SITRANS TR200 (4 to 20 mA, universal)

Overview

Keep flexible - with the universal SITRANS TR200 transmitter

- 2-wire device for 4 to 20 mA
- Enclosure for rail mounting
- Universal input for virtually any type of temperature sensor
- Configurable over PC

Benefits

- Compact design
- Galvanic isolation
- Test sockets for multimeters
- Diagnostics LED (green/red)
- Sensor monitoring
  open circuits and short-circuits
- Self-monitoring
- Configuration status stored in EEPROM
- Expanded diagnostic functions, such as slave pointer, operating hours counter, etc.
- Special characteristic
- Electromagnetic compatibility to EN 61326 and NE21
- SIL2 (with order note C20), SIL2/3 (with C23)

Application

SITRANS TR200 transmitters can be used in all industrial 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, 3, 4-wire connection)
- Thermocouples
- Resistance-based sensors and DC voltage sources

The output signal is a direct current from 4 to 20 mA in accordance with the sensor characteristic.

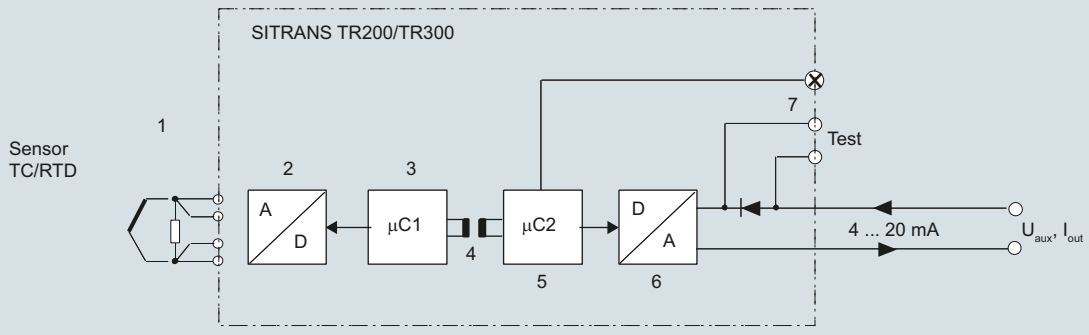
Transmitters of the "intrinsically safe" type of protection can be installed within potentially explosive atmospheres. The devices meet the directive 2014/34/EU (ATEX).

Function

The SITRANS TR200 is configured over a PC. For this purpose, the USB or RS 232 modem is connected to the output terminals. The configuration data can now be edited using the SIPROM T software tool. The configuration data are then permanently stored in the non-volatile memory (EEPROM).

Once the sensors and power supply have been correctly connected, the transmitter outputs a temperature-linear output signal and the diagnostics LED displays a green light. In the case of a sensor break, the LED flashes red, an internal device fault is indicated by a steady red light.

The test socket can be used to connect an ammeter at any time for monitoring purposes and plausibility checks. The output current can be read without any interruption, or even without opening the current loop.



1 Sensor such as resistance thermometer, thermocouple, resistance-based, sensor, mV sensor
2 Analog-digital converter
3 Microcontroller, secondary circuit
4 Electrical isolation
5 Microcontroller, primary circuit
6 Digital-analog converter
7 LED

U_{aux} Auxiliary power supply
I_{out} Output current
Test Test terminals for temporary connection of an amperemeter

SITRANS TR200 function diagram

Technical specifications

Input	
Resistance thermometer	
Measured variable	Temperature
Sensor type	
• According to IEC 60751	Pt25 … Pt1000
• Acc. to JIS C 1604; a=0.00392 K^{-1}	Pt25 … Pt1000
• According to IEC 60751	Ni25 … Ni1000
• Special type	Via special characteristic (max. 30 points)
Sensor factor	0.25 ... 10 (adaptation of the basic type, e.g. Pt100 to version Pt25 ... 1000)
Units	°C or °F
Connection	
• Standard connection	1 resistance thermometer (RTD) in 2-wire, 3-wire or 4-wire connection
• Averaging	2 resistance thermometers in 2-wire connection for generation of average temperature
• Differentiation	2 resistance thermometers (RTD) in 2-wire connection (RTD 1 – RTD 2 or RTD 2 – RTD 1)
Connection	
• 2-wire connection	Line resistance can be configured ≤100 Ω (loop resistance)
• 3-wire connection	No trim necessary
• 4-wire connection	No trim necessary
Sensor current	≤ 0.45 mA
Response time T_{63}	≤ 250 ms for 1 sensor with break monitoring
Break monitoring	Always active (cannot be switched off)
Short-circuit monitoring	Can be switched on/off (default value: ON)
Measuring range	Assignable (see "Digital measuring error" table)
Min. measuring span	10 °C (18 °F)
Characteristic curve	Temperature-linear or special characteristic
Resistance-based sensor	
Measured variable	Actual resistance
Sensor type	Resistance-based, potentiometers
Units	Ω
Connection	
• Standard connection	1 resistance-based sensor (R) in 2-wire, 3-wire or 4-wire connection
• Averaging	2 resistance-based sensors in 2-wire connection for averaging
• Differentiation	2 resistance thermometers in 2-wire connection (R1 – R2 or R2 – R1)
Connection	
• 2-wire connection	Line resistance can be configured ≤100 Ω (loop resistance)
• 3-wire connection	No trim necessary
• 4-wire connection	No trim necessary
Sensor current	≤ 0.45 mA
Response time T_{63}	≤ 250 ms for 1 sensor with break monitoring
Break monitoring	Always active (cannot be switched off)
Short-circuit monitoring	Can be switched on/off (default value: OFF)
Measuring range	Assignable max. 0 ... 2200 Ω (see "Digital measuring error" table)
Min. measuring span	5 ... 25 Ω (see "Digital measuring error" table)
Characteristic curve	Resistance-linear or special characteristic

