



## Function

### Without HART communications interface

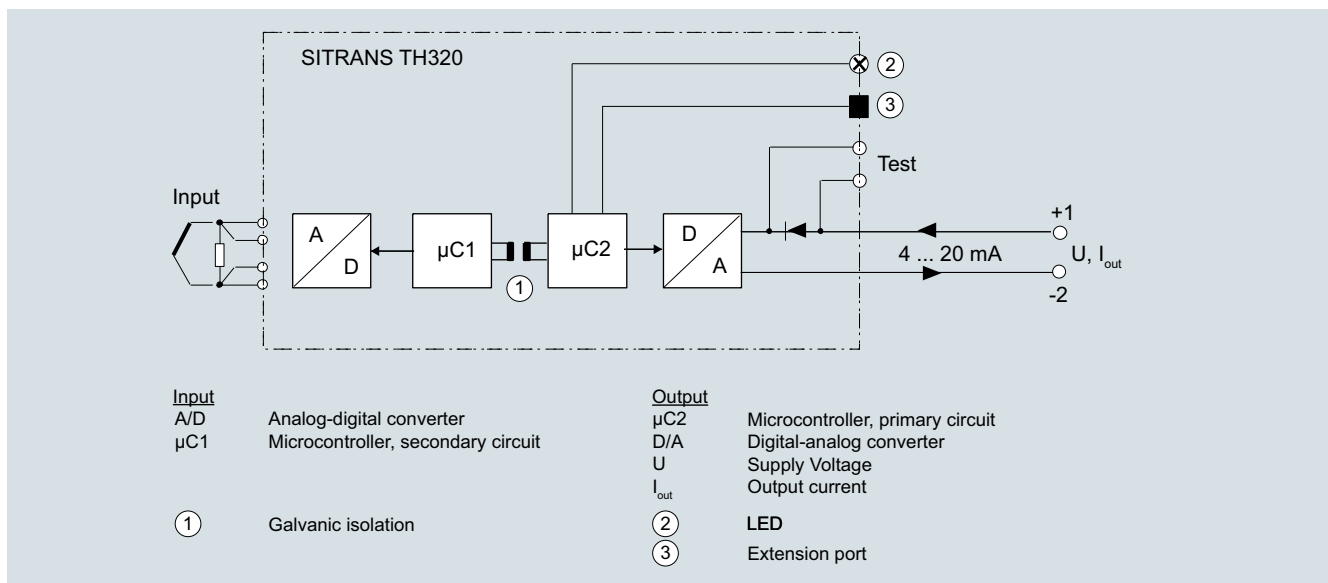
For the SITRANS TH320 without HART functionality, parameters are assigned with the PC. A special modem and the software tool SIPROM T are available for this purpose.

### With HART communications 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

## Temperature measurement

### Temperature transmitters

### Compact and head transmitters

#### SITRANS TH320 (HART, universal)

#### 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: • ± 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
	<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)	≤ 2 000 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)	≤ 75 ms (typically 70 ms)
• Fault detection time, external CJC (for 3-wire and 4-wire)	≤ 2 000 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	10 ... 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

# Temperature measurement

## Temperature transmitters

### Compact and head transmitters

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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	≤ 2 000 ms
Fault detection time (for 4-wire and 5-wire)	≤ 2 000 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	-50 ... +85 °C (-58 ... +185 °F)
Ambient temperature for devices with functional safety	-40 ... +80 °C (-40 ... +176 °F)
Storage temperature	-50 ... +85 °C (-58 ... +185 °F)
Reference temperature for sensor calibration	24 °C ±1.0 °C (75.2 °F ±1.8 °F)
Relative humidity	< 99% (no condensation)
Degree of protection	
• Transmitter enclosure	IP68
• Terminals	IPO0

<b>Design</b>	
Weight	50 g (0.11 lb)
Maximum core 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 IIC 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 IIC 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 IIC Dc
• IECEx and others	Ex ic IIC T6 ... T4 Gc Ex ic IIC 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.

