</b>
<b>Input 1: TC</b>	
Type C W5	<b>V01</b>
Type D W3	<b>V02</b>
Type U	<b>V03</b>
Type Lr	<b>V04</b>
<b>Input 1: Potentiometers</b>	
Potentiometer, 5-wire	<b>V31</b>
<b>Input 1: RTD</b>	
Pt x (IEC), 3-wire, define RTD factor x in option Y21	<b>V61</b>
Pt x (IEC), 4-wire, define RTD factor x in option Y21	<b>V62</b>
Pt x (JIS C1604-81), 3-wire, define RTD factor x in option Y21	<b>V64</b>
Pt x (JIS C1604-81), 4-wire, define RTD factor x in option Y21	<b>V65</b>
Pt x (GOST 6651-2009), 3-wire, define RTD factor x in option Y21	<b>V67</b>
Pt x (GOST 6651-2009), 4-wire, define RTD factor x in option Y21	<b>V68</b>
Ni x (DIN 43760-87), 3-wire, define RTD factor x in option Y21	<b>V70</b>
Ni x (DIN 43760-87), 4-wire, define RTD factor x in option Y21	<b>V71</b>
Ni x (GOST 6651-2009), 3-wire, define RTD factor x in option Y21	<b>V73</b>
Ni x (GOST 6651-2009), 4-wire, define RTD factor x in option Y21	<b>V74</b>
Cu x (ECW-15), 3-wire, define RTD factor x in option Y21	<b>V76</b>
Cu x (ECW-15), 4-wire, define RTD factor x in option Y21	<b>V77</b>
Cu x (GOST 6651-94), 3-wire, define RTD factor x in option Y21	<b>V79</b>
Cu x (GOST 6651-94), 4-wire, define RTD factor x in option Y21	<b>V80</b>
Cu x (GOST 6651-2009), 3-wire, define RTD factor x in option Y21	<b>V82</b>
Cu x (GOST 6651-2009), 4-wire, define RTD factor x in option Y21	<b>V83</b>
<b>Input 2: TC</b>	
Type C W5	<b>W01</b>
Type D W3	<b>W02</b>
Type U	<b>W03</b>
Type Lr	<b>W04</b>

Customer-specific device settings	Order code
Add "-Z" to article no., specify order code and plain text or drop-down list selection.	
Measuring range setting temperature input: Start of scale value (max. 5 characters), full scale value (max. 5 characters), unit (°C, °F, °Ra, K)	<b>Y01</b>
Plant designation (TAG, device parameters, max. 32 characters)	<b>Y15</b>
Measuring point message (device message and device parameters, max. 32 characters)	<b>Y16</b>
Input 1: RTD factor; e.g. factor "200" = Pt200	<b>Y21</b>
<b>Accessories</b>	Article No.
Further accessories for assembly, connection and transmitter configuration, see page 2/238.	
<b>HART modem</b>	<b>7MF4997-1DB</b>
With USB interface	
<b>SIMATIC PDM parameterization software</b>	See Catalog FI 01 section 8
<b>DIN rail adapter for temperature transmitter for head mounting</b>	<b>7NG3092-8KA</b>
(Quantity delivered: 5 units)	
<b>Connecting cable</b>	<b>7NG3092-8KC</b>
4-wire, 200 mm, for input connection with temperature transformers for head mounting in the high hinged cover (set with 5 units)	

