Overview

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

Benefits

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

Application

SITRANS TR320 transmitters can be used in all sectors. Their compact design enables simple mounting on standard DIN rails on-site in protective boxes or in control cabinets. The following sensors/signal sources can be connected over their universal input module:

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

With HART communication interface:

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

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

Function

Without HART communications interface

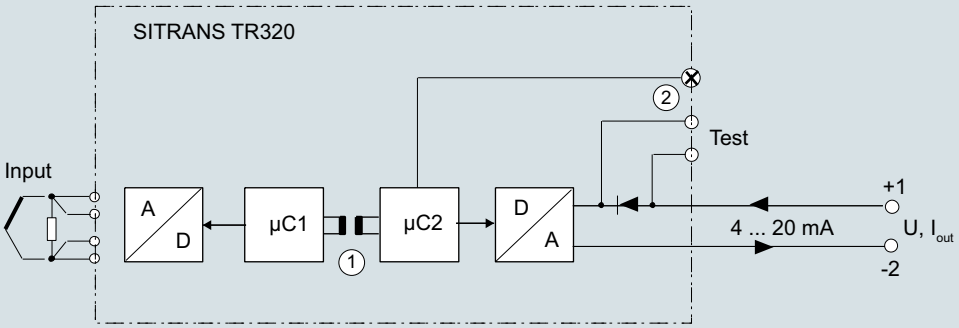
For the SITRANS TR320 without HART functionality, parameters are assigned with the PC. Available for this purpose are a special modem and the software tool SIPROM T.

With HART communications interface:

- The SITRANS TR320 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.



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**

SITRANS TR320 function block diagram

Technical specifications

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	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	• 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
Type of connection	2-wire, 3-wire or 4-wire
Line resistance per wire	Max. 50 Ω
Input current	< 0.15 mA
Effect of the line resistance (with 3-wire and 4-wire connections)	< 0.002 Ω/Ω
Cable, wire-wire capacity	
• Pt1000, Pt10000 (IEC 60751 and JIS C 1604-8)	Max. 30 nF
• All other input types	Max. 50 nF
Fault detection, programmable	None, short-circuited, defective, short-circuited or defective
	Note When the low limit for the configured input type is below the constant detection limit for short-circuited inputs, the detection of short circuits is disabled regardless of the configuration of the fault detection.
Detection limit for short-circuited input	15 Ω
Fault detection time (RTD)	≤ 75 ms (typically 70 ms)
Fault detection time (for 3-wire and 4-wire)	≤ 2 000 ms

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

SITRANS TR320 (HART, universal)

Fault 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 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
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
Fault detection, programmable	None, defective
Fault 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 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
Measuring accuracy	
Input accuracy	See "Input accuracy" table
Output accuracy	See "Output accuracy" table
Rated 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	IP20
• Terminals	IP20

Design	
Weight	122 g (0.27 lb)
Maximum core cross-section	2.5 mm² (AWG 13)
Tightening torque for clamping screws	0.5 ... 0.6 Nm
Vibrations	IEC 60068-2-6
• 2 ... 25 Hz	± 1.6 mm (0.07 inch)
• 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 1 D Ex ia IIIC Da I M1 Ex ia I Ma
• IECEx and others	Ex ia IIC T6 ... T4 Ga Ex ib [ia Ga] IIC T6 ... T4 Gb Ex ia IIIC Da Ex ia I Ma
"Intrinsic safety ic" type of protection	For use in Zones 2 and 22
• ATEX	II 2 G Ex ic IIC T6…T4 Gc II 2 D Ex ic IIIC Dc
• IECEx and others	Ex ic IIC T6 ... T4 Gc Ex ic IIIC Dc
"Non-sparking/increased safety nA/ec" type of protection	For use in Zones 2 and 22
• ATEX	II 2 G Ex nA IIC T6…T4 Gc II 2 G Ex ec IIC T6…T4 Gc
• IECEx and others	Ex nA IIC T6 ... T4 Gc Ex ec IIC T6 ... T4 Gc
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
"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 TR320.
All external voltage drops must be taken into consideration.

