

# SensyTemp TSC400 Industrial thermometer

Measurement made easy

For plug-in connection

For screw-in connection

For surface measurement



## Description

- Fastest possible measuring results through direct contact of the sheathed cable with the medium
- Widest application ranges through optimum sheath materials
- Subsequent installation possible by surface mounting
- Optimal usage due to a combination of mechanical and electrical interfaces

## Electrical connections

- By connection head Form F
- By plug or free socket
- By connecting cable

## Mechanical connections

- With compression fitting and fixed screw-in connection
- With weld-on plate for permanent surface measurement
- With molded part for tension clip mounting

## Approvals for explosion protection

- ATEX Ex ia
- ATEX Ex ib
- ATEX Ex n
- IECEx ia

## Applications

Universal application

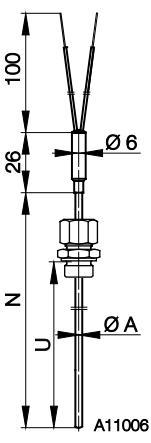
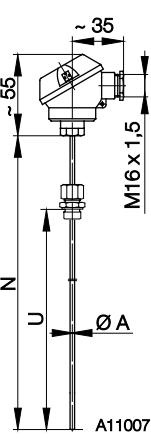
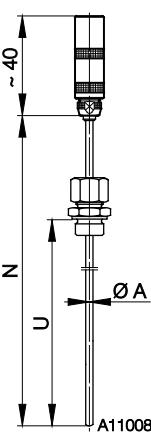
- in general process engineering
- in tank and pipeline construction
- in mechanical and plant engineering

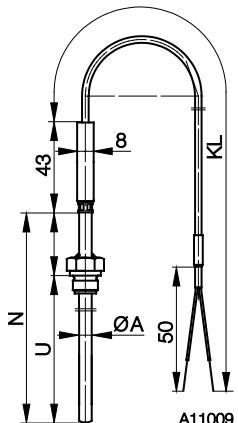
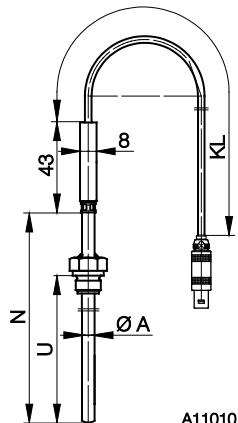
# SensyTemp TSC400

## Industrial thermometer

### General description

#### Overview of industrial thermometers

| Type TSC420, with direct electrical connection  |   |                        |                           |
|---|---|------------------------|---------------------------|
| Dimensions in mm  |   |                        |                           |
| U = Installation length<br>N = Nominal length<br>$\varnothing$ A = Diameter of MI-Cable |    |                        |                           |
| Electrical connection   | Single and double thermocouples<br>Single Pt100 / 2-W, 3-W or 4-W<br>Double Pt100 / 2-W, 3-W or 4-W   |                        |                           |
| Structure   | Bendable MI cable with sealing sleeve   | Double Pt100 / 2-W     | Double Pt100 / 2-W or 3-W |
|   | 100 mm open cable ends  | Form F connecting head | Plug, socket              |

| Type TSC430, with connection cable   |   |                           |                 |
|--|---|---------------------------|-----------------|
| Dimensions in mm   |   |                           |                 |
| U = Installation length<br>N = Nominal length<br>KL = Cable length<br>$\varnothing$ A = Diameter of MI-Cable |   |                           |                 |
| Electrical connection  | Single and double thermocouples<br>Single Pt100 / 2-W, 3-W, or 4-W<br>Double Pt100 / 2-W, 3-W, or 4-W   |                           |                 |
| Structure  | Bendable MI cable with sealing sleeve   | Double Pt100 / 2-W or 3-W | Open cable ends |
|  | Open cable ends   | Plug, socket              |                 |

### Selectable process connections

- Without process connection
- With fixed connection  
(please specify nominal length N and installation length U)
- With sliding connection  
(please specify installation length U, only)
- With weld-on plate 25 x 25 x 3 mm or 35 x 25 x 3 mm for surface measurement
- With molded part for tension clip mounting
- Thermometers can be used with or without thermowells

### Installation instructions

The usual way of ensuring that thermal measurements are accurate is to comply with the minimum installation length of the thermometer. Ideally, the sensor on a thermometer should be located in the center of the pipe.

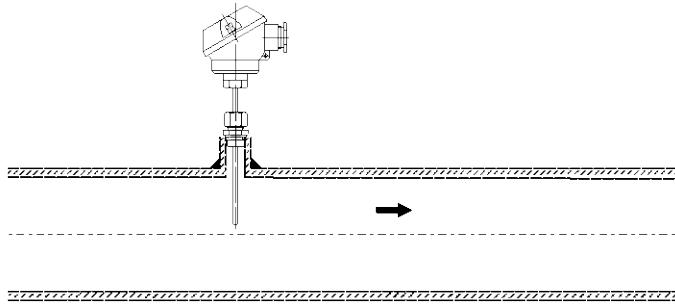


Fig. 1

### Insufficient nominal diameter

In the case of pipelines with very small nominal diameters, installation inside an elbow pipe is recommended. The tip of the MI-Cable is set in opposition to the flow direction of the measuring medium. Installing the thermometer with an adapter at an angle of < 45° against the flow direction can also distort measurement results.

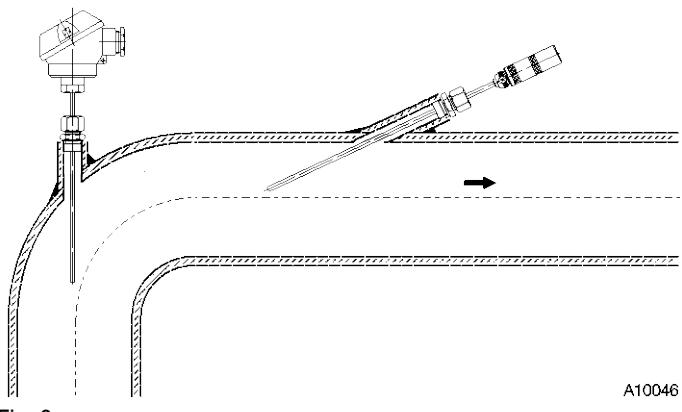


Fig. 2

# SensyTemp TSC400

## Industrial thermometer

### Technical Data

#### Resistance thermometer

The use of an MI-Cable and special sensors, including their installation, ensures that the vibration resistance of all SensyTemp TSC400 industrial thermometers is very high.

The peak-to-peak acceleration values of 30 m/sec<sup>2</sup> (3 g) for frequencies between 10 and 500 Hz (predefined in standard IEC 60751 for increased requirements) are exceeded by all industrial thermometers.

The ideal combination of measuring range, diameter, accuracy, and vibration resistance can be derived from the following tables.

#### Designs

##### Basic design

Thin film resistor (TF)

|                 | Measuring range |     |               | Vibration resistance                             |     |     |
|-----------------|-----------------|-----|---------------|--|-----|-----|
|                 |                 |     |               | 100 m/sec <sup>2</sup> (10 g) at<br>10 to 500 Hz |     |     |
| Class B         | -50 ... 400 °C  |     |               |  |     |     |
| Class A         | -30 ... 300 °C  |     |               |  |     |     |
| Class AA        | 0 ... 100 °C    |     |               |  |     |     |
|                 | Single sensor   |     | Double sensor |  |     |     |
|                 | 2-W             | 3-W | 4-W           | 2-W  | 3-W | 4-W |
| 3.0 mm, class B | ●               | ●   | ●             |  |     |     |
| 3.0 mm, class A |                 | ●   | ●             |  |     |     |
| 4.5 mm, class B | ●               | ●   | ●             |  |     |     |
| 4.5 mm, class A |                 |     | ●             | ●  |     |     |
| 6.0 mm, class B | ●               | ●   | ●             | ●  | ●   | ●   |
| 6.0 mm, class A |                 | ●   | ●             |  | ●   | ●   |

#### Increased vibration resistance

Thin film resistor (TF)

|         | Measuring range |  |  | Vibration resistance                             |  |  |
|---------|-----------------|--|--|--|--|--|
| Class B | -50 ... 400 °C  |  |  | 600 m/sec <sup>2</sup> (60 g) at<br>10 to 500 Hz |  |  |
| Class A | -30 ... 300 °C  |  |  |  |  |  |

|                 | Single sensor |     |     | Double sensor |     |     |
|-----------------|---------------|-----|-----|---------------|-----|-----|
|                 | 2-W           | 3-W | 4-W | 2-W           | 3-W | 4-W |
| 3.0 mm, class B | ●             | ●   | ●   |               |     |     |
| 3.0 mm, class A |               | ●   | ●   |               |     |     |
| 4.5 mm, class B | ●             | ●   | ●   |               |     |     |
| 4.5 mm, class A |               | ●   | ●   |               |     |     |
| 6.0 mm, class B | ●             | ●   | ●   | ●             | ●   | ●   |
| 6.0 mm, class A |               | ●   | ●   |               | ●   | ●   |

#### Extended range, increased vibration resistance

Wire wound resistor (WW)

|                     | Measuring range |  |  | Vibration resistance                             |  |  |
|---------------------|-----------------|--|--|--|--|--|
| Class B             | -196 ... 600 °C |  |  | 100 m/sec <sup>2</sup> (10 g) at<br>10 to 500 Hz |  |  |
| Class A, single DMW | -196 ... 500 °C |  |  |  |  |  |
| Class A, double DMW | 0 ... 250 °C    |  |  |  |  |  |

|                  | Single sensor |     |     | Double sensor |     |     |
|------------------|---------------|-----|-----|---------------|-----|-----|
|                  | 2-W           | 3-W | 4-W | 2-W           | 3-W | 4-W |
| 3.0 mm, class B  | ●             | ●   | ●   | ●             | ●   |     |
| 3.0 mm, class A  |               | ●   | ●   |               | ●   |     |
| 4.5 mm, class B  | ●             | ●   | ●   |               |     |     |
| 4.5 mm, class A  |               | ●   | ●   |               |     |     |
| 6.0 mm, class B  | ●             | ●   | ●   | ●             | ●   | ●   |
| 6.0 mm, class A  |               | ●   | ●   | ●             | ●   | ●   |
| 6.0 mm, class AA |               | ●   | ●   | ●             | ●   | ●   |

## Accuracy classes of measurement resistors according to IEC 60751

Both thin film resistors and wire wound resistors according to IEC 60751 can be used across the entire range (even with increased accuracy class AA or class A). Subsequently, only the accuracy class of the temperature range used can remain valid.

