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Overview

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

Benefits

- Compact design
- Flexible mounting and center hole allow you to select your preferred mounting type
- Galvanic 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 EN 61326 and NE21

Application

SITRANS TH320 transmitters can be used in all sectors. Its compact size means that it can be installed in connection heads of type B 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 communications 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

Without HART communications interface

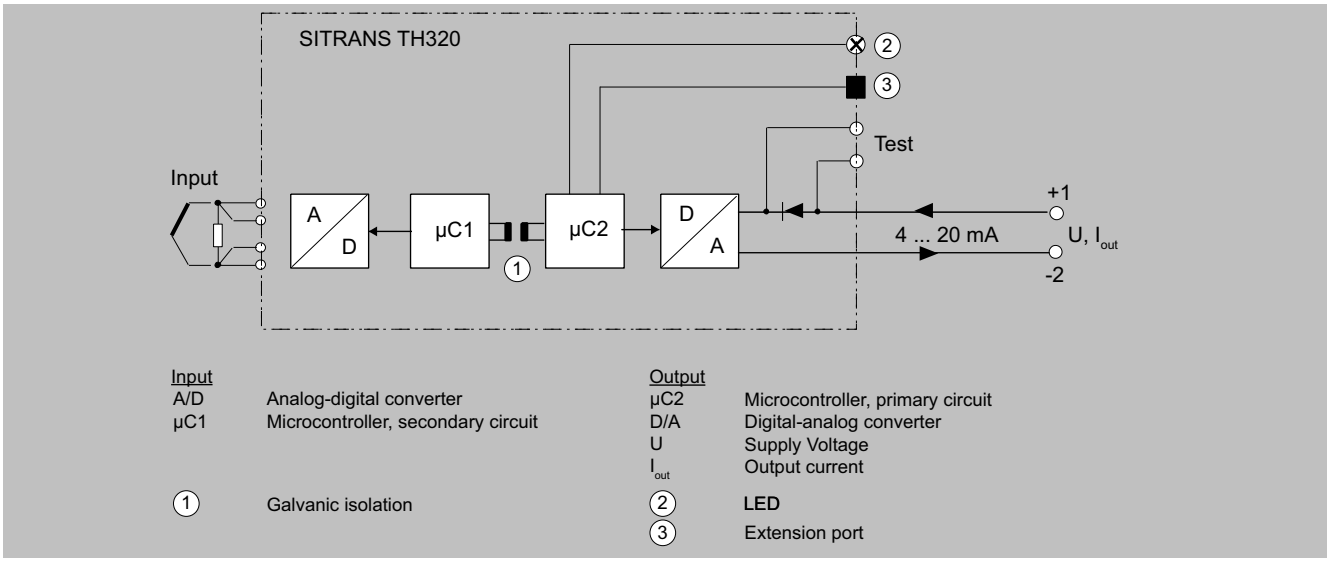
For the SITRANS TH320 without HART functionality, parameters are assigned with the PC. A special modem and the software tool SIPROM T are available for this purpose.

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 parameterization 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 device 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.



Input		Output	
A/D	Analog-digital converter	µC2	Microcontroller, primary circuit
µC1	Microcontroller, secondary circuit	D/A	Digital-analog converter
		U	Supply Voltage
		I_{out}	Output current
①	Galvanic isolation	②	LED
		③	Extension port

SITRANS TH320 function block diagram

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Selection and ordering data

SITRANS TH320 head-mounted transmitter with 1 input	Article No. 7NG031 ● - ● ● ● ● ● - 0 ● ● ●
Click the article number for online configuration in the PIA Life Cycle Portal.	
Communication	
With HART	0
2-wire, 4 ... 20 mA	7
Primary value output	
Input 1	0
Input 1, type	
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
Input 1, type customer-specific	
Define customer-specific input configurations in V options	Y
Input 2, type	
Without input 2	A
CJC configuration for TC	
Without CJC	0
Internal CJC	1
External CJC Pt100 (IEC), 3-wire	3
External CJC Ni100 (DIN), 3-wire	6
Define fixed CJC value with option Y60	8
Materials not in contact with media	
None	0
Type of protection	
General safety (non-Ex); CE, RCM, FM, KCC, EAC, CSA, UK	A
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, UKEx)	N
Electrical connection/cable entries	
None	A
Local HMI	
Without local display	0

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Selection and ordering data (continued)

Options Add "-Z" to article number, specify order code and, if applicable, free text	Order code
Manufacturer's declarations	
Inspection certificate EN 10204-3.1: Manufacturer test certificate for transmitters (5 measured values)	**C11**
Certificates for functional safety	
Functional safety SIL2/3 (IEC 61508)	**C20**
Device options	
PDF file with device settings	**D10**
Without labeling of the measuring range on the TAG plate	**D41**
Input 1: Cable extension 200 mm fixed, for RTD Pt100 (0 ... 100 °C) 4-wire	**D73**
Jumper plug set on device for write protection	**D81**
Jumper plug set on device set for fault current > 21 mA (instead of < 3.6 mA) (only non-SIL)	**D82**
Noise damping	
Noise damping 60 Hz instead of 50 Hz	**P10**
Input 1: TC	
Type C W5	**V01**
Type D W3	**V02**
Type U	**V03**
Type Lr	**V04**
Input 1: Callendar Van Dusen	
2-wire (define wire resistance value in option Y51 and Callendar Van Dusen parameter in option Y35)	**V50**
3-wire (define Callendar Van Dusen parameter in option Y35)	**V51**
4-wire (define Callendar Van Dusen parameter in option Y35)	**V52**
Input 1: RTD	
Pt × (IEC 60751), 2-wire (define wire resistance value in option Y51 and RTD factor × in option Y21)	**V60**
Pt × (IEC 60721), 3-wire, define RTD factor × in option Y21	**V61**
Pt × (IEC 60721), 4-wire, define RTD factor × in option Y21	**V62**
Pt × (JIS C1604), 2-wire (define wire resistance value in option Y51 and RTD factor × in option Y21)	**V63**
Pt × (JIS C1604-81), 3-wire, define RTD factor × in option Y21	**V64**
Pt × (JIS C1604-81), 4-wire, define RTD factor × in option Y21	**V65**
Pt x (GOST 6651-2009), 2-wire (define wire resistance value in option Y51 and RTD factor x in option Y21)	**V66**
Pt × (GOST 6651-2009), 3-wire, define RTD factor × in option Y21	**V67**
Pt × (GOST 6651-2009), 4-wire, define RTD factor × in option Y21	**V68**
Ni × (DIN 43760-87), 2-wire (define wire resistance value in option Y51 and RTD factor × in option Y21)	**V69**
Ni × (DIN 43760-87), 3-wire, define RTD factor × in option Y21	**V70**
Ni × (DIN 43760-87), 4-wire, define RTD factor × in option Y21	**V71**
Ni × (GOST 6651-2009), 2-wire (define wire resistance value in option Y51 and RTD factor × in option Y21)	**V72**
Ni × (GOST 6651-2009), 3-wire, define RTD factor × in option Y21	**V73**
Ni × (GOST 6651-2009), 4-wire, define RTD factor × in option Y21	**V74**
Cu x (ECW-15), 2-wire (define wire resistance value in option Y51 and RTD factor x in option Y21)	**V75**
Cu × (ECW-15), 3-wire, define RTD factor × in option Y21	**V76**
Cu × (ECW-15), 4-wire, define RTD factor × in option Y21	**V77**
Cu × (GOST 6651-94), 2-wire (define wire resistance value in option Y51 and RTD factor × in option Y21)	**V78**
Cu × (GOST 6651-94), define 3-wire, define RTD factor × in option Y21	**V79**
Cu × (GOST 6651-94), define 4-wire, define RTD factor × in option Y21	**V80**
Cu x (GOST 6651-2009), 2-wire (define wire resistance value in option Y51 and RTD factor x in option Y21)	**V81**
Cu × (GOST 6651-2009), define 3-wire, define RTD factor × in option Y21	**V82**
Cu × (GOST 6651-2009), define 4-wire, define RTD factor × in option Y21	**V83**
Device settings	
Measuring range setting temperature input: Lower range value (max. 5 characters), upper range value (max. 5 characters), unit (°C, °F, °Ra, K)	**Y01**
Customer-specific programming in plain text (n-lines)	**Y09**
Tag (device parameters, max. 32 characters), adhesive label	**Y15**
Measuring point description (device parameters, max. 32 characters), adhesive label	**Y16**
Tag (device parameters, max. 8 characters), adhesive label	**Y17**
Descriptor (device parameters, max. 16 characters), adhesive label	**Y18**
Input 1: RTD factor; e.g. factor "200" = Pt200, adhesive label	**Y21**
Fault current for input circuit short-circuit & interruption instead of 22.4 mA (short-circuit) and 22.8 mA (interruption) e.g. 3.6 mA and 22.4 mA [3.6 - 3.6; 3.6 - 22.8; 22.4 - 3.6]	**Y31**
CvD Sensor matching factors input 1 R0, A, B, C, Beta, Delta Selection: CVDR - R0 (format for example 100.0), CVDA - A (format for example 0.003908), CVDB - B (format for example -5.775E-07), CVDC - C (format for example -4.183E-12)	**Y35**
Wire resistance value input 1 in ohms (0 ... 100 ohms)	**Y51**
Input 1: CJC sensor, fixed value (see measuring range for unit)	**Y60**
ID number of special design	**Y99**