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>

## Temperature measurement

Temperature transmitters

Compact and head transmitters

### SITRANS TH320 (HART, universal)

#### 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	≤ ±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

## Temperature transmitters

### Compact and head transmitters

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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)

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
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

Compact and head transmitters

### SITRANS TH320 (HART, universal)

#### Selection and ordering data

	Article No.	Options	Order code
<b>SITRANS TH320 head transmitter with 1 input</b>	<b>7NG031</b>	Add "-Z" to article number, specify order code and, if applicable, free text.	
<a href="#">Click on the Article No. for the online configuration in the PIA Life Cycle Portal.</a>		<b>Manufacturer's declarations</b>	
<b>Communication</b>		Inspection certificate EN 10204-3.1: Manufacturer test certificate for transmitters (5 measured values)	<b>C11</b>
With HART	0	<b>Certificates for functional safety</b>	
2-wire, 4 ... 20 mA	7	Functional safety SIL2/3 (IEC 61508)	<b>C20</b>
<b>Primary value output</b>		<b>Device options</b>	
Input 1	0	PDF file with device settings	<b>D10</b>
<b>Input 1, type</b>		Without labeling of the measuring range on the TAG plate	<b>D41</b>
RTD		Input 1 with add-on cable tail 200 mm, for Pt100 (0-100°C) 4-wire	<b>D73</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 C D E	Jumper plug set on device for write protection	<b>D81</b>
TC	F G H J K L N P Q	Jumper plug set on device for fault current > 21 mA (instead of < 3.6 mA) (only non-SIL)	<b>D82</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>Noise damping</b>	
Potentiometer, 4-wire	R	Noise damping 60 Hz instead of 50 Hz	<b>P10</b>
<b>Input 1, type customer-specific</b>	Y	<b>Input 1: TC</b>	
Define customer-specific input configurations in V options		Type C W5	<b>V01</b>
<b>Input 2, type</b>	A	Type D W3	<b>V02</b>
Without input 2		Type U	<b>V03</b>
<b>CJC configuration for TC</b>		Type Lr	<b>V04</b>
Without CJC	0	<b>Input 1: RTD</b>	
Internal CJC	1	RTD Pt x IEC 60751 2-wire (wire resistance value defined in option Y51, RTD factor x defined in option Y21)	<b>V60</b>
External CJC Pt100 (IEC), 3-wire	3	Pt x (IEC), 3-wire, define RTD factor x in option Y21	<b>V61</b>
External CJC Ni100 (DIN), 3-wire	6	Pt x (IEC), 4-wire, define RTD factor x in option Y21	<b>V62</b>
<b>Materials not in contact with media</b>		Pt x (JIS C1604-81), 3-wire, define RTD factor x in option Y21	<b>V64</b>
None	0	Pt x (JIS C1604-81), 4-wire, define RTD factor x in option Y21	<b>V65</b>
<b>Type of protection</b>		Pt x (GOST 6651-2009), 3-wire, define RTD factor x in option Y21	<b>V67</b>
General purpose (non-Ex); CE, RCM, FM, KCC, EAC	A	Pt x (GOST 6651-2009), 4-wire, define RTD factor x in option Y21	<b>V68</b>
Intrinsic safety (Ex i) / Non-incendive field wiring (NIFW) / Increased safety zone 2 (Ex ec) / Non-incendive (NI) (ATEX, IECEx, EACEx, CSA, FM, NEPSI, Inmetro)	N	Ni x (DIN 43760-87), 3-wire, define RTD factor x in option Y21	<b>V70</b>
<b>Electrical connection/cable entry</b>		Ni x (DIN 43760-87), 4-wire, define RTD factor x in option Y21	<b>V71</b>
None	A	Ni x (GOST 6651-2009), 3-wire, define RTD factor x in option Y21	<b>V73</b>
<b>Local HMI</b>		Ni x (GOST 6651-2009), 4-wire, define RTD factor x in option Y21	<b>V74</b>
Without display	0	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>

## Temperature measurement

### Temperature transmitters

### Compact and head transmitters

SITRANS TH320 (HART, universal)

Options	Order code
Add "-Z" to article number, specify order code and, if applicable, free text.	
<b>Device settings</b>	
Measuring range setting temperature input: Lower range value (max. 5 characters), upper range value (max. 5 characters), unit (°C, °F, °Ra, K)	<b>Y01</b>
Long tag (device parameter, max. 32 characters), adhesive label	<b>Y15</b>
Measuring point description (device parameter, max. 32 characters), adhesive label	<b>Y16</b>
Long tag (device parameter, max. 8 characters), adhesive label	<b>Y17</b>
Descriptor (device parameter, max. 16 characters), adhesive label	<b>Y18</b>
Input 1: RTD factor; e.g. factor "200" = Pt200, adhesive label	<b>Y21</b>
Value wire resistance input 1 in Ohm (0...100 Ohm)	<b>Y51</b>