Thermocouples	
Measured variable	Temperature
Sensor type (thermocouples)	
• Type B	Pt30Rh-Pt6Rh acc. to IEC 584
• Type C	W5%-Re acc. to ASTM 988
• Type D	W3%-Re acc. to ASTM 988
• Type E	NiCr-CuNi acc. to IEC 584
• Type J	Fe-CuNi acc. to IEC 584
• Type K	NiCr-Ni acc. to IEC 584
• Type L	Fe-CuNi acc. to DIN 43710
• Type N	NiCrSi-NiSi acc. to IEC 584
• Type R	Pt13Rh-Pt acc. to IEC 584
• Type S	Pt10Rh-Pt acc. to IEC 584
• Type T	Cu-CuNi acc. to IEC 584
• Type U	Cu-CuNi acc. to DIN 43710
Units	°C or °F
Connection	
• Standard connection	1 thermocouple (TC)
• Averaging	2 thermocouples (TC)
• Differentiation	2 thermocouples (TC) (TC1 – TC2 or TC2 – TC1)
Response time T_{63}	≤ 250 ms for 1 sensor with break monitoring
Break monitoring	Can be switched off
Reference junction compensation	
• Internal	With integrated Pt100 resistance thermometer
• External	With external Pt100 IEC 60751 (2-wire or 3-wire connection)
• External fixed	Reference junction temperature can be set as fixed value
Measuring range	Assignable (see "Digital measuring error" table)
Min. measuring span	Min. 40 ... 100 °C (72 ... 180 °F) (see "Digital measuring error" table)
Characteristic curve	Temperature-linear or special characteristic
mV sensor	
Measured variable	DC voltage
Sensor type	DC voltage source (DC voltage source possible over an externally connected resistor)
Units	mV
Response time T_{63}	≤ 250 ms for 1 sensor with break monitoring
Break monitoring	Can be switched off
Measuring range	Assignable max. -100 … 1100 mV
Min. measuring span	2 mV or 20 mV
Overload capability of the input	-1.5 ... +3.5 V DC
Input resistance	≥ 1 MΩ
Characteristic curve	Voltage-linear or special characteristic

SITRANS TR200 (4 to 20 mA, universal)

Output	
Output signal	4 ... 20 mA, 2-wire
Auxiliary power	11 ... 35 V DC (to 30 V with Ex i/ic; to 32 V with Ex nA)
Max. load	$(U_{aux} - 11\ V)/0.023\ A$
Overrange	3.6 ... 23 mA, infinitely adjustable (default range: 3.84 mA ... 20.5 mA)
Error signal (e.g. following sensor fault) (conforming to NE43)	3.6 ... 23 mA, infinitely adjustable (default value: 22.8 mA)
Sample cycle	0.25 s nominal
Damping	Software filter 1st order 0 ... 30 s (parameterizable)
Protection	Against reverse polarity
Galvanic isolation	Input against output 2.12 kV DC (1.5 kV_{rms} AC)
Measuring accuracy	
Digital measuring error	See "Digital measuring error" table
Reference conditions	
• Auxiliary power	24 V ± 1 %
• Load	500 Ω
• Ambient temperature	23 °C
• Warming-up time	> 5 min
Error in the analog output (digital/analog converter)	< 0.025 % of measuring span
Error due to internal reference junction	< 0.5 °C (0.9 °F)
Effect of ambient temperature	
• Analog measuring error	0.02 % of meas. span/10 °C (18 °F)
• Digital measuring error	
- With resistance thermometer	0.06 °C (0.11 °F)/10 °C (18 °F)
- With thermocouples	0.6 °C (1.1 °F)/10 °C (18 °F)
Auxiliary power effect	< 0.001 % of meas. span/V
Effect of load impedance	< 0.002 % of meas. span/100 Ω
Long-term drift	
• In the first month	< 0.02 % of measuring span
• After one year	< 0.2 % of measuring span
• After 5 years	< 0.3 % of measuring span
Rated conditions	
Ambient conditions	
Ambient temperature	-40 ... +85 °C (-40 ... +185 °F)
Storage temperature	-40 ... +85 °C (-40 ... +185 °F)
Relative humidity	< 98 %, with condensation
Electromagnetic compatibility	According to EN 61326 and NE21
Design	
Material	Plastic, electronic module potted
Weight	122 g
Dimensions	See "Dimensional drawings"
Cross-section of cables	Max. 2.5 mm^2 (AWG 13)
Degree of protection according to IEC 60529	
• Enclosure	IP20

Certificates and approvals	
Explosion protection ATEX	
EC type-examination certificate	PTB 07 ATEX 2032X
• "Intrinsic safety" type of protection	II 2(1) G Ex ia/ib IIC T6/T4 II 3(1) G Ex ia/ic IIC T6/T4 II 3 G Ex ic IIC T6/T4 II 2(1) D Ex iaD/ibD 20/21 T115 °C
• "Non-sparking equipment" type of protection	II 3 G Ex nA IIC T6/T4
Other certificates	NEPSI and EAC Ex
Software requirements for SIPROM T	
PC operating system	Windows ME, 2000, XP, Win 7 and Win 8; in connection with RS 232 modem, also Windows 95, 98 and 98SE

Factory setting:

- Pt100 (IEC 751); 3-wire connection
- Measuring range: 0 ... 100 °C (32 ... 212 °F)
- Fault current: 22.8 mA
- Sensor offset: 0 °C (0 °F)
- Damping 0.0 s