Example: A class AA sensor is used at 290 °C. After this albeit brief application, class A applies for this sensor.

### Thin film resistor (TF), inserted

|          |                                     |                |
|----------|-------------------------------------|----------------|
| Class B  | $\Delta t = \pm (0.30 + 0.0050[t])$ | -50 ... 400 °C |
| Class A  | $\Delta t = \pm (0.15 + 0.0020[t])$ | -30 ... 300 °C |
| Class AA | $\Delta t = \pm (0.10 + 0.0017[t])$ | 0 ... 100 °C   |

### Wire wound resistor (WW), installed

|         |                                     |                 |
|---------|-------------------------------------|-----------------|
| Class B | $\Delta t = \pm (0.30 + 0.0050[t])$ | -196 ... 600 °C |
| Class A | $\Delta t = \pm (0.15 + 0.0020[t])$ | -196 ... 500 °C |

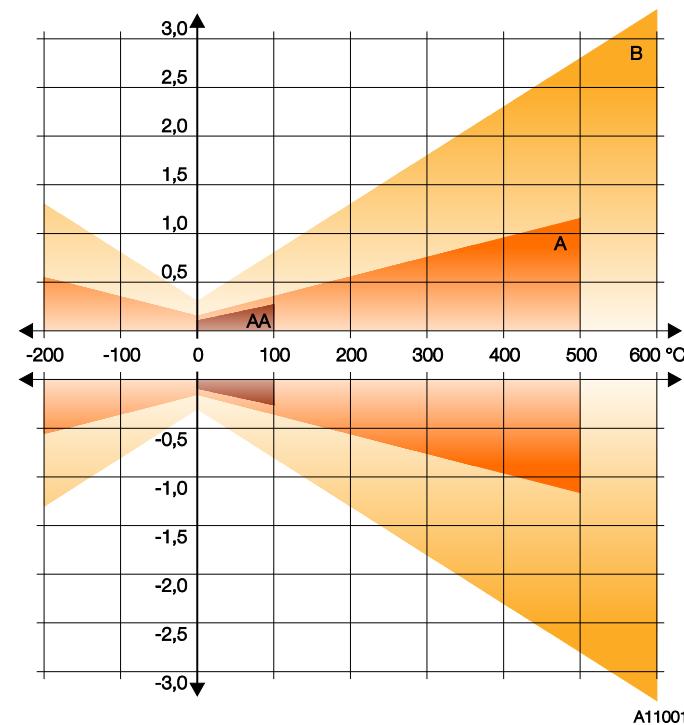


Fig. 3: Graphical representation of accuracy classes

## Measuring errors with two-wire circuits

The electrical resistance of the copper inner conductor for the measuring inset affects the measured value of two-wire circuits and must be taken into consideration. It is determined by the diameter and length of the industrial thermometer. If the error cannot be compensated mechanically, the following values apply:

- Ø measuring inset 3.0 mm:  $(0,281 \Omega/m \Rightarrow 0.7 \text{ }^{\circ}\text{C}/m)$
- Ø measuring inset 6.0 mm:  $(0,1 \Omega/m \Rightarrow 0,25 \text{ }^{\circ}\text{C}/m)$

It is for this reason that ABB supplies three-wire / four-wire circuit thermometers as standard.

## Length data for the thermometer tip

The minimum insertion depth, the temperature-sensitive length and the non-bendable section at the tip of the temperature sensor can be derived from the following table.

| Design   | Minimum insertion depth | Temperature-sensitive length | Non-bendable length |
|--|-------------------------|------------------------------|---------------------|
| Basic design   | 70 mm                   | 7 mm                         | 30 mm               |
| Increased vibration resistance                           | 70 mm                   | 10 mm                        | 40 mm               |
| Extended measuring range, increased vibration resistance | 70 mm                   | 50 mm                        | 60 mm               |

# SensyTemp TSC400

## Industrial thermometer

### Thermocouples

The measuring accuracy of standard thermocouples are in accordance with the international standard IEC 60584. On request, ABB can also supply thermocouples according to ANSI MC96.1.

Since the values of both standards differ only very slightly at low temperatures (up to approx. 300 °C), ABB recommends using thermocouples according to IEC 60584. Tolerance data is listed in the "Accuracy classes according to IEC 60584" table.

### Basic Design

Vibration-resistant up to 600 m/sec<sup>2</sup> (60 g)

|                 | 1 x<br>K | 2 x<br>K | 1 x<br>J | 2 x<br>J | 1 x<br>N | 2 x<br>N | 1 x<br>E | 2 x<br>E |
|-----------------|----------|----------|----------|----------|----------|----------|----------|----------|
| 1.5 mm, class 2 | ●        |          |          |          | ●        |          |          |          |
| 3.0 mm, class 2 | ●        | ●        | ●        | ●        | ●        | ●        | ●        | ●        |
| 3.0 mm, class 1 | ●        | ●        | ●        | ●        | ●        | ●        | ●        | ●        |
| 4.5 mm, class 2 | ●        | ●        | ●        | ●        | ●        | ●        | ●        |          |
| 4.5 mm, class 1 | ●        | ●        | ●        | ●        | ●        | ●        |          |          |
| 6.0 mm, class 2 | ●        | ●        | ●        | ●        | ●        | ●        | ●        | ●        |
| 6.0 mm, class 1 | ●        | ●        | ●        | ●        | ●        | ●        | ●        | ●        |

### IMPORTANT (NOTE)

The diameter of 8 mm is achieved by using 6.0 mm diameter MI cable and pressing a sleeve onto the tip of the temperature sensor.

### Accuracy classes according to IEC 60584

| IEC 60584       | Class (CL) | Temperature range | Maximum measuring error |
|-----------------|------------|-------------------|-------------------------|
| K (NiCr-Ni)     | 2          | -40 ... 333 °C    | ±2.5 °C                 |
|                 |            | 333 ... 1200 °C   | ±0.0075 x [t]           |
|                 | 1          | -40 ... 375 °C    | ±1.5 °C                 |
|                 |            | 375 ... 1000 °C   | ±0.0040 x [t]           |
| N (NiCrSi-NiSi) | 2          | -40 ... 333 °C    | ±2.5 °C                 |
|                 |            | 333 ... 1200 °C   | ±0.0075 x [t]           |
|                 | 1          | -40 ... 375 °C    | ±1.5 °C                 |
|                 |            | 375 ... 1000 °C   | ±0.0040 x [t]           |

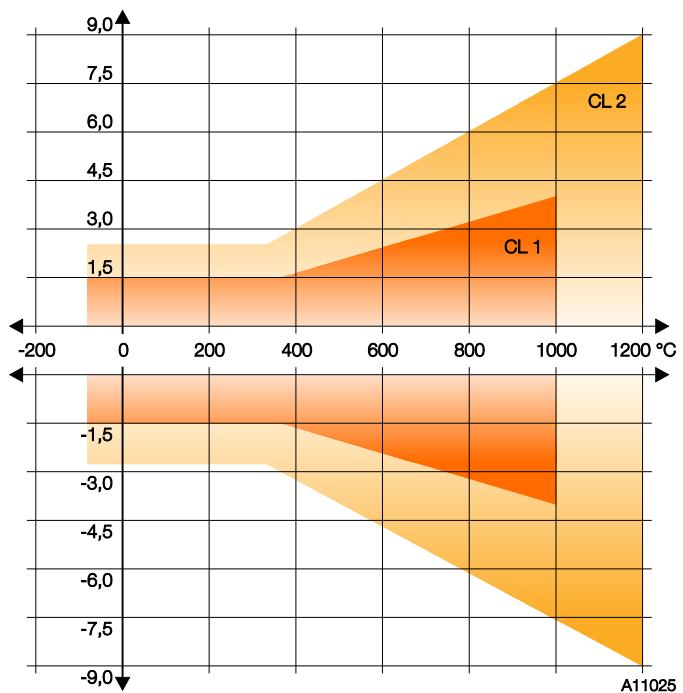


Fig. 4: Graphical representation of accuracy classes

| IEC 60584     | Class (CL) | Temperature range | Maximum measuring error |
|---------------|------------|-------------------|-------------------------|
| J (Fe-CuNi)   | 2          | -40 ... 333 °C    | ±2.5 °C                 |
|               |            | 333 ... 750 °C    | ±0.0075 x [t]           |
|               | 1          | -40 ... 375 °C    | ±1.5 °C                 |
|               |            | 375 ... 750 °C    | ±0.0040 x [t]           |
| E (NiCr-CuNi) | 2          | -40 ... 333 °C    | ±2.5 °C                 |
|               |            | 333 ... 900 °C    | ±0.0075 x [t]           |
|               | 1          | -40 ... 375 °C    | ±1.5 °C                 |
|               |            | 375 ... 800 °C    | ±0.0040 x [t]           |