### Accessories

	Article No.
Additional accessories for assembly, connection and transmitter configuration, see page 2/251.	
<b>Modems</b>	
Modem with USB interface	<b>7MF4997-1DB</b>
Modem with USB interface and SIPROM T software	<b>7NG3092-8KN</b>
<b>SIMATIC PDM parameterization software</b>	See Catalog FI 01 section 8
<b>Mounting rail adapter for head transmitter</b> (Quantity delivered: 5 units)	<b>7NG3092-8KA</b>
<b>Connecting cable</b> 4-wire, 200 mm (7.97 inch), for input connections when using head transmitters in the high hinged cover (set with 5 units)	<b>7NG3092-8KC</b>

### Ordering example

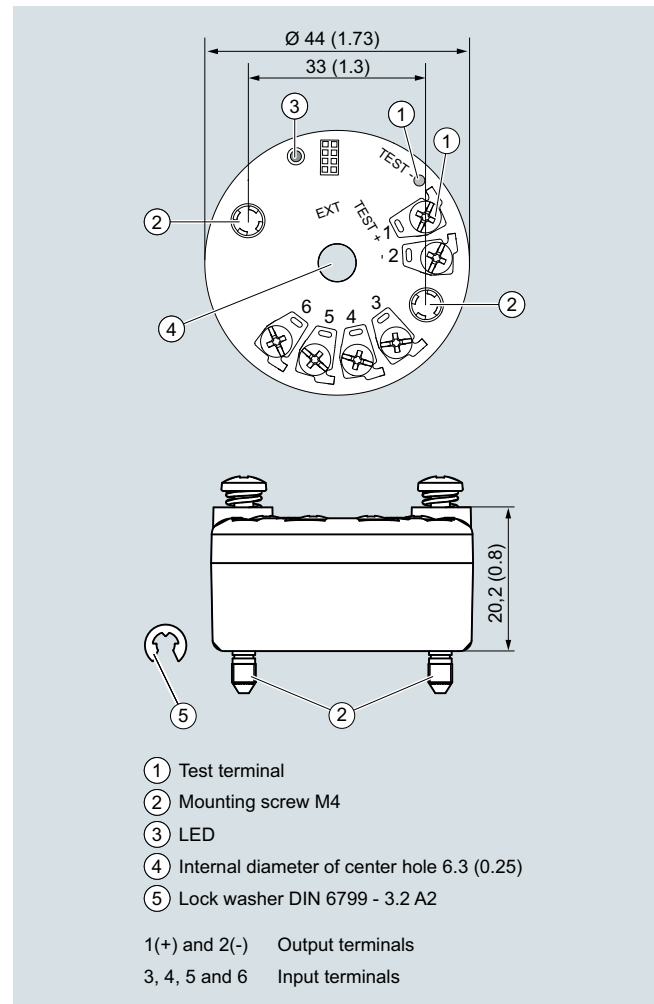
7NG0310-0BA00-0AA0-Z Y01

Y01: -10 ... +100 °C

### Factory setting

- Pt100 (IEC 60751); 3-wire connection
- 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)





#### Overview



- 2-wire head transmitter with HART communications 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 via HART 7

#### 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
- Galvanic 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 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

Temperature transmitters

Compact and head transmitters

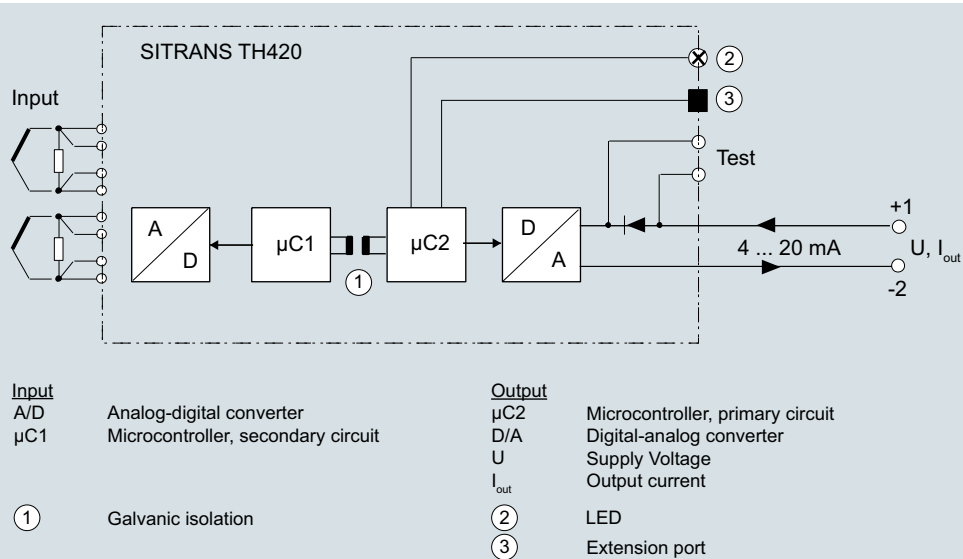
### SITRANS TH420 (HART, universal)

