Overview

SITRANS TH400 fieldbus transmitters

Versions:

- for FOUNDATION Fieldbus and
- for PROFIBUS PA

The SITRANS TH400 temperature transmitter is a small field bus transmitter for mounting in the connection head of form B. Extensive functionality enables the temperature transmitter to be precisely adapted to the plant's requirements. Operation is very simple in spite of the numerous setting options. Thanks to its universal concept it can be used in all industries and is easy to integrate in Totally Integrated Automation applications.

Temperature transmitters with type of protection "Intrinsic safety" may be installed within potentially explosive atmospheres (zone 1) or in zone 0. The devices have an EC type test certificate and meet the appropriate harmonized European standards (ATEX). In addition they offer approvals for USA (FM) and Canada (CSA).

Installing SITRANS TH400 in temperature sensors turns them into complete, bus-capable measuring points; compact - and in a single device.

Application

- Linearized temperature measurement with resistance thermometers or thermocouple elements
- Differential, mean-value or redundant temperature measurement with resistance thermometers or thermocouple elements
- Linear resistance and bipolar millivolt measurements
- Differential, mean-value or redundant resistance and bipolar millivolt measurements

Function

Features

common

- Mounting in connection head, type B, to DIN 43729, or larger
- Polarity-neutral bus connection
- 24-bit analog-digital converter for high resolution
- Electrically isolated
- Intrinsically-safe version for use in potentially explosive areas
- Special characteristic
- Sensor redundance

Transmitter with PROFIBUS PA communication

- Function blocks: 2 x analog

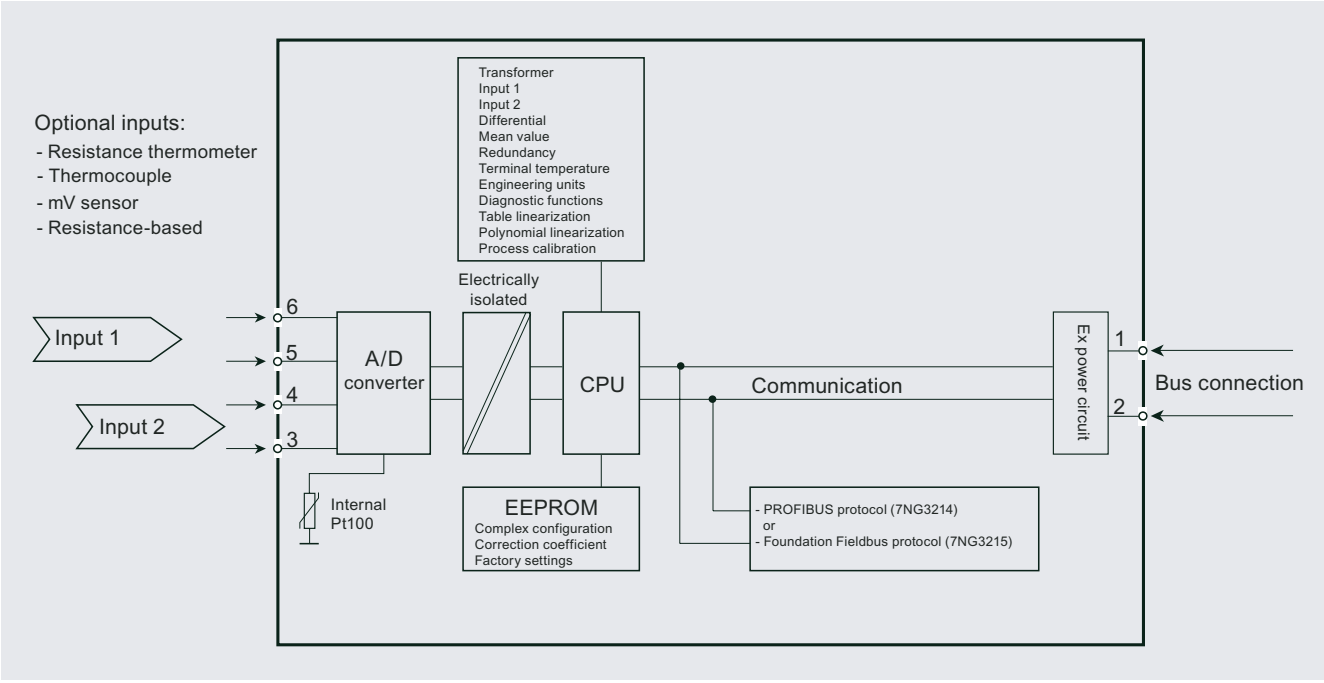
Transmitter with FOUNDATION Fieldbus communication

- Function blocks: 2 x analog and 1 x PID
- Functionality: Basic or LAS

Mode of operation

The following function plan explains the mode of operation of the transmitter.