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

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

Measuring ranges/Minimum measuring span

RTD

Input type	Standard	Measuring range in °C (°F)	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 R84:2003	-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[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)

SITRANS TR320 (HART, universal)

Input type	Basic accuracy	Temperature coefficient[1]
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)
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)

Selection and ordering data

	Article No.
SITRANS TR320 rail transmitter with 1 input ↗	**7NG032** - ■■■■■ - 0■■■
↗ Click on the Article No. for the 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 with 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**
Materials not in contact with media	
None	**0**
Type of protection	
General purpose (non-Ex); CE, RCM, FM, KCC, EAC	**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)	**N**
Electrical connection/cable entry	
None	**A**
Local HMI	
Without display	**0**

Options	Order code
Add **"-Z"** to article number, specify order code and, if applicable, free text.	
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**
Jumper plug set on device for write protection	**D81**
Jumper plug set on device 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: RTD	
RTD Pt x IEC 60751 2-wire (wire resistance value defined in option Y51, RTD factor x defined in option Y21)	**V60**
Pt x (IEC), 3-wire, define RTD factor x in option Y21	**V61**
Pt x (IEC), 4-wire, define RTD factor x in option Y21	**V62**
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), 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), 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), 4-wire, define RTD factor x in option Y21	**V74**
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), 3-wire, define RTD factor x in option Y21	**V79**
Cu x (GOST 6651-94), 4-wire, define RTD factor x in option Y21	**V80**
Cu x (GOST 6651-2009), 3-wire, define RTD factor x in option Y21	**V82**
Cu x (GOST 6651-2009), 4-wire, define RTD factor x 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**
Long tag (device parameter, max. 32 characters), adhesive label	**Y15**
Measuring point description (device parameter, max. 32 characters), adhesive label	**Y16**
Descriptor (device parameter, max. 16 characters), adhesive label	**Y18**
Input 1: RTD factor; e.g. factor "200" = Pt200, adhesive label	**Y21**
Value wire resistance input 1 in Ohm (0…100 Ohm)	**Y51**

SITRANS TR320 (HART, universal)

Accessories

	Article No.
Additional accessories for assembly, connection and transmitter configuration, see page 2/251.	
Modems	
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

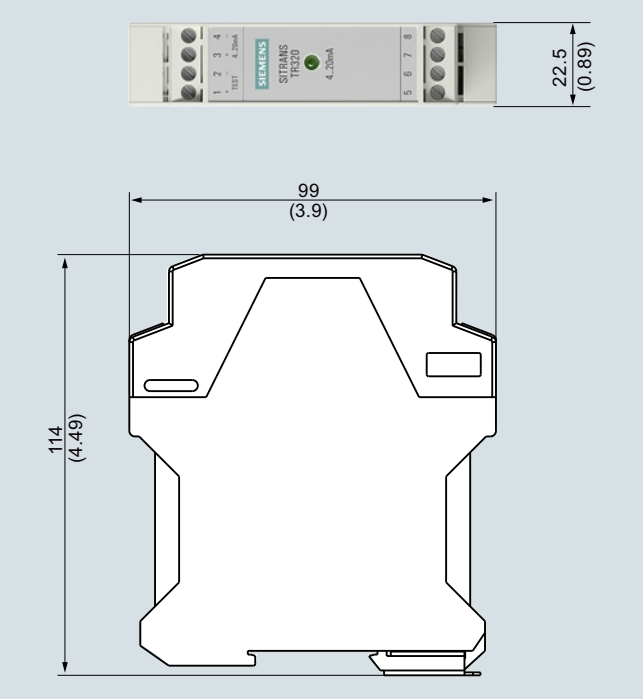
Ordering example

7NG0320-0BA00-0AA0-Z Y01
Y01: -10 ... +100 °C

Factory setting

- Pt100 (IEC 751); 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 TR320, dimensions in mm (inch)

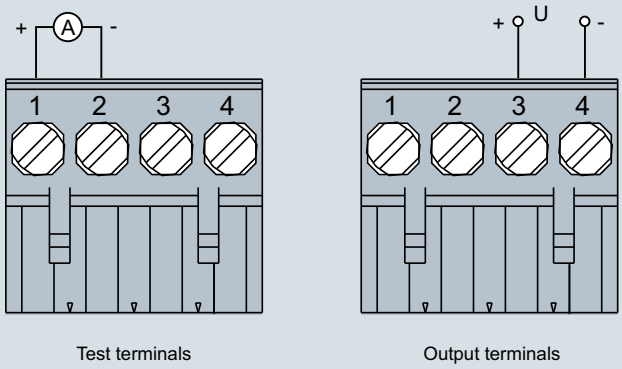
Circuit diagrams

Connections

1 (+) and 2 (-)	Test terminals for measurement of the output current with an amperemeter
3 (+) and 4 (-)	Output terminals
5, 6, 7 and 8	Input terminals