#### 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 are 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)	≤ 2 000 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)	≤ 2 000 ms
	<b>Linear resistance</b>
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
	<b>Potentiometers</b>
Input range	10 ... 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

### Temperature transmitters

#### Compact and head transmitters

#### SITRANS TH420 (HART, universal)

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	≤ 2 000 ms
Fault detection time (for 4-wire and 5-wire)	≤ 2 000 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	-50 ... +85 °C (-58 ... +185 °F)
Ambient temperature for devices with functional safety	-40 ... +80 °C (-40 ... +176 °F)
Storage temperature	-50 ... +85 °C (-58 ... +185 °F)
Reference temperature for sensor calibration	24 °C ±1.0 °C (75.2 °F ±1.8 °F)
Relative humidity	< 99% (no condensation)
Degree of protection	
• Transmitter enclosure	IP68
• Terminals	IP00

<b>Design</b>	
Weight	50 g (0.11 lb)
Maximum core 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 IIC 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 IIC 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 IIC Dc
• IECEx and others	Ex ic IIC T6 ... T4 Gc Ex ic IIC 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 Ex nA IIC T6 ... T4 Gc
• IECEx and others	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 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

1) Note that the minimum supply voltage must correspond to the value measured at the terminals of the SITRANS TH420.

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 ... +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	≤ ±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