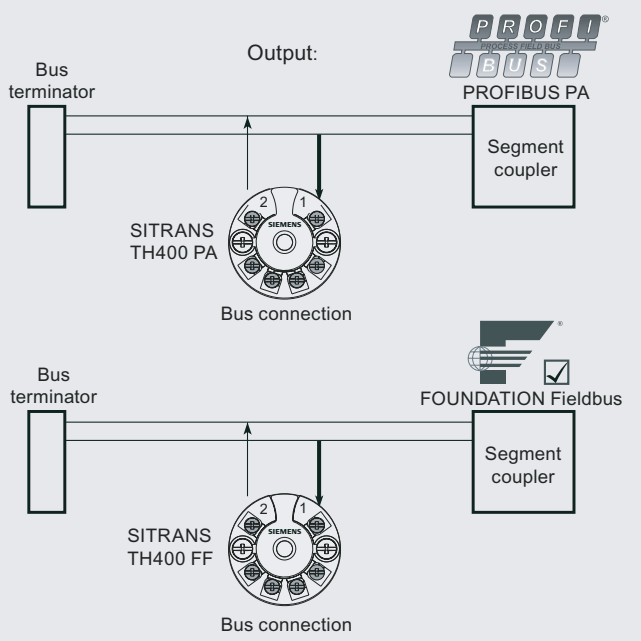
The only difference between the two versions of the SITRANS TH400 (7NG3214-... and 7NG3215-...) is the type of fieldbus protocol used (PROFIBUS PA or FOUNDATION fieldbus).



SITRANS TH400, function diagram

SITRANS TH400, fieldbus transmitters

System communication



SITRANS TH400, communication interface

Technische Daten

Input

Analog-to-digital conversion	
• Measurement rate	< 50 ms
• Resolution	24 Bit

Resistance thermometer

Pt25 ... Pt1000 to IEC 60751/JIS C 1604	
• Measuring range	-200 °C ... +850 °C (-328 ... +1562 °F)
Ni25 ... Ni1000 to DIN 43760	
• Measuring range	-60 °C ... +250 °C (-76 ... +482 °F)
Cu10 ... Cu1000, α = 0,00427	
• Measuring range	-50 °C ... +200 °C (-58 ... +392 °F)
Line resistance per sensor cable	Max. 50 Ω
Sensor current	Nominal 0.2 mA
Sensor fault detection	
• Sensor break detection	Yes
• Sensor short-circuit detection	Yes, < 15 Ω

Resistance-based sensors

Measuring range	0 Ω... 10 kΩ
Line resistance per sensor cable	Max. 50 Ω
Sensor current	Nominal 0.2 mA
Sensor fault detection	
• Sensor break detection	Yes
• Sensor short-circuit detection	Yes, < 15 Ω

Thermocouple

to IEC 584	Measuring range
• Type B	400 .. +1820 °C (752 ... 3308 °F)
• Type E	-100 ... +1000 °C (-148 ... 1832 °F)
• Type J	-100 ... +1000 °C (-148 ... 1832 °F)
• Type K	-100 ... +1200 °C (-148 ... +2192 °F)
• Type N	-180 ... +1300 °C (-292 ... 2372 °F)
• Type R	-50 ... +1760 °C (-58 ... +3200 °F)
• Type S	-50 ... +1760 °C (-58 ... +3200 °F)
• Type T	-200 ... +400 °C (-328 ... +752 °F)
to DIN 43710	
• Type L	-200 ... +900 °C (-328 ... +1652 °F)
• Type U	-200 ... +600 °C (-328 ... +1112 °F)
to ASTM E988-90	
• Type W3	0 ... 2300 °C (32 ... 4172 °F)
• Type W5	0 ... 2300 °C (32 ... 4172 °F)
to IEC 60751	
• External cold junction compensation	-40 ... +135 °C (-40 ... +275 °F)
Sensor fault detection	
• Sensor break detection	Yes
• Sensor short-circuit detection	Yes, < 3 mV
• Sensor current in the event of open-circuit monitoring	4 µA

mV sensor - voltage input

Measuring range	-800 ... +800 mV
Input resistance	10 MΩ

Output

Filter time (programmable)	0 ... 60 s
Update time	< 400 ms

Measuring accuracy

Accuracy is defined as the higher value of general values and basic values.