Accessories

	Article No.
Other accessories for assembly, connection and transmitter configuration, see page 2/198.	
Modems	
HART modem with USB interface	**7MF4997-1DB**
Modem with USB interface and SIPROM T software	**7NG3092-8KN**
SIMATIC PDM parameterization software	See Catalog FI 01 section 8
Mounting rail adapter for head-mounted transmitter (Quantity delivered: 5 units)	**7NG3092-8KA**

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Selection and ordering data (continued)

	Article No.
Connecting cable 4-wire, 200 mm (7.97 inches), for input connections when using head-mounted transmitters in the high spring flap (set with 5 units)	7NG3092-8KC

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 fault: < 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

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Technical specifications

SITRANS TH320 (HART, universal)	
General	
Supply voltage[1) 2)]	
• 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_{supply} - 37 V)/23 mA
Insulation voltage, test/operation	
• Without explosion protection (non-Ex)	2.5 kV AC/55 V AC
• With explosion protection (Ex i)	2.5 kV AC/42 V AC
Polarity protection	All inputs and outputs
Write protection	Wire jumper or software
Warm-up time	< 5 min
Starting time	< 2.75 s
Programming	HART
Signal-to-noise ratio	> 60 dB
Long-term stability	Better than: • ± 0.05% of measuring span/year • ± 0.18% of measuring span/5 years
Response time	4 ... 20 mA: ≤ 55 ms HART: ≤ 75 ms (typically 70 ms)
Programmable damping	0 ... 60 s
Signal dynamic	
• Input	24 bit
• Output	18 bit
Influence of change in supply voltage	< 0.005% of measuring span/V DC
Input	
Resistance thermometer (RTD)	
Input type	
• Pt10 ... 10000	• IEC 60751 • JIS C 1604-8 • GOST 6651_2009 • Callendar Van Dusen
• Ni10 ... 10000	• DIN 43760-1987 • GOST 6651-2009/OIML R84:2003
• Cu5 ... 1000	• Edison Copper Winding No. 15 • GOST 6651-2009/OIML R84:2003
Connection type	2-wire, 3-wire or 4-wire
Wire resistance per wire	Max. 50 Ω
Input current	< 0.15 mA
Effect of the wire 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
Error detection, programmable	None, short-circuited, defective, short-circuited or defective **Note** When the low limit for the configured input type is below the constant detection limit for short-circuited inputs, the detection of short circuits is disabled regardless of the configuration of the error detection.
Detection limit for short-circuited input	15 Ω

SITRANS TH320 (HART, universal)	
Error detection time (RTD)	≤ 75 ms (typically 70 ms)
Error 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, wire resistance per wire (for 3-wire and 4-wire connections)	50 Ω
• Effect of the wire 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 wire resistance	Max. 10 kΩ
• Error detection, programmable	None, short-circuited, defective, short-circuited or defective **Note** The short-circuited error detection only applies to the CJC input.
• Error detection time (TC)	≤ 75 ms (typically 70 ms)
• Error 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
Connection type	2-wire, 3-wire or 4-wire
Wire resistance per wire	Max. 50 Ω
Input current	< 0.15 mA
Effect of the wire resistance (with 3-wire and 4-wire connections)	< 0.002 Ω/Ω
Cable, wire-wire capacity	
• R > 400 Ω	Max. 30 nF

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Technical specifications (continued)

SITRANS TH320 (HART, universal)	
• R ≤ 400 Ω	Max. 50 nF
Error detection, programmable	None, defective
Potentiometers	
Input range	10 ... 100 kΩ
Minimum measuring span	25 Ω
Connection type	3-wire or 4-wire
Wire resistance per wire	Max. 50 Ω
Input current	< 0.15 mA
Effect of the wire 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
Error detection, programmable	None, short-circuited, defective, short-circuited or defective **Note** 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 error detection.
Detection limit for short-circuited input	15 Ω
Error detection time, wiper arm (no short-circuit detection)	≤ 75 ms (typically 70 ms)
Error detection time, element	≤ 2 000 ms
Error detection time (for 4-wire and 5-wire)	≤ 2 000 ms
Voltage input	
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
Error detection, programmable	None, defective
Error detection time	≤ 75 ms (typically 70 ms)
Output and HART communication	
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_{supply} - 7.5)/0.023 Ω
Load stability	< 0.01% of measuring span/100 Ω (measuring span = currently selected range)
Input error 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
Measuring accuracy	
Input accuracy	See "Input accuracy" table
Output accuracy	See "Output accuracy" table

SITRANS TH320 (HART, universal)	
Operating conditions	
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
Structural design	
Weight	50 g (0.11 lb)
Maximum core cross-section	1 × 1.5 mm² (stranded wire)
Tightening torque for clamping screws	0.4 Nm
Vibrations	IEC 60068-2-6
• 2 ... 25 Hz	± 1.6 mm (0.07 inches)
• 25 ... 100 Hz	± 4 g
Certificates and approvals	
Explosion protection ATEX/IECEx and others	
Certificates[3)]	• 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 2 D Ex ia IIIC Db • 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 Db • Ex ia I Ma
"Intrinsic safety ic" type of protection	For use in Zones 2 and 22
• ATEX	• II 3 G Ex ic IIC T6...T4 Gc • II 3 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 3 G Ex nA IIC T6...T4 Gc • II 3 G Ex ec IIC T6...T4 Gc
• IECEx and others	• Ex nA IIC T6 ... T4 Gc • Ex ec IIC T6 ... T4 Gc
Explosion protection CSA/FM for Canada and USA	
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

