

# Temperature Measurement

## Temperature transmitters

### Compact and head transmitters / SITRANS TH320 (HART, universal)

#### Overview



- 2-wire head transmitter with and without HART communications interface
- Mounting in the connection head of the temperature sensor
- Universal input for virtually any type of temperature sensor
- Can be configured via PC, HART 7 or optional local operation

#### Benefits

- Compact design
- Flexible mounting and center hole allow you to select your preferred mounting type
- Galvanic isolation

#### Benefits

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

#### Application

SITRANS TH320 transmitters can be used in all sectors. Its compact size means that it can be installed in connection heads of type B or larger. 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 communications 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

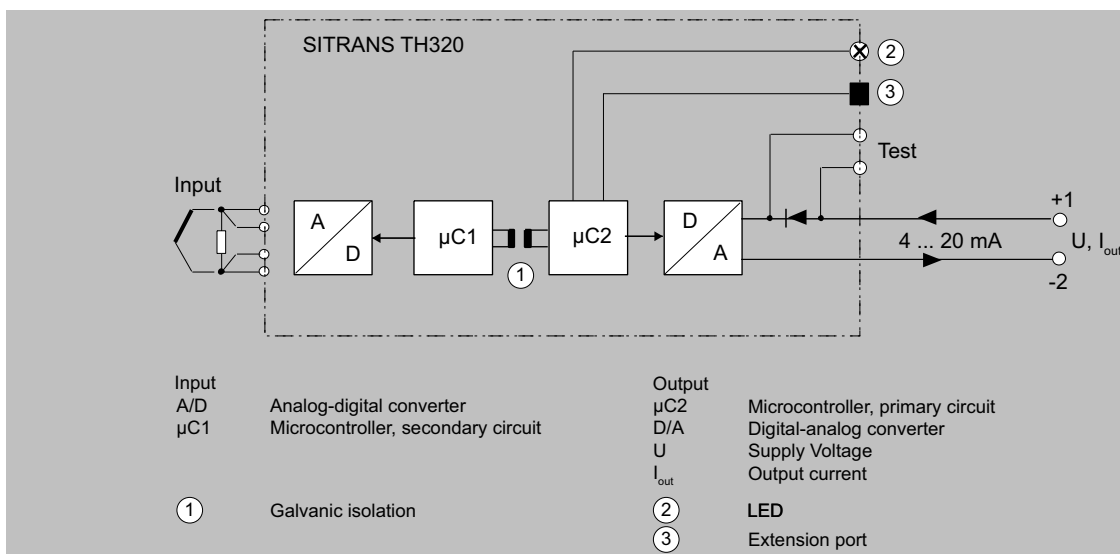
For the SITRANS TH320 without HART functionality, parameters are assigned with the PC. A special modem and the software tool SIPROM T are available for this purpose.

##### With HART communications interface:

The SITRANS TH320 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 parameterization software. The configuration data is 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 device 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.



SITRANS TH320  
function block diagram

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## Selection and ordering data

| SITRANS TH320 head transmitter with 1 input                                                                                                                            | Article No.<br>7NG031 |   |   |   |   |   |   |   |   |   |   |   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---|---|---|---|---|---|---|---|---|---|---|
|                                                                                                                                                                        | ●                     | - | ● | ● | ● | ● | ● | - | 0 | ● | ● | ● |
| Click the article number for online configuration in the PIA Life Cycle Portal.                                                                                        |                       |   |   |   |   |   |   |   |   |   |   |   |
| Communication                                                                                                                                                          |                       |   |   |   |   |   |   |   |   |   |   |   |
| With HART                                                                                                                                                              | 0                     |   |   |   |   |   |   |   |   |   |   |   |
| 2-wire, 4 ... 20 mA                                                                                                                                                    | 7                     |   |   |   |   |   |   |   |   |   |   |   |
| Primary value output                                                                                                                                                   |                       |   |   |   |   |   |   |   |   |   |   |   |
| Input 1                                                                                                                                                                |                       |   | 0 |   |   |   |   |   |   |   |   |   |
| Input 1, type                                                                                                                                                          |                       |   |   |   |   |   |   |   |   |   |   |   |
| RTD                                                                                                                                                                    |                       |   |   |   |   |   |   |   |   |   |   |   |
| • Pt100 (IEC), 3-wire                                                                                                                                                  |                       |   |   |   |   | B |   |   |   |   |   |   |
| • Pt100 (IEC), 4-wire                                                                                                                                                  |                       |   |   |   |   | C |   |   |   |   |   |   |
| • Pt1000 (IEC), 3-wire                                                                                                                                                 |                       |   |   |   |   | D |   |   |   |   |   |   |
| • Pt1000 (IEC), 4-wire                                                                                                                                                 |                       |   |   |   |   | E |   |   |   |   |   |   |
| TC                                                                                                                                                                     |                       |   |   |   |   |   |   |   |   |   |   |   |
| • Type B                                                                                                                                                               |                       |   |   |   |   | F |   |   |   |   |   |   |
| • Type E                                                                                                                                                               |                       |   |   |   |   | G |   |   |   |   |   |   |
| • Type J                                                                                                                                                               |                       |   |   |   |   | H |   |   |   |   |   |   |
| • Type K                                                                                                                                                               |                       |   |   |   |   | J |   |   |   |   |   |   |
| • Type L                                                                                                                                                               |                       |   |   |   |   | K |   |   |   |   |   |   |
| • Type N                                                                                                                                                               |                       |   |   |   |   | L |   |   |   |   |   |   |
| • Type R                                                                                                                                                               |                       |   |   |   |   | N |   |   |   |   |   |   |
| • Type S                                                                                                                                                               |                       |   |   |   |   | P |   |   |   |   |   |   |
| • Type T                                                                                                                                                               |                       |   |   |   |   | Q |   |   |   |   |   |   |
| Potentiometer, 4-wire                                                                                                                                                  |                       |   |   |   |   | R |   |   |   |   |   |   |
| Input 1, type customer-specific                                                                                                                                        |                       |   |   |   |   |   |   |   |   |   |   |   |
| Define customer-specific input configurations in V options                                                                                                             |                       |   |   |   |   | Y |   |   |   |   |   |   |
| Input 2, type                                                                                                                                                          |                       |   |   |   |   |   |   |   |   |   |   |   |
| Without input 2                                                                                                                                                        |                       |   |   |   |   | A |   |   |   |   |   |   |
| CJC configuration for TC                                                                                                                                               |                       |   |   |   |   |   |   |   |   |   |   |   |
| Without CJC                                                                                                                                                            |                       |   |   |   |   |   | 0 |   |   |   |   |   |
| Internal CJC                                                                                                                                                           |                       |   |   |   |   |   | 1 |   |   |   |   |   |
| External CJC Pt100 (IEC), 3-wire                                                                                                                                       |                       |   |   |   |   |   | 3 |   |   |   |   |   |
| External CJC Ni100 (DIN), 3-wire                                                                                                                                       |                       |   |   |   |   |   | 6 |   |   |   |   |   |
| Define fixed CJC value with option Y60                                                                                                                                 |                       |   |   |   |   |   | 8 |   |   |   |   |   |
| Materials not in contact with media                                                                                                                                    |                       |   |   |   |   |   |   |   |   |   |   |   |
| None                                                                                                                                                                   |                       |   |   |   |   |   | 0 |   |   |   |   |   |
| Type of protection                                                                                                                                                     |                       |   |   |   |   |   |   |   |   |   |   |   |
| General safety (non-Ex); CE, RCM, FM, KCC, EAC, CSA, UK                                                                                                                |                       |   |   |   |   |   |   |   |   |   | A |   |
| Intrinsic safety (Ex i) / non-incendive field wiring (NIFW) / increased safety zone 2 (Ex ec) / non-incendive (NI) (ATEX, IECEx, EACEx, CSA, FM, NEPSI, Inmetro, UKEx) |                       |   |   |   |   |   |   |   |   |   | N |   |
| Electrical connection/cable entries                                                                                                                                    |                       |   |   |   |   |   |   |   |   |   |   |   |
| None                                                                                                                                                                   |                       |   |   |   |   |   |   |   |   |   | A |   |
| Local HMI                                                                                                                                                              |                       |   |   |   |   |   |   |   |   |   |   |   |
| Without display                                                                                                                                                        |                       |   |   |   |   |   |   |   |   |   |   | 0 |

| Options                                                                                                    | Order code |
|------------------------------------------------------------------------------------------------------------|------------|
| Add "-Z" to article number, specify order code and, if applicable, free text                               |            |
| <b>Manufacturer's declarations</b>                                                                         |            |
| Inspection certificate EN 10204-3.1:<br>Manufacturer test certificate for transmitters (5 measured values) | C11        |
| <b>Certificates for functional safety</b>                                                                  |            |
| Functional safety SIL2/3 (IEC 61508)                                                                       | C20        |

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#### Selection and ordering data (continued)

| Options<br>Add "Z" to article number, specify order code and, if applicable, free text                    | Order code |
|-----------------------------------------------------------------------------------------------------------|------------|
| <b>Device options</b>                                                                                     |            |
| PDF file with device settings                                                                             | <b>D10</b> |
| Without labeling of the measuring range on the TAG plate                                                  | <b>D41</b> |
| Input 1: Cable extension 200 mm fixed, for RTD Pt100 (0 ... 100 °C) 4-wire                                | <b>D73</b> |
| Jumper plug set on device for write protection                                                            | <b>D81</b> |
| Jumper plug set on device set for fault current > 21 mA (instead of < 3.6 mA) (only non-SIL)              | <b>D82</b> |
| <b>Noise damping</b>                                                                                      |            |
| Noise damping 60 Hz instead of 50 Hz                                                                      | <b>P10</b> |
| <b>Input 1: TC</b>                                                                                        |            |
| Type C W5                                                                                                 | <b>V01</b> |
| Type D W3                                                                                                 | <b>V02</b> |
| Type U                                                                                                    | <b>V03</b> |
| Type Lr                                                                                                   | <b>V04</b> |
| <b>Input 1: Callendar-Van Dusen</b>                                                                       |            |
| 2-wire (define wire resistance value in option Y51 and Callendar-Van Dusen parameter in option Y35)       | <b>V50</b> |
| 3-wire (define Callendar-Van Dusen parameter in option Y35)                                               | <b>V51</b> |
| 4-wire (define Callendar-Van Dusen parameter in option Y35)                                               | <b>V52</b> |
| <b>Input 1: RTD</b>                                                                                       |            |
| Pt × (IEC 60751), 2-wire (define wire resistance value in option Y51 and RTD factor × in option Y21)      | <b>V60</b> |
| Pt × (IEC 60721), 3-wire, define RTD factor × in option Y21                                               | <b>V61</b> |
| Pt × (IEC 60721), 4-wire, define RTD factor × in option Y21                                               | <b>V62</b> |
| Pt × (JIS C1604), 2-wire (define wire resistance value in option Y51 and RTD factor × in option Y21)      | <b>V63</b> |
| Pt × (JIS C1604-81), 3-wire, define RTD factor × in option Y21                                            | <b>V64</b> |
| Pt × (JIS C1604-81), 4-wire, define RTD factor × in option Y21                                            | <b>V65</b> |
| Pt × (GOST 6651-2009), 2-wire (define wire resistance value in option Y51 and RTD factor × in option Y21) | <b>V66</b> |
| Pt × (GOST 6651-2009), 3-wire, define RTD factor × in option Y21                                          | <b>V67</b> |
| Pt × (GOST 6651-2009), 4-wire, define RTD factor × in option Y21                                          | <b>V68</b> |
| Ni × (DIN 43760-87), 2-wire (define wire resistance value in option Y51 and RTD factor × in option Y21)   | <b>V69</b> |
| Ni × (DIN 43760-87), 3-wire, define RTD factor × in option Y21                                            | <b>V70</b> |
| Ni × (DIN 43760-87), 4-wire, define RTD factor × in option Y21                                            | <b>V71</b> |
| Ni × (GOST 6651-2009), 2-wire (define wire resistance value in option Y51 and RTD factor × in option Y21) | <b>V72</b> |
| Ni × (GOST 6651-2009), 3-wire, define RTD factor × in option Y21                                          | <b>V73</b> |
| Ni × (GOST 6651-2009), 4-wire, define RTD factor × in option Y21                                          | <b>V74</b> |
| Cu × (ECW-15), 2-wire (define wire resistance value in option Y51 and RTD factor × in option Y21)         | <b>V75</b> |
| Cu × (ECW-15), 3-wire, define RTD factor × in option Y21                                                  | <b>V76</b> |
| Cu × (ECW-15), 4-wire, define RTD factor × in option Y21                                                  | <b>V77</b> |
| Cu × (GOST 6651-94), 2-wire (define wire resistance value in option Y51 and RTD factor × in option Y21)   | <b>V78</b> |
| Cu × (GOST 6651-94), define 3-wire, define RTD factor × in option Y21                                     | <b>V79</b> |