### Temperature transmitters

#### Compact and head transmitters

#### SITRANS TH420 (HART, universal)

Input type	Basic accuracy	Temperature coefficient <sup>1)</sup>
Ni10000	$\leq \pm 0.32 \text{ }^\circ\text{C}$ (0.576 $^\circ\text{F}$ )	$\leq \pm 0.002 \text{ }^\circ\text{C}/^\circ\text{C}$ ( $^\circ\text{F}/^\circ\text{F}$ )
Ni x	Largest tolerance of neighboring points	Largest temperature coefficient of neighboring points
Cu5	$\leq \pm 1.6 \text{ }^\circ\text{C}$ (2.88 $^\circ\text{F}$ )	$\leq \pm 0.040 \text{ }^\circ\text{C}/^\circ\text{C}$ ( $^\circ\text{F}/^\circ\text{F}$ )
Cu10	$\leq \pm 0.8 \text{ }^\circ\text{C}$ (1.44 $^\circ\text{F}$ )	$\leq \pm 0.020 \text{ }^\circ\text{C}/^\circ\text{C}$ ( $^\circ\text{F}/^\circ\text{F}$ )
Cu20	$\leq \pm 0.4 \text{ }^\circ\text{C}$ (0.72 $^\circ\text{F}$ )	$\leq \pm 0.010 \text{ }^\circ\text{C}/^\circ\text{C}$ ( $^\circ\text{F}/^\circ\text{F}$ )
Cu50	$\leq \pm 0.16 \text{ }^\circ\text{C}$ (0.288 $^\circ\text{F}$ )	$\leq \pm 0.004 \text{ }^\circ\text{C}/^\circ\text{C}$ ( $^\circ\text{F}/^\circ\text{F}$ )
Cu100	$\leq \pm 0.08 \text{ }^\circ\text{C}$ (0.144 $^\circ\text{F}$ )	$\leq \pm 0.002 \text{ }^\circ\text{C}/^\circ\text{C}$ ( $^\circ\text{F}/^\circ\text{F}$ )
Cu200	$\leq \pm 0.08 \text{ }^\circ\text{C}$ (0.144 $^\circ\text{F}$ )	$\leq \pm 0.002 \text{ }^\circ\text{C}/^\circ\text{C}$ ( $^\circ\text{F}/^\circ\text{F}$ )
Cu500	$\leq \pm 0.16 \text{ }^\circ\text{C}$ (0.288 $^\circ\text{F}$ )	$\leq \pm 0.002 \text{ }^\circ\text{C}/^\circ\text{C}$ ( $^\circ\text{F}/^\circ\text{F}$ )
Cu1000	$\leq \pm 0.08 \text{ }^\circ\text{C}$ (0.144 $^\circ\text{F}$ )	$\leq \pm 0.002 \text{ }^\circ\text{C}/^\circ\text{C}$ ( $^\circ\text{F}/^\circ\text{F}$ )
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>Voltage input</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 $^\circ\text{F}$ )	$\leq \pm 0.025 \text{ }^\circ\text{C}/^\circ\text{C}$ ( $^\circ\text{F}/^\circ\text{F}$ )
J	$\leq \pm 0.25 \text{ }^\circ\text{C}$ (0.45 $^\circ\text{F}$ )	$\leq \pm 0.025 \text{ }^\circ\text{C}/^\circ\text{C}$ ( $^\circ\text{F}/^\circ\text{F}$ )
K	$\leq \pm 0.25 \text{ }^\circ\text{C}$ (0.45 $^\circ\text{F}$ )	$\leq \pm 0.025 \text{ }^\circ\text{C}/^\circ\text{C}$ ( $^\circ\text{F}/^\circ\text{F}$ )
L	$\leq \pm 0.35 \text{ }^\circ\text{C}$ (0.63 $^\circ\text{F}$ )	$\leq \pm 0.025 \text{ }^\circ\text{C}/^\circ\text{C}$ ( $^\circ\text{F}/^\circ\text{F}$ )
N	$\leq \pm 0.4 \text{ }^\circ\text{C}$ (0.72 $^\circ\text{F}$ )	$\leq \pm 0.025 \text{ }^\circ\text{C}/^\circ\text{C}$ ( $^\circ\text{F}/^\circ\text{F}$ )
T	$\leq \pm 0.25 \text{ }^\circ\text{C}$ (0.45 $^\circ\text{F}$ )	$\leq \pm 0.025 \text{ }^\circ\text{C}/^\circ\text{C}$ ( $^\circ\text{F}/^\circ\text{F}$ )
U	< 0 $^\circ\text{C}$ (32 $^\circ\text{F}$ ) $\leq \pm 0.8 \text{ }^\circ\text{C}$ (1.44 $^\circ\text{F}$ ) $\geq 0 \text{ }^\circ\text{C}$ (32 $^\circ\text{F}$ ) $\leq \pm 0.4 \text{ }^\circ\text{C}$ (0.72 $^\circ\text{F}$ )	$\leq \pm 0.025 \text{ }^\circ\text{C}/^\circ\text{C}$ ( $^\circ\text{F}/^\circ\text{F}$ )
Lr	$\leq \pm 0.2 \text{ }^\circ\text{C}$ (0.36 $^\circ\text{F}$ )	$\leq \pm 0.1 \text{ }^\circ\text{C}/^\circ\text{C}$ ( $^\circ\text{F}/^\circ\text{F}$ )
R	< 200 $^\circ\text{C}$ (392 $^\circ\text{F}$ ) $\leq \pm 0.5 \text{ }^\circ\text{C}$ (0.9 $^\circ\text{F}$ ) $\geq 200 \text{ }^\circ\text{C}$ (392 $^\circ\text{F}$ ) $\leq \pm 1 \text{ }^\circ\text{C}$ (1.8 $^\circ\text{F}$ )	$\leq \pm 0.1 \text{ }^\circ\text{C}/^\circ\text{C}$ ( $^\circ\text{F}/^\circ\text{F}$ )
S	< 200 $^\circ\text{C}$ (392 $^\circ\text{F}$ ) $\leq \pm 0.5 \text{ }^\circ\text{C}$ (0.9 $^\circ\text{F}$ ) $\geq 200 \text{ }^\circ\text{C}$ (392 $^\circ\text{F}$ ) $\leq \pm 1 \text{ }^\circ\text{C}$ (1.8 $^\circ\text{F}$ )	$\leq \pm 0.1 \text{ }^\circ\text{C}/^\circ\text{C}$ ( $^\circ\text{F}/^\circ\text{F}$ )
W3	$\leq \pm 0.6 \text{ }^\circ\text{C}$ (1.08 $^\circ\text{F}$ )	$\leq \pm 0.1 \text{ }^\circ\text{C}/^\circ\text{C}$ ( $^\circ\text{F}/^\circ\text{F}$ )
W5	$\leq \pm 0.4 \text{ }^\circ\text{C}$ (0.72 $^\circ\text{F}$ )	$\leq \pm 0.1 \text{ }^\circ\text{C}/^\circ\text{C}$ ( $^\circ\text{F}/^\circ\text{F}$ )
B <sup>2)</sup>	$\leq \pm 1 \text{ }^\circ\text{C}$ (1.8 $^\circ\text{F}$ )	$\leq \pm 0.1 \text{ }^\circ\text{C}/^\circ\text{C}$ ( $^\circ\text{F}/^\circ\text{F}$ )
B <sup>3)</sup>	$\leq \pm 3 \text{ }^\circ\text{C}$ (5.4 $^\circ\text{F}$ )	$\leq \pm 0.1 \text{ }^\circ\text{C}/^\circ\text{C}$ ( $^\circ\text{F}/^\circ\text{F}$ )
B <sup>4)</sup>	$\leq \pm 8 \text{ }^\circ\text{C}$ (14.4 $^\circ\text{F}$ )	$\leq \pm 0.8 \text{ }^\circ\text{C}/^\circ\text{C}$ ( $^\circ\text{F}/^\circ\text{F}$ )
B <sup>5)</sup>	Not specified	Not specified
CJC (internal)	< $\pm 0.5 \text{ }^\circ\text{C}$ (0.9 $^\circ\text{F}$ )	Included in basic accuracy
CJC (external)	$\leq \pm 0.08 \text{ }^\circ\text{C}$ (0.144 $^\circ\text{F}$ )	$\leq \pm 0.002 \text{ }^\circ\text{C}/^\circ\text{C}$ ( $^\circ\text{F}/^\circ\text{F}$ )