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Technical specifications (continued)

SITRANS TH320 (HART, universal)	
"Non incendive field wiring NIFW" type of protection	NIFW, CL I, Div 2, GP ABCD T6 ... T4
"Non incendive 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 account.
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)	α_0 in $°C^{-1}$ ($°F^{-1}$)	Minimum measuring span in °C (°F)
Pt10 ... 10000	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)
Ni10 ... 10000	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)
Cu5 ... 1000	Edison Copper Winding No. 15	-200 ... +260 (-328 ... +500)	0.004270 (0.002372)	100 (212)
	GOST 6651-2009/OIML R84:2-003	-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[1)]
RTD		
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 °C (356 °F) = ≤ ±0.08 °C (0.144 °F) $T_{max.}$ > 180 °C (356 °F) = ≤ ±0.16 °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 °C (572 °F) = ≤ ±0.08 °C (0.144 °F) $T_{max.}$ > 300 °C (572 °F) = ≤ ±0.4 °C (0.72 °F)	≤ ±0.002 °C/°C (°F/°F)

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Technical specifications (continued)

Input type	Basic accuracy	Temperature coefficient[1]
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)
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
Linear resistance		
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)
Potentiometers		
0 ... 100%	< 0.05%	< ± 0.005%
Voltage input		
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)
TC		
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[2]	≤ ±1 °C (1.8 °F)	≤ ±0.1 °C/°C (°F/°F)
B[3]	≤ ±3 °C (5.4 °F)	≤ ±0.1 °C/°C (°F/°F)
B[4]	≤ ±8 °C (14.4 °F)	≤ ±0.8 °C/°C (°F/°F)
B[5]	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)

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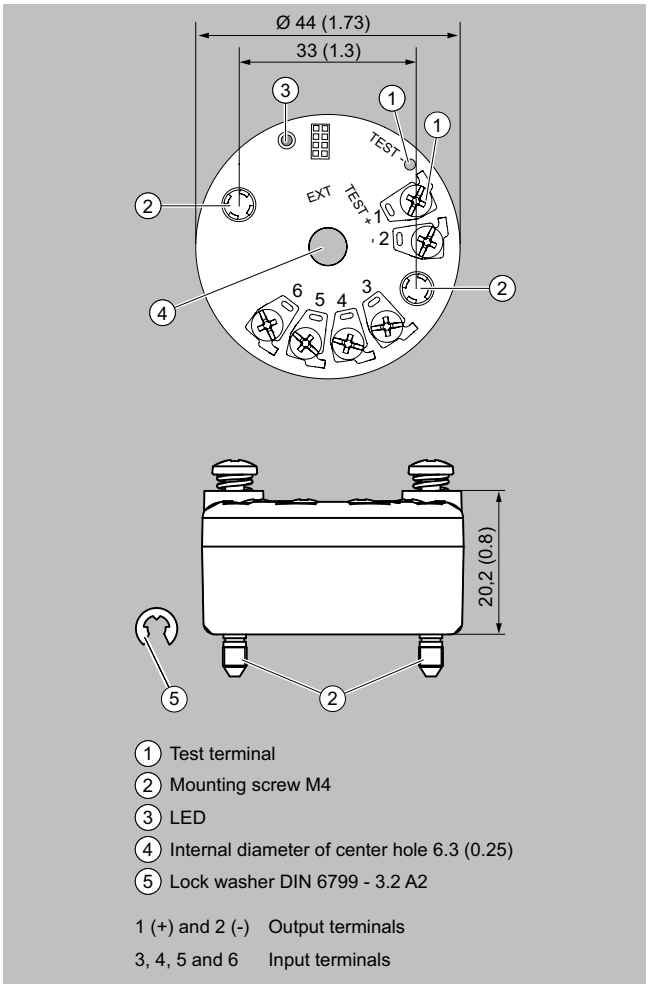
Technical specifications (continued)

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)

Dimensional drawings



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

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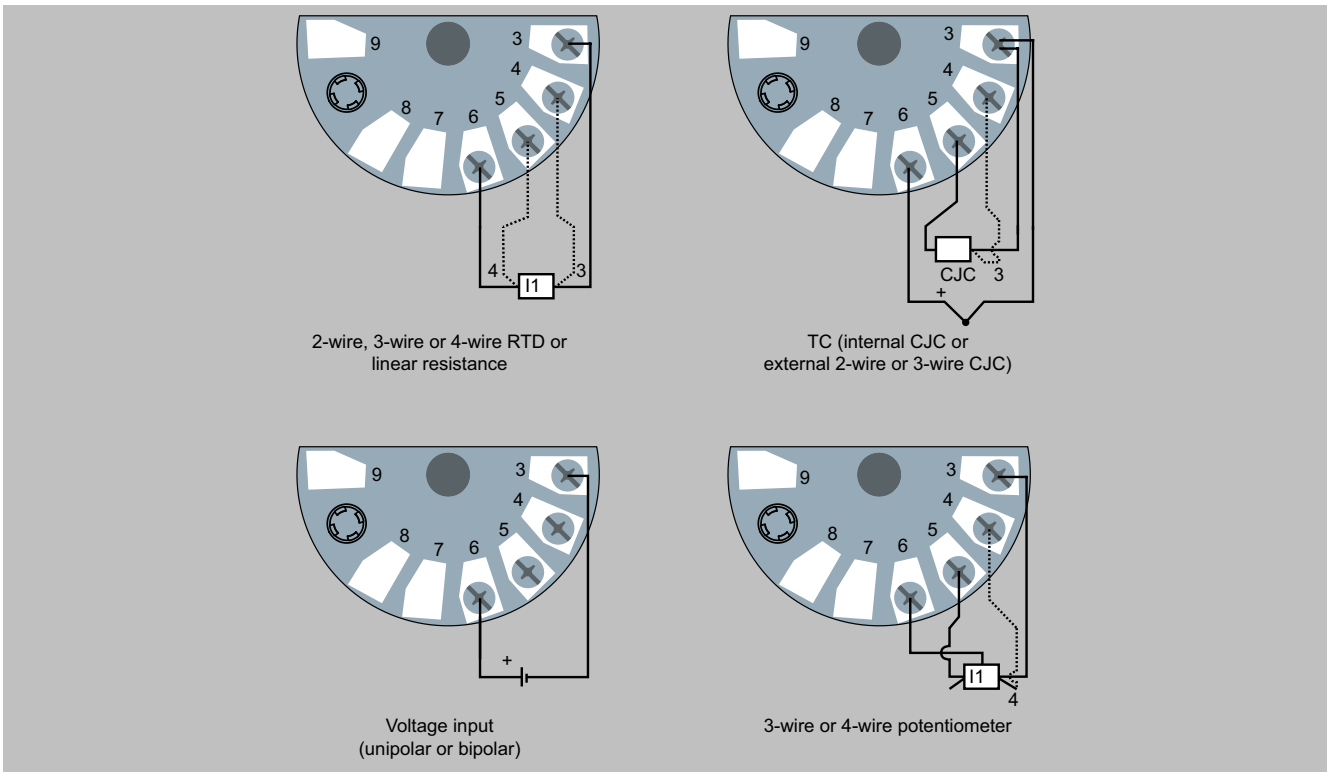
Circuit diagrams

