

Temperature Measurement

Transmitters for mounting in sensor head

SITRANS TH400 fieldbus transmitter

Overview



SITRANS TH400 fieldbus transmitters

Versions:

- For FOUNDATION fieldbus
- 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 the context of Totally Integrated Automation applications.

Transmitters of the "intrinsically safe" type of protection can be installed within potentially explosive atmospheres. The devices comply with the Directive 2014/34/EU (ATEX), as well as FM and CSA regulations.

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

Function

Features

- 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 redundancy

With PROFIBUS PA communication

- Function blocks: 2 x analog

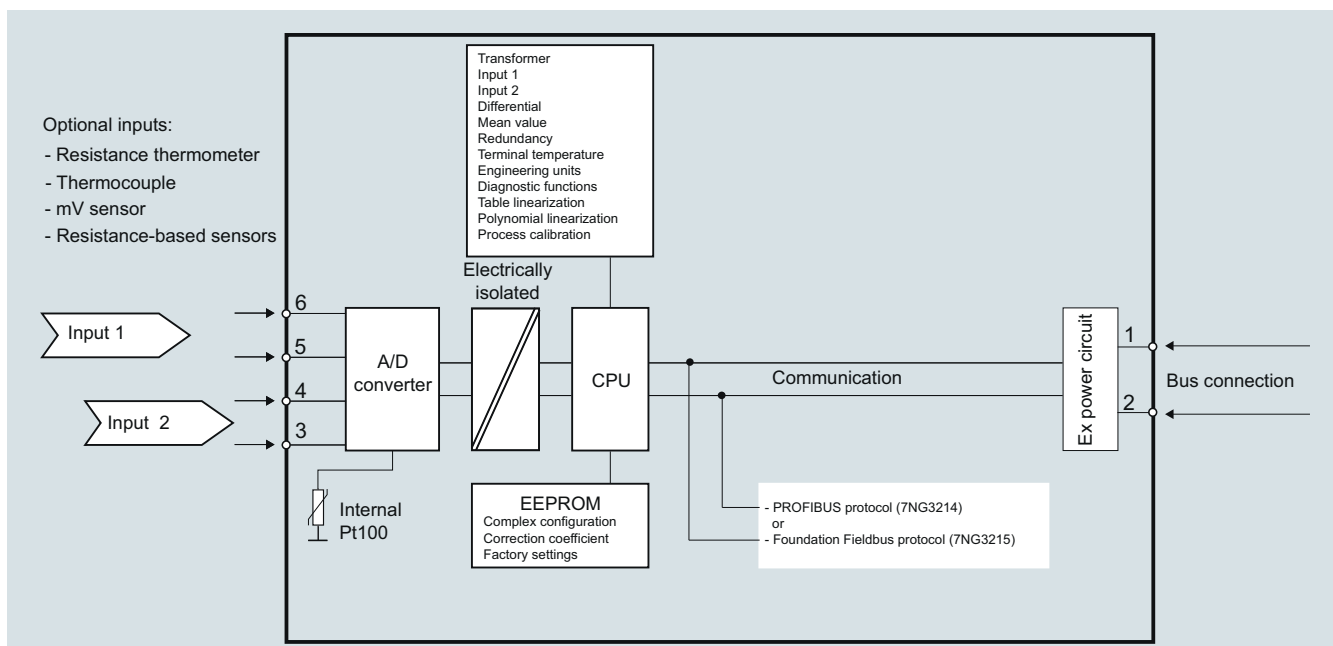
With FOUNDATION fieldbus communication

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

Mode of operation

The following function diagram 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).