<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  $^\circ\text{C}$  (752  $^\circ\text{F}$ )

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

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

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

#### 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	$\leq \pm 1.6 \text{ }\mu\text{A}$ (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

	Article No.	Order code		Article No.	Order code
<b>SITRANS TH420</b> <b>Head transmitter with 2 inputs</b>	<b>7NG041</b>		<b>SITRANS TH420</b> <b>Head transmitter with 2 inputs</b>	<b>7NG041</b>	
<a href="#">Click on the Article No. for the online configuration in the PIA Life Cycle Portal.</a>	- - - - - 0 - - - - -		<b>Input 2, type</b> Without input 2 RTD • Pt100 (IEC), 3-wire • Pt100 (IEC), 4-wire • Pt1000 (IEC), 3-wire • Pt1000 (IEC), 4-wire TC • Type B • Type E • Type J • Type K • Type L • Type N • Type R • Type S • Type T Potentiometer, 4-wire	- - - - - 0 - - - - -	A B C D E F G H J K L N P Q R
<b>Communication</b>			<b>Input 2, type customer-specific</b>		Y
With HART	0		Define customer-specific input configurations in W options		
<b>Primary value output</b>			<b>CJC configuration for TC</b>		
Input 1	0		Input 1: no CJC; input 2: No CJC	0	
Input 1, input 2 as redundancy	1		Input 1: internal CJC; input 2: internal CJC	1	
Input 2, input 1 as redundancy	2		Input 1: external CJC; input 2: external CJC; define type in option Jxx	2	
Average input 1 and input 2, both as redundancy	3		Input 1: external CJC; define type in option Jxx; input 2: internal CJC	3	
Minimum input 1 and input 2, both as redundancy	4		Input 1: internal CJC; input 2: external CJC; define type in option Jxx	4	
Maximum input 1 and input 2, both as redundancy	5		Input 1: Internal CJC; Input 2: No CJC	5	
Difference input 1 - input 2	6		Input 1: External CJC (define type in option Jxx); input 2: No CJC	6	
Difference input 2 - input 1	7		<b>Materials not in contact with media</b>		
Absolute difference	8		None	0	
<b>Primary value output, customer-specific</b>			<b>Type of protection</b>		
Minimum input 1 and input 2, without redundancy	9	H 1 A	General purpose (non-Ex); CE, RCM, FM, KCC, EAC		A
Maximum input 1 and input 2, without redundancy	9	H 1 B	Intrinsic safety (Ex i) / Non-incendive field wiring (NIFW) / Increased safety zone 2 (Ex ec) / Non-incendive (NI) (ATEX, IECEx, EACEx, CSA, FM, NEPSI, Inmetro)		N
Average input 1 and input 2, without redundancy	9	H 1 C	<b>Electrical connection/cable entry</b>		
Input 2	9	H 1 D	None		A
<b>Input 1, type</b>			<b>Local HMI</b>		
RTD			Without display		0
• Pt100 (IEC), 3-wire					
• Pt100 (IEC), 4-wire					
• Pt1000 (IEC), 3-wire					
• Pt1000 (IEC), 4-wire					
TC					
• Type B					
• Type E					
• Type J					
• Type K					
• Type L					
• Type N					
• Type R					
• Type S					
• Type T					
Potentiometer, 4-wire					
<b>Input 1, type customer-specific</b>					
Define customer-specific input configurations in V options					



