

# SensyTemp TSW200, TSW300 Welded and drilled thermowells

Safe, robust and reliable thermowells  
for industrial temperature sensors

Measurement made easy



#### Developed in accordance with international standards

- ISO19001:2000

#### Manufactured with complete materials testing

- Traceability back to the production site
- Material certification
- Welding certification

#### Areas of application

- Chemical industry
- Energy industry
- General process engineering
- Tank and pipeline construction
- Mechanical engineering and plant construction
- Offshore and coastal areas
- Petroleum and natural gas production and transport
- Petrochemical industry

# SensyTemp TSW200, TSW300

## Welded and drilled thermowells

### Available versions

The range of conventionally welded (TSW200) and drilled (TSW300) thermowells from ABB comprises the following versions. Companies with their own standards may select "Other versions" and provide a drawing to obtain a corresponding quote.

#### Flanged connection (TSWX20)

Thermowells with a flanged connection are available in two manufacturing options:

##### Welded with a fillet and butt weld

- Fillet and butt welding is usually adequate in most cases; the weld is more stable than the operating pressure requires.

##### Full penetration welded

- Full penetration welding provides a more stable welded joint and is mandatory in cases where the integrity of the pipelines must be absolutely guaranteed.

#### Weld-in (TSWX10) and Screw-in (TSWX30)

The ABB weld-in and screw-in thermowell versions are manufactured from a single piece of top-quality material and do not have any welded seams.

### Profiles

There are three basic profile types available:

#### Straight shaft

- The shaft diameter remains constant over the entire length.

#### Tapered tip (conical)

- The profile tapers toward the tip in a conical form after initially maintaining a constant diameter.

#### Stepped tip (tiered)

- In the lower area of the thermowell, the diameter is reduced by one increment.

### Thermowell functions

- Protection against aggressive media, high process pressures, and high flow rates
- Replacement or recalibration of the measuring unit without interrupting the process

Depending on the medium, temperature and process pressure, several different designs and materials are available. The thermowells are divided into two categories:

- Welded protective fittings manufactured from pipe material for TSPX21
- Drilled thermowells manufactured from bar stock material for TSPX31

Available in accordance with DIN 43772 or ABB standard.

### Use in highly aggressive media

- A special coating of PFA or ECTFE with a standard coat thickness of 0.5 mm (0.02 inch) can be applied for the corresponding usage.

### Use in highly corrosive applications

- For thermowells with flange, a tantalum sheath can be applied for the corresponding usage.

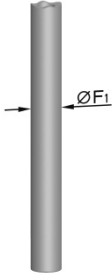
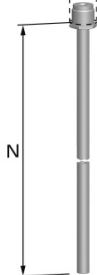
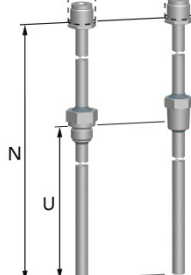
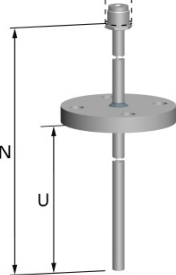
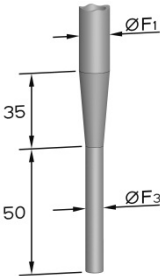
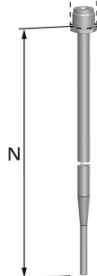
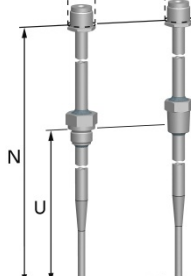
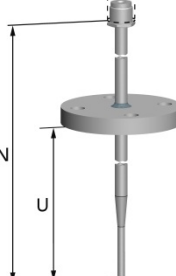
If required, contact your ABB partner.

### Response times in accordance with IEC 60751 and IEC 60584

The thermowell used in each application and the thermal contact between thermowell and measuring inset have an impact on the response times of TSP temperature sensors. In the case of TSPX21 and TSPX31 temperature sensors, the design of the thermowell tip has been adapted to the measuring inset. This maximizes heat transmission. The following table shows typical response times for the SensyTemp TSP series, measured in accordance with IEC 60751 in water with 0.4 m/s and a temperature rise from 25 °C (77 °F) to 35 °C (95 °F).

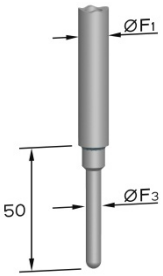
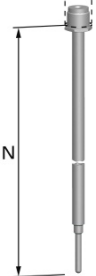
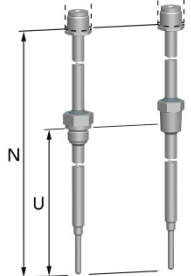
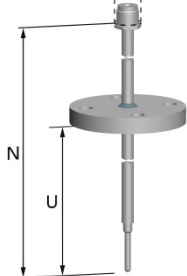
| Thermowell form               | Diameter [mm] | In water 0.4 m/s |                  |
|-------------------------------|---------------|------------------|------------------|
|                               |               | t <sub>0,5</sub> | t <sub>0,9</sub> |
| <b>Resistance thermometer</b> |               |                  |                  |
| 2, 2G, 2F, 2G0                | 9 x 1         | 25               | 77               |
|                               | 11 x 2        | 23               | 64               |
| 3, 3G, 3F                     | 12 / 9 mm tip | 15               | 38               |
| 2S, 2GS, 2FS, 2GS0            | 12 / 6 mm tip | 21               | 55               |
| <b>Thermocouples</b>          |               |                  |                  |
| 2, 2G, 2F, 2G0                | 9             | 10               | 24               |
|                               | 11            | 12               | 28               |
| 3, 3G, 3F                     | 12 / 9 mm tip | 12               | 24               |
| 2S, 2GS, 2FS, 2GS0            | 12 / 6 mm tip | 6                | 14               |
|                               | 14 / 6 mm tip | 6                | 14               |