General values

Type of input	Absolute accuracy	Temperature coefficient
All	≤ ±0,05% of measured value	≤ ±0,002% of measured value/°C

Basic values

Type of input	Basic accuracy	Temperature coefficient
Pt100 and Pt1000	≤ ±0.1 °C	≤ ±0.002 °C/°C
Ni100	≤ ±0.15 °C	≤ ±0.002 °C/°C
Cu10	≤ ±1.3 °C	≤ ±0.02 °C/°C
Resistance-based sensors	≤ ±0.05 Ω	≤ ±0.002 Ω/°C
Voltage source	≤ ±10 µV	≤ ±0.2 µV/°C
Thermal element, type: E, J, K, L, N, T, U	≤ ±0.5 °C	≤ ±0.01 °C/°C
Thermal element, type: B, R, S, W3, W5	≤ ±1 °C	≤ ±0.025 °C/°C
Cold junction compensation	≤ ±0.5 °C	

Reference conditions

Warming-up time	30 s
Signal-to-noise ratio	Min. 60 dB
Calibration condition	20 ... 28 °C (68 ... 82 °F)

Rated conditions

Ambient temperature

Permissible ambient temperature	-40 ... +85 °C (-40 ... +185 °F)
Permissible storage temperature	-40 ... +85 °C (-40 ... +185 °F)
Relative humidity	≤ 98%, with condensation
Insulation resistance	
• Test voltage	500 V AC for 60 s
• Continuous operation	50 V AC/75 V DC
Mechanical testing	
• Vibrations (DIN class B) to	IEC 60068-2-6 and IEC 60068-2-64 4 g/2 ... 100 Hz

Electromagnetic compatibility

EMC noise voltage influence	< ±0,1% of span
Extended EMC noise immunity: NAMUR NE 21, criterion A, Burst	< ±1% of span
EMC 2004/108/EC Emission and Noise Immunity to	EN 61326

Construction

Dimensions	Ø 44 x 26.3 mm (Ø 1.73 x 1.04 inch)
Degree of protection	
• Transmitter enclosure	IP40
• Terminal	IP00
Approx. weight	55 g (0.12 lb)

Auxiliary power supply

Power supply	
• Standard	DC 9.0 ... 32 V
• ATEX, FM, UL and CSA	DC 9.0 ... 30 V
• In FISCO installation	DC 9.0 ... 17.5 V
Power consumption	< 11 mA
Max. increase in power consumption in the event of a fault	< 7 mA

Certificate and approvals

ATEX 94/9/EG to	EN 50014, EN 50020, EN 60079-15, EN 50284, IEC 60079-27 (FISCO)
FM to	3600, 3610, 3611
CSA, CAN/CSA to	C22.2 No. 142, No. 157, No. 213
CAN/CAS to	E79-0, -11, -15

Explosion protection ATEX

• for 7NG3214-0AN00 or 7NG3215-0AN00	
- Type of protection: "Approved for operation in potentially explosive atmospheres, Zone 0 and Zone 1"	• II 1 GD or II 2 (1) GD, T65 °C ... T105 °C • EEx ia IIC or EEx ib [ia] IIC T4 ... T6
- EC type test certificate	KEMA 06 ATEX 0264 X
• for 7NG3214-0NN00 or 7NG3215-0NN00	
- Type of protection: "Approved for operation in potentially explosive atmospheres, Zone 2"	EEx nA [nL] IIC T4 ... T6
- EC type test certificate	KEMA 06 ATEX 0263 X

Explosion protection: FM for USA

• for 7NG3214-0AN00 or 7NG3215-0AN00	
- FM approval	FM 3015609
- Degree of protection	• IS Class I, Div 1 Groups A, B, C, D T4/T5/T6, FISCO • IS Class I, Zone 0, AEx ia, IIC T4/T5/T6, FISCO • NI Class I, Div. 2, Groups A, B, C, D T4/T5/T6, FNICO
• for 7NG3214-0NN00 or 7NG3215-0NN00	
- FM approval	FM 3015609
- Degree of protection	NI Class I, Div 2, Groups A, B, C, D T4/T5/T6, FNICO

Explosion protection for Canada

• for 7NG3214-0AN00 or 7NG3215-0AN00	
- CSA approval	CSA 1418937
- Degree of protection	• IS Class I, Groups A, B, C, D T4/T5/T6 • Ex ia IIC T4/T5/T6 und Ex ib [ia] IIC T4/T5/T6
• for 7NG3214-0NN00 or 7NG3215-0NN00	
- CSA approval	CSA 1418937
- Degree of protection	• Class I, Div 2, Groups A, B, C, D T4/T5/T6 • Ex nA IIC T4/T5/T6 und Ex ib [ia] IIC T4/T5/T6