## Selection and ordering data (continued)

| Options                                                                                                                                                                                                                                  | Order code |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| <b>Add "Z" to article number, specify order code and, if applicable, free text</b>                                                                                                                                                       |            |
| Cu × (GOST 6651-94), define 4-wire, define RTD factor × in option Y21                                                                                                                                                                    | <b>V80</b> |
| Cu × (GOST 6651-2009), 2-wire (define wire resistance value in option Y51 and RTD factor × in option Y21)                                                                                                                                | <b>V81</b> |
| Cu × (GOST 6651-2009), define 3-wire, define RTD factor × in option Y21                                                                                                                                                                  | <b>V82</b> |
| Cu × (GOST 6651-2009), define 4-wire, define RTD factor × in option Y21                                                                                                                                                                  | <b>V83</b> |
| <b>Device settings</b>                                                                                                                                                                                                                   |            |
| Measuring range setting temperature input: Lower range value (max. 5 characters), upper range value (max. 5 characters), unit (°C, °F, °Ra, K)                                                                                           | <b>Y01</b> |
| Customer-specific programming in plain text (n-lines)                                                                                                                                                                                    | <b>Y09</b> |
| Tag (device parameters, max. 32 characters), adhesive label                                                                                                                                                                              | <b>Y15</b> |
| Measuring point description (device parameters, max. 32 characters), adhesive label                                                                                                                                                      | <b>Y16</b> |
| Tag (device parameters, max. 8 characters), adhesive label                                                                                                                                                                               | <b>Y17</b> |
| Descriptor (device parameters, max. 16 characters), adhesive label                                                                                                                                                                       | <b>Y18</b> |
| Input 1: RTD factor; e.g. factor "200" = Pt200, adhesive label                                                                                                                                                                           | <b>Y21</b> |
| Fault current for input circuit short-circuit & interruption instead of 22.4 mA (short-circuit) and 22.8 mA (interruption) e.g. 3.6 mA and 22.4 mA [3.6 - 3.6; 3.6 - 22.8; 22.4 - 3.6]                                                   | <b>Y31</b> |
| CvD Sensor matching factors input 1 R0, A, B, C, Beta, Delta Selection: CVDR - R0 (format for example 100.0), CVDA - A (format for example 0.003908), CVDB - B (format for example -5.775E-07), CVDC - C (format for example -4.183E-12) | <b>Y35</b> |
| Wire resistance value input 1 in ohms (0 ... 100 ohms)                                                                                                                                                                                   | <b>Y51</b> |
| Input 1: CJC sensor, fixed value (see measuring range for unit)                                                                                                                                                                          | <b>Y60</b> |
| ID number of special design                                                                                                                                                                                                              | <b>Y99</b> |

## Accessories

|                                                                                                                                                        | Article No.                 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| Other accessories for assembly, connection and transmitter configuration, see page 2/198.                                                              |                             |
| <b>Modems</b>                                                                                                                                          |                             |
| HART modem with USB interface                                                                                                                          | <b>7MF4997-1DB</b>          |
| Modem with USB interface and SIPROM T software                                                                                                         | <b>7NG3092-8KN</b>          |
| <b>SIMATIC PDM parameterization software</b>                                                                                                           | See Catalog FI 01 section 8 |
| <b>Mounting rail adapter for head transmitter</b><br>(Quantity delivered: 5 units)                                                                     | <b>7NG3092-8KA</b>          |
| <b>Connecting cable</b><br>4-wire, 200 mm (7.97 inches), for input connections when using head transmitters in the high spring flap (set with 5 units) | <b>7NG3092-8KC</b>          |

## Ordering example

7NG0310-OBA00-OAA0-Z Y01

Y01: -10 ... +100 °C

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#### Selection and ordering data (continued)

##### **Factory setting**

- Pt100 (IEC 60751); 3-wire connection
- Measuring range: 0 ... 100 °C (32 ... 212 °F)
- Fault current
  - Device fault: < 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

## Technical specifications

| SITRANS TH320 (HART, universal)                                    |                                                                                                                                                                                                                                                                                                         |
|--------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>General</b>                                                     |                                                                                                                                                                                                                                                                                                         |
| Supply voltage <sup>1) 2)</sup>                                    |                                                                                                                                                                                                                                                                                                         |
| • 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 <sub>supply</sub> - 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                                                   | Wire jumpers or software                                                                                                                                                                                                                                                                                |
| Warm-up time                                                       | < 5 min                                                                                                                                                                                                                                                                                                 |
| Starting time                                                      | < 2.75 s                                                                                                                                                                                                                                                                                                |
| Programming                                                        | HART                                                                                                                                                                                                                                                                                                    |
| Signal-to-noise ratio                                              | > 60 dB                                                                                                                                                                                                                                                                                                 |
| Long-term stability                                                | Better than: <ul style="list-style-type: none"> <li>• ± 0.05% of measuring span/year</li> <li>• ± 0.18% of measuring span/5 years</li> </ul>                                                                                                                                                            |
| Response time                                                      | 4 ... 20 mA: ≤ 55 ms<br>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                                                                                                                                                                                                                                                                         |
| <b>Input</b>                                                       |                                                                                                                                                                                                                                                                                                         |
| <b><u>Resistance thermometer (RTD)</u></b>                         |                                                                                                                                                                                                                                                                                                         |
| Input type                                                         |                                                                                                                                                                                                                                                                                                         |
| • Pt10 ... 10000                                                   | <ul style="list-style-type: none"> <li>• IEC 60751</li> <li>• JIS C 1604-8</li> <li>• GOST 6651_2009</li> <li>• Callendar-Van Dusen</li> </ul>                                                                                                                                                          |
| • Ni10 ... 10000                                                   | <ul style="list-style-type: none"> <li>• DIN 43760-1987</li> <li>• GOST 6651-2009/OIML R84:2003</li> </ul>                                                                                                                                                                                              |
| • Cu5 ... 1000                                                     | <ul style="list-style-type: none"> <li>• Edison Copper Winding No. 15</li> <li>• GOST 6651-2009/OIML R84:2003</li> </ul>                                                                                                                                                                                |
| Connection type                                                    | 2-wire, 3-wire or 4-wire                                                                                                                                                                                                                                                                                |
| Wire resistance per wire                                           | Max. 50 Ω                                                                                                                                                                                                                                                                                               |
| Input current                                                      | < 0.15 mA                                                                                                                                                                                                                                                                                               |
| Effect of the wire 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<br><b>Note</b><br>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                                                                                                                                                                                                                                                                                              |
| <b><u>Thermocouples (TC)</u></b>                                   |                                                                                                                                                                                                                                                                                                         |

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#### Technical specifications (continued)

| SITRANS TH320 (HART, universal)                                              |                                                                                                                                                     |
|------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| 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, wire resistance per wire (for 3-wire and 4-wire connections) | 50 Ω                                                                                                                                                |
| • Effect of the wire 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 wire resistance                                                      | Max. 10 kΩ                                                                                                                                          |
| • Fault detection, programmable                                              | None, short-circuited, defective, short-circuited or defective<br><b>Note</b><br>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                                                                                                                                          |
| <b><u>Linear resistance</u></b>                                              |                                                                                                                                                     |
| Input range                                                                  | 0 ... 100 kΩ                                                                                                                                        |
| Minimum measuring span                                                       | 25 Ω                                                                                                                                                |
| Connection type                                                              | 2-wire, 3-wire or 4-wire                                                                                                                            |
| Wire resistance per wire                                                     | Max. 50 Ω                                                                                                                                           |
| Input current                                                                | < 0.15 mA                                                                                                                                           |
| Effect of the wire 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                                                                                                                                     |
| <b><u>Potentiometers</u></b>                                                 |                                                                                                                                                     |
| Input range                                                                  | 10 ... 100 kΩ                                                                                                                                       |
| Minimum measuring span                                                       | 25 Ω                                                                                                                                                |
| Connection type                                                              | 3-wire or 4-wire                                                                                                                                    |
| Wire resistance per wire                                                     | Max. 50 Ω                                                                                                                                           |
| Input current                                                                | < 0.15 mA                                                                                                                                           |
| Effect of the wire 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                                                                                                                                          |

## Technical specifications (continued)

| SITRANS TH320 (HART, universal)                                                                               |                                                                                                                                                                                                                                                                                               |
|---------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Fault detection, programmable                                                                                 | None, short-circuited, defective, short-circuited or defective<br><b>Note</b><br>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 $\Omega$                                                                                                                                                                                                                                                                                   |
| Fault detection time, wiper arm (no short-circuit detection)                                                  | $\leq 75$ ms (typically 70 ms)                                                                                                                                                                                                                                                                |
| Fault detection time, element                                                                                 | $\leq 2\,000$ ms                                                                                                                                                                                                                                                                              |
| Fault detection time (for 4-wire and 5-wire)                                                                  | $\leq 2\,000$ ms                                                                                                                                                                                                                                                                              |
| <b>Voltage input</b>                                                                                          |                                                                                                                                                                                                                                                                                               |
| Measuring range                                                                                               |                                                                                                                                                                                                                                                                                               |
| • Unipolar                                                                                                    | -100 ... 1700 mV                                                                                                                                                                                                                                                                              |
| • Bipolar                                                                                                     | -800 ... +800 mV                                                                                                                                                                                                                                                                              |
| Minimum measuring span                                                                                        | 2.5 mV                                                                                                                                                                                                                                                                                        |
| Input resistance                                                                                              | 10 M $\Omega$                                                                                                                                                                                                                                                                                 |
| 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                                                                                          | $\leq 75$ ms (typically 70 ms)                                                                                                                                                                                                                                                                |
| <b>Output and HART communication</b>                                                                          |                                                                                                                                                                                                                                                                                               |
| 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)                                                                                    | $\leq (V_{\text{Supply}} - 7.5)/0.023 \Omega$                                                                                                                                                                                                                                                 |
| Load stability                                                                                                | $< 0.01\%$ of measuring span/100 $\Omega$<br>(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                                                                                                                                                                                                                                                                                        |
| <b>Measuring accuracy</b>                                                                                     |                                                                                                                                                                                                                                                                                               |
| Input accuracy                                                                                                | See "Input accuracy" table                                                                                                                                                                                                                                                                    |
| Output accuracy                                                                                               | See "Output accuracy" table                                                                                                                                                                                                                                                                   |
| <b>Operating conditions</b>                                                                                   |                                                                                                                                                                                                                                                                                               |
| 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 $\pm 1.0$ °C (75.2 °F $\pm 1.8$ °F)                                                                                                                                                                                                                                                     |
| Relative humidity                                                                                             | $< 99\%$ (no condensation)                                                                                                                                                                                                                                                                    |
| Degree of protection                                                                                          |                                                                                                                                                                                                                                                                                               |
| • Transmitter enclosure                                                                                       | IP68                                                                                                                                                                                                                                                                                          |
| • Terminals                                                                                                   | IP00                                                                                                                                                                                                                                                                                          |
| <b>Structural design</b>                                                                                      |                                                                                                                                                                                                                                                                                               |
| Weight                                                                                                        | 50 g (0.11 lb)                                                                                                                                                                                                                                                                                |
| Maximum core cross-section                                                                                    | 1 $\times$ 1.5 mm <sup>2</sup> (stranded wire)                                                                                                                                                                                                                                                |
| Tightening torque for clamping screws                                                                         | 0.4 Nm                                                                                                                                                                                                                                                                                        |
| Vibrations                                                                                                    | IEC 60068-2-6                                                                                                                                                                                                                                                                                 |
| • 2 ... 25 Hz                                                                                                 | $\pm 1.6$ mm (0.07 inches)                                                                                                                                                                                                                                                                    |
| • 25 ... 100 Hz                                                                                               | $\pm 4$ g                                                                                                                                                                                                                                                                                     |

# Temperature Measurement

## Temperature transmitters

### Compact and head transmitters / SITRANS TH320 (HART, universal)

#### Technical specifications (continued)

| SITRANS TH320 (HART, universal)                              |                                                                                                                                                                                                                   |
|--------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Certificates and approvals</b>                            |                                                                                                                                                                                                                   |
| <b><u>Explosion protection ATEX/IECEx and others</u></b>     |                                                                                                                                                                                                                   |
| Certificates <sup>3)</sup>                                   | <ul style="list-style-type: none"> <li>• DEKRA 17ATEX0116 X</li> <li>• IECEx DEK 17.0054X</li> <li>• A5E43700604A-2018X</li> </ul>                                                                                |
| "Intrinsic safety ia/ib" type of protection                  | For use in Zone 0, 1, 2, 20, 21, 22                                                                                                                                                                               |
| • ATEX                                                       | <ul style="list-style-type: none"> <li>• II 1 G Ex ia IIC T6 ... T4 Ga</li> <li>• II 2(1) G Ex ib [ia Ga] IIC T6 ... T4 Gb</li> <li>• II 2 D Ex ia IIIC Db</li> <li>• I M1 Ex ia I Ma</li> </ul>                  |
| • IECEx and others                                           | <ul style="list-style-type: none"> <li>• Ex ia IIC T6 ... T4 Ga</li> <li>• Ex ib [ia Ga] IIC T6 ... T4 Gb</li> <li>• Ex ia IIIC Db</li> <li>• Ex ia I Ma</li> </ul>                                               |
| "Intrinsic safety ic" type of protection                     | For use in Zones 2 and 22                                                                                                                                                                                         |
| • ATEX                                                       | <ul style="list-style-type: none"> <li>• II 3 G Ex ic IIC T6...T4 Gc</li> <li>• II 3 D Ex ic IIIC Dc</li> </ul>                                                                                                   |
| • IECEx and others                                           | <ul style="list-style-type: none"> <li>• Ex ic IIC T6 ... T4 Gc</li> <li>• Ex ic IIIC Dc</li> </ul>                                                                                                               |
| "Non-sparking/increased safety nA/lec" type of protection    | For use in Zones 2 and 22                                                                                                                                                                                         |
| • ATEX                                                       | <ul style="list-style-type: none"> <li>• II 3 G Ex nA IIC T6...T4 Gc</li> <li>• II 3 G Ex ec IIC T6...T4 Gc</li> </ul>                                                                                            |
| • IECEx and others                                           | <ul style="list-style-type: none"> <li>• Ex nA IIC T6 ... T4 Gc</li> <li>• Ex ec IIC T6 ... T4 Gc</li> </ul>                                                                                                      |
| <b><u>Explosion protection CSA/FM for Canada and USA</u></b> |                                                                                                                                                                                                                   |
| Certificates                                                 | <ul style="list-style-type: none"> <li>• CSA 1861385</li> <li>• FM18CA0024</li> <li>• FM18US0046</li> </ul>                                                                                                       |
| "Intrinsic safety ia" type of protection                     | <ul style="list-style-type: none"> <li>• IS, CL I, Div 1, GP ABCD, T6 ... T4</li> <li>• 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</li> </ul> |
| "Non incandive field wiring NIFW" type of protection         | NIFW, CL I, Div 2, GP ABCD T6 ... T4                                                                                                                                                                              |
| "Non incandive NI" type of protection                        | <ul style="list-style-type: none"> <li>• NI, CL I, Div 2, GP ABCD T6...T4</li> <li>• Ex nA IIC T6 ... T4 Gc</li> <li>• AEx nA IIC T6 ... T4 Gc</li> </ul>                                                         |