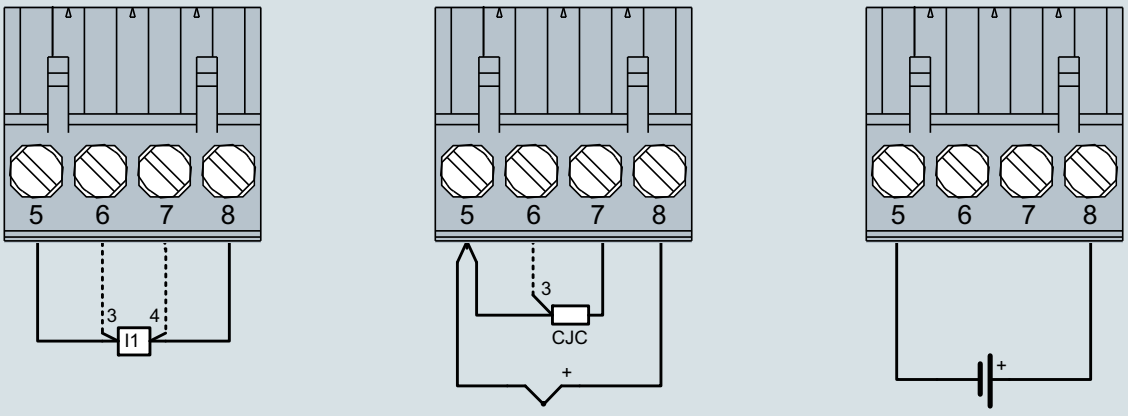
SITRANS TR320, connector assignment

Output and test connection



SITRANS TR320, output connection assignment

Input connection



SITRANS TR320, input connection assignment

SITRANS TR420 (HART, universal)

Overview

- 2-wire rail transmitter with HART communications interface
- Device for rail mounting
- 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)
- Galvanic isolation
- Test terminals for ammeter
- Diagnostics LED (green/red)
- Input monitoring
  Wire break and short-circuit
- Self-monitoring
- Configuration status stored in EEPROM
- Expanded diagnostic functions, such as slave pointer, operating hours counter, etc.
- Special characteristic
- Electromagnetic compatibility according to DIN EN 61326 and NE21
- SIL2/3 (with order note C20)

Application

SITRANS TR420 transmitters with two inputs can be used in all sectors. Their compact design enables simple mounting on standard DIN rails on-site in protective boxes or in control cabinets. The following sensors/signal sources can be connected over their universal input module:

- 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.

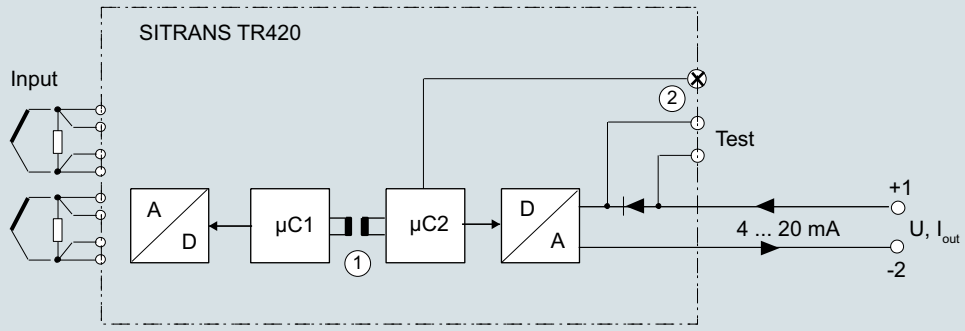
Transmitters of the "intrinsically safe or Zone 2 increased safety" type of protection can be installed in hazardous areas. The device meets the requirements of the EU Directive 2014/34/EU (ATEX), the FM and CSA regulations as well as other national approvals.