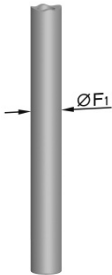
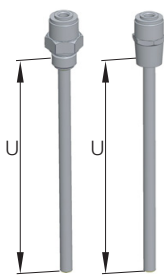
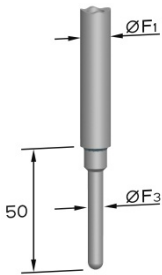
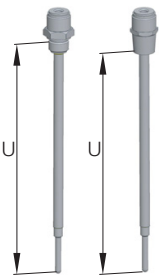
## Welded thermowells (TSW200)

| Straight shaft  | DIN 43772 – form 2  | DIN 43772 – form 2G  | DIN 43772 – form 2F   |
|---|---|--|---|
| M24 x 1.5 head connection   |   |  |   |
|    |    |    |    |
| 1.4571/316Ti  | F1 = 12, 14 mm  | F1 = 9, 11, 12, 14 mm  | F1 = 11, 12, 14 mm  |
| 1.4404/316L   | F1 = 12, 14 mm  | F1 = 12, 14 mm   | F1 = 12, 14 mm  |
| 2.4819/C-276  | —   | F1 = 13.7 mm <sup>1)</sup>   | F1 = 13.7 mm <sup>1)</sup>  |
| Measuring inset   | Ø 6 mm  | Ø 6 mm   | Ø 6 mm  |
| Tapered tip   | DIN 43772 – form 3  | DIN 43772 – form 3G  | DIN 43772 – form 3F   |
| M24 x 1.5 head connection   |   |  |   |
|  |  |  |  |
| 1.4571/316Ti  | F1/F3 = 12/9, 16/10 mm  | F1/F3 = 12/9 mm  | F1/F3 = 12/9, 16/10 mm  |
| 1.4404/316L   | F1/F3 = 12/9 mm   | F1/F3 = 12/9 mm  | F1/F3 = 12/9 mm   |
| Measuring inset   | Ø 6 mm  | Ø 6 mm   | Ø 6 mm  |

# SensyTemp TSW200, TSW300

## Welded and drilled thermowells

| Stepped tip   | ABB – form 2S   | ABB – form 2GS   | ABB – form 2FS  |
|---|---|--|---|
| M24 x 1.5 head connection   |   |  |   |
|  |  |  |  |
| 1.4571/316Ti  | F1/F3 = 12/6, 14/6 mm   | F1/F3 = 11/6, 12/6, 14/6 mm  | F1/F3 = 11/6, 12/6, 14/6 mm   |
| 1.4404/316L   | F1/F3 = 12/6, 14/6 mm   | F1/F3 = 12/6, 14/6 mm  | F1/F3 = 12/6, 14/6 mm   |
| 2.4819/C-276  | –   | F1/F3 = 13.7/6 mm <sup>1)</sup>  | F1/F3 = 13.7/6 mm <sup>2)</sup>   |
| Measuring inset   | Ø 3 mm  | Ø 3 mm   | Ø 3 mm  |

| Straight shaft without extension tube   | ABB – form 2G0  | Stepped tip without extension tube   | ABB – form 2GS0   |
|---|---|--|---|
| M24 x 1.5 head connection   |   | M24 x 1.5 head connection  |   |
|  |  |  |  |
| 1.4571/316Ti  | F1 = 9, 11, 12 mm <sup>1)</sup>   | 1.4571/316Ti   | F1/F3 = 11/6, 12/6 mm <sup>1)</sup>   |
| Measuring inset   | Ø 6 mm  | Measuring inset  | Ø 3 mm  |

1) Only with G1/2A, 1/2" NPT thread

2) Flange 1.4571/316Ti, flange disc 2.4819/C-276

Other diameters and materials available on request.

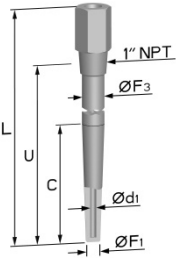
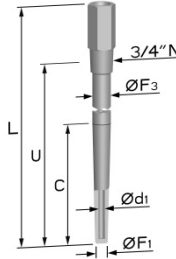
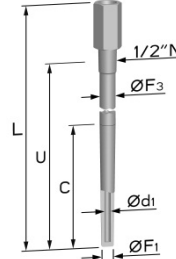
## Drilled thermowells (TSW300)

| Weld-in thermowell        |    | DIN 43772 – form 4  |      | DIN 43772 – form 4        |        | ABB – form PW   |      |
|---------------------------|----|---|------|---------------------------|--------|---|------|
| Extension tube connection |    | M18 x 1.5   |      | M14 x 1.5                 |        | 1/2" NPT  |      |
|                           |    |   |      |                           |        |   |      |
| Material                  |    | 1.4404/316L; 1.4571/316Ti; 1.7335/13CrMo4-5; 1.5415/15Mo3 |      |                           |        | 1.4404/316L; 1.4571/316Ti<br>1.4876/Incoloy 800; 2.4360/Monel 400<br>2.4816/Inconel 600; 2.4819/C-276                             |      |
| F3/F2/F1                  | d1 | 24h7/12.5 mm  | 7 mm | 18h7/9 mm                 | 3.5 mm | 32/23/13.5 mm   | 7 mm |
| Measuring inset           |    | Ø 6 mm  |      | Ø 3 mm                    |        | Ø 6 mm  |      |
| Flange thermowell         |    | DIN 43772 – form 4F                                       |      | DIN 43772 – form 4FS      |        | ABB – form PF   |      |
| Extension tube connection |    | M18 x 1.5   |      | M14 x 1.5                 |        | 1/2" NPT  |      |
|                           |    |   |      |                           |        |   |      |
| Material                  |    | 1.4404/316L; 1.4571/316Ti                                 |      | 1.4404/316L; 1.4571/316Ti |        | 1.4404/316L; 1.4571/316Ti<br>1.4876/Incoloy 800; 2.4360/Monel 400 <sup>1)</sup><br>2.4816/Inconel 600; 2.4819/C-276 <sup>1)</sup> |      |
| F3/F2/F1                  | d1 | 24/12.5 mm  | 7 mm | 18/9 mm                   | 3.5 mm | 32/23/13.5 mm   | 7 mm |
| Measuring inset           |    | Ø 6 mm  |      | Ø 3 mm                    |        | Ø 6 mm  |      |