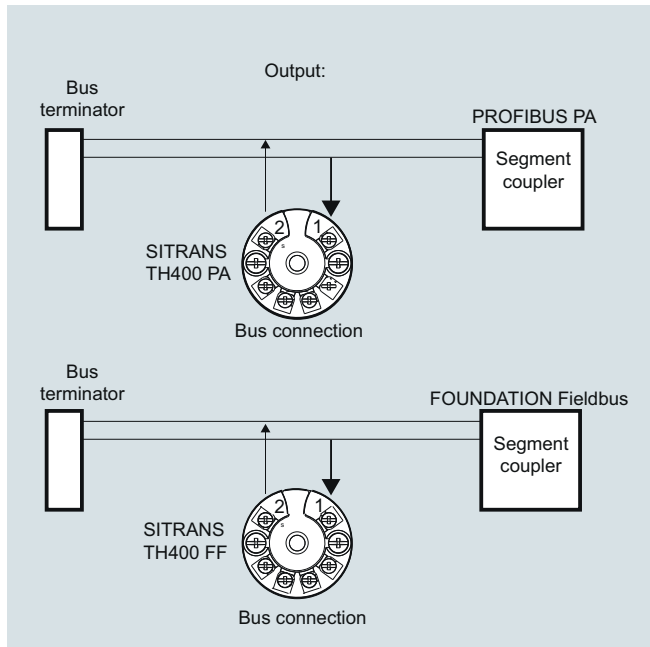
SITRANS TH400, function diagram

Temperature Measurement

Transmitters for mounting in sensor head

SITRANS TH400 fieldbus transmitter

System communication



SITRANS TH400, communication interface

Technical specifications

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 ... +850 °C (-328 ... +1562 °F)

Ni25 ... Ni1000 to DIN 43760

- Measuring range -60 ... +250 °C (-76 ... +482 °F)

Cu10 ... Cu1000, $\alpha = 0.00427$

- Measuring range -50 ... +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 k Ω

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

- Type B
- Type E
- Type J
- Type K
- Type N
- Type R
- Type S
- Type T

to DIN 43710

- Type L
- Type U

to ASTM E988-90

- Type W3
- Type W5

External cold junction compensation

Sensor fault detection

- Sensor break detection Yes
- Sensor short-circuit detection Yes, < 3 mV
- Sensor current in the event of open-circuit monitoring 4 μ A

mV sensor - voltage input

Measuring range

-800 ... +800 mV

Input resistance

10 M Ω

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

$\leq \pm 0.05$ % of the measured value

$\leq \pm 0.002$ % of the measured value/ $^{\circ}$ C

Basic values

Type of input

Basic accuracy

Temperature coefficient

Pt100 and Pt1000

$\leq \pm 0.1$ $^{\circ}$ C

$\leq \pm 0.002$ $^{\circ}$ C/ $^{\circ}$ C

Ni100

$\leq \pm 0.15$ $^{\circ}$ C

$\leq \pm 0.002$ $^{\circ}$ C/ $^{\circ}$ C

Cu10

$\leq \pm 1.3$ $^{\circ}$ C

$\leq \pm 0.02$ $^{\circ}$ C/ $^{\circ}$ C

Resistance-based sensors

$\leq \pm 0.05$ Ω

$\leq \pm 0.002$ Ω / $^{\circ}$ C

Voltage source

$\leq \pm 10$ μ V

$\leq \pm 0.2$ % μ V/ $^{\circ}$ C

Thermocouple, type:

E, J, K, L, N, T, U

$\leq \pm 0.5$ $^{\circ}$ C

$\leq \pm 0.01$ $^{\circ}$ C/ $^{\circ}$ C

Thermocouple, type:

B, R, S, W3, W5

$\leq \pm 1$ $^{\circ}$ C

$\leq \pm 0.025$ $^{\circ}$ C/ $^{\circ}$ C

Cold junction compensation

$\leq \pm 0.5$ $^{\circ}$ C

Reference conditions

Warming-up time

30 s

Signal-to-noise ratio

Min. 60 dB

Calibration condition

20 ... 28 $^{\circ}$ C (68 ... 82 $^{\circ}$ F)

Temperature Measurement

Transmitters for mounting in sensor head

SITRANS TH400 fieldbus transmitter

Conditions of use

Ambient conditions

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
----------------	-------------------

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 2014/30/EU Emission and Noise Immunity to	EN 61326
--	----------

Construction

Material	Molded plastic
Weight	55 g (0.12 lb)
Dimensions	See Dimensional drawings
Cross-section of cables	Max. 2.5 mm ² (AWG 13)
Degree of protection	
• Transmitter enclosure	IP40
• Terminal	IP00

Auxiliary power

Power supply	
• Standard, Ex "nA", Ex "nL", NI	9.0 ... 32 V DC
• ATEX, FM, UL and CSA	9.0 ... 30 V DC
• In FISCO/FNICO installations	9.0 ... 17.5 V DC
Power consumption	< 11 mA
Max. increase in power consumption in the event of a fault	< 7 mA