#### Length data for the thermometer tip

The temperature-sensitive length, the minimum insertion depth and the non-bendable section at the tip of the thermometer can be derived from the following table.

| Design       | Minimum insertion depth | Temperature-sensitive length | Non-bendable length |
|--------------|-------------------------|------------------------------|---------------------|
| Basic design | 70 mm                   | 7 mm                         | 30 mm               |

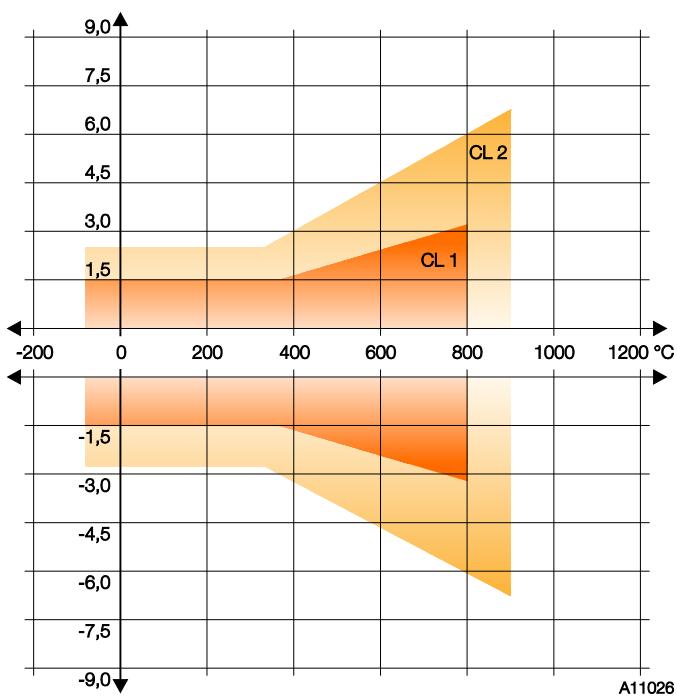


Fig. 5: Graphical representation of accuracy classes

# SensyTemp TSC400

## Industrial thermometer

### Resistance thermometers and thermocouples

#### Insulation resistance of measuring inset

IEC 60751 requires a measurement between the fitting and the measurement circuit with at least 100 V DC and an insulation resistance > 100 MΩ.

Test conditions at ABB:

- 250 V DC
- Insulation resistance  $R_{iso} \geq 1G\Omega$  with an ambient temperature range 15 ... 35 °C
- Humidity < 80 %.

#### Sealing material of the MI-Cable

Material that is temperature-resistant up to 120 °C is used to seal the MI-Cable. Alternatively, material that is temperature-resistant up to 200 °C can be used.

#### Response times to IEC 60751 and IEC 60584

| Ø MI-Cable                    | In water 0.4 m/s |           | In air 3 m/s |           |
|-------------------------------|------------------|-----------|--------------|-----------|
|                               | $t_{0,5}$        | $t_{0,9}$ | $t_{0,5}$    | $t_{0,9}$ |
| <b>Resistance thermometer</b> |                  |           |              |           |
| 3.0 mm                        | 1,5              | 4,5       | 15,0         | 50,0      |
| 4.5 mm                        | 2,5              | 6,3       | 24,7         | 75,5      |
| 6.0 mm                        | 4,0              | 9,7       | 43,5         | 105,0     |
| <b>Thermocouples</b>          |                  |           |              |           |
| 1.5 mm                        | 0,7              | 1,8       | 12,4         | 38,6      |
| 3.0 mm                        | 0,8              | 2,1       | 14,5         | 44,5      |
| 4.5 mm                        | 1,8              | 5,4       | 24,8         | 67,6      |
| 6.0 mm                        | 3,0              | 7,5       | 38,6         | 98,5      |

### Maximum operating temperature

| Sensor types               | Maximum operating temperature |
|----------------------------|-------------------------------|
| Thin film resistor (TF)    | 400 °C                        |
| Wire wound resistor (WW)   | 600 °C                        |
| Type K and N thermocouples | 1200 °C                       |
| Type J thermocouples       | 750 °C                        |
| Type E thermocouples       | 900 °C                        |
| <b>Materials</b>           |                               |
| 316L / 1.4404              | 600 °C                        |
| 316Ti / 1.4571             | 800 °C                        |
| Inconel 600 / 2.4816       | 1100 °C                       |
| 314 / 1.4841               | 1100 °C                       |

### Transport temperature / Storage temperature

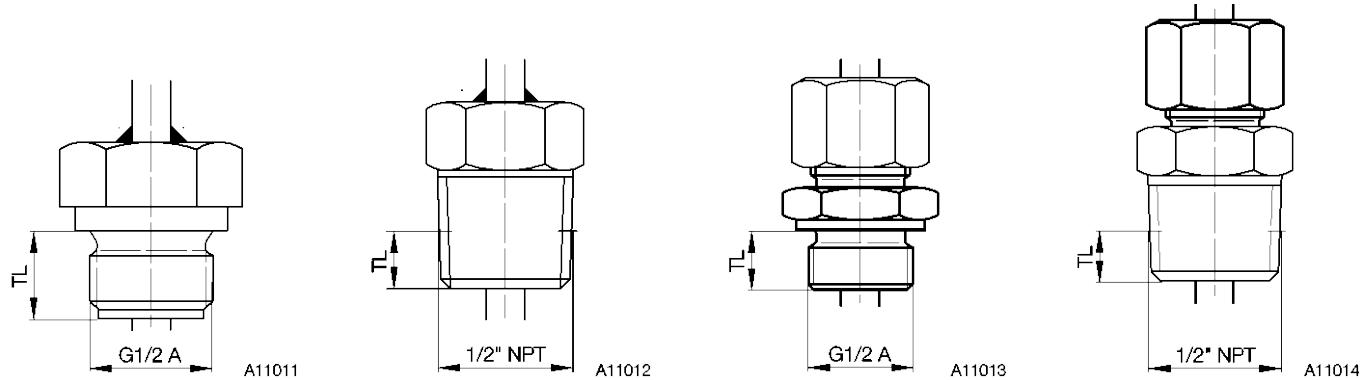
-20 ... 70 °C

### IMPORTANT (NOTE)

Depending on the sensor type and material selected, the lower temperature value in each case counts.

The maximum operating temperatures and pressures specified are maximum values and do not take into consideration process-related stress. The effects of viscosity, flow rate, pressure, and temperature in the process usually cause these values to drop.

## Process connections



| Design             | Material                  | Connecting thread | For MI-Cable with diameter | Length of engaged thread (TL) | Clamp ring |
|--------------------|---------------------------|-------------------|----------------------------|-------------------------------|------------|
| Fixed connection   | Corrosion-resistant steel | M8 x 1            | 3,0 mm                     | 6,5 mm                        | —          |
|                    |                           | G1/4 A            | 3,0 / 4,5 / 6,0 mm         | 12,0 mm                       | —          |
|                    |                           | G1/2 A            | 3,0 / 4,5 / 6,0 mm         | 14,0 mm                       | —          |
|                    |                           | 1/4" NPT          | 3,0 / 4,5 / 6,0 mm         | 5,08 mm                       | —          |
|                    |                           | 1/2" NPT          | 3,0 / 4,5 / 6,0 mm         | 8,12 mm                       | —          |
| Sliding connection | Corrosion-resistant steel | M8 x 1            | 3,0 mm                     | 6,5 mm                        | PTFE or VA |
|                    |                           | G1/4 A            | 3,0 / 4,5 / 6,0 mm         | 12,0 mm                       | PTFE or VA |
|                    |                           | G1/2 A            | 3,0 / 4,5 / 6,0 mm         | 14,0 mm                       | PTFE or VA |
|                    |                           | 1/4" NPT          | 3,0 / 4,5 / 6,0 mm         | 5,08 mm                       | PTFE or VA |
|                    |                           | 1/2" NPT          | 3,0 / 4,5 / 6,0 mm         | 8,12 mm                       | PTFE or VA |

### IMPORTANT (NOTE)

For fixed process connections, the connection to the MI-Cable is established by hard-soldering. The process connections for MI-Cables with a diameter of 6 mm and 8 mm are identical.