1) 1.4876/Incoloy 800; 2.4360/Monel 400; 2.4816/Inconel 600; 2.4819/C-276 with flange in 1.4571/316Ti and flange disc

# SensyTemp TSW200, TSW300

## Welded and drilled thermowells

| Screw-in thermowell       |    | ABB – form PS   |      | ABB – form PS  |      | ABB – form PS   |      |
|---------------------------|----|---|------|--|------|---|------|
| Extension tube connection |    | 1/2" NPT; WAF 36  |      | 1/2" NPT; WAF 27   |      | 1/2" NPT; WAF 27  |      |
|                           |    |                  |      |  |      |  |      |
| Material                  |    | 1.4404/316L; 1.4571/316Ti; 1.4876/Incoloy 800; 2.4360/Monel 400; 2.4816/Inconel 600; 2.4819/C-276 |      |  |      |   |      |
| F3/F1                     | d1 | 25/16 mm  | 7 mm | 20/13.5 mm   | 7 mm | 17/13.5 mm  | 7 mm |
| Measuring inset           |    | Ø 6 mm  |      |  |      |   |      |

Other diameters and materials available on request.

### Standard lengths

| Tubular thermowells mm (inch) |  |                   |
|-------------------------------|--|-------------------|
| Form                          | N = 230 (9.055)  | U = 100 (3.94)    |
| 2; 2G; 2F,                    | N = 290 (11.42)  | U = 160 (6.30)    |
| 3; 3G; 3F;                    | N = 380 (14.96)  | U = 250 (9.84)    |
| 2S; 2GS; 2FS                  | N = 530 (20.87)  | U = 400 (15.75)   |
| Drilled thermowells mm (inch) |  |                   |
| Form 4                        | L = 140 (5.51)   | C = 65 (2.56)     |
|                               | L = 200 (7.87)   | C = 65 (2.56)     |
|                               | L = 200 (7.87)   | C = 125 (4.92)    |
|                               | L = 260 (10.24)  | C = 125 (4.92)    |
| Form 4S                       | L = 410 (16.14)  | C = 275 (10.83)   |
|                               | L = 110 (4.33)   | C = 65 (2.65)     |
| Form 4S                       | L = 140 (5.51)   | C = 65 (2.65)     |
|                               | U = 100 (3.94), 150 (5.91),<br>200 (7.87), 250 (9.84),<br>300 (11.81), 350 (13.78) | L = U + 65 (2.56) |
| Form PW;<br>PF; PS            | U = 130 (5.12), L = 200 (7.87)   | C = 65 (2.56)     |
|                               | U = 190 (7.48), L = 260 (10.24)  | C = 125 (4.92)    |
|                               | U = 340 (13.39),<br>L = 410 (16.14)  | C = 275 (10.83)   |
| Form 4FS                      | U = 130 (5.12), L = 200 (7.87)   | C = 65 (2.65)     |

### Pressure and vibration resistance of thermowell

The permissible compressive loads for thermowells at various temperatures are illustrated in the following figures (thermowells conforming to DIN 43772).

The curves can also be applied to identical thermowell models.

#### Thermowell form 2 (material 1.4571)

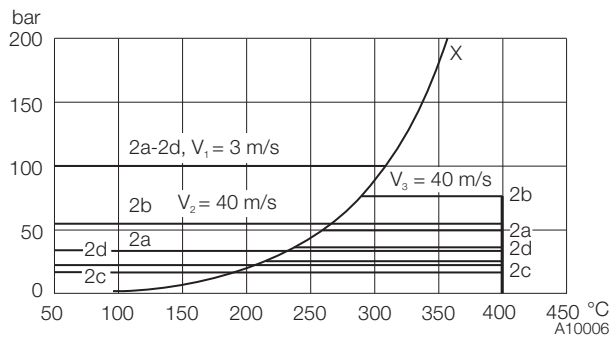


Fig. 1

- X Vapor-pressure curve
- V<sub>1</sub> Flow rate in water
- V<sub>2</sub> Flow rate in air
- V<sub>3</sub> Flow rate in steam

| Curve | Installation length (mm) | Thermowell diameter (mm) |
|-------|--------------------------|--------------------------|
| 2a    | 250                      | 11                       |
| 2b    | 250                      | 14                       |
| 2c    | 400                      | 11                       |
| 2d    | 400                      | 14                       |

#### Thermowell form 3 (material 1.4571)

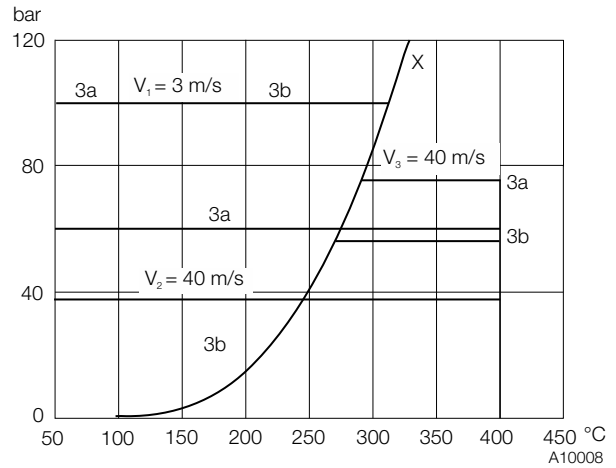


Fig. 2

- X Vapor-pressure curve
- V<sub>1</sub> Flow rate in water
- V<sub>2</sub> Flow rate in air
- V<sub>3</sub> Flow rate in steam

| Curve | Installation length (mm) | Thermowell diameter (mm) |
|-------|--------------------------|--------------------------|
| 3a    | 225                      | 12/9                     |
| 3b    | 285                      | 12/9                     |

