Transmitter for temperature, head mounting for Pt100

2 wire technology universal, SIEMENS Sitrans TH200

Type series PA220.



Application area

- all process industry field

Features

- Digital programmable transmitter
- Suitable for installation in connecting heads in accordance with DIN, form B
- Input for
  - Resistance thermometer (2-, 3- or 4-wire technology)
- Thermocouples
  - Resistance-based sensors and DC voltage sources
- Output signal: 4...20 mA invertible, 2-wire technology
- Power supply:
  - 8...35 V DC
  - 8...30 V DC (Ex)
- Electrically isolated
- Test sockets for multimeters for monitoring purposes and plausibility checks without interruption of the current loop.
- Diagnostics LED:
  - Sensor and power supply have been correctly connected (LED displays a green light)
  - Sensor breakage or short-circuit (LED flashes red)
  - Internal device fault (steady red light)
- Sensor monitoring, open circuit and short-circuit
- Self-monitoring

Options

- Approvals/Certificates
  - Explosion protection for gases and dust
  - Classification per SIL2
- Parameterization via PC Software
- Special characteristic
- Expanded diagnostic functions, such as slave pointer, operating hours counter

Application

The digital transmitter converts different signal sources to a load-independent current signal commonly found in process control systems. The output is the standard sensor line signal, a load-independent, 4 to 20 mA, DC signal. The transmitter has extensive configuration options.

Technical data

Constructional design

Dimensions:	see dimensional drawing, molded plastic
Degree of protection per EN 60529:	■ case IP 40 ■ Terminals IP 00
Weight:	50 g (0.11 lb)

Input

Resistance thermometer

Measured variable:	Temperature
Sensor type:	per EN 60751 - Pt25...Pt1000 per JIS C 1604; a = 0.00392 K^{-1} - Pt25...Pt1000 per EN 60751 - Ni25...Ni1000
Special type:	over 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-, 3- or 4-wire technology
Generation of average:	value 2 identical resistance thermometers in 2-wire technology for generation of average temperature
Generation of difference:	2 identical resistance thermometers (RTD) in 2-wire technology (RTD 1 – RTD 2 or RTD 2 – RTD 1)

Interface

2-wire technology:	parameterizable line resistance ≤ 100 Ω (loop resistance)
3-wire technology:	no balancing required
4-wire technology:	no balancing required
Sensor current:	≤ 0.45 mA
Response time:	≤ 250 ms for 1 sensor with open circuit monitoring
Open-circuit monitoring:	always active (cannot be disabled)
Short-circuit monitoring:	can be switched on/off (default value: ON)
Measuring range:	parameterizable (see table "Digital measuring errors")
Min. measured span:	10 °C (18 °F)
Characteristic curve:	Temperature-linear or special characteristic

Resistance-based sensors

Measured variable:	Actual resistance
Sensor type:	Resistance-based, potentiometers
Units:	Ω

Connection:

Normal connection:	1 resistance-based sensor(R) in 2-, 3- or 4-wire technology
Generation of average value:	2 resistance-based sensors in 2-wire technology for generation of average value
Generation of difference:	2 resistance thermometers in 2-wire technology (R1 – R2 or R2 – R1)

Interface:

2-wire technology:	parameterizable line resistance ≤ 100 W (loop resistance)
3-wire technology:	no balancing required
4-wire technology:	no balancing required
Sensor current:	≤ 0.45 mA
Response time:	≤ 250 ms for 1 sensor with open circuit monitoring
Open-circuit monitoring:	always active (cannot be disabled)
Short-circuit monitoring:	can be switched on/off (default value: OFF)
Measuring range:	parameterizable max. 0...2200 Ω (see table "Digital measuring errors")
Min. measured span:	5 Ω ... 25 Ω (see table "Digital measuring errors")
Characteristic curve:	Resistance-linear or special characteristic