- 1) Note that the minimum supply voltage must correspond to the value measured at the terminals of the SITRANS TH320. All external voltage drops must be taken into account.
- 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>

## Temperature Measurement

## Temperature transmitters

## Compact and head transmitters / SITRANS TH320 (HART, universal)

## Technical specifications (continued)

## Measuring ranges/Minimum measuring span

## RTD

| Input type     | Standard                      | Measuring range in °C (°F)      | $\alpha_0$ in °C <sup>-1</sup> (°F <sup>-1</sup> ) | 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 R84:2-003 | -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 <sup>1)</sup>                 |
|------------|--------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|
| RTD        |                                                                                                                                |                                                       |
| Pt10       | $\leq \pm 0.8$ °C (1.44 °F)                                                                                                    | $\leq \pm 0.020$ °C/°C (°F/°F)                        |
| Pt20       | $\leq \pm 0.4$ °C (0.72 °F)                                                                                                    | $\leq \pm 0.010$ °C/°C (°F/°F)                        |
| Pt50       | $\leq \pm 0.16$ °C (0.288 °F)                                                                                                  | $\leq \pm 0.004$ °C/°C (°F/°F)                        |
| Pt100      | $\leq \pm 0.04$ °C (0.072 °F)                                                                                                  | $\leq \pm 0.002$ °C/°C (°F/°F)                        |
| Pt200      | $\leq \pm 0.08$ °C (0.144 °F)                                                                                                  | $\leq \pm 0.002$ °C/°C (°F/°F)                        |
| Pt500      | $T_{\max.} < 180$ °C (356 °F) = $\leq \pm 0.08$ °C (0.144 °F)<br>$T_{\max.} > 180$ °C (356 °F) = $\leq \pm 0.16$ °C (0.288 °F) | $\leq \pm 0.002$ °C/°C (°F/°F)                        |
| Pt1000     | $\leq \pm 0.08$ °C (0.144 °F)                                                                                                  | $\leq \pm 0.002$ °C/°C (°F/°F)                        |
| Pt2000     | $T_{\max.} < 300$ °C (572 °F) = $\leq \pm 0.08$ °C (0.144 °F)<br>$T_{\max.} > 300$ °C (572 °F) = $\leq \pm 0.4$ °C (0.72 °F)   | $\leq \pm 0.002$ °C/°C (°F/°F)                        |
| Pt10000    | $\leq \pm 0.16$ °C (0.288 °F)                                                                                                  | $\leq \pm 0.002$ °C/°C (°F/°F)                        |
| Pt x       | Largest tolerance of neighboring points                                                                                        | Largest temperature coefficient of neighboring points |
| Ni10       | $\leq \pm 1.6$ °C (2.88 °F)                                                                                                    | $\leq \pm 0.020$ °C/°C (°F/°F)                        |

# Temperature Measurement

## Temperature transmitters

### Compact and head transmitters / SITRANS TH320 (HART, universal)

#### Technical specifications (continued)

| Input type               | Basic accuracy                                                                                                                                | Temperature coefficient <sup>1)</sup>                                                 |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Ni20                     | $\leq \pm 0.8^\circ\text{C}$ (1.44 °F)                                                                                                        | $\leq \pm 0.010^\circ\text{C}/^\circ\text{C}$ (°F/°F)                                 |
| Ni50                     | $\leq \pm 0.32^\circ\text{C}$ (0.576 °F)                                                                                                      | $\leq \pm 0.004^\circ\text{C}/^\circ\text{C}$ (°F/°F)                                 |
| Ni100                    | $\leq \pm 0.16^\circ\text{C}$ (0.288 °F)                                                                                                      | $\leq \pm 0.002^\circ\text{C}/^\circ\text{C}$ (°F/°F)                                 |
| Ni120                    | $\leq \pm 0.16^\circ\text{C}$ (0.288 °F)                                                                                                      | $\leq \pm 0.002^\circ\text{C}/^\circ\text{C}$ (°F/°F)                                 |
| Ni200                    | $\leq \pm 0.16^\circ\text{C}$ (0.288 °F)                                                                                                      | $\leq \pm 0.002^\circ\text{C}/^\circ\text{C}$ (°F/°F)                                 |
| Ni500                    | $\leq \pm 0.16^\circ\text{C}$ (0.288 °F)                                                                                                      | $\leq \pm 0.002^\circ\text{C}/^\circ\text{C}$ (°F/°F)                                 |
| Ni1000                   | $\leq \pm 0.16^\circ\text{C}$ (0.288 °F)                                                                                                      | $\leq \pm 0.002^\circ\text{C}/^\circ\text{C}$ (°F/°F)                                 |
| Ni2000                   | $\leq \pm 0.16^\circ\text{C}$ (0.288 °F)                                                                                                      | $\leq \pm 0.002^\circ\text{C}/^\circ\text{C}$ (°F/°F)                                 |
| Ni10000                  | $\leq \pm 0.32^\circ\text{C}$ (0.576 °F)                                                                                                      | $\leq \pm 0.002^\circ\text{C}/^\circ\text{C}$ (°F/°F)                                 |
| Ni x                     | Largest tolerance of neighboring points                                                                                                       | Largest temperature coefficient of neighboring points                                 |
| Cu5                      | $\leq \pm 1.6^\circ\text{C}$ (2.88 °F)                                                                                                        | $\leq \pm 0.040^\circ\text{C}/^\circ\text{C}$ (°F/°F)                                 |
| Cu10                     | $\leq \pm 0.8^\circ\text{C}$ (1.44 °F)                                                                                                        | $\leq \pm 0.020^\circ\text{C}/^\circ\text{C}$ (°F/°F)                                 |
| Cu20                     | $\leq \pm 0.4^\circ\text{C}$ (0.72 °F)                                                                                                        | $\leq \pm 0.010^\circ\text{C}/^\circ\text{C}$ (°F/°F)                                 |
| Cu50                     | $\leq \pm 0.16^\circ\text{C}$ (0.288 °F)                                                                                                      | $\leq \pm 0.004^\circ\text{C}/^\circ\text{C}$ (°F/°F)                                 |
| Cu100                    | $\leq \pm 0.08^\circ\text{C}$ (0.144 °F)                                                                                                      | $\leq \pm 0.002^\circ\text{C}/^\circ\text{C}$ (°F/°F)                                 |
| Cu200                    | $\leq \pm 0.08^\circ\text{C}$ (0.144 °F)                                                                                                      | $\leq \pm 0.002^\circ\text{C}/^\circ\text{C}$ (°F/°F)                                 |
| Cu500                    | $\leq \pm 0.16^\circ\text{C}$ (0.288 °F)                                                                                                      | $\leq \pm 0.002^\circ\text{C}/^\circ\text{C}$ (°F/°F)                                 |
| Cu1000                   | $\leq \pm 0.08^\circ\text{C}$ (0.144 °F)                                                                                                      | $\leq \pm 0.002^\circ\text{C}/^\circ\text{C}$ (°F/°F)                                 |
| Cu x                     | Largest tolerance of neighboring points                                                                                                       | Largest temperature coefficient of neighboring points                                 |
| <b>Linear resistance</b> |                                                                                                                                               |                                                                                       |
| 0 ... 400 $\Omega$       | $\leq \pm 40\text{ m}\Omega$                                                                                                                  | $\leq \pm 2\text{ m}\Omega/^\circ\text{C}$ (1.11 m $\Omega/^\circ\text{F}$ )          |
| 0 ... 100 k $\Omega$     | $\leq \pm 4\text{ }\Omega$                                                                                                                    | $\leq \pm 0.2\text{ }\Omega/^\circ\text{C}$ (0.11 $\Omega/^\circ\text{F}$ )           |
| <b>Potentiometers</b>    |                                                                                                                                               |                                                                                       |
| 0 ... 100%               | $< 0.05\%$                                                                                                                                    | $< \pm 0.005\%$                                                                       |
| <b>Voltage input</b>     |                                                                                                                                               |                                                                                       |
| mV: -20 ... 100 mV       | $\leq \pm 5\text{ }\mu\text{V}$                                                                                                               | $\leq \pm 0.2\text{ }\mu\text{V}/^\circ\text{C}$ (0.11 $\mu\text{V}/^\circ\text{F}$ ) |
| mV: -100 ... 1700 mV     | $\leq \pm 0.1\text{ mV}$                                                                                                                      | $\leq \pm 36\text{ }\mu\text{V}/^\circ\text{C}$ (20 $\mu\text{V}/^\circ\text{F}$ )    |
| mV: $\pm 800\text{ mV}$  | $\leq \pm 0.1\text{ mV}$                                                                                                                      | $\leq \pm 32\text{ }\mu\text{V}/^\circ\text{C}$ (17.8 $\mu\text{V}/^\circ\text{F}$ )  |
| <b>TC</b>                |                                                                                                                                               |                                                                                       |
| E                        | $\leq \pm 0.2^\circ\text{C}$ (0.36 °F)                                                                                                        | $\leq \pm 0.025^\circ\text{C}/^\circ\text{C}$ (°F/°F)                                 |
| J                        | $\leq \pm 0.25^\circ\text{C}$ (0.45 °F)                                                                                                       | $\leq \pm 0.025^\circ\text{C}/^\circ\text{C}$ (°F/°F)                                 |
| K                        | $\leq \pm 0.25^\circ\text{C}$ (0.45 °F)                                                                                                       | $\leq \pm 0.025^\circ\text{C}/^\circ\text{C}$ (°F/°F)                                 |
| L                        | $\leq \pm 0.35^\circ\text{C}$ (0.63 °F)                                                                                                       | $\leq \pm 0.025^\circ\text{C}/^\circ\text{C}$ (°F/°F)                                 |
| N                        | $\leq \pm 0.4^\circ\text{C}$ (0.72 °F)                                                                                                        | $\leq \pm 0.025^\circ\text{C}/^\circ\text{C}$ (°F/°F)                                 |
| T                        | $\leq \pm 0.25^\circ\text{C}$ (0.45 °F)                                                                                                       | $\leq \pm 0.025^\circ\text{C}/^\circ\text{C}$ (°F/°F)                                 |
| U                        | $< 0^\circ\text{C}$ (32 °F) $\leq \pm 0.8^\circ\text{C}$ (1.44 °F)<br>$\geq 0^\circ\text{C}$ (32 °F) $\leq \pm 0.4^\circ\text{C}$ (0.72 °F)   | $\leq \pm 0.025^\circ\text{C}/^\circ\text{C}$ (°F/°F)                                 |
| Lr                       | $\leq \pm 0.2^\circ\text{C}$ (0.36 °F)                                                                                                        | $\leq \pm 0.1^\circ\text{C}/^\circ\text{C}$ (°F/°F)                                   |
| R                        | $< 200^\circ\text{C}$ (392 °F) $\leq \pm 0.5^\circ\text{C}$ (0.9 °F)<br>$\geq 200^\circ\text{C}$ (392 °F) $\leq \pm 1^\circ\text{C}$ (1.8 °F) | $\leq \pm 0.1^\circ\text{C}/^\circ\text{C}$ (°F/°F)                                   |
| S                        | $< 200^\circ\text{C}$ (392 °F) $\leq \pm 0.5^\circ\text{C}$ (0.9 °F)<br>$\geq 200^\circ\text{C}$ (392 °F) $\leq \pm 1^\circ\text{C}$ (1.8 °F) | $\leq \pm 0.1^\circ\text{C}/^\circ\text{C}$ (°F/°F)                                   |
| W3                       | $\leq \pm 0.6^\circ\text{C}$ (1.08 °F)                                                                                                        | $\leq \pm 0.1^\circ\text{C}/^\circ\text{C}$ (°F/°F)                                   |
| W5                       | $\leq \pm 0.4^\circ\text{C}$ (0.72 °F)                                                                                                        | $\leq \pm 0.1^\circ\text{C}/^\circ\text{C}$ (°F/°F)                                   |
| B <sup>2)</sup>          | $\leq \pm 1^\circ\text{C}$ (1.8 °F)                                                                                                           | $\leq \pm 0.1^\circ\text{C}/^\circ\text{C}$ (°F/°F)                                   |
| B <sup>3)</sup>          | $\leq \pm 3^\circ\text{C}$ (5.4 °F)                                                                                                           | $\leq \pm 0.1^\circ\text{C}/^\circ\text{C}$ (°F/°F)                                   |
| B <sup>4)</sup>          | $\leq \pm 8^\circ\text{C}$ (14.4 °F)                                                                                                          | $\leq \pm 0.8^\circ\text{C}/^\circ\text{C}$ (°F/°F)                                   |
| B <sup>5)</sup>          | Not specified                                                                                                                                 | Not specified                                                                         |
| CJC (internal)           | $< \pm 0.5^\circ\text{C}$ (0.9 °F)                                                                                                            | Included in basic accuracy                                                            |
| CJC (external)           | $\leq \pm 0.08^\circ\text{C}$ (0.144 °F)                                                                                                      | $\leq \pm 0.002^\circ\text{C}/^\circ\text{C}$ (°F/°F)                                 |

<sup>1)</sup> Temperature coefficients correspond to the specified values or 0.002% of the input span, depending on which value is greater.