# SensyTemp TSW200, TSW300 Welded and drilled thermowells

## Thermowell form 4 (material 1.4571)

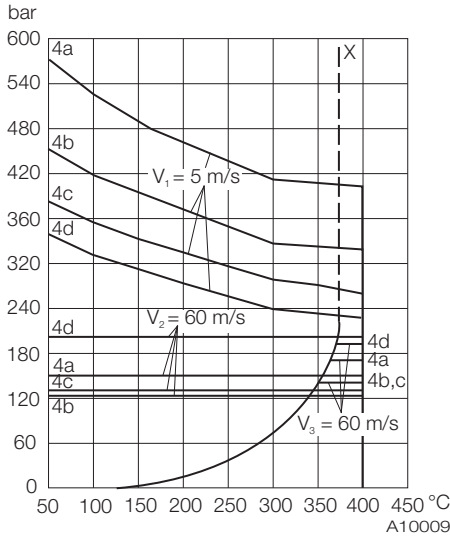


Fig. 3

- X Vapor-pressure curve
- $V_1$  Flow rate in water
- $V_2$  Flow rate in air
- $V_3$  Flow rate in steam

| Curve | Installation length (mm) | Thermowell diameter (mm) |
|-------|--------------------------|--------------------------|
| 4a    | 65                       | 18                       |
| 4b    | 125                      | 24                       |
| 4c    | 125                      | 26                       |
| 4d    | 125                      | 32                       |

### NOTE

The diagrams above have been taken from DIN 43772. They are based on the Dittrich calculation model. They do not take possible vibration caused by vortex excitation of the flowing medium into account.

ABB's standard thermowells are sufficiently robust for most industrial applications provided that design, material, and length are properly selected.

Most thermowell failures are caused by flow-related vibration. For this reason, ABB offers a stress analysis for ABB thermowells, based on the respective usage parameters.

## Thermowell form 4 (material 1.7335 and 1.7380)

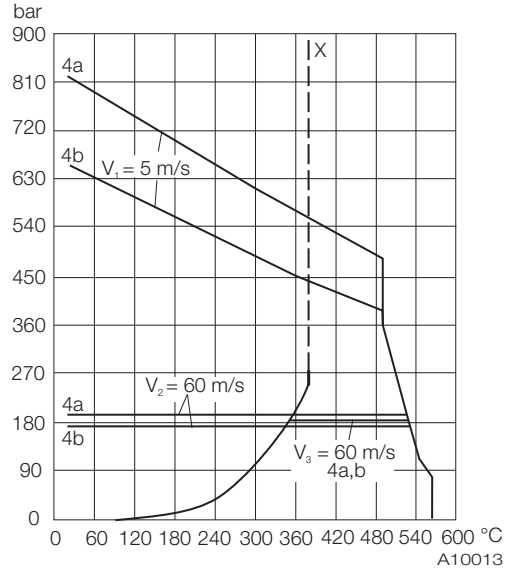


Fig. 4

- X Vapor-pressure curve
- $V_1$  Flow rate in water
- $V_2$  Flow rate in air
- $V_3$  Flow rate in steam

| Curve | Installation length (mm) | Thermowell diameter (mm) |
|-------|--------------------------|--------------------------|
| 4a    | 65                       | 18                       |
| 4b    | 125                      | 24                       |

The stress analysis conforms to ASME PTC 19.3-2010. It is based on recognized theoretical methods and is intended to support thermowell selection for critical applications.

It is not, however, a guarantee against failure of the thermowell.

Given the relatively unreliable computational estimation of the natural frequency of a thermowell and taking the numerous influencing factors into account, experimental testing is recommended in critical cases.

For more detailed information about thermowell loads and calculation methods, please see DIN 43772.



## Process connections

| Plug-in thermowells, welded        | Sliding connection |
|------------------------------------|--------------------|
| DIN 43772 – form 2, straight shaft | G1/2"A, 1/2" NPT   |
| DIN 43772 – form 3, tapered tip    |                    |
| ABB – form 2S, stepped tip         |                    |

### NOTE

All ABB compression fittings are manufactured from stainless steel and are supplied without material certification in accordance with EN 10204.

| Screw-in thermowells, welded                           | Fixed connection   |
|--|--|
| DIN 43772 – form 2G, straight shaft                    | G3/8"A, G1/2"A, G3/4"A, G1"A, 1/2" NPT, 3/4" NPT, 1" NPT<br>M20 x 1,5, M27 x 2,<br>1/2" BSPT, 3/4" BSPT, 1" BSPT |
| DIN 43772 – form 3G, tapered tip                       |  |
| ABB – form 2GS, stepped tip                            |  |
| ABB – form 2G0, without extension tube                 | G1/2"A, 1/2" NPT   |
| ABB – form 2GS0, without extension tube<br>Stepped tip |  |

| Flange thermowells, welded          | Flange in accordance with EN 1092-1<br>Form B1/B2 sealing surface <sup>1)</sup>  | Flange in accordance with ASME<br>B16.5 TW<br>Form RF sealing surface <sup>1)</sup>   | Tri-clamp<br>flange<br>BS4825 |
|-------------------------------------|--|---|-------------------------------|
| DIN 43772 – form 2F, straight shaft | DN 15, PN 10 ... PN 40<br>DN 20, PN 10 ... PN 40   | Nominal diameter 1",<br>nominal pressure 150, 300, 600 lbs.<br>Nominal diameter 1 1/2", nominal<br>pressure 150, 300, 600, 900/1500 lbs.<br>Nominal diameter 2", nominal pressure<br>150, 300, 600, 900/1500 lbs. | On request                    |
| DIN 43772 – form 3F, tapered tip    | DN 25, PN 10 ... PN 40, PN 63 ... PN 100<br>DN 32, PN 16 ... PN 40, PN 63 ... PN 100<br>DN 40, PN 10 ... PN 40, PN 63 ... PN 100 |   |                               |
| ABB – form 2FS, stepped tip         | DN 50, PN 6, PN 10 ... PN 40, PN 63 ... PN 100<br>DN 80, PN 16<br>DN 100, PN 40  |   |                               |