Digital measuring error

Resistance thermometer

Input	Measuring range	Minimum measuring span		Digital accuracy	
	°C (°F)	°C	(°F)	°C	(°F)
According to IEC 60751					
Pt25	-200 ... +850 (-328 ... +1562)	10	(18)	0.3	(0.54)
Pt50	-200 ... +850 (-328 ... +1562)	10	(18)	0.15	(0.27)
Pt100 ... Pt200	-200 ... +850 (-328 ... +1562)	10	(18)	0.1	(0.18)
Pt500	-200 ... +850 (-328 ... +1562)	10	(18)	0.15	(0.27)
Pt1000	-200 ... +350 (-328 ... +662)	10	(18)	0.15	(0.27)
According to JIS C1604-81					
Pt25	-200 ... +649 (-328 ... +1200)	10	(18)	0.3	(0.54)
Pt50	-200 ... +649 (-328 ... +1200)	10	(18)	0.15	(0.27)
Pt100 ... Pt200	-200 ... +649 (-328 ... +1200)	10	(18)	0.1	(0.18)
Pt500	-200 ... +649 (-328 ... +1200)	10	(18)	0.15	(0.27)
Pt1000	-200 ... +350 (-328 ... +662)	10	(18)	0.15	(0.27)
Ni 25 ... Ni1000	-60 ... +250 (-76 ... +482)	10	(18)	0.1	(0.18)

Resistance-based sensor

Input	Measuring range	Minimum measuring span	Digital accuracy
	Ω	Ω	Ω
Resistance	0 ... 390	5	0.05
Resistance	0 ... 2200	25	0.25

Thermocouples

Input	Measuring range	Minimum measuring span		Digital accuracy	
	°C (°F)	°C	(°F)	°C	(°F)
Type B	100 ... 1820 (212 ... 3308)	100	(180)	2[1]	(3.6)[1]
Type C (W5)	0 ... 2300 (32 ... 4172)	100	(180)	2	(3.6)
Type D (W3)	0 ... 2300 (32 ... 4172)	100	(180)	1[2]	(1.8)[2]
Type E	-200 ... +1000 (-328 ... +1832)	50	(90)	1	(1.8)
Type J	-200 ... +1200 (-328 ... +2192)	50	(90)	1	(1.8)
Type K	-200 ... +1370 (-328 ... +2498)	50	(90)	1	(1.8)
Type L	-200 ... +900 (-328 ... +1652)	50	(90)	1	(1.8)
Type N	-200 ... +1300 (-328 ... +2372)	50	(90)	1	(1.8)
Type R	-50 ... +1760 (-58 ... +3200)	100	(180)	2	(3.6)
Type S	-50 ... +1760 (-58 ... +3200)	100	(180)	2	(3.6)
Type T	-200 ... +400 (-328 ... +752)	40	(72)	1	(1.8)
Type U	-200 ... +600 (-328 ... +1112)	50	(90)	2	(3.6)

[1] The digital accuracy in the range 100 to 300 °C (212 to 572 °F) is 3 °C (5.4 °F).

[2] The digital accuracy in the range 1750 to 2300 °C (3182 to 4172 °F) is 2 °C (3.6 °F).

mV sensor

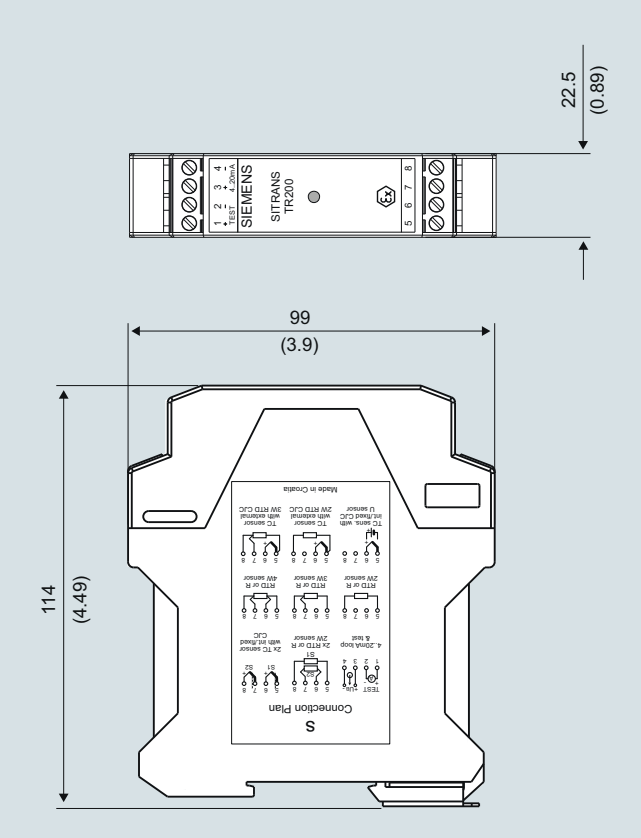
Input	Measuring range	Minimum measuring span	Digital accuracy
	mV	mV	µV
mV sensor	-10 ... +70	2	40
mV sensor	-100 ... +1100	20	400

The digital accuracy is the accuracy after the analog/digital conversion including linearization and calculation of the measured value.

An additional error is generated in the output current 4 to 20 mA as a result of the digital/analog conversion of 0.025% of the set measuring span (digital-analog error).

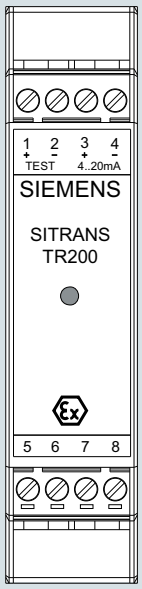
The total error under reference conditions at the analog output is the sum from the digital error and the digital-analog error (poss. with the addition of reference junction errors in the case of thermocouple measurements).