Thermocouples

Measured variable:	Temperature
Sensor type (thermocouples):	
Type B:	Pt30Rh-Pt6Rh per IEC 584
Type C:	W5%-Re per ASTM 988
Type D:	W3%-Re per ASTM 988
Type E:	NiCr-CuNi per IEC 584
Type J:	Fe-CuNi per IEC 584
Type K:	NiCr-Ni per IEC 584
Type L:	Fe-CuNi per DIN 43710
Type N:	NiCrSi-NiSi per IEC 584
Type R:	Pt13Rh-Pt per IEC 584
Type S:	Pt10Rh-Pt per IEC 584
Type T:	Cu-CuNi per IEC 584
Type U:	Cu-CuNi per DIN 43710
Units:	°C or °F

Connection:

Standard connection:	1 thermocouple (TC)
Generation of average value:	2 thermocouples (TC)
Generation of difference:	2 thermocouples (TC) (TC1 – TC2 or TC2 – TC1)
Response time:	≤ 250 ms for 1 sensor with open circuit monitoring
Open-circuit monitoring:	can be switched off

Cold junction compensation

Internal:	with integrated Pt100 resistance thermometer
External:	with external Pt100 IEC 60571 (2- or 3-wire technology)
External fixed:	cold junction temperature can be set as fixe value
Measuring range:	parameterizable (see table "Digital measuring errors")
Min. measured span:	min. 40 ... 100 °C (72 ... 180 °F) (see table "Digital measuring errors")
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:	≤ 250 ms for 1 sensor with open circuit monitoring
Open-circuit monitoring:	can be switched off
Measuring range:	■ -10 ... 70 mV ■ -100 ... 1100 mV
Min. measured 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 technology
Auxiliary power:	11 ... 35 V DC (to 30 V with Ex)
Max. load:	$(U_{aux} – 11 V)/0.023 A$
Overrange:	3.6...23 mA, infinitel adjustable (default range: 3.80 mA ... 20.5 mA)
Error signal:	(e.g. following sensor fault) 3.6...23 mA, infinitel adjustable (conforming NE43) (default value: 22.8 mA)
Sample cycle:	0.25 s nominal
Damping:	Software filter 1st order 0...30 s (parameterizable)
Protection:	against reversed polarity
Electrically isolated:	input against output (1 kV_{eff})

Measuring accuracy

Digital measuring errors:	see table "Digital measuring errors"
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 span
Error due to internal cold junction:	< 0.5 °C (0.9 °F)
Influenc of ambient temperature:	Analog measuring error: 0.02 % of span/10°C (18 °F) Digital measuring errors with resistance thermometers: 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 span/V
Effect of load impedance:	< 0.002 % of span/100 Ω
Long-term drift:	- in the first month < 0.02 % of span - after one year < 0.2 % of span - after 5 years < 0.3 % of span

Temperature ranges and ambient conditions

Ambient:	-40...+85 °C (-40...+185 °F)
Storage:	-40...+85 °C (-40...+185 °F)
Relative humidity:	< 98 %, with condensation

Electromagnetic compatibility

According to:	EN 61326 and NAMUR NE21

Certificates and Approvals

Explosion protection ATEX SIEMENS Sitrans TH200

EC type test certificate: PTB 05 ATEX 2040X

Type of protection: "Intrinsic safety"
II 1G Ex ia IIC T6/T4
II 2(1)G Ex ia/ib IIC T6/T4
II 3(1)G Ex ia/ic IIC T6/T4
II 1D Ex iaD 20 T115 °C

Type of protection: "Operating equipment that is nonignitable and has limited energy"
II 3G Ex nL IIC T6/T4
II 3G Ex nA IIC T6/T4

Software Requirements (SIPROM T)

PC opreating system: Windows ME, 2000 und XP
Windows 7
Windows 8

Digital measuring errors

Resistance thermometer

Input	Measuring range	Min. measured span	Digital accurancy
	°C / °F	°C / °F	°C / °F
per EN 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)
per 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 sensors

Input	Measuring range	Min. measured span	Digital accurancy
	Ω	Ω	Ω
Resistance	0 ... 390	5	0.05
Resistance	0 ... 2200	25	0.25