1) Others available on request

# SensyTemp TSW200, TSW300

## Welded and drilled thermowells

| <b>Weld-in thermowells, drilled</b>  |  |   |                                |
|--|--|---|--------------------------------|
| Weld-in thermowells are available as DIN 43772 form 4 and ABB form PW. Other forms are available on request. |  |   |                                |
| <b>Screw-in thermowells, drilled</b>   |  | <b>Screw-in thread</b>  |                                |
| DIN 43772 – form 6 and ABB – form PS   |  | G1/2"A, 1/2" NPT, 3/4" NPT, 1" NPT, M20 x 1,5   |                                |
| <b>Flange thermowells, drilled</b>   | <b>Flange in accordance with EN 1092-1</b><br>Form B1/B2 sealing surface <sup>1)</sup>                         | <b>Flange in accordance with ASME B16.5 TW</b><br>Form RF sealing surface <sup>1)</sup>   | <b>Tri-clamp flange BS4825</b> |
| DIN 43772 – form 4F, F2 = 18 mm, 24 mm, 26 mm, thermowell manufactured from bar stock material               | DN 25, PN 10 ... PN 40, PN 63 ... PN 100<br>DN 32, PN 16 ... PN 40<br>DN 40, PN 10 ... PN 40, PN 63 ... PN 100 | Nominal diameter 1",<br>nominal pressure 150, 300, 600 lbs.<br>Nominal diameter 1 1/2", nominal pressure 150, 300, 600, 900/1500 lbs.<br>Nominal diameter 2", nominal pressure 150, 300, 600, 900/1500 lbs. | On request                     |
| ABB – form PF, thermowell manufactured from bar stock material   | DN 50, PN 6, PN 10 ... PN 40, PN 63 ... PN 100<br>DN 80, PN 16<br>DN 100, PN 40                                |   |                                |

1) Others available on request

### NOTE

Other process connections are available on request. If required, contact your ABB partner.

## Materials

ABB can manufacture thermowells from almost any commercially available material. If the material required is not listed in the following list, contact ABB to seek advice.

### **Stainless steel 1.4404 (ASTM 316L)**

The most commonly used material for thermowells combines good corrosion resistance with high strength and good availability. Operating temperature up to 800 °C.

### **Stainless steel 1.4571 (ASTM 316Ti)**

An improved version of 316 with a small amount of titanium to stabilize the material at temperatures up to 800 °C. Good resistance against intergranular corrosion. Suited for low temperatures.

### **Stainless steel 1.4541 (ASTM 321 Ti)**

Has properties similar to 316Ti.

### **Stainless steel 1.4539 Uranus B6 (ASTM 904L)**

A stainless steel for use in applications in the process industry that are subject to high levels of corrosion. Very good resistance against attacks in acidic media, e.g. sulfuric, phosphoric and acetic acids, acidic gas conditions. Very good resistance against pitting corrosion in neutral media containing chloride (sea water, salt solutions). High resistance against stress corrosion cracking and crevice corrosion.

### **Heat-resistant steel 1.4841 (ASTM 314 Ti)**

Chrome steel, heat-resistant up to 1150 °C. Good resistance against nitrogenous and oxygen-deficient gases. Low resistance against sulfurous gases. High resistance against oxidation with high mechanical strength and excellent chemical resistance up to 1100 °C.

**Highly heat-resistant stainless steel 1.4961 (ASTM 347 H)**

Highly heat-resistant stainless steel with very good resistance against high temperatures up to 750 °C.

**Ni alloy 2.4610 Hastelloy C-4**

A material for applications at temperatures up to 1100 °C, suited to a wide variety of applications in corrosive media plus oxidizing and reducing conditions such as wet chlorine gas and chloride solutions. High resistance against pitting and crevice corrosion and stress corrosion cracking.

**Ni-alloy 2.4819 Hastelloy C-276**

A material suited for applications at temperatures up to 1100 °C in atmospheres and processes containing chloride. It is not advisable to use stainless steel grades from the 300-series in environments with high chloride and low oxygen concentration.

**NiCr alloy 2.4816 (Inconel 600)**

This alloy with is suitable for use in high temperatures and in oxidizing and reducing atmospheres. Good resistance against stress corrosion cracking caused by chloride.

**NiCu alloy 2.4360 (Monel 400)**

This highly heat-resistant and chemical-resistant NiCu alloy is suited to use in a wide range of ambient conditions. Operating temperature up to 600 °C.

**Duplex stainless steel 1.4462**

A ferritic / austenitic stainless steel with good resistance against pitting and intercrystalline corrosion. A stainless steel designed specifically for use in environments with media contaminated by chlorides at elevated temperatures, in which excellent corrosion resistance is required.

**Stainless steel 1.4301 (ASTM 304 Ti)**

Heat- and corrosion-resistant stainless steel up to 550 °C (max. 800 °C). Good resistance at moderate temperatures to organic acids, salt solutions (such as sulfates and sulfides) as well as to alkaline solutions.

**NiCrFe alloy 1.4876 (Incoloy 800)**

Particularly good heat resistance due to the addition of titanium and aluminum. Suitable for applications up to 1100 °C where the highest load capacity is required, in addition to resistance to scaling. Resistant to carburization, nitride hardening, high-temperature corrosion and thermal shock.

**Steel 1.4749 (ASTM A446-1) and 1.4762 (ASTM A268)**

Heat-resistant chrome steel up to 1150 °C with high to very high resistance to oxidizing and reducing flames and to sulfurous gases and salts due to a high chromium content. Very good oxidation resistance both at constant and cyclical temperature loads.

**Note**

The temperatures indicated are maximum values (pressure-free in air).

The effects of viscosity, medium velocity, pressure and temperature in the process usually cause these values to drop. For applications in pressure vessels, the recognized regulations, Pressure Equipment Directives etc. must be observed.

**Disclaimer:**

All of the information above is provided as guidance and must be checked in accordance with the required operating conditions.

# SensyTemp TSW200, TSW300

## Welded and drilled thermowells

### Additional requirements

Materials for use in "acidic" environments (i.e. environments with high concentrations of hydrogen sulphide) must normally correspond to the relevant NACE standard. ABB can meet all of these requirements.

### Load calculation in accordance with ASME PTC 19.3 2010

**TW** These are the only published specifications for evaluating the load to which thermowells are exposed when in use. The technicians from ABB can conduct such a calculation on request in line with ASME specifications. A certification may also be provided if requested.

### Positive material identification (PMI)

If absolute verification of the materials supplied is required, ABB can conduct a positive material identification process in-house. This technique involves the quantitative analysis of the heavy elements in the chemical composition of the material. The result can then be compared with the certification provided by the manufacturing plant.