Communication

Parameterization interface	
• PROFIBUS PA connection	
- Protocol	Profile 3.0
- Address (for delivery)	126
• FOUNDATION Fieldbus connection	
- Protocol	FF Protocoll
- Functionality	Basic or LAS
- Version	ITK 4.6
- Function blocks	2 x Analog and 1 x PID

Factory setting for SITRANS TH400 PA and SITRANS TH400 FF

Sensor	Pt100 (IEC)
Type of connection	Three-wire system
Unit	°C
Failure mode	Last valid value
Filter time	0 s
only for SITRANS TH400 PA	
PA address	126
PROFIBUS Ident No.	Manufacturer-specific
only for SITRANS TH400 FF	
Node address	22

3

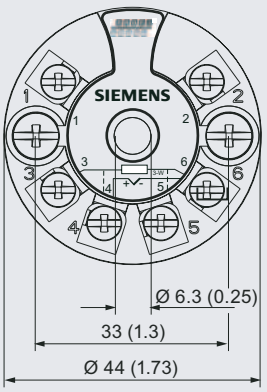
SITRANS TH400, fieldbus transmitters

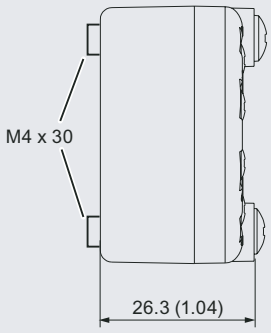
Selection and Ordering data	Order No.
Temperature transmitter SITRANS TH400 for installation in the sensor head, with electrical isolation, order instruction manual separately.	
• Bus-capable to PROFIBUS PA	
- without explosion protection, EEx n for zone 2 ▶	**7NG3214-0NN00**
- with explosion protection „intrinsic safety to ATEX/FM/CSA“ ▶	**7NG3214-0AN00**
• Bus-capable to FOUNDATION Fieldbus	
- without explosion protection, EEx n for zone 2 ▶	**7NG3215-0NN00**
- with explosion protection „intrinsic safety to ATEX/FM/CSA“ ▶	**7NG3215-0AN00**
Further designs Please add „**-Z**“ to Order No. and specifiy Order code (s) and plain text.	Order code
• Customer-specific setting of operating data (specify in plain text)	**Y01**[1]
• With test protocol (5 measuring points)	**C11**[1]
Accessories	Order No.
CD for measuring instruments for temperature ▶ with documentation in German, English, French, Spanish, Italian, Portuguese and SIPROM T parameterization software	**A5E00364512**
SIMATIC PDM operating software	**see chapter 9**
For additional PA components	**see catalog IK PI**

▶ Available ex stock.

1) For TH400 FF available soon.

Dimensional drawings



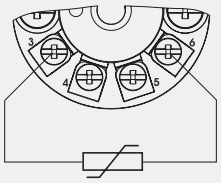


Terminals 1, 2: Fieldbus connection
Terminals 3 ... 6: Sensor connection

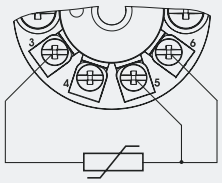
SITRANS TH400 dimensions in mm (inches) and connections

Schematics

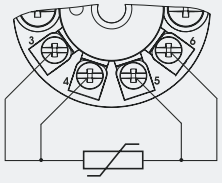
Resistance thermometer



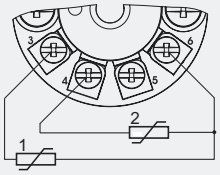
Two-wire system [1)]



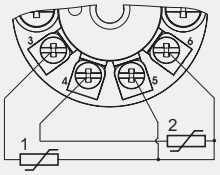
Three-wire system



Four-wire system

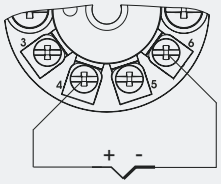


Mean-value/differential or
redundancy generation
2 x two-wire system [1)]

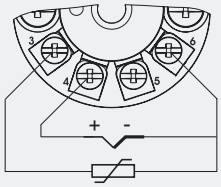


Mean-value/differential or
redundancy generation
1 sensor in two-wire system [1)]
1 sensor in three-wire system

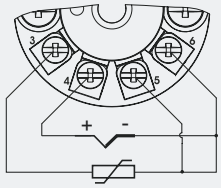
Thermocouple



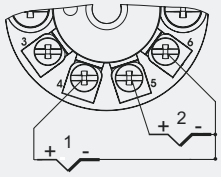
Internal
cold junction compensation



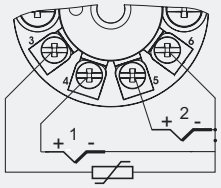
Cold junction compensation
with external Pt100 in two-wire system [1)]