Thermocouples

Input	Measuring range	Min. measured span	Digital accurnacy
	°C / °F	°C / °F	°C / °F
Type B	0 ... 182 (32 ... 3308)	100 / (180)	2[1] / (3.60)
Type C (W5)	0 ... 2300 (32 ... 4172)	100 / (180)	2 / (3.60)
Type D (W3)	0 ... 2300 (32 ... 4172)	100 / (180)	1[2] / (1.80)
Type E	-200 ... +1000 (-328 ... +1832)	50 / (90)	1 / (1.80)
Type J	-210 ... +1200 (-346 ... +2192)	50 / (90)	1 / (1.80)
Type K	-230 ... +1370 (-382 ... +2498)	50 / (90)	1 / (1.80)
Type L	-200 ... +900 (-328...+1652)	50 / (90)	1 / (1.80)
Type N	-200 ... +1300 (-328 ... +2372)	50 / (90)	1 / (1.80)
Type R	-50 ... +1760 (-58 ... +3200)	100 / (180)	2 / (3.60)
Type S	-50 ... +1760 (-58 ... +3200)	100 / (180)	2 / (3.60)
Type T	-200 ... +400 (-328 ... +752)	40 / (72)	1 / (1.80)
Type U	-200 ... +600 (-328 ... +1112)	50 / (90)	2 / (3.60)

[1] The digital accuracy in the range 0 to 300 °C (32 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).

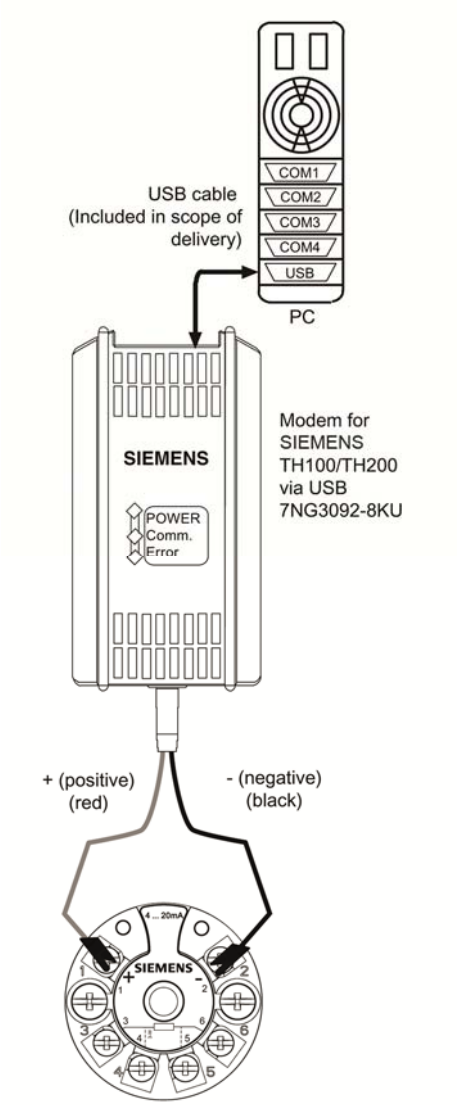
mV sensor

Input	Measuring range	Min. measured span	Digital accurancy
	mV	mV	µV
mV sensor	-10 ... +70	2	40
mV sensor	-100 ... +1100	20	400

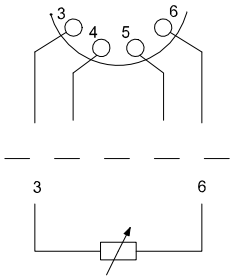
The digital accuracy is the accuracy after the analog/digital conversion including linearization and calculation of the measured value.
An additional error is generated in the output current 4 to 20 mA as a result of the digital/analog conversion of 0.025 % of the set span (digital-analog error).
The 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 cold junction errors in the case of thermocouple measurements).