## Temperature measurement

### Temperature transmitters

#### Compact and head transmitters

#### SITRANS TH420 (HART, universal)

Options	Order code
Add "-Z" to article number, specify order code and, if applicable, free text.	
<b>Manufacturer's declarations</b>	
Inspection certificate EN 10204-3.1: Manufacturer test certificate for transmitters (5 measured values)	<b>C11</b>
<b>Certificates for functional safety</b>	
Functional safety SIL2/3 (IEC 61508)	<b>C20</b>
<b>Device options</b>	
PDF file with device settings	<b>D10</b>
Without labeling of the measuring range on the TAG plate	<b>D41</b>
Input 1 with add-on cable tail 200 mm, for Pt100 (0-100°C) 4-wire	<b>D73</b>
Input 2 with add-on cable tail 200 mm, for Pt100 (0-100°C) 4-wire	<b>D74</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>Noise damping</b>	
Noise damping 60 Hz instead of 50 Hz	<b>P10</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: RTD</b>	
RTD Pt x IEC 60751 2-wire (wire resistance value defined in option Y51, RTD factor x defined in option Y21)	<b>V60</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>

Options	Order code
Add "-Z" to article number, specify order code and, if applicable, free text.	
<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>
<b>Input 2: RTD</b>	
RTD Pt x IEC 60751 2-wire (wire resistance value defined in option Y52, RTD factor x defined in option Y22)	<b>W60</b>
<b>Device settings</b>	
Measuring range setting temperature input: Lower range value (max. 5 characters), upper range value (max. 5 characters), unit (°C, °F, °Ra, K)	<b>Y01</b>
Long tag (device parameter, max. 32 characters), adhesive label	<b>Y15</b>
Measuring point description (device parameter, max. 32 characters), adhesive label	<b>Y16</b>
Long tag (device parameter, max. 8 characters), adhesive label	<b>Y17</b>
Descriptor (device parameter, max. 16 characters), adhesive label	<b>Y18</b>
Input 1: RTD factor; e.g. factor "200" = Pt200, adhesive label	<b>Y21</b>
Input 2: RTD factor (e.g. factor = 200 => RTD Pt200), adhesive label	<b>Y22</b>
Value wire resistance input 1 in Ohm (0...100 Ohm)	<b>Y51</b>
Value wire resistance input 2 in Ohm (0...100 Ohm)	<b>Y52</b>

#### Accessories

	Article No.
Additional accessories for assembly, connection and transmitter configuration, see page 2/251.	
<b>Modems</b>	
Modem with USB interface	<b>7MF4997-1DB</b>
<b>SIMATIC PDM parameterization software</b>	See Catalog FI 01 section 8
<b>Mounting rail adapter for head transmitter</b> (Quantity delivered: 5 units)	<b>7NG3092-8KA</b>
<b>Connecting cable</b>	<b>7NG3092-8KC</b>
4-wire, 200 mm (7.87 inch), for input connections when using head transmitters in the high hinged cover (set with 5 units)	