Certificates and approvals

Explosion protection ATEX

EC type test certificate	KEMA 06 ATEX 0264
• "Intrinsic safety" type of protection	II 1 G Ex ia IIC T4...T6 II 2(1) G Ex ib[ia] IIC T4...T6 II 1 D Ex iaD

EC type test certificate

• Type of protection for "equipment is non-arcing"	KEMA 06 ATEX 0263 X II 3 GD Ex nA[nL] IIC T4...T6 II 3 GD Ex nL IIC T4...T6 II 3 GD Ex nA[ic] IIC T4...T6 II 3 GD Ex ic IIC T4...T6
---	---

Explosion protection: FM for USA

• FM approval	FM 3027985
• 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

Explosion protection CSA for Canada

• CSA approval	CSA 1861385
• Degree of protection	• IS Class I, Div 1, Groups A, B, C, D T4/T5/T6 • Ex ia IIC T4/T5/T6 and Ex ib [ia] IIC T4/T5/T6 • NI Class I, Div 2, Groups A, B, C, D T4/T5/T6 • Ex nA II T4/T5/T6

Other certificates

Communication

Parameterization interface

• PROFIBUS PA connection	
- Protocol	Profile 3.0
- Address (for delivery)	126
• FOUNDATION fieldbus connection	
- Protocol	FF protocol
- Functionality	Basic or LAS
- Version	ITK 4.6
- Function blocks	2 x analog and 1 x PID

Factory setting

only for SITRANS TH400 PA

Sensor	Pt100 (IEC)
Type of connection	3-wire circuit
Unit	°C
Failure mode	Last valid value
Filter time	0 s
PA address	126
PROFIBUS Ident No.	Manufacturer-specific

only for SITRANS TH400 FF

Sensor	Pt100 (IEC)
Type of connection	3-wire circuit
Unit	°C
Failure mode	Last valid value
Filter time	0 s
Node address	22

Temperature Measurement

Transmitters for mounting in sensor head

SITRANS TH400 fieldbus transmitter

Selection and Ordering data

Article No.

Temperature transmitter SITRANS TH400

for installation in connection head, with electrical isolation, order operating instructions separately.

- Bus-compatible to PROFIBUS PA
 - No explosion protection or Zone 2/Div 2 to ATEX/FM/CSA/IECEX/NEPSI
 - With explosion protection "Intrinsically safe to ATEX/FM/CSA/IECEX/NEPSI"
- Bus-compatible to FOUNDATION Fieldbus
 - No explosion protection or Zone 2/Div 2 to ATEX/FM/CSA/IECEX/NEPSI
 - With explosion protection "Intrinsically safe to ATEX/FM/CSA/IECEX/NEPSI"

7NG3214-0NN00

7NG3214-0AN00

7NG3215-0NN00

7NG3215-0AN00

Further designs

Order code

Please add **"-Z"** to Article No. and specify Order code(s) and plain text.

With test protocol (5 measuring points)

C11

Customer-specific programming

Add **"-Z"** to Article No. and specify Order code(s)

Measuring range to be set
Specify in plain text (max. 5 digits):
Y01: ... to ... °C, °F

Y01¹⁾

Measuring point no. (TAG), max. 8 characters

Y17²⁾

Measuring point descriptor,
max. 16 characters

Y23²⁾

Measuring point message,
max. 32 characters

Y24²⁾

Bus address, specify in plain text

Y25²⁾

Pt100 (IEC) 2-wire, $R_L = 0 \Omega$

U02³⁾

Pt100 (IEC) 3-wire

U03³⁾

Pt100 (IEC) 4-wire

U04³⁾

Thermocouple type B

U20³⁾⁴⁾

Thermocouple type C (W5)

U21³⁾⁴⁾

Thermocouple type D (W3)

U22³⁾⁴⁾

Thermocouple type E

U23³⁾⁴⁾

Thermocouple type J

U24³⁾⁴⁾

Thermocouple type K

U25³⁾⁴⁾

Thermocouple type L

U26³⁾⁴⁾

Thermocouple type N

U27³⁾⁴⁾

Thermocouple type R

U28³⁾⁴⁾

Thermocouple type S

U29³⁾⁴⁾

Thermocouple type T

U30³⁾⁴⁾

Thermocouple type U

U31³⁾⁴⁾

With TC: CJC external (Pt100, 3-wire)

U41

With TC: CJC external with fixed value, specify in plain text

Y50

Special differing customer-specific programming, specify in plain text

Y09⁵⁾

Accessories

Further accessories for assembly, connection and transmitter configuration, see page 2/238.