Parameterization

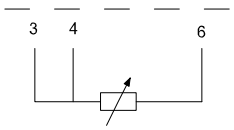
SIEMENS Sitrans TH200 via USB-Modem



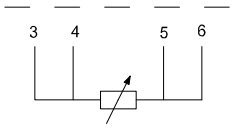
Connection diagram



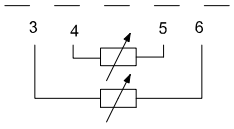
2-wire [1)]



3-wire

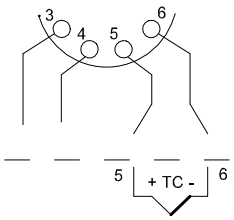


4-wire

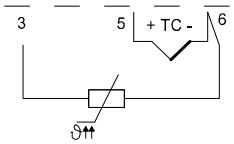


Averaging/determination [1)] off difference

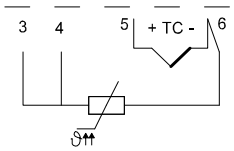
Thermo couple



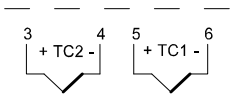
Cold junction compensation/ fixed value



Cold junction compensation with external Pt100 in 2-wire connection [1)]

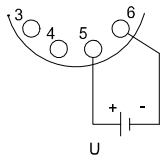


Cold junction compensation with external Pt100 in 3-wire circuit

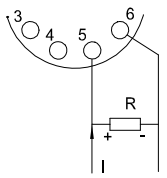


Averaging/determination of difference with internal cold junction compensation

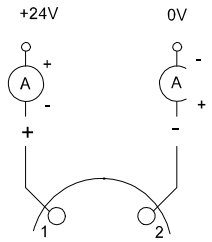
Voltage measurement



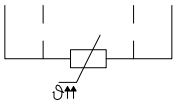
Current measurement



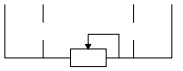
Supply



For resistence thermometers or resistors



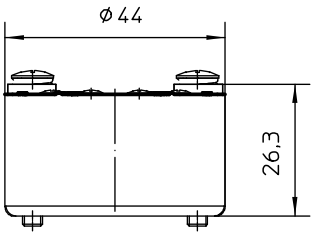
Resistance thermometer

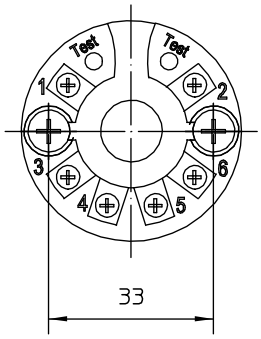


Resistor

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

Dimensions





Internal diameter
of center hole 6,3 mm

Fixing screw
M4x25

Order details

Transmitter for temperature, head mounting for Pt100, 2-wire technology universal, SIEMENS Sitrans TH200 Type series PA220.

Order code for temperature, head mounting for Pt100, 2-wire technology universal, SIEMENS Sitrans TH200			
PA2200	design	standard	
PA2201		Ex-protection, type of ex-protection as follows	
F11	standard range	input	Pt100 in 3-wire technology
		temperature range	0...100 °C
		error current (following sensor breakage)	22.8 mA
		sensor offset	0 °C
		damping	0.0 s
F12	custom-made configuration	input	as per customers specification
		measuring range	
		error current (following sensor breakage)	
		sensor offset	
		damping	
H1	output signal	4...20 mA, 2-wire technology	

additional features (to be indicated in case of need, only)		
S81	type of ex-protection (SIEMENS Sitrans TH200)	⟨Ex⟩ II 1G Ex ia IIC T6/T4
		⟨Ex⟩ II 2(1)G Ex ia/ib IIC T6/T4
		⟨Ex⟩ II 3(1)G Ex ia/ic IIC T6/T4
		⟨Ex⟩ II 1D Ex iaD 20 T115 °C
		⟨Ex⟩ II 3G Ex nL IIC T6/T4
		⟨Ex⟩ II 3G Ex nA IIC T6/T4
W2606	functional safety per IEC 61508, classification per SIL2	

accessories	
MC1250	Programming set consisting of Software SIPROM T and modem with USB-port (PA2100 compatible to SIEMENS Sitrans TH200)

Order code (example): PA2200 - F11 - H1