<sup>2)</sup> Accuracy of the specification range  $> 400^\circ\text{C}$  (752 °F)

<sup>3)</sup> Accuracy of the specification range  $> 160^\circ\text{C}$  (320 °F)  $< 400^\circ\text{C}$  (752 °F)

<sup>4)</sup> Accuracy of the specification range  $> 85^\circ\text{C}$  (185 °F)  $< 160^\circ\text{C}$  (320 °F)

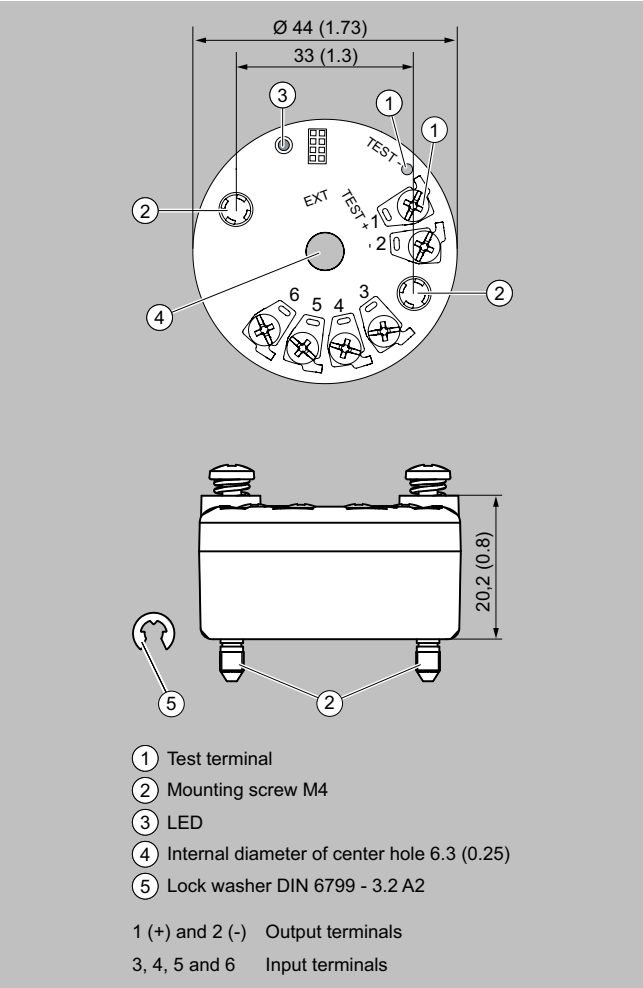
<sup>5)</sup> Accuracy of the specification range  $< 85^\circ\text{C}$  (185 °F)

Technical specifications (continued)

Output accuracy

| Output type   | Basic accuracy                                             | Temperature coefficient                                                       |
|---------------|------------------------------------------------------------|-------------------------------------------------------------------------------|
| Analog output | $\leq \pm 1.6 \mu\text{A}$ (0.01% of the full output span) | $\leq \pm 0.48 \mu\text{A/K}$ ( $\leq \pm 0.003\%$ of the full output span/K) |

Dimensional drawings



SITRANS TH320, dimensions and pin assignment, dimensions in mm (inch)

# Temperature Measurement

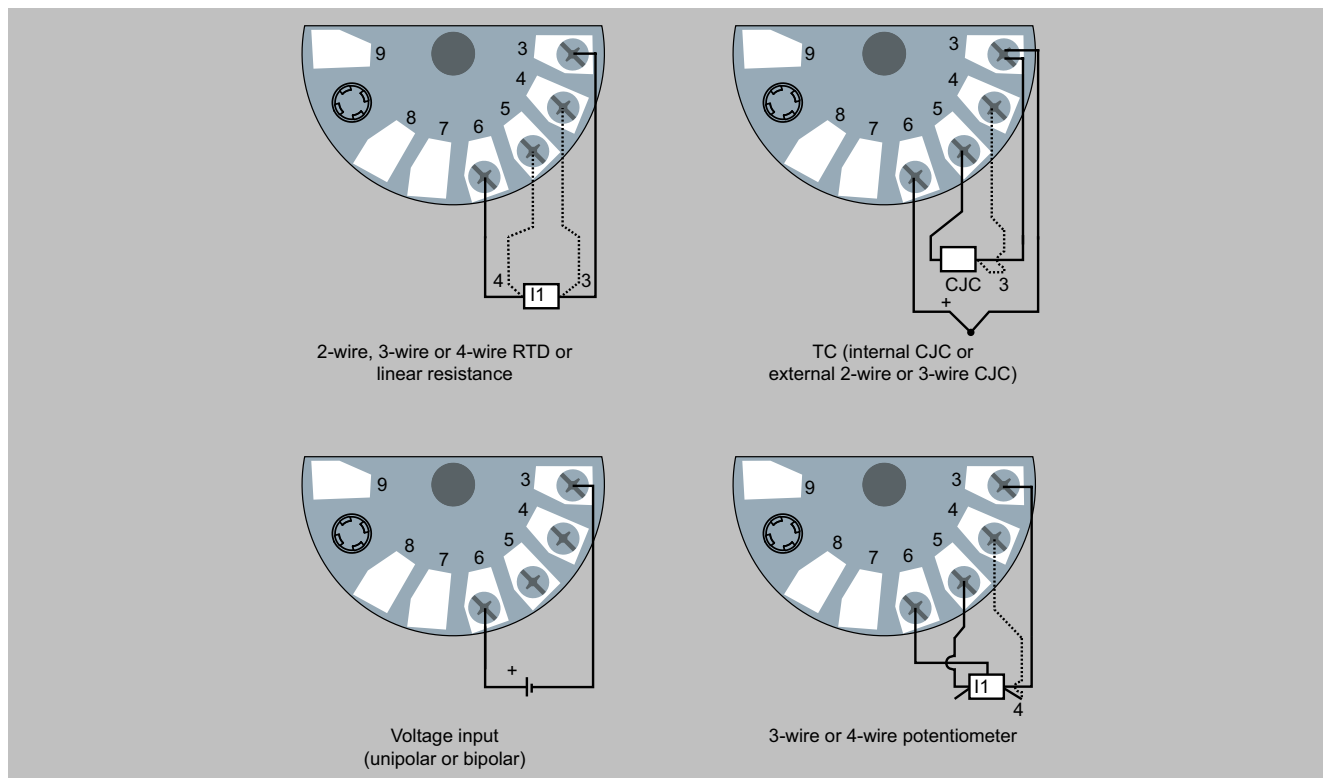
## Temperature transmitters

### Compact and head transmitters / SITRANS TH320 (HART, universal)

#### Circuit diagrams

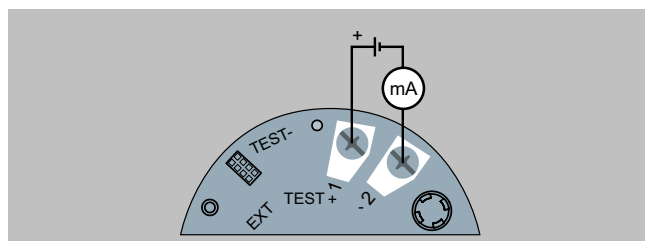
##### Connections

##### Input connection



SITRANS TH320, input connection assignment

##### Output connection



SITRANS TH320, output connection assignment

## Temperature Measurement

### Temperature transmitters

#### Compact and head transmitters / SITRANS TH420 (HART, universal)

##### Overview



- 2-wire head transmitter with HART communications interface
- Mounting in the connection head of the temperature sensor
- Universal input for virtually any type of temperature sensor
- Connection of two independent input circuits for redundant operation (high input availability)
- Input drift detection
- Configurable via HART 7

##### Benefits

- Compact design
- Connection of two independent input circuits for redundant operation (high input availability)
- Flexible mounting and center hole allow you to select your preferred mounting type
- Galvanic isolation
- Test terminals for ammeter
- Diagnostics LED (green/red)
- Input monitoring wire break, short-circuit and drift
- Self-monitoring
- Configuration status stored in EEPROM
- SIL2/3 (with order note C20)
- Expanded diagnostic functions, such as slave pointer, operating hours counter, etc.
- Special characteristic
- Electromagnetic compatibility according to EN 61326 and NE21

##### Application

The SITRANS TH420 transmitter with two inputs can be used in all sectors. Its compact size means that it can be installed in connection heads of type B or larger. Due to its universal input module, the following sensors and signal sources can be connected in redundant operation (high input availability):

- 2 resistance thermometers (2-wire, 3-wire, 4-wire connection)
- 2 thermocouples
- 2 linear resistors, potentiometer and DC voltage sources

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

The dual input mode also supports drift detection of the inputs, whereby maintenance intervals can be more easily planned. Transmitters of the "intrinsically safe or Zone 2 increased safety" type of protection can be installed in hazardous areas. The device meets the requirements of the EU Directive 2014/34/EU (ATEX), the FM and CSA regulations as well as other national approvals.

# Temperature Measurement

## Temperature transmitters

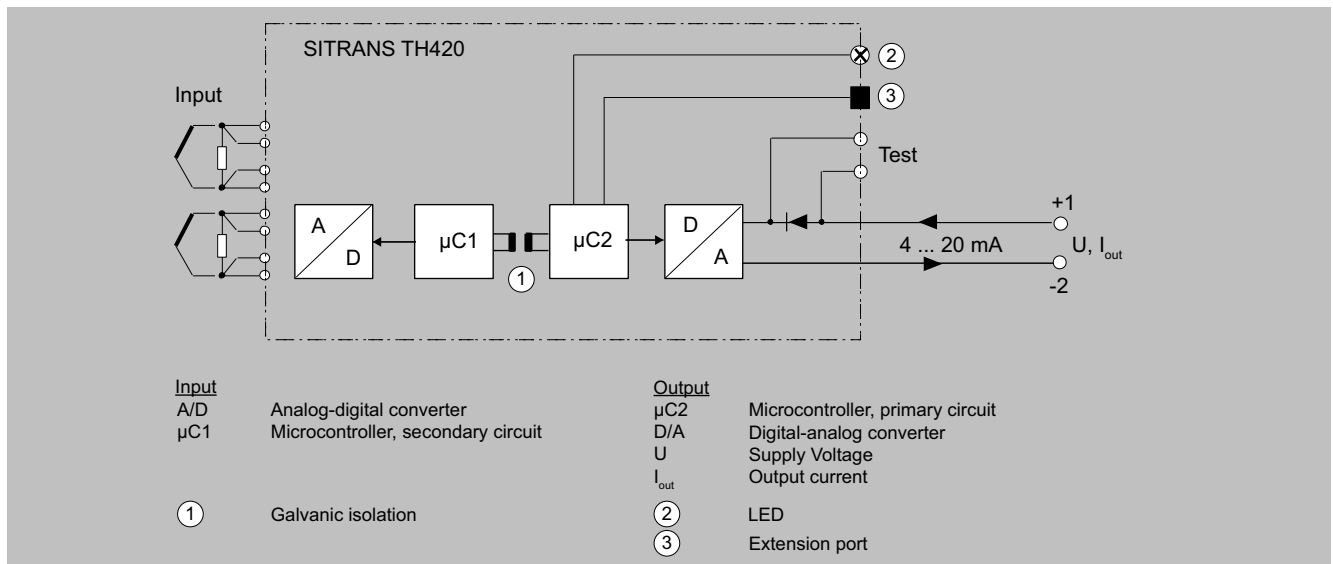
### Compact and head transmitters / SITRANS TH420 (HART, universal)

#### Function

The SITRANS TH420 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.