### Pressure test

ABB offers two type of hydrostatic pressure tests:

#### External

Test of the thermowell, in which external pressure 1.5 times the nominal pressure for the flange is applied.

#### Internal

Examination of the interior of the thermowell for leaks

### Examination of the welding integrity

The integrity of the welding can be determined by:

#### Dye penetration test

For detecting external defects in the welding.

#### X-ray

For examining the welding for internal defects deep within the material.

The X-ray examination is the only test that generates a permanent record of the integrity of the welding in the form of a photo (X-ray image).

### Bore hole concentricity

The concentricity of the bore hole in the thermowell is fundamentally important to the operating performance and safety of the thermowell. ABB uses specially designed deep-hole drilling machines in order to absolutely ensure the concentricity of the bore hole. At ABB plants, ultrasound tests for bore hole concentricity form part of standard procedure. X-ray images on two axes of the concentric bore holes are offered as an additional verification option.

### Treatment of the stainless steel surface

The corrosion resistance of stainless steel varieties is provided by a thin chromium-oxide coating on the surface. This coating may be damaged during the production process by contamination. In order for the oxide coating to regenerate, which in turn guarantees the thermowell's corrosion resistance, it is essential for this contamination to be removed. The standard ABB procedure involves the thorough degreasing of each individual thermowell on the inside and outside prior to delivery.

ABB can also conduct a separate "pickling and passivation process" on request. This involves dipping the thermowell in a bath of hot acid to remove any contamination. Then the thermowell is "passivated" in order to rebuild the chromium oxide layer.

## Installation instructions

The usual way of ensuring that thermal measurements are accurate is to comply with the minimum insertion depth of the temperature sensor. Ideally, in the case of pipelines, the sensor on a thermometer should be located in the center of the pipe. If this is not possible, both in the case of pipes and with containers, a minimum insertion depth of 10 to 15-times the thermowell diameter is assumed to be sufficient.

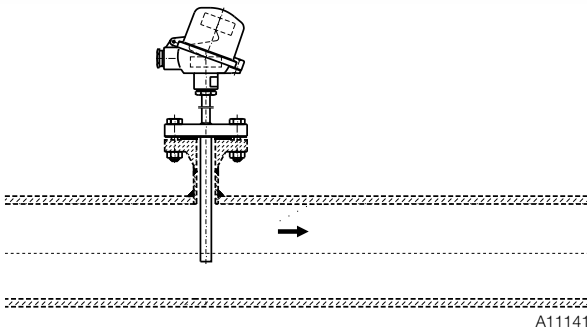


Fig. 5

### Insufficient nominal diameter

In the case of pipelines with very small nominal diameters, insertion inside an elbow pipe is recommended. The thermowell tip is set in opposition to the flow direction of the medium. Inserting the thermowell with an adapter at an acute angle against the flow direction can also distort measurement results.

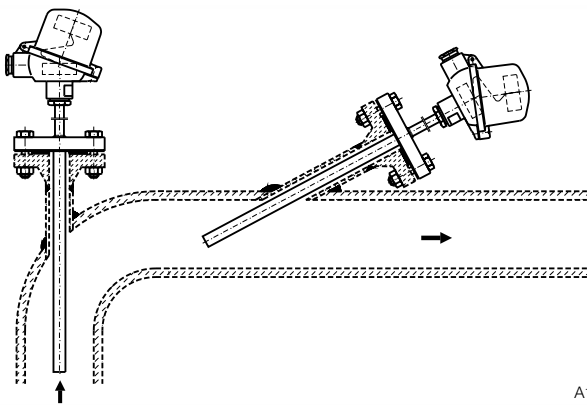


Fig. 6

## Response time

The factors affecting the response time are both numerous and very varied, including:

- Thermal conductivity of the medium
- Flow rate of the medium
- Thermal conductivity of the thermowell material
- Dimensions of the thermowell

Each of these factors influences the ultimate response time.

Generally, measuring instruments fitted in the thermowells respond more quickly to temperature changes than the process itself. If a faster response time is required, this can be achieved by reducing the amount of material surrounding the measuring element, i.e. a stepped thermowell must be used. However, a compromise must be found between the targeted response time and the stability required by the thermowell. More information regarding response times can be found in chapter "Response times in accordance with IEC 60751 and IEC 60584" on page 2.

## Special forms

Situations may arise in which a thermowell design is required that cannot be developed from the specifications available. The technicians from ABB can help with such requirements. ABB has experience with the development of special designs and can provide you with a quote for such special cases.

Some customers require an approval before the production of such designs. This can be obtained by using the special design constructed by ABB.

No matter what your requirements look like, whether it is a special design or problems with erosion or corrosion, the technicians from ABB are here to help you.