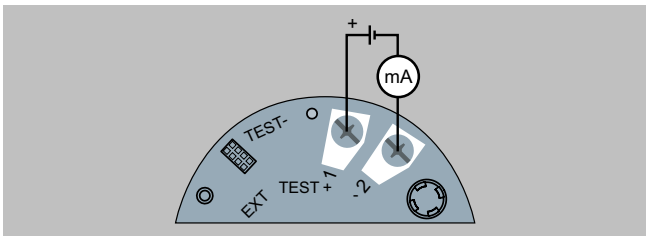
Connections

Input connection



SITRANS TH320, input connection assignment

Output connection



SITRANS TH320, output connection assignment

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Overview

- 2-wire head-mounted transmitter with HART/PA 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 via HART 7 and Profibus PA

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 mounting type
- Galvanic isolation
- Test terminals for ammeter for HART variant
- 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) for HART variant
- Expanded diagnostic functions, such as slave pointer, operating hours counter, etc.
- Special characteristic curve
- Up to 32 devices on one Profibus PA segment
- Backwards compatible to Profibus PA profile 3.x
- No GSD file update necessary if replacement for previous unit SITRANS TH400PA
- Transparent product lifecycle thanks to recording of supply voltage (PA variant only) and diagnostic messages
- Electromagnetic compatibility according to 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 or digitally using Profibus PA.

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.

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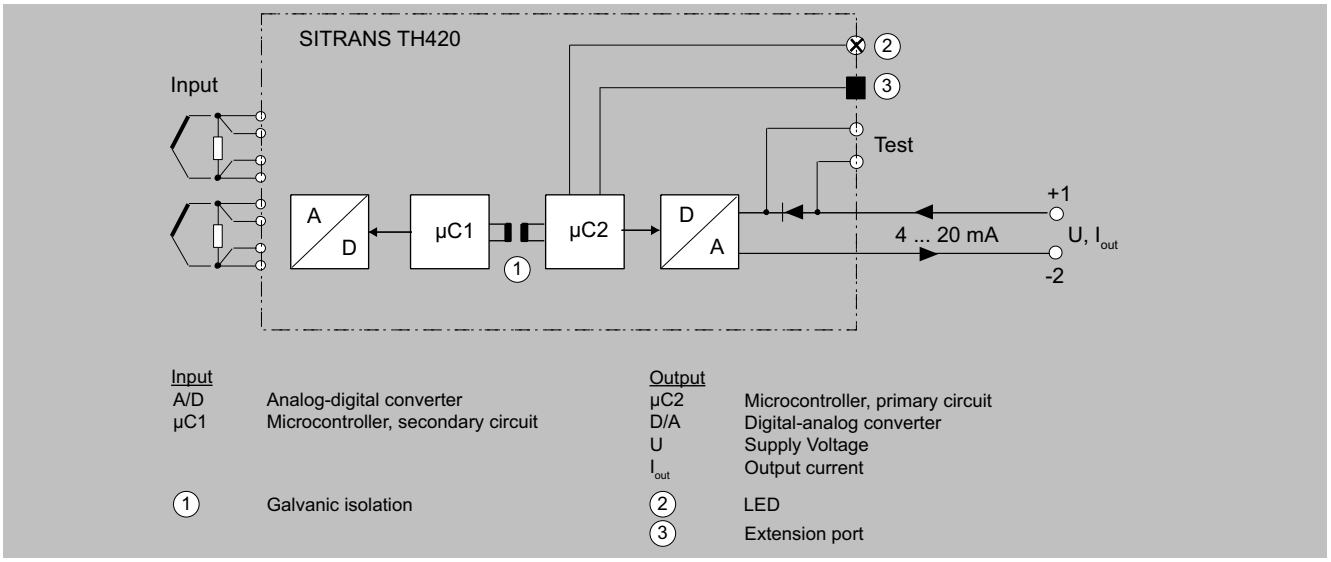
Function

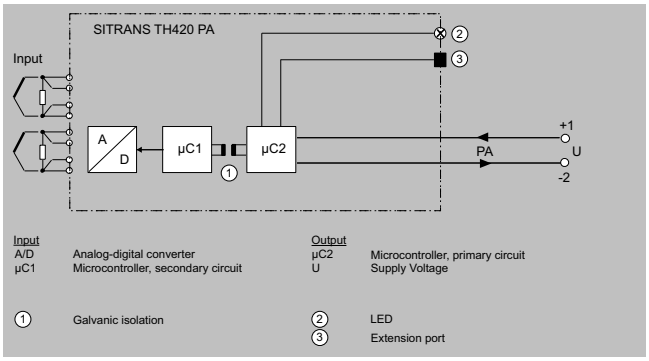
The SITRANS TH420 is configured via HART or Profibus PA. The configuration of the HART variant can be carried out using a handheld communicator or, more conveniently, with a HART modem using EDD or DTM in Asset management tools (e.g. SIMATIC PDM). The configuration data are then permanently stored in 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.

The test terminals (with HART variant only) can be used to connect an ammeter at any time for monitoring purposes and performing plausibility checks. The output current can be read without any interruption, or even without opening the current loop.



SITRANS TH420 HART, function block diagram



SITRANS TH420 PA, function block diagram

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Selection and ordering data

SITRANS TH420 head-mounted transmitter with 2 inputs	Article No. 7NG041 ● - ● ● ● ● ● - 0 ● ● ●	Order code ● ● ●
Click the article number for online configuration in the PIA Life Cycle Portal.		
Communication		
With HART	0	
With Profibus PA	1	
Primary value output		
Input 1	0	
Input 1, input 2 as redundancy	1	
Input 2, input 1 as redundancy	2	
Mean value 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	
Primary value output, customer-specific		
Minimum input 1 and input 2, without redundancy	9	H 1 A
Maximum input 1 and input 2, without redundancy	9	H 1 B
Mean value input 1 and input 2, without redundancy	9	H 1 C
Input 2	9	H 1 D
Input 1, type		
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	
Input 1, type customer-specific		
Define customer-specific input configurations in V options	Y	
Input 2, type		
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	

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Selection and ordering data (continued)

SITRANS TH420 head-mounted transmitter with 2 inputs	Article No. 7NG041 ● - ● ● ● ● ● - 0 ● ● ●	Order code ● ● ●
• 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	
Input 2, type customer-specific		
Define customer-specific input configurations in W options	Y	
CJC configuration for TC		
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	
Materials not in contact with media		
None	0	
Type of protection		
General safety (non-Ex); CE, RCM, FM, KCC, EAC, CSA, UK	A	
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, UKEx)	N	
Electrical connection/cable entries		
None	A	
Local HMI		
Without local display	0	

Options Add "-Z" to article number, specify order code and, if applicable, free text	Order code
Manufacturer's declarations	
Inspection certificate EN 10204-3.1: Manufacturer test certificate for transmitters (5 measured values)	**C11**
Certificates for functional safety	
Functional safety SIL2/3 (IEC 61508)	**C20**
Device options	
PDF file with device settings	**D10**
Without labeling of the measuring range on the TAG plate	**D41**
Input 1: Cable extension 200 mm fixed, for RTD Pt100 (0 ... 100 °C) 4-wire	**D73**
Input 2: Cable extension 200 mm fixed, for RTD Pt100 (0 ... 100 °C) 4-wire	**D74**
Jumper plug set on device for write protection	**D81**
Jumper plug set on device set for fault current > 21 mA (instead of < 3.6 mA) (only non-SIL)	**D82**
External CJC types	
Pt100, IEC 60751, 3-wire	**J02**
Pt100, IEC 60751, 4-wire	**J03**