SITRANS TH420, function block diagram

## Temperature Measurement

## Temperature transmitters

## Compact and head transmitters / SITRANS TH420 (HART, universal)

## Selection and ordering data

| SITRANS TH420<br>head transmitter with 2 inputs                                 | Article No.<br>7NG041 |   |   |   |   |   |   |   |   |   | Order code |   |   |
|---------------------------------------------------------------------------------|-----------------------|---|---|---|---|---|---|---|---|---|------------|---|---|
|                                                                                 | ●                     | - | ● | ● | ● | ● | ● | - | 0 | ● | ●          | ● | ● |
| Click the article number for online configuration in the PIA Life Cycle Portal. |                       |   |   |   |   |   |   |   |   |   |            |   |   |
| <b>Communication</b>                                                            |                       |   |   |   |   |   |   |   |   |   |            |   |   |
| With HART                                                                       | 0                     |   |   |   |   |   |   |   |   |   |            |   |   |
| <b>Primary value output</b>                                                     |                       |   |   |   |   |   |   |   |   |   |            |   |   |
| Input 1                                                                         | 0                     |   |   |   |   |   |   |   |   |   |            |   |   |
| Input 1, input 2 as redundancy                                                  | 1                     |   |   |   |   |   |   |   |   |   |            |   |   |
| Input 2, input 1 as redundancy                                                  | 2                     |   |   |   |   |   |   |   |   |   |            |   |   |
| Mean value input 1 and input 2, both as redundancy                              | 3                     |   |   |   |   |   |   |   |   |   |            |   |   |
| Minimum input 1 and input 2, both as redundancy                                 | 4                     |   |   |   |   |   |   |   |   |   |            |   |   |
| Maximum input 1 and input 2, both as redundancy                                 | 5                     |   |   |   |   |   |   |   |   |   |            |   |   |
| Difference input 1 - input 2                                                    | 6                     |   |   |   |   |   |   |   |   |   |            |   |   |
| Difference input 2 - input 1                                                    | 7                     |   |   |   |   |   |   |   |   |   |            |   |   |
| Absolute difference                                                             | 8                     |   |   |   |   |   |   |   |   |   |            |   |   |
| <b>Primary value output, customer-specific</b>                                  |                       |   |   |   |   |   |   |   |   |   |            |   |   |
| Minimum input 1 and input 2, without redundancy                                 | 9                     |   |   |   |   |   |   |   |   |   | H          | 1 | A |
| Maximum input 1 and input 2, without redundancy                                 | 9                     |   |   |   |   |   |   |   |   |   | H          | 1 | B |
| Mean value input 1 and input 2, without redundancy                              | 9                     |   |   |   |   |   |   |   |   |   | H          | 1 | C |
| Input 2                                                                         | 9                     |   |   |   |   |   |   |   |   |   | H          | 1 | D |
| <b>Input 1, type</b>                                                            |                       |   |   |   |   |   |   |   |   |   |            |   |   |
| RTD                                                                             |                       |   |   |   |   |   |   |   |   |   |            |   |   |
| • Pt100 (IEC), 3-wire                                                           |                       |   |   |   |   |   |   |   |   |   | B          |   |   |
| • Pt100 (IEC), 4-wire                                                           |                       |   |   |   |   |   |   |   |   |   | C          |   |   |
| • Pt1000 (IEC), 3-wire                                                          |                       |   |   |   |   |   |   |   |   |   | D          |   |   |
| • Pt1000 (IEC), 4-wire                                                          |                       |   |   |   |   |   |   |   |   |   | E          |   |   |
| TC                                                                              |                       |   |   |   |   |   |   |   |   |   |            |   |   |
| • Type B                                                                        |                       |   |   |   |   |   |   |   |   |   | F          |   |   |
| • Type E                                                                        |                       |   |   |   |   |   |   |   |   |   | G          |   |   |
| • Type J                                                                        |                       |   |   |   |   |   |   |   |   |   | H          |   |   |
| • Type K                                                                        |                       |   |   |   |   |   |   |   |   |   | J          |   |   |
| • Type L                                                                        |                       |   |   |   |   |   |   |   |   |   | K          |   |   |
| • Type N                                                                        |                       |   |   |   |   |   |   |   |   |   | L          |   |   |
| • Type R                                                                        |                       |   |   |   |   |   |   |   |   |   | N          |   |   |
| • Type S                                                                        |                       |   |   |   |   |   |   |   |   |   | P          |   |   |
| • Type T                                                                        |                       |   |   |   |   |   |   |   |   |   | Q          |   |   |
| Potentiometer, 4-wire                                                           |                       |   |   |   |   |   |   |   |   |   | R          |   |   |
| <b>Input 1, type customer-specific</b>                                          |                       |   |   |   |   |   |   |   |   |   |            |   |   |
| Define customer-specific input configurations in V options                      |                       |   |   |   |   |   |   |   |   |   | Y          |   |   |
| <b>Input 2, type</b>                                                            |                       |   |   |   |   |   |   |   |   |   |            |   |   |
| Without input 2                                                                 |                       |   |   |   |   |   |   |   |   |   | A          |   |   |
| RTD                                                                             |                       |   |   |   |   |   |   |   |   |   |            |   |   |
| • Pt100 (IEC), 3-wire                                                           |                       |   |   |   |   |   |   |   |   |   | B          |   |   |
| • Pt100 (IEC), 4-wire                                                           |                       |   |   |   |   |   |   |   |   |   | C          |   |   |
| • Pt1000 (IEC), 3-wire                                                          |                       |   |   |   |   |   |   |   |   |   | D          |   |   |
| • Pt1000 (IEC), 4-wire                                                          |                       |   |   |   |   |   |   |   |   |   | E          |   |   |
| TC                                                                              |                       |   |   |   |   |   |   |   |   |   |            |   |   |
| • Type B                                                                        |                       |   |   |   |   |   |   |   |   |   | F          |   |   |
| • Type E                                                                        |                       |   |   |   |   |   |   |   |   |   | G          |   |   |
| • Type J                                                                        |                       |   |   |   |   |   |   |   |   |   | H          |   |   |
| • Type K                                                                        |                       |   |   |   |   |   |   |   |   |   | J          |   |   |
| • Type L                                                                        |                       |   |   |   |   |   |   |   |   |   | K          |   |   |
| • Type N                                                                        |                       |   |   |   |   |   |   |   |   |   | L          |   |   |
| • Type R                                                                        |                       |   |   |   |   |   |   |   |   |   | N          |   |   |

# Temperature Measurement

## Temperature transmitters

### Compact and head transmitters / SITRANS TH420 (HART, universal)

#### Selection and ordering data (continued)

| SITRANS TH420<br>head transmitter with 2 inputs                                                                                                                        | Article No.<br>7NG041 |  |  |  |  |  |  |  |  |  | Order code |  |  |  |  |  |  |  |  |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|--|--|--|--|--|--|--|--|--|------------|--|--|--|--|--|--|--|--|--|
| • Type S                                                                                                                                                               |                       |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |
| • Type T                                                                                                                                                               |                       |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |
| Potentiometer, 4-wire                                                                                                                                                  |                       |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |
| <b>Input 2, type customer-specific</b>                                                                                                                                 |                       |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |
| Define customer-specific input configurations in W options                                                                                                             |                       |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |
| <b>CJC configuration for TC</b>                                                                                                                                        |                       |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |
| Input 1: no CJC; input 2: No CJC                                                                                                                                       |                       |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |
| Input 1: internal CJC; input 2: internal CJC                                                                                                                           |                       |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |
| Input 1: external CJC; input 2: external CJC; define type in option Jxx                                                                                                |                       |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |
| Input 1: external CJC; define type in option Jxx; input 2: internal CJC                                                                                                |                       |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |
| Input 1: internal CJC; input 2: external CJC; define type in option Jxx                                                                                                |                       |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |
| Input 1: Internal CJC; Input 2: No CJC                                                                                                                                 |                       |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |
| Input 1: External CJC (define type in option Jxx); input 2: No CJC                                                                                                     |                       |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |
| <b>Materials not in contact with media</b>                                                                                                                             |                       |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |
| None                                                                                                                                                                   |                       |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |
| <b>Type of protection</b>                                                                                                                                              |                       |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |
| General safety (non-Ex); CE, RCM, FM, KCC, EAC, CSA, UK                                                                                                                |                       |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |
| Intrinsic safety (Ex i) / non-incendive field wiring (NIFW) / increased safety zone 2 (Ex ec) / non-incendive (NI) (ATEX, IECEx, EACEx, CSA, FM, NEPSI, Inmetro, UKEx) |                       |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |
| <b>Electrical connection/cable entries</b>                                                                                                                             |                       |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |
| None                                                                                                                                                                   |                       |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |
| <b>Local HMI</b>                                                                                                                                                       |                       |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |
| Without display                                                                                                                                                        |                       |  |  |  |  |  |  |  |  |  |            |  |  |  |  |  |  |  |  |  |

| Options                                                                                                 | Order code |
|---------------------------------------------------------------------------------------------------------|------------|
| <b>Add "Z" to article number, specify order code and, if applicable, free text</b>                      |            |
| <b>Manufacturer's declarations</b>                                                                      |            |
| Inspection certificate EN 10204-3.1: Manufacturer test certificate for transmitters (5 measured values) | <b>C11</b> |
| <b>Certificates for functional safety</b>                                                               |            |
| Functional safety SIL2/3 (IEC 61508)                                                                    | <b>C20</b> |
| <b>Device options</b>                                                                                   |            |
| PDF file with device settings                                                                           | <b>D10</b> |
| Without labeling of the measuring range on the TAG plate                                                | <b>D41</b> |
| Input 1: Cable extension 200 mm fixed, for RTD Pt100 (0 ... 100 °C) 4-wire                              | <b>D73</b> |
| Input 2: Cable extension 200 mm fixed, for RTD Pt100 (0 ... 100 °C) 4-wire                              | <b>D74</b> |
| Jumper plug set on device for write protection                                                          | <b>D81</b> |
| Jumper plug set on device set for fault current > 21 mA (instead of < 3.6 mA) (only non-SIL)            | <b>D82</b> |
| <b>External CJC types</b>                                                                               |            |
| Pt100, IEC 60751, 3-wire                                                                                | <b>J02</b> |
| Pt100, IEC 60751, 4-wire                                                                                | <b>J03</b> |
| Ni100, DIN 43760-87, 3-wire                                                                             | <b>J05</b> |
| Ni100, DIN 43760-87, 4-wire                                                                             | <b>J06</b> |
| <b>Noise damping</b>                                                                                    |            |
| Noise damping 60 Hz instead of 50 Hz                                                                    | <b>P10</b> |
| <b>Input 1: TC</b>                                                                                      |            |
| Type C W5                                                                                               | <b>V01</b> |
| Type D W3                                                                                               | <b>V02</b> |
| Type U                                                                                                  | <b>V03</b> |
| Type Lr                                                                                                 | <b>V04</b> |

## Selection and ordering data (continued)

| Options<br>Add "Z" to article number, specify order code and, if applicable, free text                    | Order code |
|-----------------------------------------------------------------------------------------------------------|------------|
| <b>Input 1: Callendar-Van Dusen</b>                                                                       |            |
| 2-wire (define wire resistance value in option Y51 and Callendar-Van Dusen parameter in option Y35)       | <b>V50</b> |
| 3-wire (define Callendar-Van Dusen parameter in option Y35)                                               | <b>V51</b> |
| 4-wire (define Callendar-Van Dusen parameter in option Y35)                                               | <b>V52</b> |
| <b>Input 1: RTD</b>                                                                                       |            |
| Pt × (IEC 60751), 2-wire (define wire resistance value in option Y51 and RTD factor × in option Y21)      | <b>V60</b> |
| Pt × (IEC 60751), 3-wire, define RTD factor × in option Y21                                               | <b>V61</b> |
| Pt × (IEC 60751), 4-wire, define RTD factor × in option Y21                                               | <b>V62</b> |
| Pt × (JIS C1604), 2-wire (define wire resistance value in option Y51 and RTD factor × in option Y21)      | <b>V63</b> |
| Pt × (JIS C1604-81), 3-wire, define RTD factor × in option Y21                                            | <b>V64</b> |
| Pt × (JIS C1604-81), 4-wire, define RTD factor × in option Y21                                            | <b>V65</b> |
| Pt × (GOST 6651-2009), 2-wire (define wire resistance value in option Y51 and RTD factor × in option Y21) | <b>V66</b> |
| Pt × (GOST 6651-2009), 3-wire, define RTD factor × in option Y21                                          | <b>V67</b> |
| Pt × (GOST 6651-2009), 4-wire, define RTD factor × in option Y21                                          | <b>V68</b> |
| Ni × (DIN 43760-87), 2-wire (define wire resistance value in option Y51 and RTD factor × in option Y21)   | <b>V69</b> |
| Ni × (DIN 43760-87), 3-wire, define RTD factor × in option Y21                                            | <b>V70</b> |
| Ni × (DIN 43760-87), 4-wire, define RTD factor × in option Y21                                            | <b>V71</b> |
| Ni × (GOST 6651-2009), 2-wire (define wire resistance value in option Y51 and RTD factor × in option Y21) | <b>V72</b> |
| Ni × (GOST 6651-2009), 3-wire, define RTD factor × in option Y21                                          | <b>V73</b> |
| Ni × (GOST 6651-2009), 4-wire, define RTD factor × in option Y21                                          | <b>V74</b> |
| Cu × (ECW-15), 2-wire (define wire resistance value in option Y51 and RTD factor × in option Y21)         | <b>V75</b> |
| Cu × (ECW-15), 3-wire, define RTD factor × in option Y21                                                  | <b>V76</b> |
| Cu × (ECW-15), 4-wire, define RTD factor × in option Y21                                                  | <b>V77</b> |
| Cu × (GOST 6651-94), 2-wire (define wire resistance value in option Y51 and RTD factor × in option Y21)   | <b>V78</b> |
| Cu × (GOST 6651-94), define 3-wire, define RTD factor × in option Y21                                     | <b>V79</b> |
| Cu × (GOST 6651-94), define 4-wire, define RTD factor × in option Y21                                     | <b>V80</b> |
| Cu × (GOST 6651-2009), 2-wire (define wire resistance value in option Y51 and RTD factor × in option Y21) | <b>V81</b> |
| Cu × (GOST 6651-2009), define 3-wire, define RTD factor × in option Y21                                   | <b>V82</b> |
| Cu × (GOST 6651-2009), define 4-wire, define RTD factor × in option Y21                                   | <b>V83</b> |
| <b>Input 2: TC</b>                                                                                        |            |
| Type C W5                                                                                                 | <b>W01</b> |
| Type D W3                                                                                                 | <b>W02</b> |
| Type U                                                                                                    | <b>W03</b> |
| Type Lr                                                                                                   | <b>W04</b> |