#### Ordering example

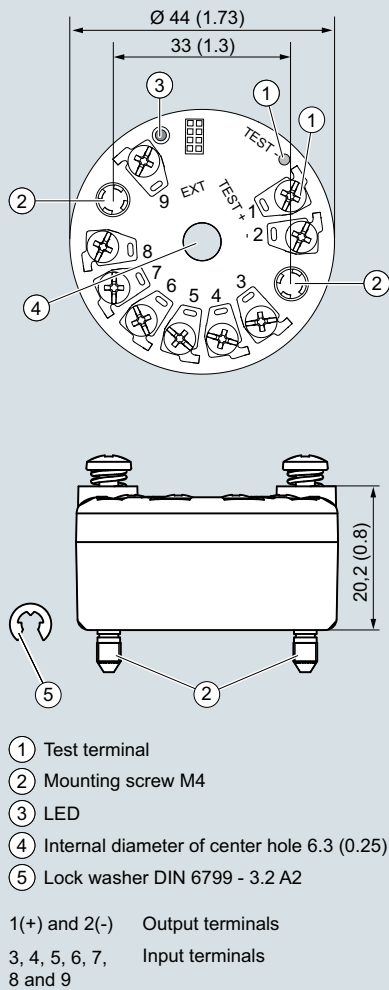
7NG0410-0BA00-0AA0-Z Y01

Y01: -10 ... +100 °C

#### 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
  - Device error: < 3.6 mA
  - 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 TH420, dimensions and pin assignment, dimensions in mm (inch)

## Temperature Measurement

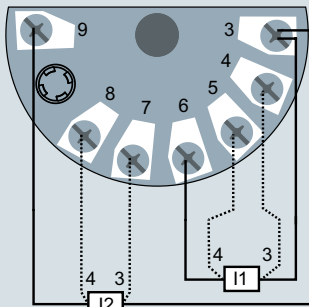
Transmitters for mounting in sensor head

### SITRANS TH420 (HART)

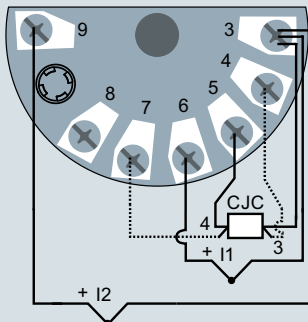
#### Circuit diagrams

##### Connections

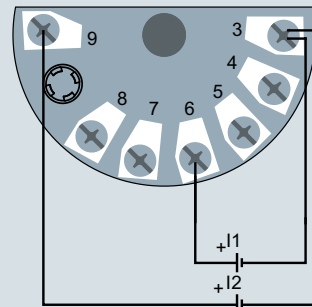
##### Input connection



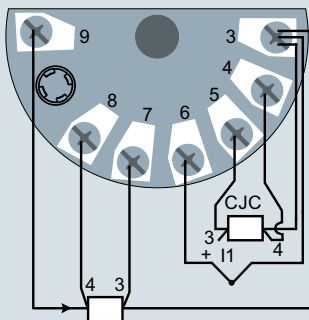
Input 1 and/or input 2:  
2-wire, 3-wire or 4-wire RTD or  
linear resistance



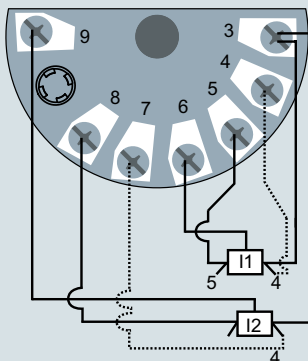
Input 1 and/or input 2:  
TC (internal CJC or  
external 2-wire, 3-wire or  
4-wire CJC)



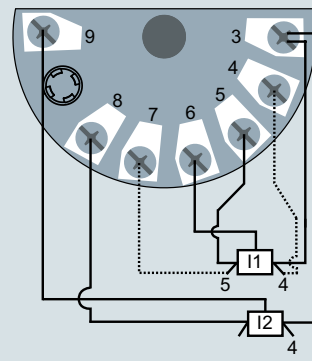
Input 1 and/or input 2:  
Voltage input  
(unipolar or bipolar)



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



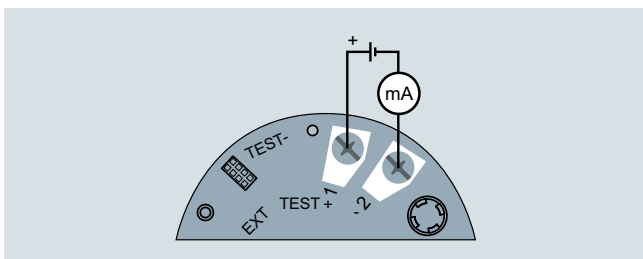
Input 1 and/or Input 2:  
3-wire or 4-wire potentiometer



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

SITRANS TH420, input connection assignment

##### Output connection



SITRANS TH420, output connection assignment

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