Options Add "-Z" to article number, specify order code and, if applicable, free text	Order code
Ni100, DIN 43760-87, 3-wire	**J05**
Ni100, DIN 43760-87, 4-wire	**J06**
Noise damping	
Noise damping 60 Hz instead of 50 Hz	**P10**
Input 1: TC	
Type C W5	**V01**
Type D W3	**V02**
Type U	**V03**
Type Lr	**V04**
Input 1: Callendar Van Dusen	
2-wire (define wire resistance value in option Y51 and Callendar Van Dusen parameter in option Y35)	**V50**
3-wire (define Callendar Van Dusen parameter in option Y35)	**V51**
4-wire (define Callendar Van Dusen parameter in option Y35)	**V52**
Input 1: RTD	
Pt x (IEC 60751), 2-wire (define wire resistance value in option Y51 and RTD factor x in option Y21)	**V60**
Pt x (IEC 60751), 3-wire, define RTD factor x in option Y21	**V61**

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Selection and ordering data (continued)

Options Add "-Z" to article number, specify order code and, if applicable, free text	Order code
Pt x (IEC 60751), 4-wire, define RTD factor x in option Y21	**V62**
Pt x (JIS C1604), 2-wire (define wire resistance value in option Y51 and RTD factor x in option Y21)	**V63**
Pt x (JIS C1604-81), 3-wire, define RTD factor x in option Y21	**V64**
Pt x (JIS C1604-81), 4-wire, define RTD factor x in option Y21	**V65**
Pt x (GOST 6651-2009), 2-wire (define wire resistance value in option Y51 and RTD factor x in option Y21)	**V66**
Pt x (GOST 6651-2009), 3-wire, define RTD factor x in option Y21	**V67**
Pt x (GOST 6651-2009), 4-wire, define RTD factor x in option Y21	**V68**
Ni x (DIN 43760-87), 2-wire (define wire resistance value in option Y51 and RTD factor x in option Y21)	**V69**
Ni x (DIN 43760-87), 3-wire, define RTD factor x in option Y21	**V70**
Ni x (DIN 43760-87), 4-wire, define RTD factor x in option Y21	**V71**
Ni x (GOST 6651-2009), 2-wire (define wire resistance value in option Y51 and RTD factor x in option Y21)	**V72**
Ni x (GOST 6651-2009), 3-wire, define RTD factor x in option Y21	**V73**
Ni x (GOST 6651-2009), 4-wire, define RTD factor x in option Y21	**V74**
Cu x (ECW-15), 2-wire (define wire resistance value in option Y51 and RTD factor x in option Y21)	**V75**
Cu x (ECW-15), 3-wire, define RTD factor x in option Y21	**V76**
Cu x (ECW-15), 4-wire, define RTD factor x in option Y21	**V77**
Cu x (GOST 6651-94), 2-wire (define wire resistance value in option Y51 and RTD factor x in option Y21)	**V78**
Cu x (GOST 6651-94), define 3-wire, define RTD factor x in option Y21	**V79**
Cu x (GOST 6651-94), define 4-wire, define RTD factor x in option Y21	**V80**
Cu x (GOST 6651-2009), 2-wire (define wire resistance value in option Y51 and RTD factor x in option Y21)	**V81**
Cu x (GOST 6651-2009), define 3-wire, define RTD factor x in option Y21	**V82**
Cu x (GOST 6651-2009), define 4-wire, define RTD factor x in option Y21	**V83**
Input 2: TC	
Type C W5	**W01**
Type D W3	**W02**
Type U	**W03**
Type Lr	**W04**
Input 2: Callendar Van Dusen	
2-wire (define wire resistance value in option Y52 and Callendar Van Dusen parameter in option Y36)	**W50**
3-wire (define Callendar Van Dusen parameter in option Y36)	**W51**
4-wire (define Callendar Van Dusen parameter in option Y36)	**W52**
Input 2: RTD	
Pt x (IEC 60751), 2-wire (define wire resistance value in option Y52 and RTD factor x in option Y22)	**W60**
Pt x (IEC 60721), 3-wire, define RTD factor x in option Y22	**W61**

Options Add "-Z" to article number, specify order code and, if applicable, free text	Order code
Pt x (IEC 60721), 4-wire, define RTD factor x in option Y22	**W62**
Pt x (JIS C1604), 2-wire (define wire resistance value in option Y52 and RTD factor x in option Y22)	**W63**
Pt x (JIS C1604-81), 3-wire, define RTD factor x in option Y22	**W64**
Pt x (JIS C1604-81), 4-wire, define RTD factor x in option Y22	**W65**
Pt x (GOST 6651-2009), 2-wire (define wire resistance value in option Y52 and RTD factor x in option Y22)	**W66**
Pt x (GOST 6651-2009), 3-wire, define RTD factor x in option Y22	**W67**
Pt x (GOST 6651-2009), 4-wire, define RTD factor x in option Y22	**W68**
Ni x (DIN 43760-87), 2-wire (define wire resistance value in option Y52 and RTD factor x in option Y22)	**W69**
Ni x (DIN 43760-87), 3-wire, define RTD factor x in option Y22	**W70**
Ni x (DIN 43760-87), 4-wire, define RTD factor x in option Y22	**W71**
Ni x (GOST 6651-2009), 2-wire (define wire resistance value in option Y52 and RTD factor x in option Y22)	**W72**
Ni x (GOST 6651-2009), 3-wire, define RTD factor x in option Y22	**W73**
Ni x (GOST 6651-2009), 4-wire, define RTD factor x in option Y22	**W74**
Cu x (ECW-15), 2-wire (define wire resistance value in option Y52 and RTD factor x in option Y22)	**W75**
Cu x (ECW-15), 3-wire, define RTD factor x in option Y22	**W76**
Cu x (ECW-15), 4-wire, define RTD factor x in option Y22	**W77**
Cu x (GOST 6651-94), 2-wire (define wire resistance value in option Y52 and RTD factor x in option Y22)	**W78**
Cu x (GOST 6651-94), 3-wire, define RTD factor x in option Y22	**W79**
Cu x (GOST 6651-94), 4-wire, define RTD factor x in option Y22	**W80**
Cu x (GOST 6651-2009), 2-wire (define wire resistance value in option Y52 and RTD factor x in option Y22)	**W81**
Cu x (GOST 6651-2009), 3-wire, define RTD factor x in option Y22	**W82**
Cu x (GOST 6651-2009), 4-wire, define RTD factor x in option Y22	**W83**
Device settings	
Measuring range setting temperature input: Lower range value (max. 5 characters), upper range value (max. 5 characters), unit (°C, °F, °Ra, K)	**Y01**
Customer-specific programming in plain text (n-lines)	**Y09**
Tag (device parameters, max. 32 characters), adhesive label	**Y15**
Measuring point description (device parameters, max. 32 characters), adhesive label	**Y16**
Tag (device parameters, max. 8 characters), adhesive label	**Y17**
Descriptor (device parameters, max. 16 characters), adhesive label	**Y18**
Input 1: RTD factor; e.g. factor "200" = Pt200, adhesive label	**Y21**
Input 2: RTD factor (e.g. factor "200" => RTD Pt200), adhesive label	**Y22**

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Selection and ordering data (continued)