### Process connections for surface thermometers

#### Molded part for clip mounting

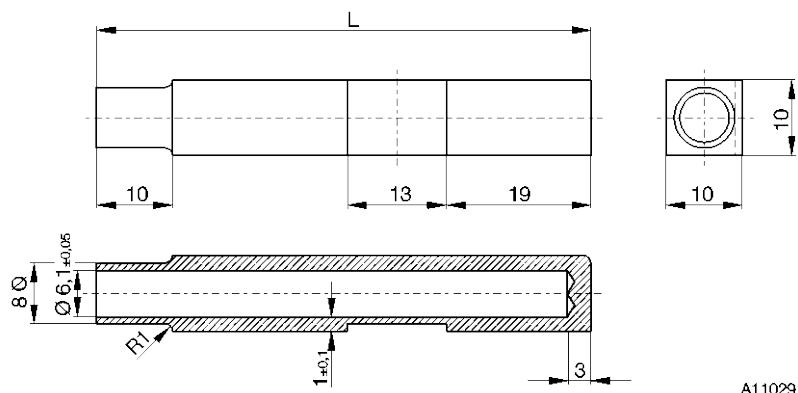


Fig. 6: Molded part for tension clips up to 500 mm, other versions available on request

# SensyTemp TSC400 Industrial thermometer

## Weld-on plate for resistance thermometers

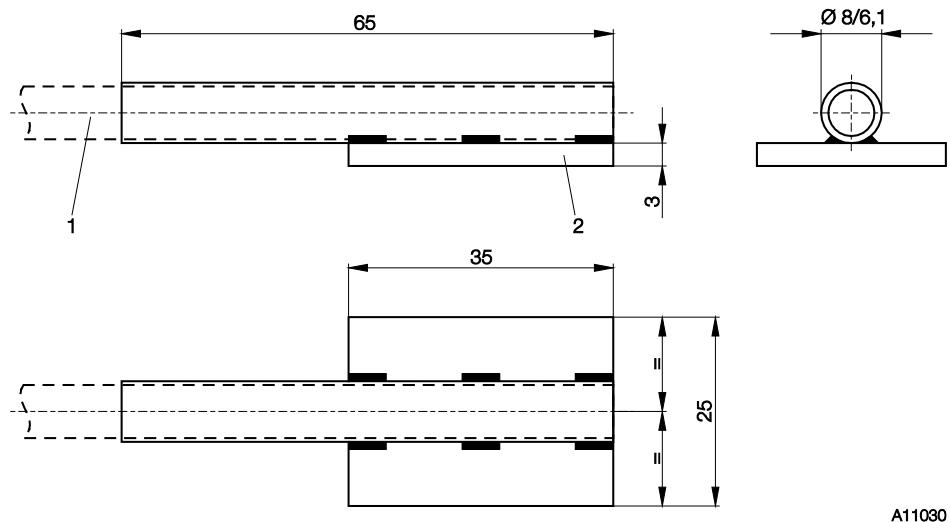


Fig. 7

1 Stainless steel 1.4571 (316Ti) | 2 Stainless steel 1.4571 (316Ti)

## Weld-on plate for thermocouples

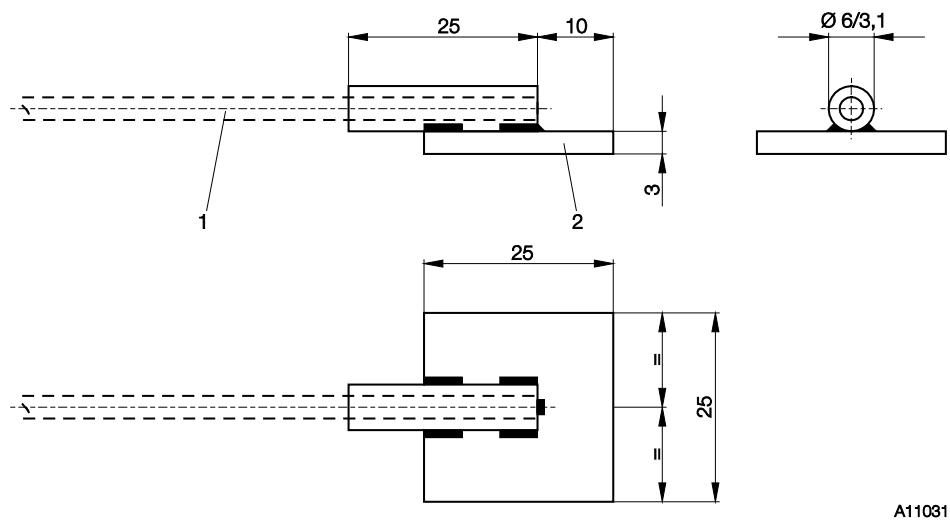
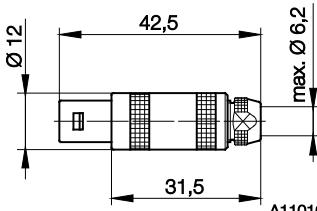
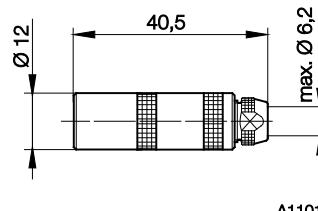
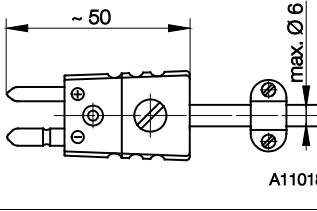
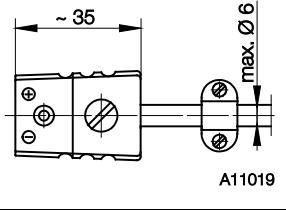
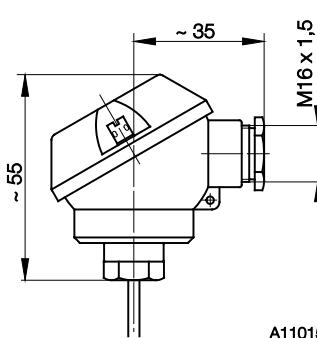


Fig. 8

1 Heat-resistant steel 2.4816 (Inconel Alloy 600) | 2 Heat-resistant steel 1.4841 (314)

## Electrical connections

|                               | Lemo plug size 1S   | Lemo socket size 1S   |
|-------------------------------|---|---|
| Dimensions in mm              |  <p>A11016</p>   |  <p>A11017</p>   |
|                               | FFA   | PCA   |
| Housing                       | Nickel-plated brass, gold-plated brass contacts, PEEK isolator, maximum 6 contacts                |   |
| Degree of protection          | IP 54   |   |
| Maximum operating temperature | 200 °C  |   |
|                               | Thermocouple – standard plug  | Thermocouple – standard socket  |
| Dimensions in mm              |  <p>A11018</p>  |  <p>A11019</p>  |
| Design                        | Standard  |   |
| Material                      | Plastic   |   |
| Maximum operating temperature | 200 °C  |   |
|                               | Connecting head Form F  | Functions of the connection head  |
| Dimensions in mm              |  <p>A11015</p> | <ul style="list-style-type: none"> <li>To accommodate a socket connector</li> <li>To protect the terminal block space against the effects of the environment</li> </ul> <p><b>Ambient temperature</b><br/>The ambient temperature at the connection head form F can be between -40 and 130 °C.<br/>The most commonly used cable gland is suited to temperatures between -20 and 100 °C. For temperatures outside this range, the appropriate cable gland must be installed.</p> |
| Housing                       | Aluminum epoxide coating, loose cover,  |   |
| Degree of protection          | IP 65   |   |
| Maximum operating temperature | 130 °C  |   |

# SensyTemp TSC400

## Industrial thermometer

**Connection head Form F – Connection diagrams and color coding of resistance thermometers according to IEC 60751**

| Single Pt100 |     |     | Double Pt100 |
|--------------|-----|-----|--------------|
| 2-W          | 3-W | 4-W | 2-W          |
|              |     |     |              |

R = red | Y = yellow | B = black | No color = white

**Connection head Form F – Connection diagrams for thermocouples according to IEC 60584**

| Single thermocouple | Double thermocouple |
|---------------------|---------------------|
|                     |                     |

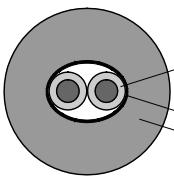
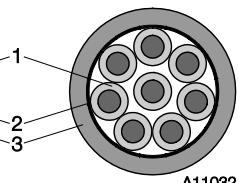
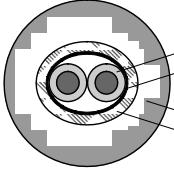
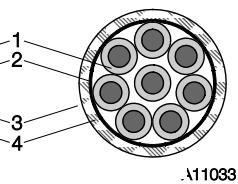
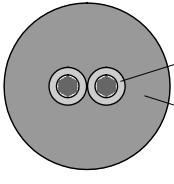
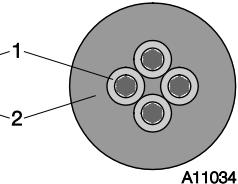
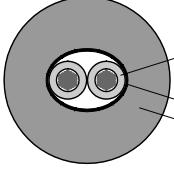
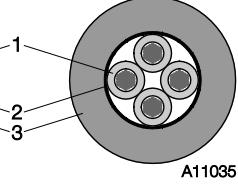
**Lemo plug / Lemo socket – Connection diagrams for resistance thermometers**

| Single Pt100 |     |     | Double Pt100 |     |
|--------------|-----|-----|--------------|-----|
| 2-W          | 3-W | 4-W | 2-W          | 3-W |
|              |     |     |              |     |

**Lemo plug / Lemo socket – Connection diagrams for thermocouples**

| Single thermocouple | Double thermocouple |
|---------------------|---------------------|
|                     |                     |