Article No.

SIMATIC PDM operating software

See Chapter 8

DIN rail adapters for head transmitters

7NG3092-8KA

(Quantity delivered: 5 units)

Connecting cable

7NG3092-8KC

4-wire, 150 mm, for sensor connections when using head transmitters in the high hinged cover (set with 5 units)

for additional PA components

See Catalog IK PI

- 1) For customer-specific programming for RTD and TC, the start value and the end value of the required measuring span must be specified here.
- 2) For this selection, Y01 or Y09 must also be selected.
- 3) For this selection, Y01 must also be selected.
- 4) Internal cold junction compensation is selected as the default for TC.
- 5) For customer-specific programming, for example mV and ohm, the start value and the end value of the required measuring span and the unit must be entered here.

Ordering example 1:

7NG3214-0NN00-Z Y01+Y17+U03
Y01: 0...100 °C
Y17: TICA1234HEAT

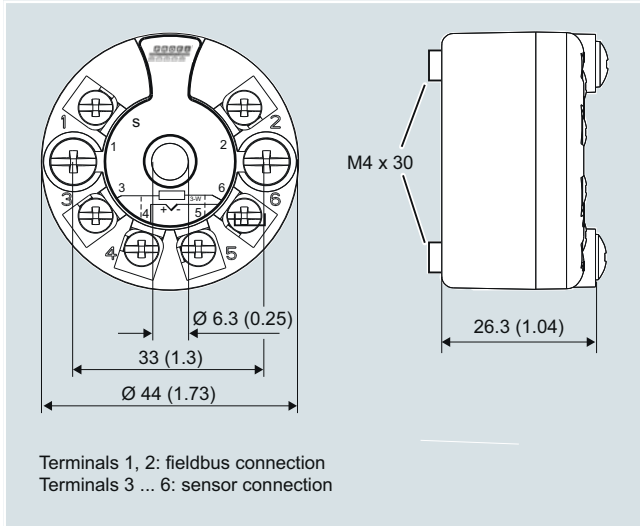
Ordering example 2:

7NG3214-0NN00-Z Y01+Y17+Y25+U25
Y01: 0...500 °C
Y17: TICA5678HEAT
Y25: 33

Factory setting:

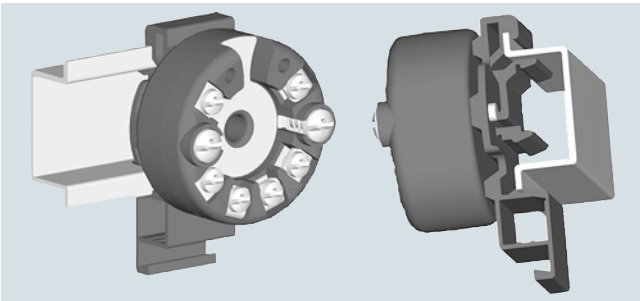
- For SITRANS TH400 PA:
 - Pt100 (IEC 751) with 3-wire circuit
 - Unit: °C
 - Failure mode: Last valid value
 - Filter time: 0 s
 - PA address: 126
 - PROFIBUS Ident No.: Manufacturer-specific
- For SITRANS TH400 FF:
 - Pt100 (IEC 751) with 3-wire circuit
 - Unit: °C
 - Failure mode: Last valid value
 - Filter time: 0 s
 - Node address: 22

Dimensional drawings

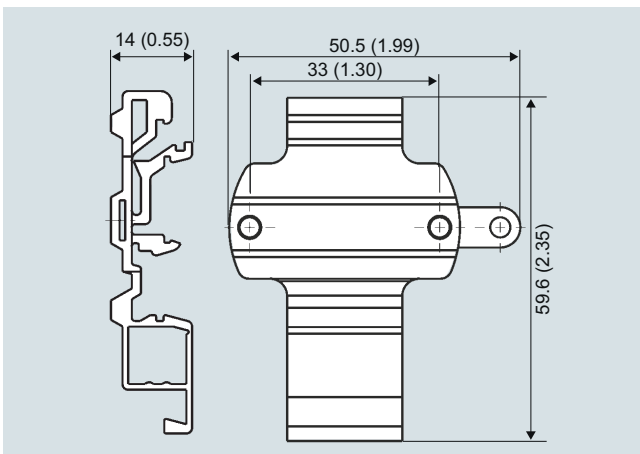


SITRANS TH400 dimensions in mm (inches) and connections

Mounting on DIN rail



SITRANS TH400, mounting of transmitter on DIN rail



DIN rail adaptor, dimensions in mm (inch)