Options Add "-Z" to article number, specify order code and, if applicable, free text	Order code
Preset bus address	**Y25**
Fault current for input circuit short-circuit & interruption instead of 22.4 mA (short-circuit) and 22.8 mA (interruption) e.g. 3.6 mA and 22.4 mA [3.6 - 3.6; 3.6 - 22.8; 22.4 - 3.6]	**Y31**
CvD Sensor matching factors input 1 R0, A, B, C, Beta, Delta Selection: CVDR - R0 (format for example 100.0), CVDA - A (format for example 0.003908), CVDB - B (format for example -5.775E-07), CVDC - C (format for example -4.183E-12)	**Y35**
CvD Sensor matching factors input 2 R0, A, B, C, Beta, Delta Selection: CVDR - R0 (format for example 100.0), CVDA - A (format for example 0.003908), CVDB - B (format for example -5.775E-07), CVDC - C (format for example -4.183E-12)	**Y36**
Wire resistance value input 1 in ohms (0 ... 100 ohms)	**Y51**
Wire resistance value input 2 in ohms (0 ... 100 ohms)	**Y52**
Input 1: CJC sensor, fixed value (see measuring range for unit)	**Y60**
Input 2: CJC sensor, fixed value (see measuring range for unit)	**Y61**

Accessories

	Article No.
Other accessories for assembly, connection and transmitter configuration, see page 2/198.	
Modems	
HART modem with USB interface	**7MF4997-1DC**
SIMATIC PDM parameterization software	See Catalog FI 01 section 8
Mounting rail adapter for head-mounted transmitter (Quantity delivered: 5 units)	**7NG3092-8KA**
Connecting cable 4-wire, 200 mm (7.87 inches), for input connections when using head-mounted transmitters in the high spring flap (set with 5 units)	**7NG3092-8KC**

Ordering example

7NG0410-0BA00-0AA0-Z Y01
Y01: -10 ... +100 °C

Factory setting of SITRANS TH420 HART

- Input 1: Pt100 (IEC 751); 3-wire connection
- Input 2: not configured (inactive)
- Measuring range: 0 ... 100 °C (32 ... 212 °F)
- Fault current
  - Device fault: < 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

Factory setting of SITRANS TH420 PA

- Input 1: Pt100 (IEC 751); 3-wire connection
- Input 2: not configured (inactive)
- No trimming of input and output (offset)
- Damping 0.0 s
- Bus address: 126

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Technical specifications

	SITRANS TH420 HART	SITRANS TH420 PA
General		
Supply voltage[1) 2)]		
• Without explosion protection (non-Ex)	7.5 ... 48 V DC	9 ... 32 V DC
• With explosion protection (Ex i)	7.5 ... 30 V DC	9 ... 30 V DC
Additional minimum supply voltage when using test terminals	0.8 V	
Maximum power loss	≤ 850 mW	≤ 544 mW
Minimum load resistance at supply voltage > 37 V	$(V_{supply}$ - 37 V)/23 mA	
Insulation voltage, test/operation		
• Without explosion protection (non-Ex)	2.5 kV AC/55 V AC	2.5 kV AC/55 V AC
• With explosion protection (Ex i)	2.5 kV AC/42 V AC	2.5 kV AC/42 V AC
Polarity protection	All inputs and outputs	Non-sensitive
Write protection	Wire jumper or software	Wire jumper or software
Warm-up time	< 5 min	< 5 min
Starting time	< 2.75 s	< 15 s
Programming	HART	PA
Signal-to-noise ratio	> 60 dB	
Long-term stability	Better than:	Better than
	• ± 0.05% of measuring span/year	• ± 0.05 % of the measured value/year
	• ± 0.18% of measuring span/5 years	• ± 0.1 % of the measured value/5 years
Response time	≤ 75 ms (typically 70 ms)	≤ 400 ms
Profibus refresh time		< 100 ms
Programmable damping	0 ... 60 s	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	• IEC 60751	• IEC 60751
	• JIS C 1604-8	• JIS C 1604-8
	• GOST 6651_2009	• GOST 6651_2009
	• Callendar Van Dusen	• Callendar Van Dusen
• Ni10 ... 10000	• DIN 43760-1987	• DIN 43760-1987
	• GOST 6651-2009/OIML R84:2003	• GOST 6651-2009/OIML R84:2003
• Cu5 ... 1000	• Edison Copper Winding No. 15	• Edison Copper Winding No. 15
	• GOST 6651-2009/OIML R84:2003	• GOST 6651-2009/OIML R84:2003
Connection type	2-wire, 3-wire or 4-wire	2-wire, 3-wire or 4-wire
Wire resistance per wire	Max. 50 Ω	Max. 50 Ω
Input current	< 0.15 mA	< 0.15 mA
Effect of the wire resistance (with 3-wire and 4-wire connections)	< 0.002 Ω/Ω	< 0.002 Ω/Ω
Cable, wire-wire capacity		
• Pt1000, Pt10000 (IEC 60751 and JIS C 1604-8)	Max. 30 nF	Max. 30 nF

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Technical specifications (continued)

	SITRANS TH420 HART	SITRANS TH420 PA
• All other input types	Max. 50 nF	Max. 50 nF
Error detection, programmable	None, short-circuited, defective, short-circuited or defective **Note** When the low limit for the configured input type is below the constant detection limit for short-circuited inputs, the detection of short circuits is disabled regardless of the configuration of the error detection.	None, short-circuited, defective, short-circuited or defective **Note** When the low limit for the configured input type is below the constant detection limit for short-circuited inputs, the detection of short circuits is disabled regardless of the configuration of the error detection.
Detection limit for short-circuited input	15 Ω	15 Ω
Error detection time (RTD)	≤ 75 ms (typically 70 ms)	≤ 400 ms
Error detection time (for 3-wire and 4-wire)	≤ 2 000 ms	≤ 2 000 ms
Thermocouples (TC)		
Input type		
• B	IEC 60584-1	IEC 60584-1
• E	IEC 60584-1	IEC 60584-1
• J	IEC 60584-1	IEC 60584-1
• K	IEC 60584-1	IEC 60584-1
• L	DIN 43710	DIN 43710
• Lr	GOST 3044-84	GOST 3044-84
• N	IEC 60584-1	IEC 60584-1
• R	IEC 60584-1	IEC 60584-1
• S	IEC 60584-1	IEC 60584-1
• T	IEC 60584-1	IEC 60584-1
• U	DIN 43710	DIN 43710
• W3	ASTM E988-96	ASTM E988-96
• W5	ASTM E988-96	ASTM E988-96
• LR	GOST 3044-84	GOST 3044-84
Cold Junction Compensation (CJC)	Constant, internal or external over Pt100 or Ni100 RTD	Constant, internal or external over Pt100 or Ni100 RTD
• Temperature range internal CJC	-50 ... +100 °C (-58 ... +212 °F)	-50 ... +100 °C (-58 ... +212 °F)
• Connection external CJC	2-wire, 3-wire or 4-wire	2-wire, 3-wire or 4-wire
• External CJC, wire resistance per wire (for 3-wire and 4-wire connections)	50 Ω	50 Ω
• Effect of the wire resistance (with 3-wire and 4-wire connections)	< 0.002 Ω/Ω	< 0.002 Ω/Ω
• Input current external CJC	< 0.15 mA	< 0.15 mA
• Temperature range external CJC	-50 ... +135 °C (-58 ... +275 °F)	-50 ... +135 °C (-58 ... +275 °F)
• Cable, wire-wire capacity	Max. 50 nF	Max. 50 nF
• Total wire resistance	Max. 10 kΩ	Max. 10 kΩ
• Error detection, programmable	None, short-circuited, defective, short-circuited or defective **Note** The short-circuited error detection only applies to the CJC input.	None, short-circuited, defective, short-circuited or defective **Note** The short-circuited error detection only applies to the CJC input.
• Error detection time (TC)	≤ 75 ms (typically 70 ms)	≤ 400 ms
• Error detection time, external CJC (for 3-wire and 4-wire)	≤ 2 000 ms	≤ 2 000 ms