Function

The SITRANS TR420 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.



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

SITRANS TR420, function block diagram

2

Technical specifications

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	Open circuits or software
Warming-up time	< 5 min
Starting time	< 2.75 s
Programming	SIPROM T and HART
Signal-to-noise ratio	> 60 dB
Long-term stability	Better than: • ± 0.05% of measuring span/year • ± 0.18% of measuring span/5 years
Response time	≤ 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
Type of connection	2-wire, 3-wire or 4-wire
Line resistance per wire	Max. 50 Ω
Input current	< 0.15 mA
Effect of the line resistance (with 3-wire and 4-wire connections)	< 0.002 Ω/Ω
Cable, wire-wire capacity	
• Pt1000, Pt10000 (IEC 60751 and JIS C 1604-8)	Max. 30 nF
• All other input types	Max. 50 nF
Fault detection, programmable	None, short-circuited, defective, short-circuited or defective
	Note When the low limit for the configured input type is below the constant detection limit for short-circuited inputs, the detection of short circuits is disabled regardless of the configuration of the fault detection.
Detection limit for short-circuited input	15 Ω
Fault detection time (RTD)	≤ 75 ms (typically 70 ms)
Fault detection time (for 3-wire and 4-wire)	≤ 2 000 ms

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
	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, 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

Fault 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 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
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
Fault detection, programmable	None, defective
Fault 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 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
Measuring accuracy	
Input accuracy	See "Input accuracy" table
Output accuracy	See "Output accuracy" table
Rated 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	IP20
• Terminals	IP20

Design	
Weight	122 g (0.27 lb)
Maximum core cross-section	2.5 mm² (AWG 13)
Tightening torque for clamping screws	0.5 ... 0.6 Nm
Vibrations	IEC 60068-2-6
• 2 ... 25 Hz	± 1.6 mm (0.07 inch)
• 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 1 D Ex ia IIIC Da I M1 Ex ia I Ma
• IECEx and others	Ex ia IIC T6 ... T4 Ga Ex ib [ia Ga] IIC T6 ... T4 Gb Ex ia IIIC Da Ex ia I Ma
"Intrinsic safety ic" type of protection	For use in Zones 2 and 22
• ATEX	II 2 G Ex ic IIC T6…T4 Gc II 2 D Ex ic IIIC Dc
• IECEx and others	Ex ic IIC T6 ... T4 Gc Ex ic IIIC Dc
"Non-sparking/increased safety nA/ec" type of protection	For use in Zones 2 and 22
• ATEX	II 2 G Ex nA IIC T6…T4 Gc II 2 G Ex ec IIC T6…T4 Gc
• IECEx and others	Ex nA IIC T6 ... T4 Gc Ex ec IIC T6 ... T4 Gc
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
"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 TR420.
All external voltage drops must be taken into consideration.

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

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

SITRANS TR420 (HART, universal)

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 R84:2003	-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[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)

Input type	Basic accuracy	Temperature coefficient[1]
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)
4) Accuracy of the specification range > 85 °C (185 °F) < 160 °C (320 °F)
5) Accuracy of the specification range < 85 °C (185 °F)

Output accuracy

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

2

Selection and ordering data

	Article No.	Order code
SITRANS TR420 rail transmitter with 2 inputs ↗	**7NG042** - - 0	
↗ Click on the Article No. for the online configuration in the PIA Life Cycle Portal.		
Communication		
With HART	**0**	
Primary value output		
Input 1	**0**	
Input 1, input 2 as redundancy	**1**	
Input 2, input 1 as redundancy	**2**	
Average input 1 and input 2, both as redundancy	**3**	
Minimum input 1 and input 2, both as redundancy	**4**	
Maximum input 1 and input 2, both as redundancy	**5**	
Difference input 1 - input 2	**6**	
Difference input 2 - input 1	**7**	
Absolute difference	**8**	
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**
Average 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**	

	Article No.	Order code
SITRANS TR420 rail transmitter with 2 inputs	**7NG042** - - 0	
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**	
• 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 purpose (non-Ex); CE, RCM, FM, KCC, EAC	**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)	**N**	
Electrical connection/ cable entry		
None	**A**	
Local HMI		
Without display	**0**	