## Connection cables with inner copper conductors for resistance thermometers

| Design  | Insulation  | Sensor design  |
|---|---|--|
| <b>PFA cable TFT – coding T2</b><br><br> <br>A11032     | 1 PFA wire insulation (T)<br>2 Aluminum foil with silver-plated copper strand (F)<br>3 PFA cable sheath (T)<br>– Stranded wires<br>– Outer diameter approx. 4.5 mm<br><br>Temperature resistance of the insulation: -200 ... 200 °C                                       | 1 x Pt100 / 2-W – coding P1<br>1 x Pt100 / 3-W – coding P2<br>1 x Pt100 / 4-W – coding P3<br>2 x Pt100 / 2-W – coding P4<br>2 x Pt100 / 3-W – coding P5<br>2 x Pt100 / 4-W – coding P6 |
| <b>PFA cable TFTV – coding T3</b><br><br> <br>A11033  | 1 PFA wire insulation (T)<br>2 Aluminum foil with silver-plated copper strand (F)<br>3 PFA cable sheath (T)<br>4 Mesh made of stainless steel (V)<br>– Stranded wires<br>– Outer diameter approx. 5.5 mm<br><br>Temperature resistance of the insulation: -200 ... 200 °C | 1 x Pt100 / 2-W – coding P1<br>1 x Pt100 / 3-W – coding P2<br>1 x Pt100 / 4-W – coding P3<br>2 x Pt100 / 2-W – coding P4<br>2 x Pt100 / 3-W – coding P5<br>2 x Pt100 / 4-W – coding P6 |
| <b>PVC cable JJ – coding P2</b><br><br> <br>A11034  | 1 PVC strand insulation (J)<br>2 PVC sheath (J)<br>– Outer diameter approx. 5.5 mm<br><br>Temperature resistance of the insulation: -20 ... 105 °C  | 1 x Pt100 / 2-W – coding P1<br>1 x Pt100 / 3-W – coding P2<br>1 x Pt100 / 4-W – coding P3<br>2 x Pt100 / 2-W – coding P4   |
| <b>PVC cable YFY – coding P3</b><br><br> <br>A11035 | 1 PVC strand insulation (Y)<br>2 Aluminum foil with silver-plated copper strand (F)<br>3 PVC sheath (Y)<br>– Outer diameter approx. 5.5 mm<br><br>Temperature resistance of the insulation: -20 ... 105 °C  | 1 x Pt100 / 2-W – coding P1<br>1 x Pt100 / 3-W – coding P2<br>1 x Pt100 / 4-W – coding P3<br>2 x Pt100 / 2-W – coding P4   |

# SensyTemp TSC400

## Industrial thermometer

### Connection cables for thermocouples

| Design                            | Insulation  | Sensor design   |
|-----------------------------------|---|---|
| PVC cable JFJ – coding P3         | <p>1 PVC sheathed (J)<br/>     2 Plastic-laminated aluminum foil shield (F)<br/>     3 PVC sheath (J)</p> <p>— Stranded wires<br/>     — Outer diameter approx. 5.4 mm</p> <p>Temperature resistance of the insulation: -10 ... 105 °C</p>                                | <p>1 x JX – coding J1<br/>     2 x JX – coding J2<br/>     1 x KCA – coding K1<br/>     2 x KCA – coding K2</p>   |
| Silicone cable SLSLGL – coding S3 | <p>1 Silicone rubber sheathed (SL)<br/>     2 Silicone rubber sheath (SL)<br/>     3 Glass filament mesh (GL)</p> <p>— Stranded wires</p> <p>Temperature resistance of the insulation: -200 ... 200 °C</p>  | <p>1 x KCA – coding K1<br/>     2 x KCA – coding K2</p>   |
| PFA cable TCUT – coding T2        | <p>1 PFA sheathed (T)<br/>     2 Tinned mesh (Cu)<br/>     3 PFA sheathed (T)</p> <p>— Parallel wires for single thermocouples<br/>     — Stranded wires for double thermocouples</p> <p>Temperature resistance of the insulation: -200 ... 200 °C</p>                    | <p>1 x NX – coding N1<br/>     2 x NX – coding N2</p>   |
| PFA cable TGLV – coding T4        | <p>1 PFA sheathed (T)<br/>     2 Glass filament (GL)<br/>     3 Mesh made of stainless steel (V)</p> <p>— Parallel wires for single thermocouples<br/>     — Stranded wires for double thermocouples</p> <p>Temperature resistance of the insulation: -200 ... 200 °C</p> | <p>1 x JX – coding J1<br/>     2 x JX – coding J2<br/>     1 x KCA – coding K1<br/>     2 x KCA – coding K2<br/>     1 x NX – coding N1<br/>     2 x NX – coding N2<br/>     1 x EX – coding E1<br/>     2 x EX – coding E2</p> |

| Type | Class of upper/lower deviation |                     | Application temperature range |
|------|--------------------------------|---------------------|-------------------------------|
|      | Class 1                        | Class 2             |                               |
| JX   | ± 85 µV (± 1.5 °C)             | —                   | -25 °C ... 200 °C             |
| EX   | ± 120 µV (± 1.5 °C)            | —                   | -25 °C ... 200 °C             |
| NX   | ± 60 µV (± 1.5 °C)             | —                   | -25 °C ... 200 °C             |
| KCA  | —                              | ± 100 µV (± 2.5 °C) | 0 °C ... 150 °C               |

## Ex relevant specifications

### Approvals

The TSC400 temperature sensors are equipped with the following approvals. ATEX approvals are valid throughout the EU and in Switzerland.

|                         |                          |
|-------------------------|--------------------------|
| — ATEX II 1G Ex ia IIC  | PTB 01 ATEX 2200 X       |
| — ATEX II 2G Ex ib IIC  | PTB 01 ATEX 2200 X       |
| — ATEX n                | Manufacturer declaration |
| — IECEx Ex ia IIC T6 Ga | IECEx PTB 11.0111X       |

### IMPORTANT (NOTE)

Thermometers with MI-Cable meeting the requirements of both type examination certificate for ATEX "Ex i" and Namur specification NE24 can be supplied on request.

### Intrinsic safety ATEX Ex i

All of the values listed below are valid assuming that an additional transmitter has been connected.

### Electrical power limit

The following electrical values must not be exceeded:

| $U_i$ (input voltage) | $I_i$ (input current) |
|-----------------------|-----------------------|
| 30 V                  | 101 mA                |
| 25 V                  | 158 mA                |
| 20 V                  | 309 mA                |

$P_i$  (internal power) corresponds to  $P_o$  (output power) of a transmitter.

$L_i$  (internal inductance) = 15  $\mu$ H/m

$C_i$  (internal capacitance) = 280 pF/m

### IMPORTANT (NOTE)

Temperature sensors for use in Zone 0 must only contain an intrinsically safe circuit and must only be connected to certified intrinsically safe circuits with type of protection "ia".

### Thermal resistance

The following table lists thermal resistances for MI-Cables of 3.0 mm, 4.5 mm, and 6.0 mm in diameter. The values are specified under "gas with a flow velocity of 0 m/s" conditions.

| Thermal resistance $R_{th}$   | MI-Cable Ø 3.0 mm | MI-Cable Ø 4.5 mm | MI-Cable Ø 6.0 mm |
|---|-------------------|-------------------|-------------------|
| $\Delta t = 200 \text{ K/W} \times 0.038 \text{ W} = 7.6 \text{ K}$ |                   |                   |                   |
| Resistance thermometer  | 200 K/W           | 200 K/W           | 84 K/W            |
| Thermocouple  | 30 K/W            | 30 K/W            | 30 K/W            |

K/W = kelvin per watt

### Output power

| Transmitter model                            | Output power $P_o$   |
|--|----------------------|
| TTR200 HART                                  | $\leq 38 \text{ mW}$ |
| TTF300/350 HART                              | $\leq 38 \text{ mW}$ |
| TTF300/350 FOUNDATION fieldbus / PROFIBUS PA | FISCO Field Device   |

The EC type examination certificates for the corresponding transmitter types contain all further information necessary to verify intrinsic safety ( $U_o$ ,  $I_o$ ,  $P_o$ ,  $L_o$ ,  $C_o$ , etc.).

### Temperature rise in the event of a fault

In the event of a fault, the thermometers will exhibit a temperature rise  $\Delta t$  as appropriate for the applied power. This temperature rise must be taken into account in the difference between the process temperature and the temperature class.

The temperature rise  $\Delta t$  can be calculated using the following formula:

$$\Delta t = R_{th} \times P_o [\text{K/W} \times \text{W}]$$

- $\Delta t$  = Temperature rise
- $R_{th}$  = Thermal resistance
- $P_o$  = Output power of an additional connected transmitter

# SensyTemp TSC400

## Industrial thermometer

### Example

Resistance thermometer 3 mm in diameter, no thermowell:

$$R_{th} = 200 \text{ K/W}$$

$$\text{Temperature transmitter } P_0 = 38 \text{ mW}$$

$$\Delta t = 200 \text{ K/W} \times 0.038 \text{ W} = 7.6 \text{ K}$$

Therefore, at a temperature transmitter output power

$P_0 = 38 \text{ mW}$ , the maximum temperature rise in the event of a fault is approximately 8 K.