# SensyTemp TSW200, TSW300

## Welded and drilled thermowells

### Ordering Information

#### Main ordering information SensyTemp TSW210 Thermowell

| Base model   | TSW210 | XX | XX | XX | XX | XX  | XX | XX |
|--|--------|----|----|----|----|-----|----|----|
| SensyTemp TSW210 Thermowell, tubular, weld in                        |        |    |    |    |    |     |    |    |
| <b>Thermowell Type</b>   |        |    |    |    |    |     |    |    |
| Tubular thermowell with straight shaft (DIN 43772, Form 2)           |        | A1 |    |    |    |     |    |    |
| Tubular thermowell, stepped tip (ABB Form 2S)                        |        | B1 |    |    |    |     |    |    |
| Tubular thermowell, tapered (DIN 43772, Form 3)                      |        | C1 |    |    |    |     |    |    |
| Tubular thermowell, stepped tip 9 mm (0.36 in.) (ABB Form 2S/9)      |        | K1 |    |    |    |     |    |    |
| <b>Wetted thermowell material</b>                                    |        |    |    |    |    |     |    |    |
| Stainless steel ASTM 316L (1.4404)                                   |        |    | S1 |    |    |     |    |    |
| Stainless steel ASTM 316Ti (1.4571)                                  |        |    | S2 |    |    |     |    |    |
| Stainless steel ASTM 904L (CrNi, 1.4539); (Uranus B6)                |        |    | S4 |    |    |     |    |    |
| Duplex stainless steel (CrNi, 1.4462)                                |        |    | S9 |    |    |     |    |    |
| Heat resistant steel ASTM A446 (1.4762)                              |        |    | H2 |    |    |     |    |    |
| Heat resistant steel ASTM A314 (CrNi, 1.4841)                        |        |    | H3 |    |    |     |    |    |
| Ni-Alloy Hastelloy C-276 (2.4819)                                    |        |    | N1 |    |    |     |    |    |
| Ni-Alloy Hastelloy C-4 (2.4610)                                      |        |    | N2 |    |    |     |    |    |
| Highly heat-resistant stainless steel, Ni-Alloy Inconel 600 (2.4816) |        |    | N5 |    |    |     |    |    |
| Others   |        |    | Z9 |    |    |     |    |    |
| <b>Process Connection</b>  |        |    |    |    |    |     |    |    |
| Without process connection (weld-in type)                            |        |    |    |    |    | Y00 |    |    |
| Adjustable compression fitting G 1/2, stainless steel                |        |    |    |    |    | A01 |    |    |
| Adjustable compression fitting 1/2 in. NPT, stainless steel          |        |    |    |    |    | A02 |    |    |
| Adjustable flange DN 25 PN 10 ... PN 40, EN 1092-1                   |        |    |    |    |    | A03 |    |    |
| Adjustable flange 1 in. 150 lbs, ASME B16.5                          |        |    |    |    |    | A07 |    |    |
| Others   |        |    |    |    |    | Z99 |    |    |
| <b>Thermowell Connection</b>   |        |    |    |    |    |     |    |    |
| Extension tube with Cylindrical thread M24 x 1,5                     |        |    |    |    |    |     | M4 |    |
| Others   |        |    |    |    |    |     | Z9 |    |
| <b>Thermowell Diameter</b>   |        |    |    |    |    |     |    |    |
| 6 mm x 1 mm  |        |    |    |    |    |     |    | A9 |
| 8 mm x 2 mm  |        |    |    |    |    |     |    | A5 |
| 9 mm x 1 mm  |        |    |    |    |    |     |    | A1 |
| 10 mm x 1,5 mm   |        |    |    |    |    |     |    | A6 |
| 11 mm x 2 mm   |        |    |    |    |    |     |    | A2 |
| 12 mm x 2,5 mm   |        |    |    |    |    |     |    | A3 |
| 13,5 mm x 2,3 mm   |        |    |    |    |    |     |    | B6 |
| 13,7 mm x 2,24 mm  |        |    |    |    |    |     |    | B2 |
| 14 mm x 2,5 mm   |        |    |    |    |    |     |    | A4 |
| 15 mm x 2 mm   |        |    |    |    |    |     |    | A7 |
| 16 mm x 3 mm   |        |    |    |    |    |     |    | A8 |
| 22 mm x 2 mm   |        |    |    |    |    |     |    | B1 |
| Andere   |        |    |    |    |    |     |    | Z9 |

Continued see next page

| Main ordering information SensyTemp TSW210 |  | XX | XX |
|--|--|----|----|
| <b>Immersion Length</b>                    |  |    |    |
| Without fixed immersion length             |  | Y0 |    |
| <b>Nominal Length</b>                      |  |    |    |
| N = 230 mm (9.1 in.)                       |  |    | N1 |
| N = 290 mm (11.4 in.)                      |  |    | N3 |
| N = 380 mm (15 in.)                        |  |    | N5 |
| N = 530 mm (20.9 in.)                      |  |    | N7 |
| Customer specific length                   |  |    | Z9 |

### Additional ordering information SensyTemp TSW210

|  |  | XX | XX | XX |
|--|--|----|----|----|
| <b>Thermowell Options</b>  |  |    |    |    |
| Thermowell stainless steel with additional tantalum sleeve                                 |  | S1 |    |    |
| Thermowell coated with 0.5 mm (0.02 in.) E-CTFE / Halar, wetted parts incl. flange surface |  | S2 |    |    |
| Thermowell coated with 0.5 mm (0.02 in.) PFA, wetted parts incl. flange surface            |  | S3 |    |    |
| Thermowell coated with 1 mm (0.04 in.) NiCrB / META 43                                     |  | S4 |    |    |
| Thermowell coated with 0.5 mm (0.02 in.) NiZrO2 / PL1312                                   |  | S5 |    |    |
| Thermowell incl. tests and certificates AD-2000 standard for austenitic steel              |  | S6 |    |    |
| Thermowell clean for oxygen service  |  | S9 |    |    |
| Thermowell stress calculation according Dittrich / Kohler                                  |  | SD |    |    |
| Others   |  | SZ |    |    |
| <b>Certificates</b>  |  |    |    |    |
| Test report according EN 10204-2.2, material monitoring for wetted parts                   |  |    | C1 |    |
| Inspection certificate according EN 10204-3.1, material monitoring for wetted parts        |  |    | C2 |    |
| Inspection certificate according EN 10204-3.2, material monitoring for wetted parts        |  |    | C3 |    |
| Inspection certificate according EN 10204-3.1, visual, dimensional and functional test     |  |    | C6 |    |
| Inspection certificate according EN 10204-3.1, helium leakage test                         |  |    | C7 |    |
| Inspection certificate according EN 10204-3.1, dye penetration test                        |  |    | C9 |    |
| Inspection certificate according EN 10204-3.1, Positive Material Identification (PMI)      |  |    | CA |    |
| Inspection certificate according EN 10204-3.1, pressure test on thermowell                 |  |    | CB |    |
| <b>Documentation Language</b>  |  |    |    |    |
| German   |  |    |    | M1 |
| English  |  |    |    | M5 |