Dimensional drawings



SITRANS TR200, dimensions in mm (inch)

Circuit diagrams

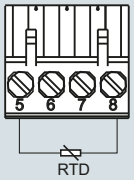
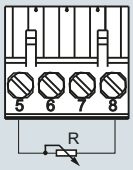
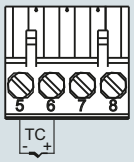
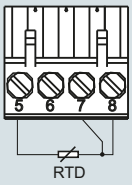
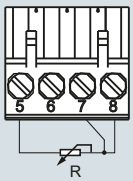
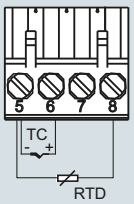
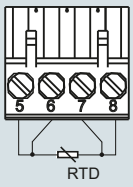
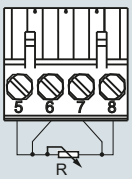
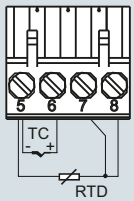
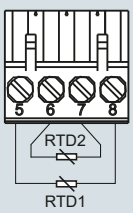
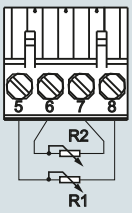
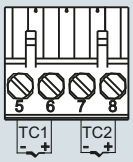


Connections

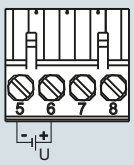
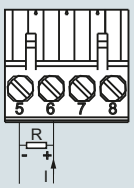
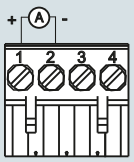
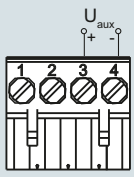
1 (+) and 2 (-)	Test terminals (test) for measurement of the output current with a multimeter
3 (+) and 4 (-)	Power supply U_{aux}, output current I_{out}
5, 6, 7 and 8	Sensor connection, see schematics

SITRANS TR200, connector assignment

SITRANS TR200 (4 to 20 mA, universal)

Resistance thermometer	Resistance	Thermocouple
 2-wire system [1]	 2-wire system [1]	 Cold junction compensation internal/fixed value
 3-wire system	 3-wire system	 Cold junction compensation with external Pt100 in 2-wire system [1]
 4-wire system	 4-wire system	 Cold junction compensation with external Pt100 in 3-wire system
 Generation of average value/difference [1]	 Generation of average value/difference [1]	 Generation of average value / difference with internal cold junction compensation

[1] Programmable line resistance for the purpose of correction.

Voltage measurement	Current measurement	Test terminals	Power supply/ 4 ... 20 mA (U_{aux})
			

SITRANS TR200, sensor connection assignment

Overview

Robust and durable HART - the universal SITRANS TR300 transmitter

- 2-wire device for 4 to 20 mA, HART
- Device for rail mounting
- Universal input for virtually any type of temperature sensor
- Configurable over HART

Benefits

- Compact design
- Galvanic isolation
- Test sockets for multimeters
- Diagnostics LED (green/red)
- Sensor monitoring
  open circuits and short-circuits
- Self-monitoring
- Configuration status stored in EEPROM
- Expanded diagnostic functions, such as slave pointer, operating hours counter, etc.
- Special characteristic
- Electromagnetic compatibility to EN 61326 and NE21
- SIL2 (with order note C20), SIL2/3 (with C23)

Application

SITRANS TR300 transmitters can be used in all industrial 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, 3, 4-wire connection)
- Thermocouples
- Resistance-based sensors and DC voltage sources

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

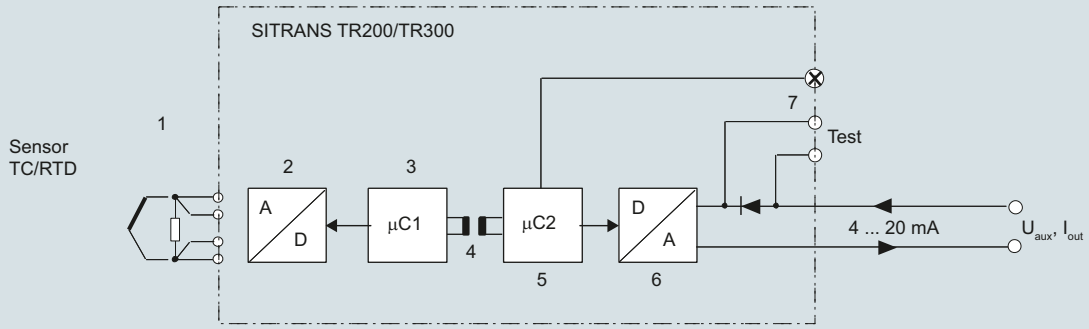
Transmitters of the "intrinsically safe" type of protection can be installed within potentially explosive atmospheres. The devices meet the directive 2014/34/EU (ATEX).

Function

The SITRANS TR300 is configured over HART. This can be done using a handheld communicator or even more conveniently with a HART modem and the SIMATIC PDM parameterization software. The configuration data are then permanently stored in the non-volatile memory (EEPROM).

Once the sensors and power supply have been correctly connected, the transmitter outputs a temperature-linear output signal and the diagnostics LED displays a green light. In the case of a sensor break, the LED flashes red, an internal device fault is indicated by a steady red light.

The test socket can be used to connect an ammeter at any time for monitoring purposes and plausibility checks. The output current can be read without any interruption, or even without opening the current loop.