This results in the following maximum process temperatures

$T_{medium}$ :

### Maximum process temperature $T_{medium}$ in Zone 0

The surface temperature of Category 1 devices must not exceed 80 % of the ignition temperature of a flammable gas or liquid.

|                                  | T6 (85 °C) | T5 (100 °C) | T4 (135 °C) | T3 (200 °C) | T2 (300 °C) | T1 (450 °C) |
|----------------------------------|------------|-------------|-------------|-------------|-------------|-------------|
| 80 % of the ignition temperature | 68 °C      | 80 °C       | 108 °C      | 160 °C      | 240 °C      | 360 °C      |
| $T_{medium}$                     | 60 °C      | 72 °C       | 100 °C      | 152 °C      | 232 °C      | 352 °C      |

### Possible process temperature $T_{medium}$ in Zone 1

To calculate the temperature classes for T6, T5, T4, and T3 deduct 5 K each; for T2 and T1, deduct 10 K each.

|              | T6 (85 °C) | T5 (100 °C) | T4 (135 °C) | T3 (200 °C) | T2 (300 °C) | T1 (450 °C) |
|--------------|------------|-------------|-------------|-------------|-------------|-------------|
| -5 K         | 80 °C      | 95 °C       | 130 °C      | 195 °C      | -           | -           |
| -10 K        | -          | -           | -           | -           | 290 °C      | 440 °C      |
| $T_{medium}$ | 72 °C      | 87 °C       | 122 °C      | 187 °C      | 282 °C      | 432 °C      |

## Tests and certificates

To increase the safety and accuracy of your process, ABB provides a number of mechanical and electrical tests. The results are certified in accordance to EN 10204.

The following certificates are issued:

- Certificate of compliance 2.1 for order conformity
- Acceptance test certificate 3.1 for the following tests:
  - Material confirmation for the MI-Cable
  - Visual, dimensional, and functional checks for thermometer
  - Reference measurement for thermometer

For measurements requiring extremely high accuracy, ABB can calibrate the thermometer in its own DAkkS calibration lab.

When DAkkS calibration is performed, a separate certificate is provided for each thermometer.

To obtain accurate measurements, observe the minimum depth for the MI-Cable:

- For low to medium temperatures: 50 ... 100 mm
- For temperatures above 500 °C: 300 ... 350 mm

These are guide values. If you are in any doubt, your ABB partner is available for on-site assistance.

For reference measurements and DAkkS calibration, the individual sensor characteristic of the thermometer can also be calculated and a suitable transmitter can be programmed based on a freestyle characteristic. Adjusting the transmitter to the sensor characteristic can considerably improve the measuring accuracy of the thermometer. The measurement must be taken with at least three temperatures.

# SensyTemp TSC400

## Industrial thermometer

### Ordering information

#### IMPORTANT (NOTE)

Order codes cannot be combined at will. Your ABB partner will be happy to answer any questions you might have regarding installation feasibility. All documentation, declarations of conformity, and certificates are available in ABB's download area.

#### Main ordering information SensyTemp TSC420

| Base model  | TSC420 | XX |
|---|--------|----|----|----|----|----|----|----|----|----|----|----|
| TSC420 Screw-in thermometer with direct electrical connection |        |    |    |    |    |    |    |    |    |    |    |    |
| <b>Explosion Protection Certification</b>                     |        |    |    |    |    |    |    |    |    |    |    |    |
| ATEX II 1 G Ex ia IIC   |        | A1 |    |    |    |    |    |    |    |    |    |    |
| ATEX II 2 G Ex ib IIC   |        | A2 |    |    |    |    |    |    |    |    |    |    |
| IECEx Ex ia IIC T6 Ga   |        | H1 |    |    |    |    |    |    |    |    |    |    |
| Without   |        | Y0 |    |    |    |    |    |    |    |    |    |    |
| <b>Mounting Type</b>  |        |    |    |    |    |    |    |    |    |    |    |    |
| Without fitting   |        | F0 |    |    |    |    |    |    |    |    |    |    |
| Fixed connection  |        | F1 |    |    |    |    |    |    |    |    |    |    |
| Compression fitting, clamp ring material PTFE                 |        | F2 |    |    |    |    |    |    |    |    |    |    |
| Compression fitting, clamp ring material stainless steel      |        | F3 |    |    |    |    |    |    |    |    |    |    |
| Weld on pad 25 mm x 25 mm x 3 mm (for Thermocouple)           |        | W2 |    |    |    |    |    |    |    |    |    |    |
| Weld on pad 35 mm x 25 mm x 3 mm (for Pt100)                  |        | W3 |    |    |    |    |    |    |    |    |    |    |
| Clamping adapter (please define clip separately)              |        | C1 |    |    |    |    |    |    |    |    |    |    |
| Others  |        | Z9 |    |    |    |    |    |    |    |    |    |    |
| <b>Sensor Type and Wiring</b>                                 |        |    |    |    |    |    |    |    |    |    |    |    |
| 1 x Pt100, two-wire circuit                                   |        |    | P1 |    |    |    |    |    |    |    |    |    |
| 1 x Pt100, three-wire circuit                                 |        |    | P2 |    |    |    |    |    |    |    |    |    |
| 1 x Pt100, four-wire circuit                                  |        |    | P3 |    |    |    |    |    |    |    |    |    |
| 2 x Pt100, two-wire circuit                                   |        |    | P4 |    |    |    |    |    |    |    |    |    |
| 2 x Pt100, three-wire circuit                                 |        |    | P5 |    |    |    |    |    |    |    |    |    |
| 2 x Pt100, four-wire circuit                                  |        |    | P6 |    |    |    |    |    |    |    |    |    |
| 1 x Type J (Fe-CuNi)  |        |    | J1 |    |    |    |    |    |    |    |    |    |
| 2 x Type J (Fe-CuNi)  |        |    | J2 |    |    |    |    |    |    |    |    |    |
| 1 x Type K (NiCr-NiAl)  |        |    | K1 |    |    |    |    |    |    |    |    |    |
| 2 x Type K (NiCr-NiAl)  |        |    | K2 |    |    |    |    |    |    |    |    |    |
| 1 x Type N (NiCrSi-NiSi)                                      |        |    | N1 |    |    |    |    |    |    |    |    |    |
| 2 x Type N (NiCrSi-NiSi)                                      |        |    | N2 |    |    |    |    |    |    |    |    |    |
| 1 x Type E (NiCr-CuNi)  |        |    | E1 |    |    |    |    |    |    |    |    |    |
| 2 x Type E (NiCr-CuNi)  |        |    | E2 |    |    |    |    |    |    |    |    |    |
| Others  |        |    | Z9 |    |    |    |    |    |    |    |    |    |

| Main ordering information SensyTemp TSC420  | XX | XX | XX | XX | XX | XX |
|---|----|----|----|----|----|----|
| <b>Sensor / Accuracy Class</b>  |    |    |    |    |    |    |
| RTD, IEC 60751 / class B, -196 ... 600 °C (-321 ... 1112 °F), wire wound resistor | B2 |    |    |    |    |    |
| RTD, IEC 60751 / class A, 0 ... 250 °C (32 ... 482 °F), wire wound resistor       | D2 |    |    |    |    |    |
| RTD, IEC 60751 / class A, -196 ... 500 °C (-321 ... 932 °F), wire wound resistor  | D1 |    |    |    |    |    |
| RTD, IEC 60751 / class B, -50 ... 400 °C (-58 ... 752 °F), thin film resistor     | S5 |    |    |    |    |    |
| RTD, IEC 60751 / class A, -30 ... 300 °C (-22 ... 572 °F), thin film resistor     | S1 |    |    |    |    |    |
| RTD, IEC 60751 / class AA, 0 ... 100 °C (32 ... 212 °F), thin film resistor       | S3 |    |    |    |    |    |
| Thermocouple, IEC 60584 / class 2   | T2 |    |    |    |    |    |
| Thermocouple, IEC 60584 / class 1   | T1 |    |    |    |    |    |
| Others  | Z9 |    |    |    |    |    |
| <b>Mineral Insulated Cable Diameter</b>   |    |    |    |    |    |    |
| 1,5 mm  | C2 |    |    |    |    |    |
| 3,0 mm  | D3 |    |    |    |    |    |
| 4,5 mm  | C5 |    |    |    |    |    |
| 6,0 mm  | D6 |    |    |    |    |    |
| 6,0 mm, tip with sleeve 8,0 mm  | H8 |    |    |    |    |    |
| Others  | Z9 |    |    |    |    |    |
| <b>Mineral Insulated Cable Material</b>   |    |    |    |    |    |    |
| Stainless steel 316Ti (1.4571)  | S1 |    |    |    |    |    |
| Stainless steel 316L (1.4404)   | S2 |    |    |    |    |    |
| Inconel Alloy 600 (2.4816)  | J1 |    |    |    |    |    |
| Others  | Z9 |    |    |    |    |    |
| <b>Process Connection Type</b>  |    |    |    |    |    |    |
| Without   | Y0 |    |    |    |    |    |
| Parallel thread M8 x 1  | M1 |    |    |    |    |    |
| Parallel thread G 1/4 A   | G1 |    |    |    |    |    |
| Parallel thread G 1/2 A   | G2 |    |    |    |    |    |
| Tapered thread 1/4 in. NPT  | N1 |    |    |    |    |    |
| Tapered thread 1/2 in. NPT  | N2 |    |    |    |    |    |
| Others  | Z9 |    |    |    |    |    |
| <b>Electrical Connection</b>  |    |    |    |    |    |    |
| Open wires, length 100 mm (4 in.)   | C1 |    |    |    |    |    |
| Thermocouple-plug, size: standard   | C3 |    |    |    |    |    |
| Thermocouple-socket, size: standard   | C4 |    |    |    |    |    |
| Lemo-plug, size: 1S   | C5 |    |    |    |    |    |
| Lemo-socket, size: 1S   | C6 |    |    |    |    |    |
| Head type F / aluminium   | C7 |    |    |    |    |    |
| Others  | Z9 |    |    |    |    |    |
| <b>Length Unit of Measure</b>   |    |    |    |    |    |    |
| Millimeter (mm)   | U1 |    |    |    |    |    |
| Inches (in.)  | U3 |    |    |    |    |    |