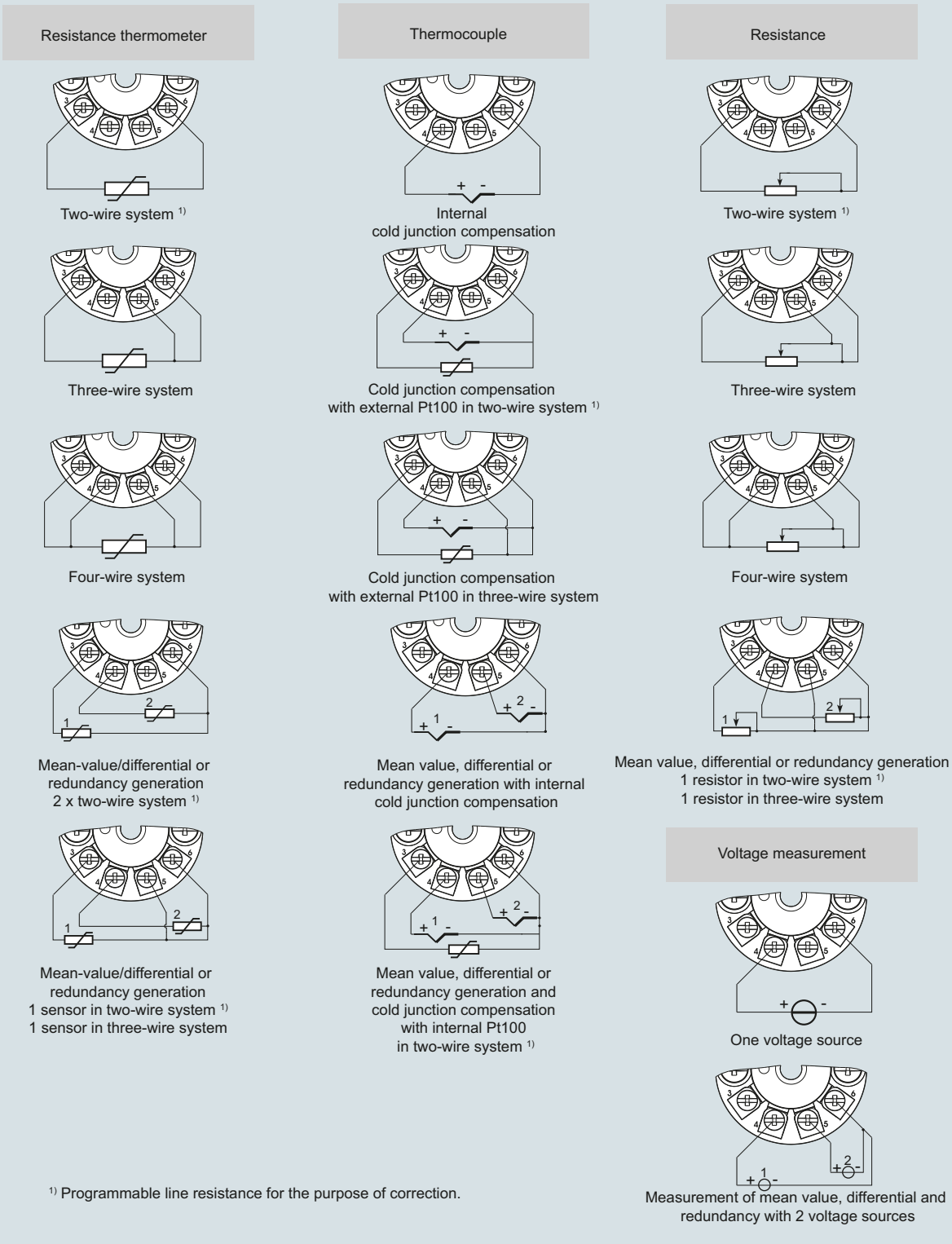
Temperature Measurement

Transmitters for mounting in sensor head

SITRANS TH400 fieldbus transmitter

Schematics

2



SITRANS TH400, sensor connection assignment