# Temperature Measurement

## Temperature transmitters

### Compact and head transmitters / SITRANS TH420 (HART, universal)

#### Selection and ordering data (continued)

| Options<br>Add "Z" to article number, specify order code and, if applicable, free text                                                         | Order code |
|------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| <b>Input 2: Callendar-Van Dusen</b>                                                                                                            |            |
| 2-wire (define wire resistance value in option Y52 and Callendar-Van Dusen parameter in option Y36)                                            | <b>W50</b> |
| 3-wire (define Callendar-Van Dusen parameter in option Y36)                                                                                    | <b>W51</b> |
| 4-wire (define Callendar-Van Dusen parameter in option Y36)                                                                                    | <b>W52</b> |
| <b>Input 2: RTD</b>                                                                                                                            |            |
| Pt × (IEC 60751), 2-wire (define wire resistance value in option Y52 and RTD factor × in option Y22)                                           | <b>W60</b> |
| Pt × (IEC 60721), 3-wire, define RTD factor × in option Y22                                                                                    | <b>W61</b> |
| Pt × (IEC 60721), 4-wire, define RTD factor × in option Y22                                                                                    | <b>W62</b> |
| Pt × (JIS C1604), 2-wire (define wire resistance value in option Y52 and RTD factor × in option Y22)                                           | <b>W63</b> |
| Pt × (JIS C1604-81), 3-wire, define RTD factor × in option Y22                                                                                 | <b>W64</b> |
| Pt × (JIS C1604-81), 4-wire, define RTD factor × in option Y22                                                                                 | <b>W65</b> |
| Pt × (GOST 6651-2009), 2-wire (define wire resistance value in option Y52 and RTD factor × in option Y22)                                      | <b>W66</b> |
| Pt × (GOST 6651-2009), 3-wire, define RTD factor × in option Y22                                                                               | <b>W67</b> |
| Pt × (GOST 6651-2009), 4-wire, define RTD factor × in option Y22                                                                               | <b>W68</b> |
| Ni × (DIN 43760-87), 2-wire (define wire resistance value in option Y52 and RTD factor × in option Y22)                                        | <b>W69</b> |
| Ni × (DIN 43760-87), 3-wire, define RTD factor × in option Y22                                                                                 | <b>W70</b> |
| Ni × (DIN 43760-87), 4-wire, define RTD factor × in option Y22                                                                                 | <b>W71</b> |
| Ni × (GOST 6651-2009), 2-wire (define wire resistance value in option Y52 and RTD factor × in option Y22)                                      | <b>W72</b> |
| Ni × (GOST 6651-2009), 3-wire, define RTD factor × in option Y22                                                                               | <b>W73</b> |
| Ni × (GOST 6651-2009), 4-wire, define RTD factor × in option Y22                                                                               | <b>W74</b> |
| Cu × (ECW-15), 2-wire (define wire resistance value in option Y52 and RTD factor × in option Y22)                                              | <b>W75</b> |
| Cu × (ECW-15), 3-wire, define RTD factor × in option Y22                                                                                       | <b>W76</b> |
| Cu × (ECW-15), 4-wire, define RTD factor × in option Y22                                                                                       | <b>W77</b> |
| Cu × (GOST 6651-94), 2-wire (define wire resistance value in option Y52 and RTD factor × in option Y22)                                        | <b>W78</b> |
| Cu × (GOST 6651-94), 3-wire, define RTD factor × in option Y22                                                                                 | <b>W79</b> |
| Cu × (GOST 6651-94), 4-wire, define RTD factor × in option Y22                                                                                 | <b>W80</b> |
| Cu × (GOST 6651-2009), 2-wire (define wire resistance value in option Y52 and RTD factor × in option Y22)                                      | <b>W81</b> |
| Cu × (GOST 6651-2009), 3-wire, define RTD factor × in option Y22                                                                               | <b>W82</b> |
| Cu × (GOST 6651-2009), 4-wire, define RTD factor × in option Y22                                                                               | <b>W83</b> |
| <b>Device settings</b>                                                                                                                         |            |
| Measuring range setting temperature input: Lower range value (max. 5 characters), upper range value (max. 5 characters), unit (°C, °F, °Ra, K) | <b>Y01</b> |
| Customer-specific programming in plain text (n-lines)                                                                                          | <b>Y09</b> |

## Selection and ordering data (continued)

| Options<br>Add "Z" to article number, specify order code and, if applicable, free text                                                                                                                                                   | Order code |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| Tag<br>(device parameters, max. 32 characters), adhesive label                                                                                                                                                                           | Y15        |
| Measuring point description<br>(device parameters, max. 32 characters), adhesive label                                                                                                                                                   | Y16        |
| Tag (device parameters, max. 8 characters), adhesive label                                                                                                                                                                               | Y17        |
| Descriptor (device parameters, max. 16 characters), adhesive label                                                                                                                                                                       | Y18        |
| Input 1: RTD factor; e.g. factor "200" = Pt200, adhesive label                                                                                                                                                                           | Y21        |
| Input 2: RTD factor (e.g. factor "200" => RTD Pt200), adhesive label                                                                                                                                                                     | Y22        |
| Fault current for input circuit short-circuit & interruption instead of 22.4 mA (short-circuit) and 22.8 mA (interruption) e.g. 3.6 mA and 22.4 mA [3.6 - 3.6; 3.6 - 22.8; 22.4 - 3.6]                                                   | Y31        |
| CvD Sensor matching factors input 1 R0, A, B, C, Beta, Delta Selection: CVDR - R0 (format for example 100.0), CVDA - A (format for example 0.003908), CVDB - B (format for example -5.775E-07), CVDC - C (format for example -4.183E-12) | Y35        |
| CvD Sensor matching factors input 2 R0, A, B, C, Beta, Delta Selection: CVDR - R0 (format for example 100.0), CVDA - A (format for example 0.003908), CVDB - B (format for example -5.775E-07), CVDC - C (format for example -4.183E-12) | Y36        |
| Wire resistance value input 1 in ohms (0 ... 100 ohms)                                                                                                                                                                                   | Y51        |
| Wire resistance value input 2 in ohms (0 ... 100 ohms)                                                                                                                                                                                   | Y52        |
| Input 1: CJC sensor, fixed value (see measuring range for unit)                                                                                                                                                                          | Y60        |
| Input 2: CJC sensor, fixed value (see measuring range for unit)                                                                                                                                                                          | Y61        |

## Accessories

| Article No.                                                                                                                                            |                             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| Other accessories for assembly, connection and transmitter configuration, see page 2/198.                                                              |                             |
| <b>Modems</b>                                                                                                                                          |                             |
| HART modem with USB interface                                                                                                                          | 7MF4997-1DB                 |
| <b>SIMATIC PDM parameterization software</b>                                                                                                           | See Catalog FI 01 section 8 |
| <b>Mounting rail adapter for head transmitter</b><br>(Quantity delivered: 5 units)                                                                     | 7NG3092-8KA                 |
| <b>Connecting cable</b><br>4-wire, 200 mm (7.87 inches), for input connections when using head transmitters in the high spring flap (set with 5 units) | 7NG3092-8KC                 |

## Ordering example

7NG0410-0BA00-0AA0-Z Y01  
Y01: -10 ... +100 °C

## Factory setting

- Input 1: Pt100 (IEC 751); 3-wire connection
- Input 2: not configured (inactive)
- Measuring range: 0 ... 100 °C (32 ... 212 °F)

# Temperature Measurement

## Temperature transmitters

### Compact and head transmitters / SITRANS TH420 (HART, universal)

#### Selection and ordering data (continued)

- Fault current
  - Device fault: < 3.6 mA
  - Input circuit wire break: 22.8 mA
  - Input circuit short-circuit: 22.4 mA
  - Input circuit drift: 22 mA (active when input 2 is active)
  - Input monitoring wire break and short-circuit
- No trimming of input and output (offset)
- Damping 0.0 s

#### Technical specifications

| SITRANS TH420 (HART, universal)                                    |                                                                                                                                                |
|--------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>General</b>                                                     |                                                                                                                                                |
| Supply voltage <sup>1) 2)</sup>                                    |                                                                                                                                                |
| • 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                   | $(V_{\text{supply}} - 37 \text{ V})/23 \text{ mA}$                                                                                             |
| 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                                                   | Wire jumpers or software                                                                                                                       |
| Warm-up time                                                       | < 5 min                                                                                                                                        |
| Starting time                                                      | < 2.75 s                                                                                                                                       |
| Programming                                                        | HART                                                                                                                                           |
| Signal-to-noise ratio                                              | > 60 dB                                                                                                                                        |
| Long-term stability                                                | Better than: <ul style="list-style-type: none"> <li>• ± 0.05% of measuring span/year</li> <li>• ± 0.18% of measuring span/5 years</li> </ul>   |
| Response time                                                      | ≤ 75 ms (typically 70 ms)                                                                                                                      |
| Programmable damping                                               | 0 ... 60 s                                                                                                                                     |
| Signal dynamic                                                     |                                                                                                                                                |
| • Input                                                            | 24 bit                                                                                                                                         |
| • Output                                                           | 18 bit                                                                                                                                         |
| Influence of change in supply voltage                              | < 0.005% of measuring span/V DC                                                                                                                |
| <b>Input</b>                                                       |                                                                                                                                                |
| <b><u>Resistance thermometer (RTD)</u></b>                         |                                                                                                                                                |
| Input type                                                         |                                                                                                                                                |
| • Pt10 ... 10000                                                   | <ul style="list-style-type: none"> <li>• IEC 60751</li> <li>• JIS C 1604-8</li> <li>• GOST 6651_2009</li> <li>• Callendar-Van Dusen</li> </ul> |
| • Ni10 ... 10000                                                   | <ul style="list-style-type: none"> <li>• DIN 43760-1987</li> <li>• GOST 6651-2009/OIML R84:2003</li> </ul>                                     |
| • Cu5 ... 1000                                                     | <ul style="list-style-type: none"> <li>• Edison Copper Winding No. 15</li> <li>• GOST 6651-2009/OIML R84:2003</li> </ul>                       |
| Connection type                                                    | 2-wire, 3-wire or 4-wire                                                                                                                       |
| Wire resistance per wire                                           | Max. 50 Ω                                                                                                                                      |
| Input current                                                      | < 0.15 mA                                                                                                                                      |
| Effect of the wire 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                                                                                                                                     |

## Technical specifications (continued)

| SITRANS TH420 (HART, universal)                                              |                                                                                                                                                                                                                                                                                                         |
|------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| • All other input types                                                      | Max. 50 nF                                                                                                                                                                                                                                                                                              |
| Fault detection, programmable                                                | None, short-circuited, defective, short-circuited or defective<br><b>Note</b><br>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 $\Omega$                                                                                                                                                                                                                                                                                             |
| Fault detection time (RTD)                                                   | $\leq 75$ ms (typically 70 ms)                                                                                                                                                                                                                                                                          |
| Fault detection time (for 3-wire and 4-wire)                                 | $\leq 2\,000$ ms                                                                                                                                                                                                                                                                                        |
| <b><u>Thermocouples (TC)</u></b>                                             |                                                                                                                                                                                                                                                                                                         |
| Input type                                                                   |                                                                                                                                                                                                                                                                                                         |
| • B                                                                          | IEC 60584-1                                                                                                                                                                                                                                                                                             |
| • E                                                                          | IEC 60584-1                                                                                                                                                                                                                                                                                             |
| • J                                                                          | IEC 60584-1                                                                                                                                                                                                                                                                                             |
| • K                                                                          | IEC 60584-1                                                                                                                                                                                                                                                                                             |
| • L                                                                          | DIN 43710                                                                                                                                                                                                                                                                                               |
| • Lr                                                                         | GOST 3044-84                                                                                                                                                                                                                                                                                            |
| • N                                                                          | IEC 60584-1                                                                                                                                                                                                                                                                                             |
| • R                                                                          | IEC 60584-1                                                                                                                                                                                                                                                                                             |
| • S                                                                          | IEC 60584-1                                                                                                                                                                                                                                                                                             |
| • T                                                                          | IEC 60584-1                                                                                                                                                                                                                                                                                             |
| • U                                                                          | DIN 43710                                                                                                                                                                                                                                                                                               |
| • W3                                                                         | ASTM E988-96                                                                                                                                                                                                                                                                                            |
| • W5                                                                         | ASTM E988-96                                                                                                                                                                                                                                                                                            |
| • LR                                                                         | GOST 3044-84                                                                                                                                                                                                                                                                                            |
| Cold Junction Compensation (CJC)                                             | Constant, internal or external over Pt100 or Ni100 RTD                                                                                                                                                                                                                                                  |
| • Temperature range internal CJC                                             | -50 ... +100 °C (-58 ... +212 °F)                                                                                                                                                                                                                                                                       |
| • Connection external CJC                                                    | 2-wire, 3-wire or 4-wire                                                                                                                                                                                                                                                                                |
| • External CJC, wire resistance per wire (for 3-wire and 4-wire connections) | 50 $\Omega$                                                                                                                                                                                                                                                                                             |
| • Effect of the wire resistance (with 3-wire and 4-wire connections)         | $< 0.002$ $\Omega/\Omega$                                                                                                                                                                                                                                                                               |
| • 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 wire resistance                                                      | Max. 10 k $\Omega$                                                                                                                                                                                                                                                                                      |
| • Fault detection, programmable                                              | None, short-circuited, defective, short-circuited or defective<br><b>Note</b><br>The short-circuited fault detection only applies to the CJC input.                                                                                                                                                     |
| • Fault detection time (TC)                                                  | $\leq 75$ ms (typically 70 ms)                                                                                                                                                                                                                                                                          |
| • Fault detection time, external CJC (for 3-wire and 4-wire)                 | $\leq 2\,000$ ms                                                                                                                                                                                                                                                                                        |
| <b><u>Linear resistance</u></b>                                              |                                                                                                                                                                                                                                                                                                         |
| Input range                                                                  | 0 ... 100 k $\Omega$                                                                                                                                                                                                                                                                                    |
| Minimum measuring span                                                       | 25 $\Omega$                                                                                                                                                                                                                                                                                             |
| Connection type                                                              | 2-wire, 3-wire or 4-wire                                                                                                                                                                                                                                                                                |
| Wire resistance per wire                                                     | Max. 50 $\Omega$                                                                                                                                                                                                                                                                                        |
| Input current                                                                | $< 0.15$ mA                                                                                                                                                                                                                                                                                             |
| Effect of the wire resistance (with 3-wire and 4-wire connections)           | $< 0.002$ $\Omega/\Omega$                                                                                                                                                                                                                                                                               |
| Cable, wire-wire capacity                                                    |                                                                                                                                                                                                                                                                                                         |
| • R > 400 $\Omega$                                                           | Max. 30 nF                                                                                                                                                                                                                                                                                              |