# SensyTemp TSC400

## Industrial thermometer

### Additional ordering information SensyTemp TSC420

|   | XX | XX | XX |
|---|----|----|----|
| <b>Certificates</b>   |    |    |    |
| Inspection certificate 3.1 acc. EN 10204 of sheath material                                     | C2 |    |    |
| Declaration of compliance with the order 2.1 acc. EN 10204                                      | C4 |    |    |
| Inspection certificate 3.1 acc. EN 10204 of visual, dimensional and functional test             | C6 |    |    |
| Inspection certificate 3.1 acc. EN 10204 of sensor calibration, single RTD                      | CD |    |    |
| Inspection certificate 3.1 acc. EN 10204 of sensor calibration, double RTD                      | CE |    |    |
| Inspection certificate 3.1 acc. EN 10204 of sensor calibration, single TC                       | CF |    |    |
| Inspection certificate 3.1 acc. EN 10204 of sensor calibration, double TC                       | CG |    |    |
| DAkkS sensor calibration, single RTD, separate calibration certificate per thermometer          | CH |    |    |
| DAkkS sensor calibration, double RTD, separate calibration certificate per thermometer          | CJ |    |    |
| DAkkS sensor calibration, single thermocouple, separate calibration certificate per thermometer | CK |    |    |
| DAkkS sensor calibration, double thermocouple, separate calibration certificate per thermometer | CL |    |    |
| <b>Number of Calibration Test Points</b>  |    |    |    |
| 1 point   | P1 |    |    |
| 2 points  | P2 |    |    |
| 3 points  | P3 |    |    |
| 4 points  | P4 |    |    |
| 5 points  | P5 |    |    |
| <b>Temperatures for Sensor Calibration</b>  |    |    |    |
| Standard calibration: 0 °C (32 °F)  | V1 |    |    |
| Standard calibration: 100 °C (212 °F)   | V2 |    |    |
| Standard calibration: 400 °C (752 °F)   | V3 |    |    |
| Standard calibration: 0 °C and 100 °C (32 °F and 212 °F)  | V4 |    |    |
| Standard calibration: 0 °C and 400 °C (32 °F and 752 °F)  | V5 |    |    |
| Standard calibration: 0 °C, 100 °C and 200 °C (32 °F, 212 °F and 392 °F)                        | V7 |    |    |
| Standard calibration: 0 °C, 200 °C and 400 °C (32 °F, 392 °F and 752 °F)                        | V8 |    |    |
| Standard calibration: Customer specific temperatures  | V6 |    |    |
| DAkkS calibration: 0 °C (32 °F)   | D1 |    |    |
| DAkkS calibration: 100 °C (212 °F)  | D2 |    |    |
| DAkkS calibration: 400 °C (752 °F)  | D3 |    |    |
| DAkkS calibration: 0 °C and 100 °C (32 °F and 212 °F)   | D4 |    |    |
| DAkkS calibration: 0 °C and 400 °C (32 °F and 752 °F)   | D5 |    |    |
| DAkkS calibration: 0 °C, 100 °C and 200 °C (32 °F, 212 °F and 392 °F)                           | D7 |    |    |
| DAkkS calibration: 0 °C, 200 °C and 400 °C (32 °F, 392 °F and 752 °F)                           | D8 |    |    |
| DAkkS calibration: Customer specific temperatures   | D6 |    |    |

| <b>Additional ordering information SensyTemp TSC420</b>   | <b>XX</b> | <b>XX</b> | <b>XX</b> | <b>XX</b> |
|---|-----------|-----------|-----------|-----------|
| <b>Pipe Clamp</b>   |           |           |           |           |
| Clamping diameter 20 mm up to 40 mm   | S1        |           |           |           |
| Clamping diameter 40 mm up to 60 mm   | S2        |           |           |           |
| Clamping diameter 60 mm up to 80 mm   | S3        |           |           |           |
| Clamping diameter 80 mm up to 100 mm  | S4        |           |           |           |
| Clamping diameter 100 mm up to 120 mm   | S5        |           |           |           |
| Clamping diameter 120 mm up to 140 mm   | S6        |           |           |           |
| Clamping diameter 140 mm up to 160 mm   | S7        |           |           |           |
| Clamping diameter 160 mm up to 180 mm   | S8        |           |           |           |
| Clamping diameter 180 mm up to 200 mm   | S9        |           |           |           |
| Clamping diameter more than 200 mm  | SZ        |           |           |           |
| <b>Other Options</b>  |           |           |           |           |
| Hot junction grounded   | J1        |           |           |           |
| Mineral insulated cable sealed, up to 200 °C (392 °F)   | J6        |           |           |           |
| <b>Documentation Language</b>   |           |           |           |           |
| German  | M1        |           |           |           |
| English   | M5        |           |           |           |
| Language package Western Europe / Scandinavia (Languages: DE, EN, DA, ES, FR, IT, NL, PT, FI, SV) | MW        |           |           |           |
| Language package Eastern Europe (Languages: DE, EL, CS, ET, LV, LT, HU, PL, SK, SL, RO, BG)       | ME        |           |           |           |
| <b>Additional TAG Plate</b>   |           |           |           |           |
| Stainless steel plate with TAG no., lasered   | T1        |           |           |           |

# SensyTemp TSC400

## Industrial thermometer

### Main ordering information SensyTemp TSC430

|  |        |    |    |    |    |    |    |    |    |    |    |
|--|--------|----|----|----|----|----|----|----|----|----|----|
| <b>Base model</b>  | TSC430 | XX |
| TSC430 Screw-in thermometer with connection cable        |        |    |    |    |    |    |    |    |    |    |    |
| <b>Explosion Protection Certification</b>                |        |    |    |    |    |    |    |    |    |    |    |
| ATEX II 1 G Ex ia IIC                                    |        | A1 |    |    |    |    |    |    |    |    |    |
| ATEX II 2 G Ex ib IIC                                    |        | A2 |    |    |    |    |    |    |    |    |    |
| IECEx Ex ia IIC T6 Ga                                    |        | H1 |    |    |    |    |    |    |    |    |    |
| Without  |        | Y0 |    |    |    |    |    |    |    |    |    |
| <b>Mounting Type</b>                                     |        |    |    |    |    |    |    |    |    |    |    |
| Without fitting  |        |    | F0 |    |    |    |    |    |    |    |    |
| Fixed connection   |        |    | F1 |    |    |    |    |    |    |    |    |
| Compression fitting, clamp ring material PTFE            |        |    | F2 |    |    |    |    |    |    |    |    |
| Compression fitting, clamp ring material stainless steel |        |    | F3 |    |    |    |    |    |    |    |    |
| Weld on pad 25 mm x 25 mm x 3 mm (for Thermocouple)      |        |    | W2 |    |    |    |    |    |    |    |    |
| Weld on pad 35 mm x 25 mm x 3 mm (for Pt100)             |        |    | W3 |    |    |    |    |    |    |    |    |
| Clamping adapter (please define clip separately)         |        |    | C1 |    |    |    |    |    |    |    |    |
| Others   |        |    | Z9 |    |    |    |    |    |    |    |    |
| <b>Sensor Type and Wiring</b>                            |        |    |    |    |    |    |    |    |    |    |    |
| 1 x Pt100, two-wire circuit                              |        |    |    | P1 |    |    |    |    |    |    |    |
| 1 x Pt100, three-wire circuit                            |        |    |    | P2 |    |    |    |    |    |    |    |
| 1 x Pt100, four-wire circuit                             |        |    |    | P3 |    |    |    |    |    |    |    |
| 2 x Pt100, two-wire circuit                              |        |    |    | P4 |    |    |    |    |    |    |    |
| 2 x Pt100, three-wire circuit                            |        |    |    | P5 |    |    |    |    |    |    |    |
| 2 x Pt100, four-wire circuit                             |        |    |    | P6 |    |    |    |    |    |    |    |
| 1 x Type J (Fe-CuNi)                                     |        |    |    | J1 |    |    |    |    |    |    |    |
| 2 x Type J (Fe-CuNi)                                     |        |    |    | J2 |    |    |    |    |    |    |    |
| 1 x Type K (NiCr-NiAl)                                   |        |    |    | K1 |    |    |    |    |    |    |    |
| 2 x Type K (NiCr-NiAl)                                   |        |    |    | K2 |    |    |    |    |    |    |    |
| 1 x Type N (NiCrSi-NiSi)                                 |        |    |    | N1 |    |    |    |    |    |    |    |
| 2 x Type N (NiCrSi-NiSi)                                 |        |    |    | N2 |    |    |    |    |    |    |    |
| 1 x Type E (NiCr-CuNi)                                   |        |    |    | E1 |    |    |    |    |    |    |    |
| 2 x Type E (NiCr-CuNi)                                   |        |    |    | E2 |    |    |    |    |    |    |    |
| Others   |        |    |    | Z9 |    |    |    |    |    |    |    |