1 Sensor such as resistance thermometer, thermocouple, resistance-based, sensor, mV sensor
2 Analog-digital converter
3 Microcontroller, secondary circuit
4 Electrical isolation
5 Microcontroller, primary circuit
6 Digital-analog converter
7 LED

U_{aux} Auxiliary power supply
I_{out} Output current
Test Test terminals for temporary connection of an amperemeter

SITRANS TR300 function diagram

SITRANS TR300 (4 to 20 mA, HART, universal)

Technical specifications

Input	
Resistance thermometer	
Measured variable	Temperature
Sensor type	
• According to IEC 60751	Pt25 … Pt1000
• Acc. to JIS C 1604; a=0.00392 K^{-1}	Pt25 … Pt1000
• According to IEC 60751	Ni25 … Ni1000
• Special type	Via special characteristic (max. 30 points)
Sensor factor	0.25 ... 10 (adaptation of the basic type, e.g. Pt100 to version Pt25 ... 1000)
Units	°C or °F
Connection	
• Standard connection	1 resistance thermometer (RTD) in 2-wire, 3-wire or 4-wire connection
• Averaging	2 identical resistance thermometers in 2-wire connection for generation of average temperature
• Differentiation	2 identical resistance thermometers (RTD) in 2-wire connection (RTD 1 – RTD 2 or RTD 2 – RTD 1)
Connection	
• 2-wire connection	Line resistance can be configured ≤100 Ω (loop resistance)
• 3-wire connection	No trim necessary
• 4-wire connection	No trim necessary
Sensor current	≤ 0.45 mA
Response time T_{63}	≤ 250 ms for 1 sensor with break monitoring
Break monitoring	Always active (cannot be switched off)
Short-circuit monitoring	Can be switched on/off (default value: ON)
Measuring range	Assignable (see "Digital measuring error" table)
Min. measuring span	10 °C (18 °F)
Characteristic curve	Temperature-linear or special characteristic
Resistance-based sensor	
Measured variable	Actual resistance
Sensor type	Resistance-based, potentiometers
Units	Ω
Connection	
• Standard connection	1 resistance-based sensor (R) in 2-wire, 3-wire or 4-wire connection
• Averaging	2 resistance-based sensors in 2-wire connection for averaging
• Differentiation	2 resistance thermometers in 2-wire connection (R1 – R2 or R2 – R1)
Connection	
• 2-wire connection	Line resistance can be configured ≤100 Ω (loop resistance)
• 3-wire connection	No trim necessary
• 4-wire connection	No trim necessary
Sensor current	≤ 0.45 mA
Response time T_{63}	≤ 250 ms for 1 sensor with break monitoring
Break monitoring	Always active (cannot be switched off)
Short-circuit monitoring	Can be switched on/off (default value: OFF)
Measuring range	Assignable max. 0 ... 2200 Ω (see "Digital measuring error" table)
Min. measuring span	5 ... 25 Ω (see "Digital measuring error" table)
Characteristic curve	Resistance-linear or special characteristic

Thermocouples	
Measured variable	Temperature
Sensor type (thermocouples)	
• Type B	Pt30Rh-Pt6Rh acc. to IEC 584
• Type C	W5%-Re acc. to ASTM 988
• Type D	W3%-Re acc. to ASTM 988
• Type E	NiCr-CuNi acc. to IEC 584
• Type J	Fe-CuNi acc. to IEC 584
• Type K	NiCr-Ni acc. to IEC 584
• Type L	Fe-CuNi acc. to DIN 43710
• Type N	NiCrSi-NiSi acc. to IEC 584
• Type R	Pt13Rh-Pt acc. to IEC 584
• Type S	Pt10Rh-Pt acc. to IEC 584
• Type T	Cu-CuNi acc. to IEC 584
• Type U	Cu-CuNi acc. to DIN 43710
Units	°C or °F
Connection	
• Standard connection	1 thermocouple (TC)
• Averaging	2 thermocouples (TC)
• Differentiation	2 thermocouples (TC) (TC1 – TC2 or TC2 – TC1)
Response time T_{63}	≤ 250 ms for 1 sensor with break monitoring
Break monitoring	Can be switched off
Reference junction compensation	
• Internal	With integrated Pt100 resistance thermometer
• External	With external Pt100 IEC 60751 (2-wire or 3-wire connection)
• External fixed	Reference junction temperature can be set as fixed value
Measuring range	Assignable (see "Digital measuring error" table)
Min. measuring span	Min. 40 ... 100 °C (72 ... 180 °F) (see "Digital measuring error" table)
Characteristic curve	Temperature-linear or special characteristic
mV sensor	
Measured variable	DC voltage
Sensor type	DC voltage source (DC voltage source possible over an externally connected resistor)
Units	mV
Response time T_{63}	≤ 250 ms for 1 sensor with break monitoring
Break monitoring	Can be switched off
Measuring range	Assignable max. -100 … 1100 mV
Min. measuring span	2 mV or 20 mV
Overload capability of the input	-1.5 ... +3.5 V DC
Input resistance	≥ 1 MΩ
Characteristic curve	Voltage-linear or special characteristic