# Temperature Measurement

## Temperature transmitters

### Compact and head transmitters / SITRANS TH420 (HART, universal)

#### Technical specifications (continued)

| SITRANS TH420 (HART, universal)                                                                               |                                                                                                                                                                                                                             |
|---------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| • $R \leq 400 \Omega$                                                                                         | Max. 50 nF                                                                                                                                                                                                                  |
| Fault detection, programmable                                                                                 | None, defective                                                                                                                                                                                                             |
| <b>Potentiometers</b>                                                                                         |                                                                                                                                                                                                                             |
| Input range                                                                                                   | 10 ... 100 k $\Omega$                                                                                                                                                                                                       |
| Minimum measuring span                                                                                        | 25 $\Omega$                                                                                                                                                                                                                 |
| Connection type                                                                                               | 3-wire, 4-wire or 5-wire                                                                                                                                                                                                    |
| Wire resistance per wire                                                                                      | Max. 50 $\Omega$                                                                                                                                                                                                            |
| Input current                                                                                                 | < 0.15 mA                                                                                                                                                                                                                   |
| Effect of the wire resistance (with 4-wire and 5-wire connections)                                            | < 0.002 $\Omega/\Omega$                                                                                                                                                                                                     |
| Cable, wire-wire capacity                                                                                     |                                                                                                                                                                                                                             |
| • $R > 400 \Omega$                                                                                            | Max. 30 nF                                                                                                                                                                                                                  |
| • $R \leq 400 \Omega$                                                                                         | Max. 50 nF                                                                                                                                                                                                                  |
| Fault detection, programmable                                                                                 | None, short-circuited, defective, short-circuited or defective                                                                                                                                                              |
|                                                                                                               | <b>Note</b><br>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 $\Omega$                                                                                                                                                                                                                 |
| Fault detection time, wiper arm (no short-circuit detection)                                                  | $\leq 75$ ms (typically 70 ms)                                                                                                                                                                                              |
| Fault detection time, element                                                                                 | $\leq 2\,000$ ms                                                                                                                                                                                                            |
| Fault detection time (for 4-wire and 5-wire)                                                                  | $\leq 2\,000$ ms                                                                                                                                                                                                            |
| <b>Voltage input</b>                                                                                          |                                                                                                                                                                                                                             |
| Measuring range                                                                                               |                                                                                                                                                                                                                             |
| • Unipolar                                                                                                    | -100 ... 1700 mV                                                                                                                                                                                                            |
| • Bipolar                                                                                                     | -800 ... +800 mV                                                                                                                                                                                                            |
| Minimum measuring span                                                                                        | 2.5 mV                                                                                                                                                                                                                      |
| Input resistance                                                                                              | 10 M $\Omega$                                                                                                                                                                                                               |
| 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                                                                                          | $\leq 75$ ms (typically 70 ms)                                                                                                                                                                                              |
| <b>Output and HART communication</b>                                                                          |                                                                                                                                                                                                                             |
| 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)                                                                                    | $\leq (V_{\text{Supply}} - 7.5)/0.023 \Omega$                                                                                                                                                                               |
| Load stability                                                                                                | < 0.01% of measuring span/100 $\Omega$<br>(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                                                                                                                                                                                                                      |
| <b>Measuring accuracy</b>                                                                                     |                                                                                                                                                                                                                             |
| Input accuracy                                                                                                | See "Input accuracy" table                                                                                                                                                                                                  |
| Output accuracy                                                                                               | See "Output accuracy" table                                                                                                                                                                                                 |
| <b>Operating conditions</b>                                                                                   |                                                                                                                                                                                                                             |
| Ambient temperature                                                                                           | -50 ... +85 °C (-58 ... +185 °F)                                                                                                                                                                                            |
| Ambient temperature for devices with functional safety                                                        | -40 ... +80 °C (-40 ... +176 °F)                                                                                                                                                                                            |

## Technical specifications (continued)

| SITRANS TH420 (HART, universal)                              |                                                                                                                                                                                                                   |
|--------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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                                      | IP68                                                                                                                                                                                                              |
| • Terminals                                                  | IP00                                                                                                                                                                                                              |
| <b>Structural design</b>                                     |                                                                                                                                                                                                                   |
| Weight                                                       | 50 g (0.11 lb)                                                                                                                                                                                                    |
| Maximum core cross-section                                   | 1 × 1.5 mm <sup>2</sup> (stranded wire)                                                                                                                                                                           |
| Tightening torque for clamping screws                        | 0.4 Nm                                                                                                                                                                                                            |
| Vibrations                                                   | IEC 60068-2-6                                                                                                                                                                                                     |
| • 2 ... 25 Hz                                                | ± 1.6 mm (0.07 inches)                                                                                                                                                                                            |
| • 25 ... 100 Hz                                              | ± 4 g                                                                                                                                                                                                             |
| <b>Certificates and approvals</b>                            |                                                                                                                                                                                                                   |
| <b><u>Explosion protection ATEX/IECEx and others</u></b>     |                                                                                                                                                                                                                   |
| Certificates <sup>3)</sup>                                   | <ul style="list-style-type: none"> <li>• DEKRA 17ATEX0116 X</li> <li>• IECEx DEK 17.0054X</li> <li>• A5E43700604A-2018X</li> </ul>                                                                                |
| "Intrinsic safety ia/ib" type of protection                  | For use in Zone 0, 1, 2, 20, 21, 22                                                                                                                                                                               |
| • ATEX                                                       | <ul style="list-style-type: none"> <li>• II 1 G Ex ia IIC T6 ... T4 Ga</li> <li>• II 2(1) G Ex ib [ia Ga] IIC T6 ... T4 Gb</li> <li>• II 2 D Ex ia IIIC Db</li> <li>• I M1 Ex ia I Ma</li> </ul>                  |
| • IECEx and others                                           | <ul style="list-style-type: none"> <li>• Ex ia IIC T6 ... T4 Ga</li> <li>• Ex ib [ia Ga] IIC T6 ... T4 Gb</li> <li>• Ex ia IIIC Db</li> <li>• Ex ia I Ma</li> </ul>                                               |
| "Intrinsic safety ic" type of protection                     | For use in Zones 2 and 22                                                                                                                                                                                         |
| • ATEX                                                       | <ul style="list-style-type: none"> <li>• II 3 G Ex ic IIC T6...T4 Gc</li> <li>• II 3 D Ex ic IIIC Dc</li> </ul>                                                                                                   |
| • IECEx and others                                           | <ul style="list-style-type: none"> <li>• Ex ic IIC T6 ... T4 Gc</li> <li>• Ex ic IIIC Dc</li> </ul>                                                                                                               |
| "Non-sparking/increased safety nA/ec" type of protection     | For use in Zones 2 and 22                                                                                                                                                                                         |
| • ATEX                                                       | <ul style="list-style-type: none"> <li>• II 3 G Ex nA IIC T6...T4 Gc</li> <li>• II 3 G Ex ec IIC T6...T4 Gc</li> </ul>                                                                                            |
| • IECEx and others                                           | <ul style="list-style-type: none"> <li>• Ex nA IIC T6 ... T4 Gc</li> <li>• Ex ec IIC T6 ... T4 Gc</li> </ul>                                                                                                      |
| <b><u>Explosion protection CSA/FM for Canada and USA</u></b> |                                                                                                                                                                                                                   |
| Certificates                                                 | <ul style="list-style-type: none"> <li>• CSA 1861385</li> <li>• FM18CA0024</li> <li>• FM18US0046</li> </ul>                                                                                                       |
| "Intrinsic safety ia" type of protection                     | <ul style="list-style-type: none"> <li>• IS, CL I, Div 1, GP ABCD, T6 ... T4</li> <li>• 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</li> </ul> |
| "Non incensive field wiring NIFW" type of protection         | NIFW, CL I, Div 2, GP ABCD T6 ... T4                                                                                                                                                                              |
| "Non incensive NI" type of protection                        | <ul style="list-style-type: none"> <li>• NI, CL I, Div 2, GP ABCD T6...T4</li> <li>• Ex nA IIC T6 ... T4 Gc</li> <li>• AEx nA IIC T6 ... T4 Gc</li> </ul>                                                         |

<sup>1)</sup> Note that the minimum supply voltage must correspond to the value measured at the terminals of the SITRANS TH420. All external voltage drops must be taken into account.

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

<sup>3)</sup> Additional available certificates are listed on the internet at <http://www.siemens.com/processinstrumentation/certificates>

# Temperature Measurement

## Temperature transmitters

### Compact and head transmitters / SITRANS TH420 (HART, universal)

#### Technical specifications (continued)

##### Measuring ranges/Minimum measuring span

###### RTD

| Input type     | Standard                       | Measuring range in °C (°F)      | $\alpha_0$ in °C <sup>-1</sup> (°F <sup>-1</sup> ) | 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 R84:2-003  | -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 <sup>1)</sup>                 |
|------------|----------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|
| RTD        |                                                                                                                            |                                                       |
| Pt10       | $\leq \pm 0.8$ °C (1.44 °F)                                                                                                | $\leq \pm 0.020$ °C/°C (°F/°F)                        |
| Pt20       | $\leq \pm 0.4$ °C (0.72 °F)                                                                                                | $\leq \pm 0.010$ °C/°C (°F/°F)                        |
| Pt50       | $\leq \pm 0.16$ °C (0.288 °F)                                                                                              | $\leq \pm 0.004$ °C/°C (°F/°F)                        |
| Pt100      | $\leq \pm 0.04$ °C (0.072 °F)                                                                                              | $\leq \pm 0.002$ °C/°C (°F/°F)                        |
| Pt200      | $\leq \pm 0.08$ °C (0.144 °F)                                                                                              | $\leq \pm 0.002$ °C/°C (°F/°F)                        |
| Pt500      | $T_{\max.} < 180$ °C (356 °F) $\leq \pm 0.08$ °C (0.144 °F)<br>$T_{\max.} > 180$ °C (356 °F) $\leq \pm 0.16$ °C (0.288 °F) | $\leq \pm 0.002$ °C/°C (°F/°F)                        |
| Pt1000     | $\leq \pm 0.08$ °C (0.144 °F)                                                                                              | $\leq \pm 0.002$ °C/°C (°F/°F)                        |
| Pt2000     | $T_{\max.} < 300$ °C (572 °F) $\leq \pm 0.08$ °C (0.144 °F)<br>$T_{\max.} > 300$ °C (572 °F) $\leq \pm 0.4$ °C (0.72 °F)   | $\leq \pm 0.002$ °C/°C (°F/°F)                        |
| Pt10000    | $\leq \pm 0.16$ °C (0.288 °F)                                                                                              | $\leq \pm 0.002$ °C/°C (°F/°F)                        |
| Pt x       | Largest tolerance of neighboring points                                                                                    | Largest temperature coefficient of neighboring points |
| Ni10       | $\leq \pm 1.6$ °C (2.88 °F)                                                                                                | $\leq \pm 0.020$ °C/°C (°F/°F)                        |