Options	Order code
Add **"-Z"** to article number, specify order code and, if applicable, free text.	
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**
Jumper plug set on device for write protection	**D81**
Jumper plug set on device 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**
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: RTD	
RTD Pt x IEC 60751 2-wire (wire resistance value defined in option Y51, RTD factor x defined in option Y21)	**V60**
Pt x (IEC), 3-wire, define RTD factor x in option Y21	**V61**
Pt x (IEC), 4-wire, define RTD factor x in option Y21	**V62**
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), 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), 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), 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), 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), 3-wire, define RTD factor x in option Y21	**V79**
Cu x (GOST 6651-94), 4-wire, define RTD factor x in option Y21	**V80**
Cu x (GOST 6651-2009), 3-wire, define RTD factor x in option Y21	**V82**
Cu x (GOST 6651-2009), 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**

Options	Order code
Add **"-Z"** to article number, specify order code and, if applicable, free text.	
Input 2: RTD	
RTD Pt x IEC 60751 2-wire (wire resistance value defined in option Y52, RTD factor x defined in option Y22)	**W60**
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**
Long tag (device parameter, max. 32 characters), adhesive label	**Y15**
Measuring point description (device parameter, max. 32 characters), adhesive label	**Y16**
Descriptor (device parameter, 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**
Value wire resistance input 1 in Ohm (0…100 Ohm)	**Y51**
Value wire resistance input 2 in Ohm (0…100 Ohm)	**Y52**

Accessories

	Article No.
Additional accessories for assembly, connection and transmitter configuration, see page 2/251.	
Modem	
Modem with USB interface	**7MF4997-1DB**
SIMATIC PDM parameterization software	See Catalog FI 01 section 8

Ordering example

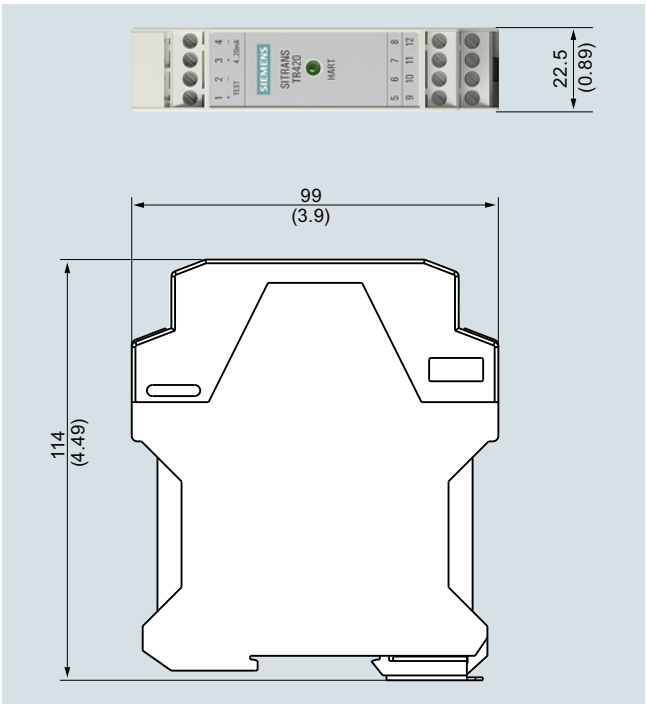
7NG0420-0BA00-0AA0-Z Y01
Y01: -10 ... +100 °C

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

SITRANS TR420 (HART, universal)

Dimensional drawings



SITRANS TR420, dimensions in mm (inch)

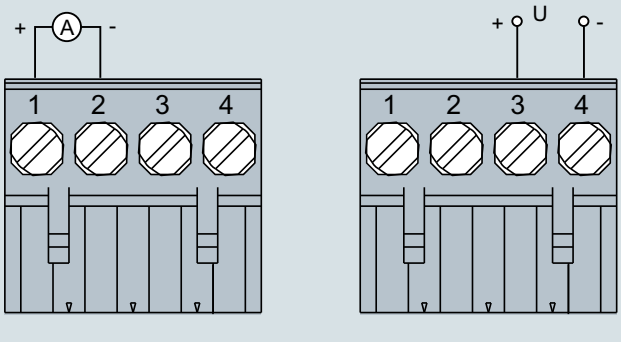
Circuit diagrams

Connections

1 (+) and 2 (-)	Test terminals for measurement of the output current with an amperemeter
3 (+) and 4 (-)	Output terminals
5, 6, 7 and 8	Input 1 terminals
9, 10, 11 and 12	Input 2 terminals