Output	
Output signal	4 ... 20 mA, 2-wire with communication acc. to HART Rev. 5.9
Auxiliary power	11 ... 35 V DC (to 30 V with Ex i/ic; to 32 V with Ex nA)
Max. load	$(U_{aux} - 11\ V)/0.023\ A$
Overrange	3.6 ... 23 mA, infinitely adjustable (default range: 3.84 mA ... 20.5 mA)
Error signal (e.g. following sensor fault) (conforming to NE43)	3.6 ... 23 mA, infinitely adjustable (default value: 22.8 mA)
Sample cycle	0.25 s nominal
Damping	Software filter 1st order 0 ... 30 s (parameterizable)
Protection	Against reverse polarity
Galvanic isolation	Input against output 2.12 kV DC ($1.5\ kV_{rms}$ AC)
Measuring accuracy	
Digital measuring error	See "Digital measuring error" table
Reference conditions	
• Auxiliary power	24 V ± 1 %
• Load	500 Ω
• Ambient temperature	23 °C
• Warming-up time	> 5 min
Error in the analog output (digital/analog converter)	< 0.025 % of measuring span
Error due to internal reference junction	< 0.5 °C (0.9 °F)
Effect of ambient temperature	
• Analog measuring error of measuring span	< 0.02% of max. meas. span/10 °C (18 °F)
• Digital measuring error	0.06 °C (0.11 °F)/10 °C (18 °F)
- With resistance thermometers	0.6 °C (1.1 °F)/10°C (18 °F)
- With thermocouples	
Auxiliary power effect	< 0.001 % of meas. span/V
Effect of load impedance	< 0.002 % of meas. span/100 Ω
Long-term drift	
• In the first month	< 0.02 % of measuring span
• After one year	< 0.2 % of measuring span
• After 5 years	< 0.3 % of measuring span
Rated conditions	
Ambient conditions	
Ambient temperature	-40 ... +85 °C (-40 ... +185 °F)
Storage temperature	-40 ... +85 °C (-40 ... +185 °F)
Relative humidity	< 98 %, with condensation
Electromagnetic compatibility	According to EN 61326 and NE21
Design	
Material	Plastic, electronic module potted
Weight	122 g
Dimensions	See "Dimensional drawings"
Cross-section of cables	Max. 2.5 mm^2 (AWG 13)
Degree of protection according to IEC 60529	
• Enclosure	IP20
Certificates and approvals	
Explosion protection ATEX	
EC type-examination certificate	PTB 07 ATEX 2032X
• "Intrinsic safety" type of protection	II 2(1) G Ex ia/ib IIC T6/T4 II 3(1) G Ex ia/ic IIC T6/T4 II 3 G Ex ic IIC T6/T4 II 2(1) D Ex iaD/ibD 20/21 T115 °C
• "Non-sparking equipment" type of protection	II 3 G Ex nA IIC T6/T4
Other certificates	EAC Ex(GOST) and NEPSI

Factory setting:

- Pt100 (IEC 751); 3-wire connection
- Measuring range: 0 ... 100 °C (32 ... 212 °F)
- Fault current: 22.8 mA
- Sensor offset: 0 °C (0 °F)
- Damping 0.0 s

SITRANS TR300 (4 to 20 mA, HART, universal)

Digital measuring error

Resistance thermometer

Input	Measuring range	Minimum measuring span		Digital accuracy	
	°C (°F)	°C	(°F)	°C	(°F)
According to IEC 60751					
Pt25	-200 ... +850 (-328 ... +1562)	10	(18)	0.3	(0.54)
Pt50	-200 ... +850 (-328 ... +1562)	10	(18)	0.15	(0.27)
Pt100 ... Pt200	-200 ... +850 (-328 ... +1562)	10	(18)	0.1	(0.18)
Pt500	-200 ... +850 (-328 ... +1562)	10	(18)	0.15	(0.27)
Pt1000	-200 ... +350 (-328 ... +662)	10	(18)	0.15	(0.27)
According to JIS C1604-81					
Pt25	-200 ... +649 (-328 ... +1200)	10	(18)	0.3	(0.54)
Pt50	-200 ... +649 (-328 ... +1200)	10	(18)	0.15	(0.27)
Pt100 ... Pt200	-200 ... +649 (-328 ... +1200)	10	(18)	0.1	(0.18)
Pt500	-200 ... +649 (-328 ... +1200)	10	(18)	0.15	(0.27)
Pt1000	-200 ... +350 (-328 ... +662)	10	(18)	0.15	(0.27)
Ni 25 ... Ni1000	-60 ... +250 (-76 ... +482)	10	(18)	0.1	(0.18)

Resistance-based sensor

Input	Measuring range	Minimum measuring span	Digital accuracy
	Ω	Ω	Ω
Resistance	0 ... 390	5	0.05
Resistance	0 ... 2200	25	0.25

Thermocouples

Input	Measuring range	Minimum measuring span		Digital accuracy	
	°C (°F)	°C	(°F)	°C	(°F)
Type B	100 ... 1820 (212 ... 3308)	100	(180)	2[1)]	(3.6)[1)]
Type C (W5)	0 ... 2300 (32 ... 4172)	100	(180)	2	(3.6)
Type D (W3)	0 ... 2300 (32 ... 4172)	100	(180)	1[2)]	(1.8)[2)]
Type E	-200 ... +1000 (-328 ... +1832)	50	(90)	1	(1.8)
Type J	-200 ... +1200 (-328 ... +2192)	50	(90)	1	(1.8)
Type K	-200 ... +1370 (-328 ... +2498)	50	(90)	1	(1.8)
Type L	-200 ... +900 (-328 ... +1652)	50	(90)	1	(1.8)
Type N	-200 ... +1300 (-328 ... +2372)	50	(90)	1	(1.8)
Type R	-50 ... +1760 (-58 ... +3200)	100	(180)	2	(3.6)
Type S	-50 ... +1760 (-58 ... +3200)	100	(180)	2	(3.6)
Type T	-200 ... +400 (-328 ... +752)	40	(72)	1	(1.8)
Type U	-200 ... +600 (-328 ... +1112)	50	(90)	2	(3.6)

[1)] The digital accuracy in the range 100 to 300 °C (212 to 572 °F) is 3 °C (5.4 °F).