## Temperature Measurement

## Temperature transmitters

## Compact and head transmitters / SITRANS TH420 (HART, universal)

## Technical specifications (continued)

| Input type               | Basic accuracy                                                                                                            | Temperature coefficient <sup>1)</sup>                          |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|
| Ni20                     | $\leq \pm 0.8\text{ °C (1.44 °F)}$                                                                                        | $\leq \pm 0.010\text{ °C/°C (°F/°F)}$                          |
| Ni50                     | $\leq \pm 0.32\text{ °C (0.576 °F)}$                                                                                      | $\leq \pm 0.004\text{ °C/°C (°F/°F)}$                          |
| Ni100                    | $\leq \pm 0.16\text{ °C (0.288 °F)}$                                                                                      | $\leq \pm 0.002\text{ °C/°C (°F/°F)}$                          |
| Ni120                    | $\leq \pm 0.16\text{ °C (0.288 °F)}$                                                                                      | $\leq \pm 0.002\text{ °C/°C (°F/°F)}$                          |
| Ni200                    | $\leq \pm 0.16\text{ °C (0.288 °F)}$                                                                                      | $\leq \pm 0.002\text{ °C/°C (°F/°F)}$                          |
| Ni500                    | $\leq \pm 0.16\text{ °C (0.288 °F)}$                                                                                      | $\leq \pm 0.002\text{ °C/°C (°F/°F)}$                          |
| Ni1000                   | $\leq \pm 0.16\text{ °C (0.288 °F)}$                                                                                      | $\leq \pm 0.002\text{ °C/°C (°F/°F)}$                          |
| Ni2000                   | $\leq \pm 0.16\text{ °C (0.288 °F)}$                                                                                      | $\leq \pm 0.002\text{ °C/°C (°F/°F)}$                          |
| Ni10000                  | $\leq \pm 0.32\text{ °C (0.576 °F)}$                                                                                      | $\leq \pm 0.002\text{ °C/°C (°F/°F)}$                          |
| Ni x                     | Largest tolerance of neighboring points                                                                                   | Largest temperature coefficient of neighboring points          |
| Cu5                      | $\leq \pm 1.6\text{ °C (2.88 °F)}$                                                                                        | $\leq \pm 0.040\text{ °C/°C (°F/°F)}$                          |
| Cu10                     | $\leq \pm 0.8\text{ °C (1.44 °F)}$                                                                                        | $\leq \pm 0.020\text{ °C/°C (°F/°F)}$                          |
| Cu20                     | $\leq \pm 0.4\text{ °C (0.72 °F)}$                                                                                        | $\leq \pm 0.010\text{ °C/°C (°F/°F)}$                          |
| Cu50                     | $\leq \pm 0.16\text{ °C (0.288 °F)}$                                                                                      | $\leq \pm 0.004\text{ °C/°C (°F/°F)}$                          |
| Cu100                    | $\leq \pm 0.08\text{ °C (0.144 °F)}$                                                                                      | $\leq \pm 0.002\text{ °C/°C (°F/°F)}$                          |
| Cu200                    | $\leq \pm 0.08\text{ °C (0.144 °F)}$                                                                                      | $\leq \pm 0.002\text{ °C/°C (°F/°F)}$                          |
| Cu500                    | $\leq \pm 0.16\text{ °C (0.288 °F)}$                                                                                      | $\leq \pm 0.002\text{ °C/°C (°F/°F)}$                          |
| Cu1000                   | $\leq \pm 0.08\text{ °C (0.144 °F)}$                                                                                      | $\leq \pm 0.002\text{ °C/°C (°F/°F)}$                          |
| Cu x                     | Largest tolerance of neighboring points                                                                                   | Largest temperature coefficient of neighboring points          |
| <b>Linear resistance</b> |                                                                                                                           |                                                                |
| 0 ... 400 $\Omega$       | $\leq \pm 40\text{ m}\Omega$                                                                                              | $\leq \pm 2\text{ m}\Omega/\text{°C (1.11 m}\Omega/\text{°F)}$ |
| 0 ... 100 k $\Omega$     | $\leq \pm 4\text{ }\Omega$                                                                                                | $\leq \pm 0.2\text{ }\Omega/\text{°C (0.11 }\Omega/\text{°F)}$ |
| <b>Potentiometers</b>    |                                                                                                                           |                                                                |
| 0 ... 100%               | $< 0.05\%$                                                                                                                | $< \pm 0.005\%$                                                |
| <b>Voltage input</b>     |                                                                                                                           |                                                                |
| mV: -20 ... 100 mV       | $\leq \pm 5\text{ }\mu\text{V}$                                                                                           | $\leq \pm 0.2\text{ }\mu\text{V/°C (0.11 }\mu\text{V/°F)}$     |
| mV: -100 ... 1700 mV     | $\leq \pm 0.1\text{ mV}$                                                                                                  | $\leq \pm 36\text{ }\mu\text{V/°C (20 }\mu\text{V/°F)}$        |
| mV: $\pm 800\text{ mV}$  | $\leq \pm 0.1\text{ mV}$                                                                                                  | $\leq \pm 32\text{ }\mu\text{V/°C (17.8 }\mu\text{V/°F)}$      |
| <b>TC</b>                |                                                                                                                           |                                                                |
| E                        | $\leq \pm 0.2\text{ °C (0.36 °F)}$                                                                                        | $\leq \pm 0.025\text{ °C/°C (°F/°F)}$                          |
| J                        | $\leq \pm 0.25\text{ °C (0.45 °F)}$                                                                                       | $\leq \pm 0.025\text{ °C/°C (°F/°F)}$                          |
| K                        | $\leq \pm 0.25\text{ °C (0.45 °F)}$                                                                                       | $\leq \pm 0.025\text{ °C/°C (°F/°F)}$                          |
| L                        | $\leq \pm 0.35\text{ °C (0.63 °F)}$                                                                                       | $\leq \pm 0.025\text{ °C/°C (°F/°F)}$                          |
| N                        | $\leq \pm 0.4\text{ °C (0.72 °F)}$                                                                                        | $\leq \pm 0.025\text{ °C/°C (°F/°F)}$                          |
| T                        | $\leq \pm 0.25\text{ °C (0.45 °F)}$                                                                                       | $\leq \pm 0.025\text{ °C/°C (°F/°F)}$                          |
| U                        | $< 0\text{ °C (32 °F)} \leq \pm 0.8\text{ °C (1.44 °F)}$<br>$\geq 0\text{ °C (32 °F)} \leq \pm 0.4\text{ °C (0.72 °F)}$   | $\leq \pm 0.025\text{ °C/°C (°F/°F)}$                          |
| Lr                       | $\leq \pm 0.2\text{ °C (0.36 °F)}$                                                                                        | $\leq \pm 0.1\text{ °C/°C (°F/°F)}$                            |
| R                        | $< 200\text{ °C (392 °F)} \leq \pm 0.5\text{ °C (0.9 °F)}$<br>$\geq 200\text{ °C (392 °F)} \leq \pm 1\text{ °C (1.8 °F)}$ | $\leq \pm 0.1\text{ °C/°C (°F/°F)}$                            |
| S                        | $< 200\text{ °C (392 °F)} \leq \pm 0.5\text{ °C (0.9 °F)}$<br>$\geq 200\text{ °C (392 °F)} \leq \pm 1\text{ °C (1.8 °F)}$ | $\leq \pm 0.1\text{ °C/°C (°F/°F)}$                            |
| W3                       | $\leq \pm 0.6\text{ °C (1.08 °F)}$                                                                                        | $\leq \pm 0.1\text{ °C/°C (°F/°F)}$                            |
| W5                       | $\leq \pm 0.4\text{ °C (0.72 °F)}$                                                                                        | $\leq \pm 0.1\text{ °C/°C (°F/°F)}$                            |
| B <sup>2)</sup>          | $\leq \pm 1\text{ °C (1.8 °F)}$                                                                                           | $\leq \pm 0.1\text{ °C/°C (°F/°F)}$                            |
| B <sup>3)</sup>          | $\leq \pm 3\text{ °C (5.4 °F)}$                                                                                           | $\leq \pm 0.1\text{ °C/°C (°F/°F)}$                            |
| B <sup>4)</sup>          | $\leq \pm 8\text{ °C (14.4 °F)}$                                                                                          | $\leq \pm 0.8\text{ °C/°C (°F/°F)}$                            |
| B <sup>5)</sup>          | Not specified                                                                                                             | Not specified                                                  |
| CJC (internal)           | $< \pm 0.5\text{ °C (0.9 °F)}$                                                                                            | Included in basic accuracy                                     |
| CJC (external)           | $\leq \pm 0.08\text{ °C (0.144 °F)}$                                                                                      | $\leq \pm 0.002\text{ °C/°C (°F/°F)}$                          |

<sup>1)</sup> Temperature coefficients correspond to the specified values or 0.002% of the input span, depending on which value is greater.

<sup>2)</sup> Accuracy of the specification range  $> 400\text{ °C (752 °F)}$

<sup>3)</sup> Accuracy of the specification range  $> 160\text{ °C (320 °F)} < 400\text{ °C (752 °F)}$

<sup>4)</sup> Accuracy of the specification range  $> 85\text{ °C (185 °F)} < 160\text{ °C (320 °F)}$

<sup>5)</sup> Accuracy of the specification range  $< 85\text{ °C (185 °F)}$

# Temperature Measurement

## Temperature transmitters

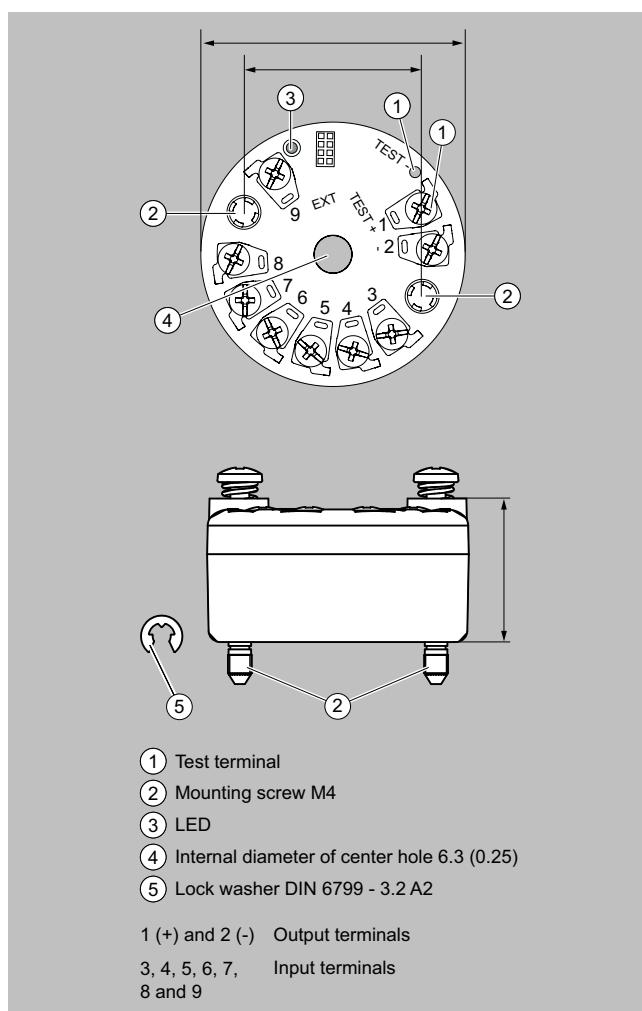
### Compact and head transmitters / SITRANS TH420 (HART, universal)

#### Technical specifications (continued)

##### Output accuracy

| Output type               | Basic accuracy                                             | Temperature coefficient                                                       |
|---------------------------|------------------------------------------------------------|-------------------------------------------------------------------------------|
| Average value measurement | Average of accuracy of input 1 and input 2                 | Average of temperature coefficient of input 1 and input 2                     |
| Differential measurement  | Sum of accuracy of input 1 and input 2                     | Sum of temperature coefficient of input 1 and input 2                         |
| Analog output             | $\leq \pm 1.6 \mu\text{A}$ (0.01% of the full output span) | $\leq \pm 0.48 \mu\text{A/K}$ ( $\leq \pm 0.003\%$ of the full output span/K) |

#### Dimensional drawings

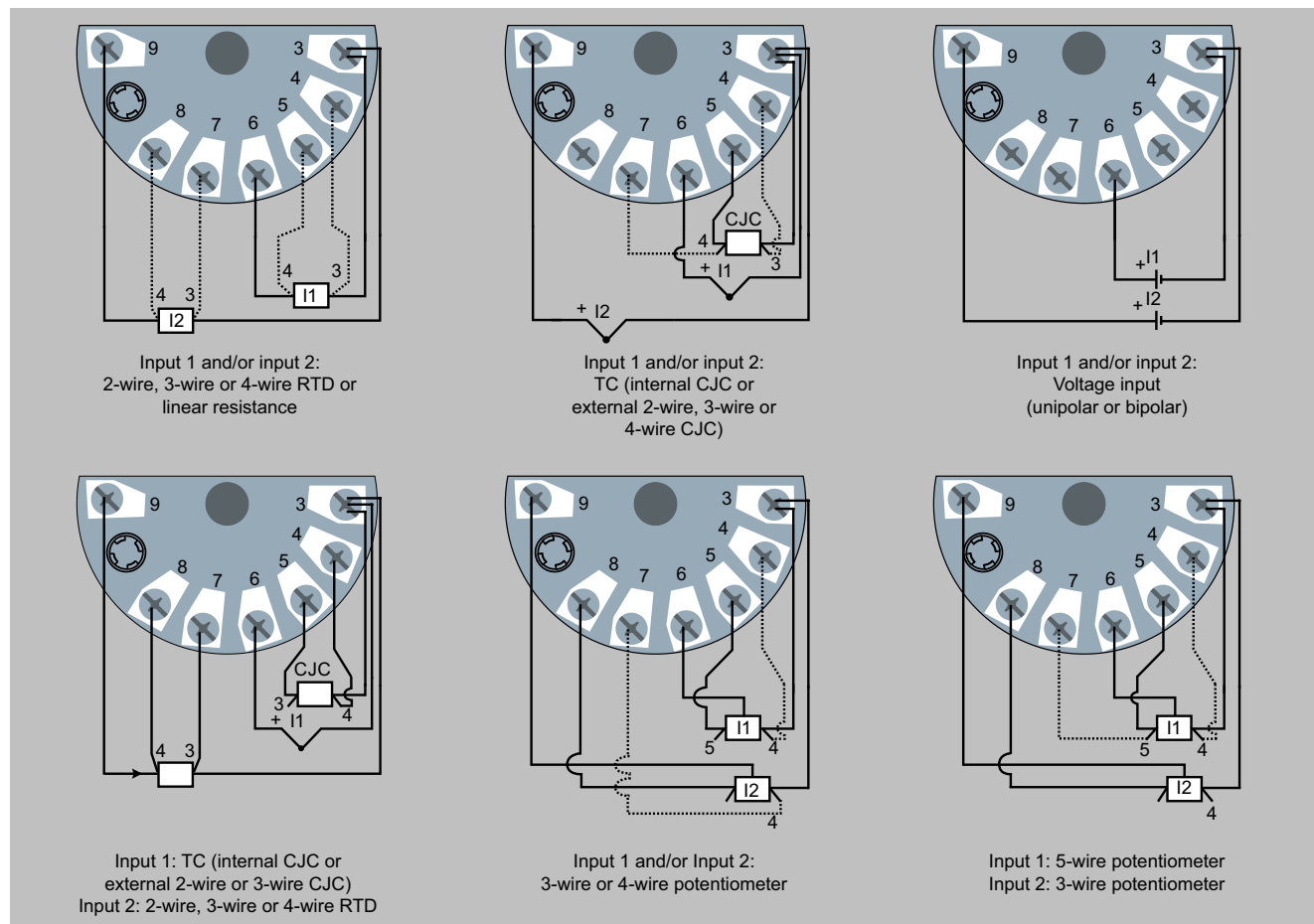


SITRANS TH420, dimensions and pin assignment, dimensions in mm (inch)

## Circuit diagrams

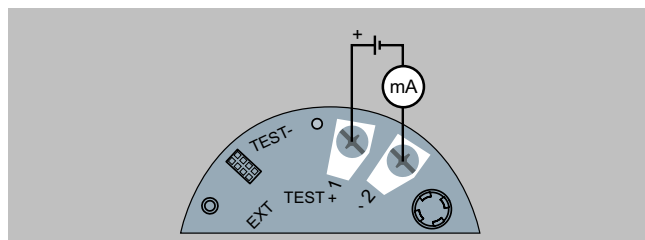
## Connections

## Input connection



SITRANS TH420, input connection assignment

## Output connection



SITRANS TH420, output connection assignment