#### Ordering example

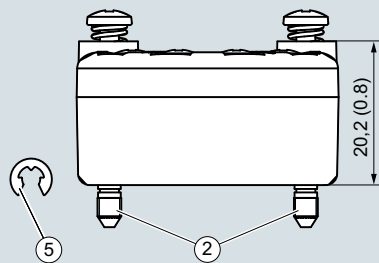
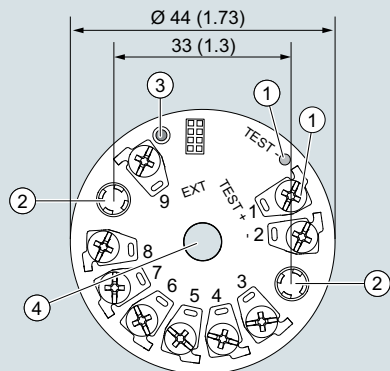
7NG0410-0BA00-0AA0-Z Y01

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



- ① Test terminal
- ② Mounting screw M4
- ③ LED
- ④ Internal diameter of center hole 6.3 (0.25)
- ⑤ Lock washer DIN 6799 - 3.2 A2

1(+) and 2(-) Output terminals

3, 4, 5, 6, 7, 8 and 9 Input terminals

SITRANS TH420, dimensions and pin assignment, dimensions in mm (inch)

## Temperature measurement

Temperature transmitters

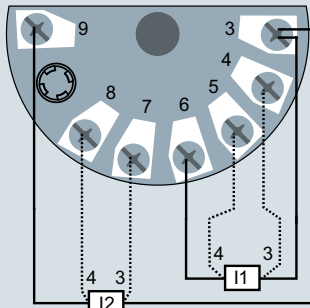
Compact and head transmitters

SITRANS TH420 (HART, universal)

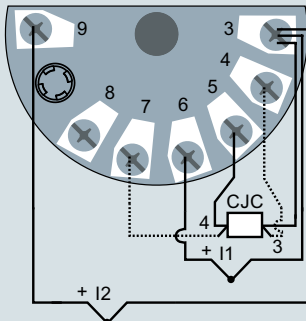
### Circuit diagrams

#### Connections

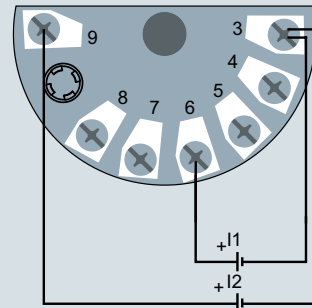
##### Input connection



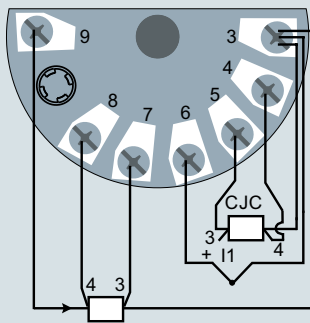
Input 1 and/or input 2:  
2-wire, 3-wire or 4-wire RTD or  
linear resistance



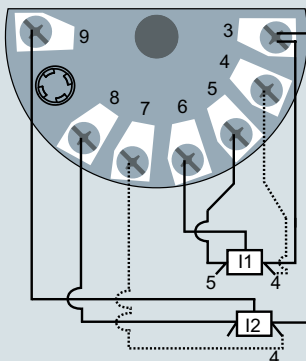
Input 1 and/or input 2:  
TC (internal CJC or  
external 2-wire, 3-wire or  
4-wire CJC)



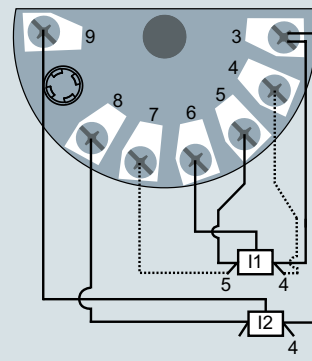
Input 1 and/or input 2:  
Voltage input  
(unipolar or bipolar)



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



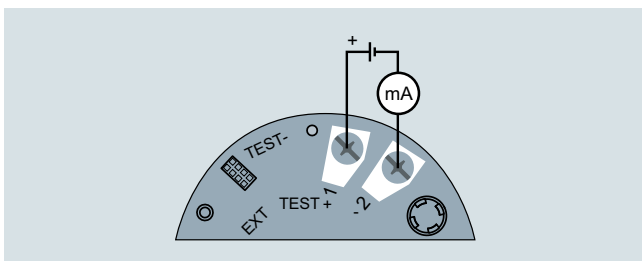
Input 1 and/or Input 2:  
3-wire or 4-wire potentiometer



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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