[2)] The digital accuracy in the range 1750 to 2300 °C (3182 to 4172 °F) is 2 °C (3.6 °F).

mV sensor

Input	Measuring range	Minimum measuring span	Digital accuracy
	mV	mV	µV
mV sensor	-10 ... +70	2	40
mV sensor	-100 ... +1100	20	400

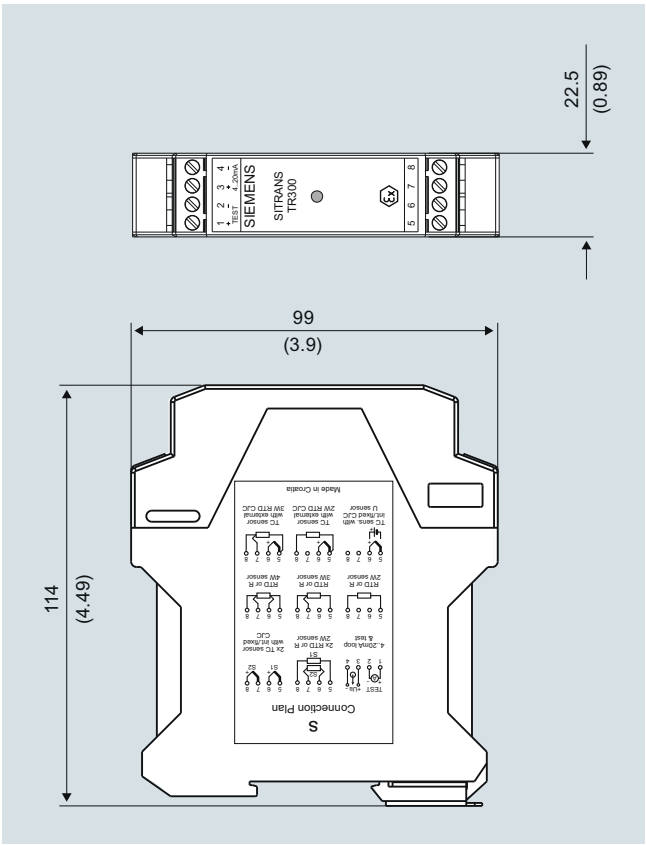
The digital accuracy is the accuracy after the analog/digital conversion including linearization and calculation of the measured value.

An additional error is generated in the output current 4 to 20 mA as a result of the digital/analog conversion of 0.025% of the set measuring span (digital-analog error).

The total error under reference conditions at the analog output is the sum from the digital error and the digital-analog error (poss. with the addition of reference junction errors in the case of thermocouple measurements).

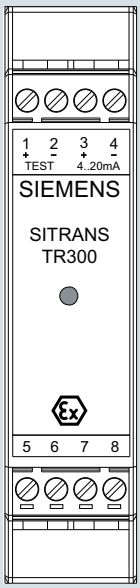
SITRANS TR300 (4 to 20 mA, HART, universal)

Dimensional drawings



SITRANS TR300, dimensions in mm (inch)

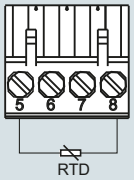
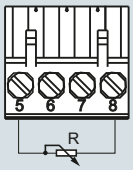
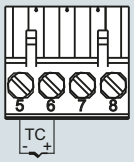
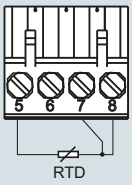
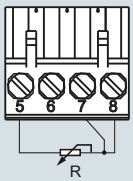
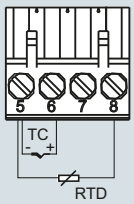
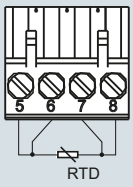
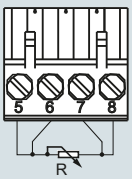
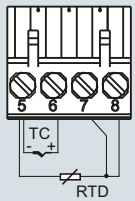
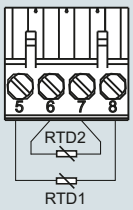
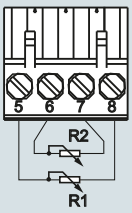
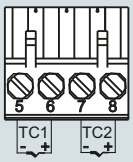
Circuit diagrams



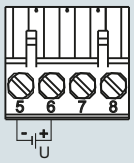
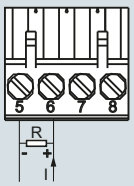
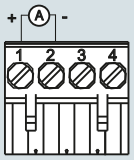
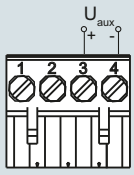
Connections

1 (+) and 2 (-)	Test terminals (Test) for measurement of the output current with a multimeter
3 (+) and 4 (-)	Power supply U_{aux}, Output current I_{out}
5, 6, 7 and 8	Sensor connection, see schematics

SITRANS TR300, connector assignment

Resistance thermometer	Resistance	Thermocouple
 2-wire system [1]	 2-wire system [1]	 Cold junction compensation internal/fixed value
 3-wire system	 3-wire system	 Cold junction compensation with external Pt100 in 2-wire system [1]
 4-wire system	 4-wire system	 Cold junction compensation with external Pt100 in 3-wire system
 Generation of average value/difference [1]	 Generation of average value/difference [1]	 Generation of average value / difference with internal cold junction compensation

[1] Programmable line resistance for the purpose of correction.