Cold junction compensation
with external Pt100 in three-wire system

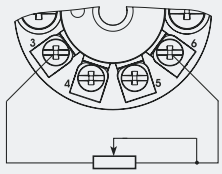


Mean value, differential or
redundancy generation with internal
cold junction compensation

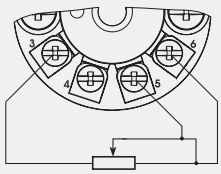


Mean value, differential or
redundancy generation and
cold junction compensation
with internal Pt100
in two-wire system [1)]

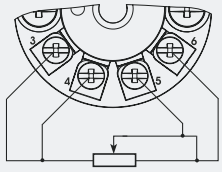
Resistance



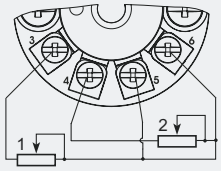
Two-wire system [1)]



Three-wire system

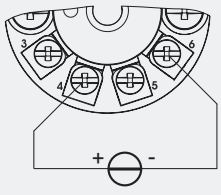


Four-wire system

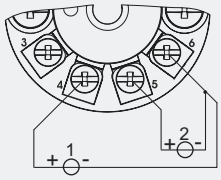


Mean value, differential or redundancy generation
1 resistor in two-wire system [1)]
1 resistor in three-wire system

Voltage measurement



One voltage source

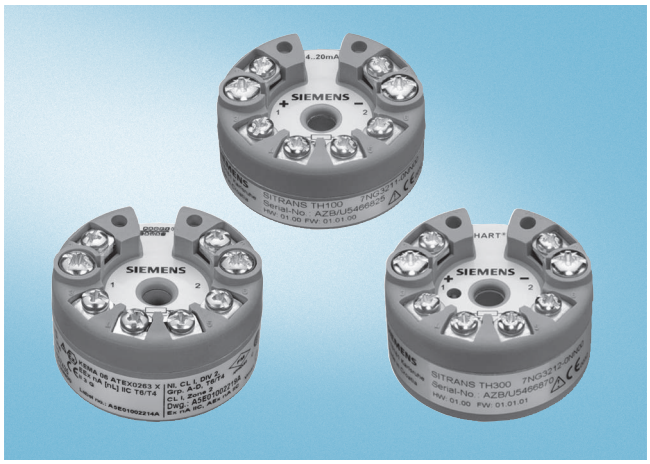


Measurement of mean value, differential and
redundancy with 2 voltage sources

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

SITRANS TH400, sensor connection assignment

Overview



The following temperature transmitters are available for mounting in the connection head:

SITRANS TH100

Programmable two-wire temperature transmitter (4 to 20 mA), without electrical isolation, only for Pt100 resistance thermometers.

SITRANS TH200

Programmable two-wire temperature transmitter (4 to 20 mA), electrical isolation for resistance thermometers and thermocouple elements.

SITRANS TH300

Two-wire temperature transmitter with HART communication (4 to 20 mA), electrical isolation for resistance thermometers and thermocouple elements.

SITRANS TH400

Temperature transmitter with PROFIBUS PA or FOUNDATION Fieldbus connection, electrical isolation for resistance thermometers and thermocouple elements.

Note:

- SITRANS TH100/TH200/TH300/TH400 can be fitted instead of the terminal block or in the high hinged cover.
- If using intrinsically-safe temperature sensors any installed temperature transmitters must also be intrinsically-safe.

Selection and Ordering Data

Detailed information on the transmitters can be found for the respective products under "Transmitters for temperature".

Transmitter to be fitted	Order code
To order the sensor with a built-in temperature transmitter, add "**-Z**" to the Order No. of the sensor, and supplement by the following Order code:	
• SITRANS TH100	
- without Ex	**T10**
- EEx ia IIC and EEx n for zone 2	**T11**
- FM	**T13**
• SITRANS TH200	
- without Ex	**T20**
- EEx ia IIC and EEx n for zone 2	**T21**
- FM (IS, I, NI)	**T23**
• SITRANS TH300	
- without Ex	**T30**
- EEx ia IIC und EEx n for zone 2	**T31**
- FM (IS, I, NI)	**T33**
• SITRANS TH400 PA	
- without Ex	**T40**
- EEx ia	**T41**
• SITRANS TH400 FF	
- without Ex	**T45**
- EEx ia	**T46**
Customer-specific setting of the built-in transmitter (specify settings in plain text)	**Y11**[1)]

[1)] For TH400 FF available soon