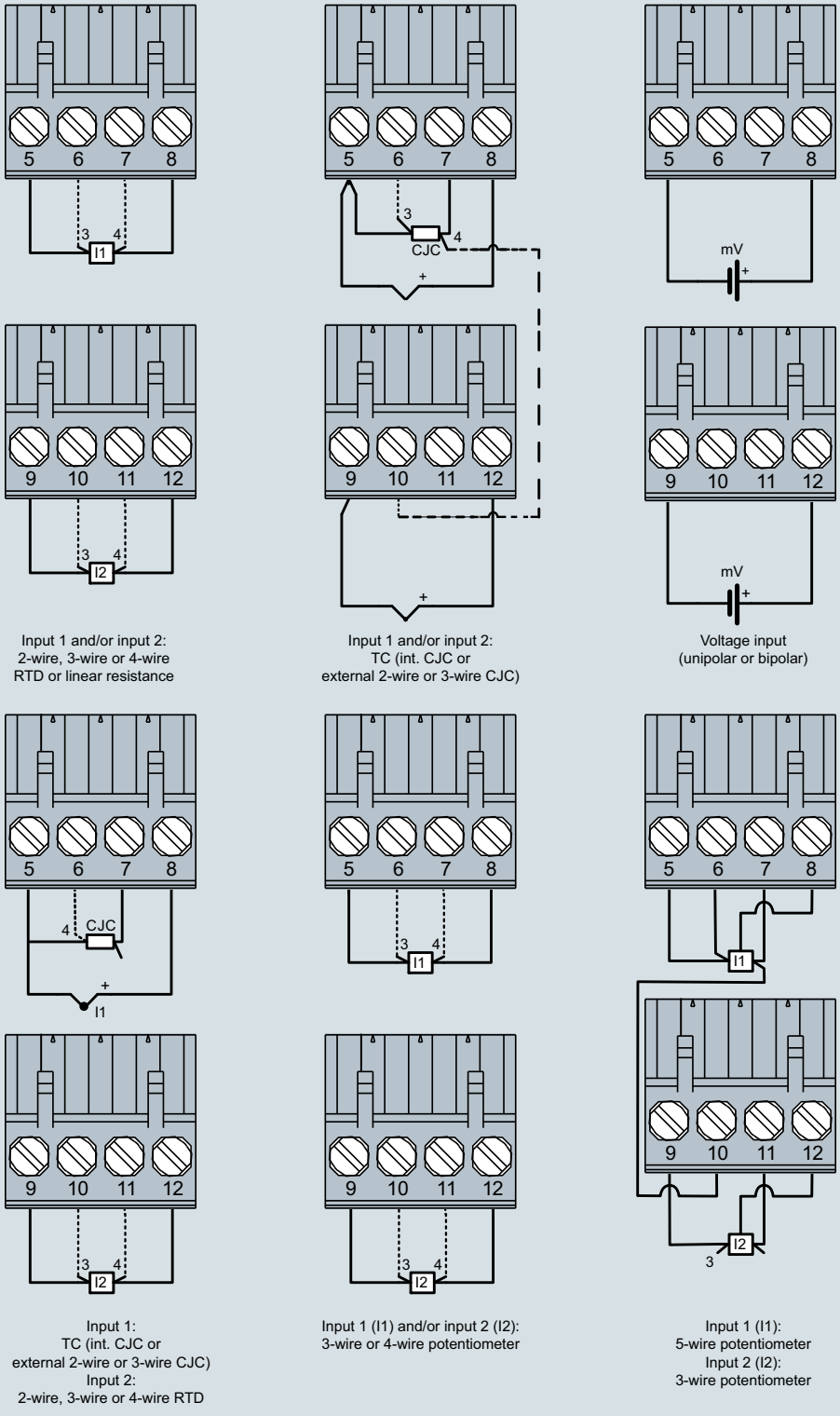
SITRANS TR420, connector assignment

Output and test connection



SITRANS TR420, output connection assignment

Input connection



SITRANS TR420, input connection assignment