Voltage measurement	Current measurement	Test terminals	Power supply/ 4 ... 20 mA (U_{aux})
			

SITRANS TR300, sensor connection assignment

SITRANS TR320 (HART, universal)

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

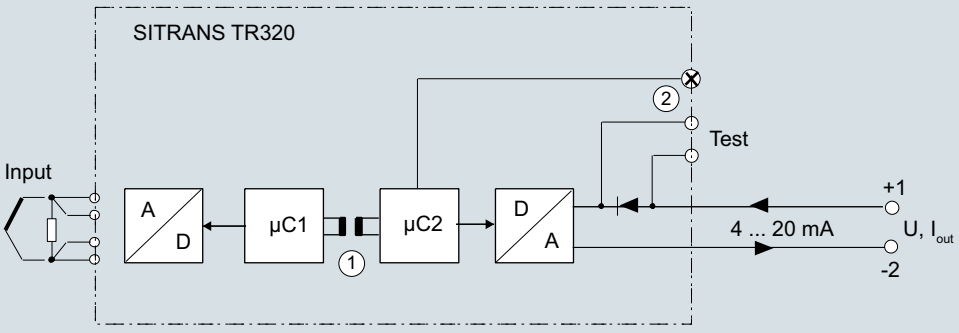
For the SITRANS TR320 without HART functionality, parameters are assigned with the PC. Available for this purpose are a special modem and the software tool SIPROM T.

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

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	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

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

SITRANS TR320 (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)

Input type	Basic accuracy	Temperature coefficient[1]
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)
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)

Accessories

	Article No.
Additional accessories for assembly, connection and transmitter configuration, see page 2/154.	
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

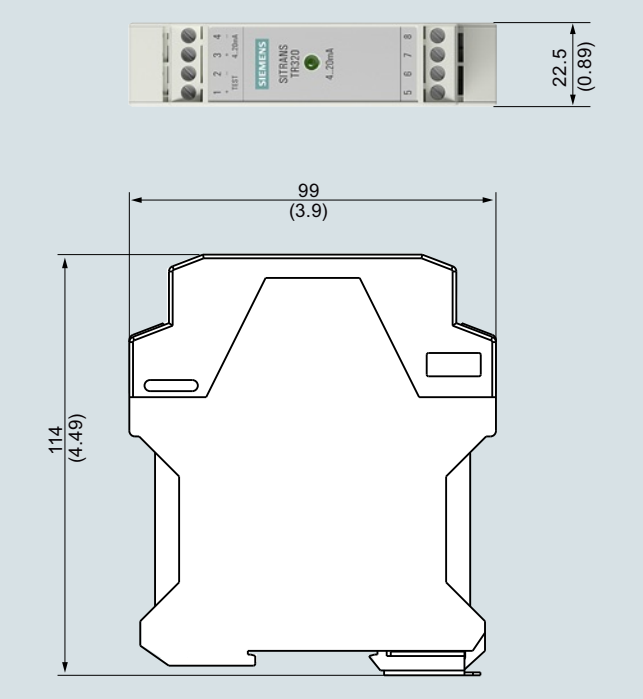
7NG0320-0BA00-0AA0-Z Y01

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)

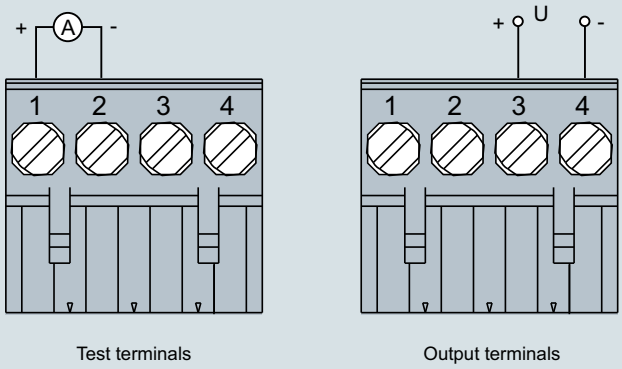
Circuit diagrams

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

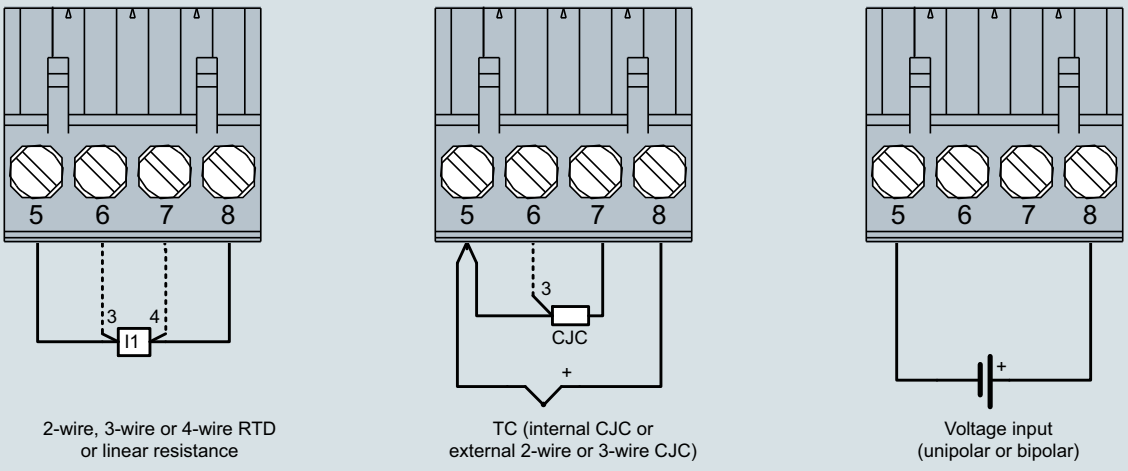
SITRANS TR320, connector assignment

Output and test connection



SITRANS TR320, output connection assignment

Input connection



SITRANS TR320, input connection assignment