Continued see next page

| Main ordering information SensyTemp TSC430  | XX | XX | XX | XX | XX |
|---|----|----|----|----|----|
| <b>Sensor / Accuracy Class</b>  |    |    |    |    |    |
| RTD, IEC 60751 / class B, -196 ... 600 °C (-321 ... 1112 °F), wire wound resistor | B2 |    |    |    |    |
| RTD, IEC 60751 / class A, 0 ... 250 °C (32 ... 482 °F), wire wound resistor       | D2 |    |    |    |    |
| RTD, IEC 60751 / class A, -196 ... 500 °C (-321 ... 932 °F), wire wound resistor  | D1 |    |    |    |    |
| RTD, IEC 60751 / class B, -50 ... 400 °C (-58 ... 752 °F), thin film resistor     | S5 |    |    |    |    |
| RTD, IEC 60751 / class A, -30 ... 300 °C (-22 ... 572 °F), thin film resistor     | S1 |    |    |    |    |
| RTD, IEC 60751 / class AA, 0 ... 100 °C (32 ... 212 °F), thin film resistor       | S3 |    |    |    |    |
| Thermocouple, IEC 60584 / class 2   | T2 |    |    |    |    |
| Thermocouple, IEC 60584 / class 1   | T1 |    |    |    |    |
| Others  | Z9 |    |    |    |    |
| <b>Mineral Insulated Cable Diameter</b>   |    |    |    |    |    |
| 1,5 mm  | C2 |    |    |    |    |
| 3,0 mm  | D3 |    |    |    |    |
| 4,5 mm  | C5 |    |    |    |    |
| 6,0 mm  | D6 |    |    |    |    |
| 6,0 mm, tip with sleeve 8.0 mm  | H8 |    |    |    |    |
| Others  | Z9 |    |    |    |    |
| <b>Mineral Insulated Cable Material</b>   |    |    |    |    |    |
| Stainless steel 316Ti (1.4571)  | S1 |    |    |    |    |
| Stainless steel 316L (1.4404)   | S2 |    |    |    |    |
| Inconel Alloy 600 (2.4816)  | J1 |    |    |    |    |
| Others  | Z9 |    |    |    |    |
| <b>Process Connection Type</b>  |    |    |    |    |    |
| Without   | Y0 |    |    |    |    |
| Parallel thread M8 x 1  | M1 |    |    |    |    |
| Parallel thread G 1/4 A   | G1 |    |    |    |    |
| Parallel thread G 1/2 A   | G2 |    |    |    |    |
| Tapered thread 1/4 in. NPT  | N1 |    |    |    |    |
| Tapered thread 1/2 in. NPT  | N2 |    |    |    |    |
| Others  | Z9 |    |    |    |    |
| <b>Electrical Connection</b>  |    |    |    |    |    |
| Open wires  | C2 |    |    |    |    |
| Thermocouple-plug, size: standard   | C3 |    |    |    |    |
| Thermocouple-socket, size: standard   | C4 |    |    |    |    |
| Lemo-plug, size: 1S   | C5 |    |    |    |    |
| Lemo-socket, size: 1S   | C6 |    |    |    |    |
| Others  | Z9 |    |    |    |    |

# SensyTemp TSC400

## Industrial thermometer

| Main ordering information SensyTemp TSC430                                | XX | XX |
|---|----|----|
| <b>Connection Cable Type</b>  |    |    |
| JJ (PVC / PVC), up to 105 °C (221 °F)                                     | P2 |    |
| JFJ (PVC / Alu Foil / PVC), up to 105 °C (221 °F)                         | P3 |    |
| SLSLGL (Silicone / Silicone / Glass filament mesh), up to 200 °C (392 °F) | S3 |    |
| TFT (PFA / Alu Foil / PFA), up to 200 °C (392 °F)                         | T2 |    |
| TFTV (PFA / Alu Foil / PFA / SST wire braid), up to 200 °C (392 °F)       | T3 |    |
| TGLV (PFA / Glas fibre / SST wire braid), up to 200 °C (392 °F)           | T4 |    |
| Others  | Z9 |    |
| <b>Length Unit of Measure</b>   |    |    |
| Millimeter (mm)   | U1 |    |
| Inches (in.)  | U3 |    |

## Additional ordering information SensyTemp TSC430

|   | XX | XX | XX |
|---|----|----|----|
| <b>Certificates</b>   |    |    |    |
| Inspection certificate 3.1 acc. EN 10204 of sheath material                                     | C2 |    |    |
| Declaration of compliance with the order 2.1 acc. EN 10204                                      | C4 |    |    |
| Inspection certificate 3.1 acc. EN 10204 of visual, dimensional and functional test             | C6 |    |    |
| Inspection certificate 3.1 acc. EN 10204 of sensor calibration, single RTD                      | CD |    |    |
| Inspection certificate 3.1 acc. EN 10204 of sensor calibration, double RTD                      | CE |    |    |
| Inspection certificate 3.1 acc. EN 10204 of sensor calibration, single TC                       | CF |    |    |
| Inspection certificate 3.1 acc. EN 10204 of sensor calibration, double TC                       | CG |    |    |
| DAkkS sensor calibration, single RTD, separate calibration certificate per thermometer          | CH |    |    |
| DAkkS sensor calibration, double RTD, separate calibration certificate per thermometer          | CJ |    |    |
| DAkkS sensor calibration, single thermocouple, separate calibration certificate per thermometer | CK |    |    |
| DAkkS sensor calibration, double thermocouple, separate calibration certificate per thermometer | CL |    |    |
| <b>Number of Calibration Test Points</b>  |    |    |    |
| 1 point   | P1 |    |    |
| 2 points  | P2 |    |    |
| 3 points  | P3 |    |    |
| 4 points  | P4 |    |    |
| 5 points  | P5 |    |    |
| <b>Temperatures for Sensor Calibration</b>  |    |    |    |
| Standard calibration: 0 °C (32 °F)  |    |    | V1 |
| Standard calibration: 100 °C (212 °F)   |    |    | V2 |
| Standard calibration: 400 °C (752 °F)   |    |    | V3 |
| Standard calibration: 0 °C and 100 °C (32 °F and 212 °F)  |    |    | V4 |
| Standard calibration: 0 °C and 400 °C (32 °F and 752 °F)  |    |    | V5 |
| Standard calibration: 0 °C, 100 °C and 200 °C (32 °F, 212 °F and 392 °F)                        |    |    | V7 |
| Standard calibration: 0 °C, 200 °C and 400 °C (32 °F, 392 °F and 752 °F)                        |    |    | V8 |
| Standard calibration: Customer specific temperatures  |    |    | V6 |
| DAkkS calibration: 0 °C (32 °F)   |    |    | D1 |
| DAkkS calibration: 100 °C (212 °F)  |    |    | D2 |
| DAkkS calibration: 400 °C (752 °F)  |    |    | D3 |
| DAkkS calibration: 0 °C and 100 °C (32 °F and 212 °F)   |    |    | D4 |
| DAkkS calibration: 0 °C and 400 °C (32 °F and 752 °F)   |    |    | D5 |
| DAkkS calibration: 0 °C, 100 °C and 200 °C (32 °F, 212 °F and 392 °F)                           |    |    | D7 |
| DAkkS calibration: 0 °C, 200 °C and 400 °C (32 °F, 392 °F and 752 °F)                           |    |    | D8 |
| DAkkS calibration: Customer specific temperatures   |    |    | D6 |

# SensyTemp TSC400

## Industrial thermometer

| Additional ordering information SensyTemp TSC430  | XX | XX | XX | XX |
|---|----|----|----|----|
| <b>Pipe Clamp</b>   |    |    |    |    |
| Clamping diameter 20 mm up to 40 mm   | S1 |    |    |    |
| Clamping diameter 40 mm up to 60 mm   | S2 |    |    |    |
| Clamping diameter 60 mm up to 80 mm   | S3 |    |    |    |
| Clamping diameter 80 mm up to 100 mm  | S4 |    |    |    |
| Clamping diameter 100 mm up to 120 mm   | S5 |    |    |    |
| Clamping diameter 120 mm up to 140 mm   | S6 |    |    |    |
| Clamping diameter 140 mm up to 160 mm   | S7 |    |    |    |
| Clamping diameter 160 mm up to 180 mm   | S8 |    |    |    |
| Clamping diameter 180 mm up to 200 mm   | S9 |    |    |    |
| Clamping diameter more than 200 mm  | SZ |    |    |    |
| <b>Other Options</b>  |    |    |    |    |
| Hot junction grounded   | J1 |    |    |    |
| Mineral insulated cable, sealed, up to 200 °C (392 °F)  | J6 |    |    |    |
| <b>Documentation Language</b>   |    |    |    |    |
| German  | M1 |    |    |    |
| English   | M5 |    |    |    |
| Language package Western Europe / Scandinavia (Languages: DE, EN, DA, ES, FR, IT, NL, PT, FI, SV) | MW |    |    |    |
| Language package Eastern Europe (Languages: DE, EL, CS, ET, LV, LT, HU, PL, SK, SL, RO, BG)       | ME |    |    |    |
| <b>Additional TAG Plate</b>   |    |    |    |    |
| Stainless steel plate with TAG no., laserred  | T1 |    |    |    |

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# Notes

# Contact us

## ABB Ltd.

### Process Automation

Salterbeck Trading Estate  
Workington, Cumbria  
CA14 5DS  
UK

Tel: +44 (0)1946 830 611  
Fax: +44 (0)1946 832 661

## ABB Inc.

### Process Automation

125 E. County Line Road  
Warminster, PA 18974  
USA

Tel: +1 215 674 6000  
Fax: +1 215 674 7183

## ABB Automation Products GmbH

### Process Automation

Schillerstr. 72  
32425 Minden  
Germany  
Tel: +49 571 830-0  
Fax: +49 571 830-1806

[www.abb.com](http://www.abb.com)

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