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Technical specifications (continued)

	SITRANS TH420 HART	SITRANS TH420 PA
Linear resistance		
Input range	0 ... 100 kΩ	0 ... 100 kΩ
Minimum measuring span	25 Ω	25 Ω
Connection type	2-wire, 3-wire or 4-wire	2-wire, 3-wire or 4-wire
Wire resistance per wire	Max. 50 Ω	Max. 50 Ω
Input current	< 0.15 mA	< 0.15 mA
Effect of the wire resistance (with 3-wire and 4-wire connections)	< 0.002 Ω/Ω	< 0.002 Ω/Ω
Cable, wire-wire capacity		
• R > 400 Ω	Max. 30 nF	Max. 30 nF
• R ≤ 400 Ω	Max. 50 nF	Max. 50 nF
Error detection, programmable	None, defective	None, defective
Potentiometers		
Input range	10 ... 100 kΩ	10 ... 100 kΩ
Minimum measuring span	25 Ω	25 Ω
Connection type	3-wire, 4-wire or 5-wire	3-wire, 4-wire or 5-wire
Wire resistance per wire	Max. 50 Ω	Max. 50 Ω
Input current	< 0.15 mA	< 0.15 mA
Effect of the wire resistance (with 4-wire and 5-wire connections)	< 0.002 Ω/Ω	< 0.002 Ω/Ω
Cable, wire-wire capacity		
• R > 400 Ω	Max. 30 nF	Max. 30 nF
• R ≤ 400 Ω	Max. 50 nF	Max. 50 nF
Error detection, programmable	None, short-circuited, defective, short-circuited or defective **Note** 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 error detection.	None, short-circuited, defective, short-circuited or defective **Note** 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 error detection.
Detection limit for short-circuited input	15 Ω	15 Ω
Error detection time, wiper arm (no short-circuit detection)	≤ 75 ms (typically 70 ms)	≤ 400 ms
Error detection time, element	≤ 2 000 ms	≤ 2 000 ms
Error detection time (for 4-wire and 5-wire)	≤ 2 000 ms	≤ 2 000 ms
Voltage input		
Measuring range		
• Unipolar	-100 ... 1700 mV	-100 ... 1700 mV
• Bipolar	-800 ... +800 mV	-800 ... +800 mV
Minimum measuring span	2.5 mV	2.5 mV
Input resistance	10 MΩ	10 MΩ
Cable, wire-wire capacity		
• Input range: -100 ... 1700 mV	Max. 30 nF	Max. 30 nF
• Input range: -20 ... 100 mV	Max. 50 nF	Max. 50 nF
Error detection, programmable	None, defective	None, defective
Error detection time	≤ 75 ms (typically 70 ms)	≤ 400 ms
Output and HART communication		
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		
• Error detection	Enable/disable	Enable/disable
• Fault current setting	3.5 ... 23 mA	

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Technical specifications (continued)

	SITRANS TH420 HART	SITRANS TH420 PA
Update time	10 ms	100 ms
Load (with current output)	≤ (V_{Supply} - 7.5)/0.023 Ω	
Load stability	< 0.01% of measuring span/100 Ω (measuring span = currently selected range)	
Input error 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	
Measuring accuracy		
Input accuracy	See "Input accuracy" table	See "Input accuracy" table
Output accuracy	See "Output accuracy" table	See "Output accuracy" table
Operating conditions		
Ambient temperature	-50 ... +85 °C (-58 ... +185 °F)	-40 ... +85 °C (-40 ... +185 °F)
Ambient temperature for devices with functional safety	-40 ... +80 °C (-40 ... +176 °F)	
Storage temperature	-50 ... +85 °C (-58 ... +185 °F)	-40 ... +85 °C (-40 ... +185 °F)
Reference temperature for sensor calibration	24 °C ±1.0 °C (75.2 °F ±1.8 °F)	24 °C ±1.0 °C (75.2 °F ±1.8 °F)
Relative humidity	< 99% (no condensation)	< 99% (no condensation)
Degree of protection		
• Transmitter enclosure	IP68	IP68
• Terminals	IP00	IP00
Structural design		
Weight	50 g (0.11 lb)	50 g (0.11 lb)
Maximum core cross-section	1 × 1.5 mm² (stranded wire)	1 × 1.5 mm² (stranded wire)
Tightening torque for clamping screws	0.4 Nm	0.4 Nm
Vibrations	IEC 60068-2-6	IEC 60068-2-6
• 2 ... 25 Hz	± 1.6 mm (0.07 inches)	± 1.6 mm (0.07 inches)
• 25 ... 100 Hz	± 4 g	± 4 g
Certificates and approvals		
Explosion protection ATEX/IECEx and others		
Certificates[3)]	• DEKRA 17ATEX0116 X • IECEx DEK 17.0054X • A5E43700604A-2018X	• in progress • in progress • in progress
"Intrinsic safety ia/ib" type of protection	For use in Zone 0, 1, 2, 20, 21, 22	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 2 D Ex ia IIIC Db • I M1 Ex ia I Ma	• II 1 G Ex ia IIC T6 ... T4 Ga • II 2(1) G Ex ib [ia Ga] IIC T6 ... T4 Gb • II 2 D Ex ia IIIC Db • 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 Db • Ex ia I Ma	• Ex ia IIC T6 ... T4 Ga • Ex ib [ia Ga] IIC T6 ... T4 Gb • Ex ia IIIC Db • Ex ia I Ma
"Intrinsic safety ic" type of protection	For use in Zones 2 and 22	For use in Zones 2 and 22
• ATEX	• II 3 G Ex ic IIC T6...T4 Gc • II 3 D Ex ic IIIC Dc	• II 3 G Ex ic IIC T6...T4 Gc • II 3 D Ex ic IIIC Dc
• IECEx and others	• Ex ic IIC T6 ... T4 Gc • Ex ic IIIC Dc	• Ex ic IIC T6 ... T4 Gc • Ex ic IIIC Dc

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Technical specifications (continued)

	SITRANS TH420 HART	SITRANS TH420 PA
"Non-sparking/increased safety nA/ec" type of protection	For use in Zones 2 and 22	For use in Zones 2 and 22
• ATEX	• II 3 G Ex nA IIC T6...T4 Gc • II 3 G Ex ec IIC T6...T4 Gc	• II 3 G Ex ec IIC T6...T4 Gc
• IECEx and others	• Ex nA IIC T6 ... T4 Gc • Ex ec IIC T6 ... T4 Gc	• Ex ec IIC T6 ... T4 Gc
Explosion protection CSA/FM for Canada and USA		
Certificates	• CSA 1861385 • FM18CA0024 • FM18US0046	• in progress • in progress • in progress
"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	• 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 incendive field wiring NIFW" type of protection	NIFW, CL I, Div 2, GP ABCD T6 ... T4	NIFW, CL I, Div 2, GP ABCD T6 ... T4
"Non incendive 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	• 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 account.
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 ranges of sensors

RTD

Input type	Standard	Sensor measuring range in °C (°F)	α_0 in $°C^{-1}$ ($°F^{-1}$)	Minimum measuring span in °C (°F)
Pt10 ... 10000	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)
Ni10 ... 10000	DIN 43760-1987	-60 ... +250 (-76 ... +482)	0.006180 (0.003433)	10 (50)
	GOST 6651-2009/OIML R84:2-003	-60 ... +180 (-76 ... +356)	0.006170 (0.003428)	10 (50)
Cu5 ... 1000	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	Sensor 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)

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Technical specifications (continued)

Input type	Standard	Sensor measuring range in °C (°F)	Minimum measuring span in °C (°F)
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[1)]
RTD		
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 °C (356 °F) = ≤ ±0.08 °C (0.144 °F) $T_{max.}$ > 180 °C (356 °F) = ≤ ±0.16 °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 °C (572 °F) = ≤ ±0.08 °C (0.144 °F) $T_{max.}$ > 300 °C (572 °F) = ≤ ±0.4 °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)
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
Linear resistance		
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)
Potentiometers		
0 ... 100%	< 0.05%	< ± 0.005%
Voltage input		
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)
TC		
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)

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Technical specifications (continued)

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

1) Temperature coefficients correspond to the specified values or 0.002% of the input span, depending on which value is greater.
2) Accuracy of the specification range > 400 °C (752 °F)
3) Accuracy of the specification range > 160 °C (320 °F) < 400 °C (752 °F)
4) Accuracy of the specification range > 85 °C (185 °F) < 160 °C (320 °F)
5) Accuracy of the specification range < 85 °C (185 °F)

Output accuracy

Output type	Basic accuracy	Temperature coefficient
Average value measurement	Average of accuracy of input 1 and input 2	Average of temperature coefficient of input 1 and input 2
Differential measurement	Sum of accuracy of input 1 and input 2	Sum of temperature coefficient of input 1 and input 2
Analog output (HART)	≤ ±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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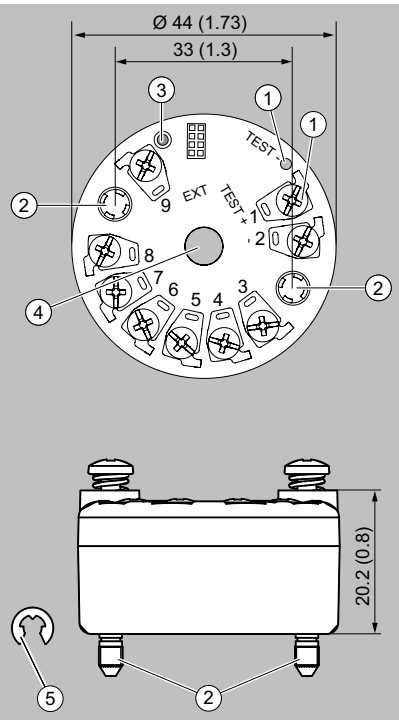
Dimensional drawings



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)

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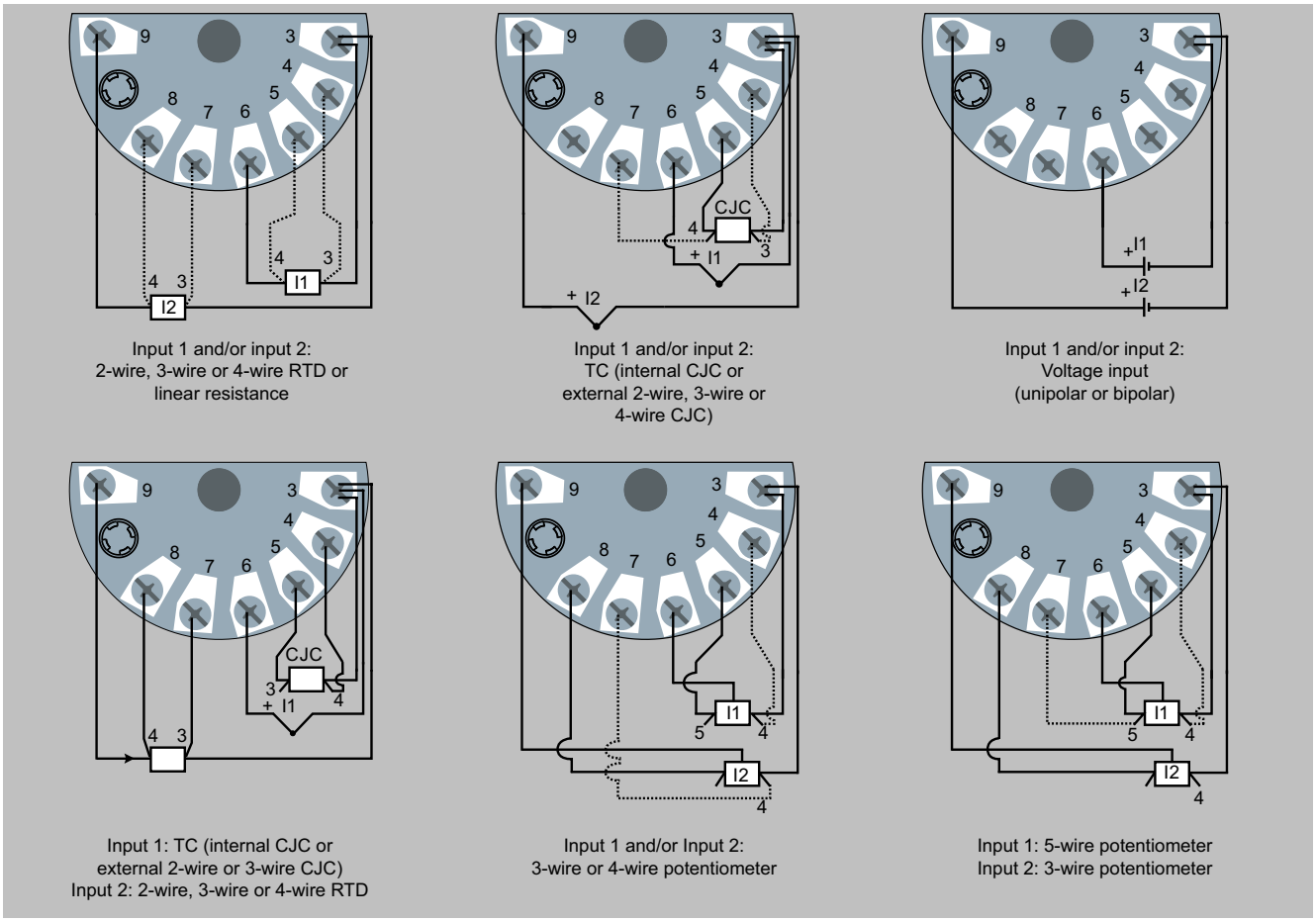
Circuit diagrams

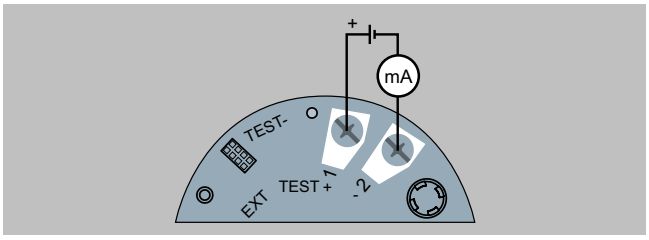
Connections

Input connection



SITRANS TH420, input connection assignment

Output connection



SITRANS TH420, output connection assignment