# SensyTemp TSW200, TSW300

## Welded and drilled thermowells

### Main ordering information SensyTemp TSW220 Thermowell

| Base model   | TSW220                  | XX | XX | XX | XX | XX | XX | XX | XX  |
|--|-------------------------|----|----|----|----|----|----|----|-----|
| SensyTemp TSW220 Thermowell, tubular, flanged                            |                         |    |    |    |    |    |    |    |     |
| <b>Thermowell Type</b>   | Continued see next page |    |    |    |    |    |    |    |     |
| Flanged tubular thermowell with straight shaft (DIN 43772, Form 2F)      | A2                      |    |    |    |    |    |    |    |     |
| Flanged tubular thermowell, stepped tip (ABB Form 2FS)                   | B2                      |    |    |    |    |    |    |    |     |
| Flanged tubular thermowell, tapered (DIN 43772, Form 3F)                 | C2                      |    |    |    |    |    |    |    |     |
| Flanged tubular thermowell, stepped tip 9 mm (0.36 in.) (ABB Form 2FS/9) | K2                      |    |    |    |    |    |    |    |     |
| <b>Wetted thermowell material</b>  |                         |    |    |    |    |    |    |    |     |
| Stainless steel ASTM 316L (1.4404)                                       |                         |    |    |    |    |    |    |    | S1  |
| Stainless steel ASTM 316Ti (1.4571)                                      |                         |    |    |    |    |    |    |    | S2  |
| Stainless steel ASTM 904L (CrNi, 1.4539); (Uranus B6)                    |                         |    |    |    |    |    |    |    | S4  |
| Duplex stainless steel (CrNi, 1.4462)                                    |                         |    |    |    |    |    |    |    | S9  |
| Heat resistant steel ASTM A446 (1.4762)                                  |                         |    |    |    |    |    |    |    | H2  |
| Heat resistant steel ASTM A314 (CrNi, 1.4841)                            |                         |    |    |    |    |    |    |    | H3  |
| Ni-Alloy Hastelloy C-276 (2.4819)  |                         |    |    |    |    |    |    |    | N1  |
| Ni-Alloy Hastelloy C-4 (2.4610)  |                         |    |    |    |    |    |    |    | N2  |
| Highly heat-resistant stainless steel , Ni-Alloy Inconel 600 (2.4816)    |                         |    |    |    |    |    |    |    | N5  |
| Others   |                         |    |    |    |    |    |    |    | Z9  |
| <b>Process Connection</b>  |                         |    |    |    |    |    |    |    |     |
| Flange DN 15 PN 10 ... PN 40, EN 1092-1                                  |                         |    |    |    |    |    |    |    | F01 |
| Flange DN 20 PN 10 ... PN 40, EN 1092-1                                  |                         |    |    |    |    |    |    |    | F02 |
| Flange DN 25 PN 10 ... PN 40, EN 1092-1                                  |                         |    |    |    |    |    |    |    | F03 |
| Flange DN 25 PN 63 ... PN100, EN 1092-1                                  |                         |    |    |    |    |    |    |    | F29 |
| Flange DN 32 PN 16 ... PN 40, EN 1092-1                                  |                         |    |    |    |    |    |    |    | F30 |
| Flange DN 40 PN 10 ... PN 40, EN 1092-1                                  |                         |    |    |    |    |    |    |    | F04 |
| Flange DN 40 PN 63 ... PN 100, EN 1092-1                                 |                         |    |    |    |    |    |    |    | F37 |
| Flange DN 50 PN 6, EN 1092-1   |                         |    |    |    |    |    |    |    | F06 |
| Flange DN 50 PN 10 ... PN 40, EN 1092-1                                  |                         |    |    |    |    |    |    |    | F05 |
| Flange DN 50 PN 63, EN 1092-1  |                         |    |    |    |    |    |    |    | F33 |
| Flange DN 50 PN 100, EN 1092-1   |                         |    |    |    |    |    |    |    | F34 |
| Flange DN 80 PN 16, EN 1092-1  |                         |    |    |    |    |    |    |    | F35 |
| Flange DN 100 PN 40, EN 1092-1   |                         |    |    |    |    |    |    |    | F36 |
| Flange 1 in. 150 lbs, ASME B16.5   |                         |    |    |    |    |    |    |    | F07 |
| Flange 1 in. 300 lbs, ASME B16.5   |                         |    |    |    |    |    |    |    | F08 |
| Flange 1 in. 600 lbs, ASME B16.5   |                         |    |    |    |    |    |    |    | F09 |
| Flange 1 in. 900 / 1500 lbs, ASME B16.5                                  |                         |    |    |    |    |    |    |    | F10 |
| Flange 1-1/2 in. 150 lbs, ASME B16.5                                     |                         |    |    |    |    |    |    |    | F11 |
| Flange 1-1/2 in. 300 lbs, ASME B16.5                                     |                         |    |    |    |    |    |    |    | F12 |
| Flange 1-1/2 in. 600 lbs, ASME B16.5                                     |                         |    |    |    |    |    |    |    | F13 |
| Flange 1-1/2 in. 900 / 1500 lbs, ASME B16.5                              |                         |    |    |    |    |    |    |    | F14 |
| Flange 2 in. 150 lbs, ASME B16.5   |                         |    |    |    |    |    |    |    | F15 |
| Flange 2 in. 300 lbs, ASME B16.5   |                         |    |    |    |    |    |    |    | F16 |
| Flange 2 in. 600 lbs, ASME B16.5   |                         |    |    |    |    |    |    |    | F17 |
| Flange 2 in. 900 / 1500 lbs, ASME B16.5                                  |                         |    |    |    |    |    |    |    | F18 |
| Others   |                         |    |    |    |    |    |    |    | Z99 |



| Main ordering information SensyTemp TSW220       |  | XX | XX | XX | XX |
|--|--|----|----|----|----|
| <b>Thermowell Connection</b>                     |  |    |    |    |    |
| Extension tube with Cylindrical thread M24 x 1,5 |  | M4 |    |    |    |
| Others   |  | Z9 |    |    |    |
| <b>Thermowell Diameter</b>                       |  |    |    |    |    |
| 6 mm x 1 mm                                      |  |    | A9 |    |    |
| 8 mm x 2 mm                                      |  |    | A5 |    |    |
| 9 mm x 1 mm                                      |  |    | A1 |    |    |
| 10 mm x 1,5 mm                                   |  |    | A6 |    |    |
| 11 mm x 2 mm                                     |  |    | A2 |    |    |
| 12 mm x 2,5 mm                                   |  |    | A3 |    |    |
| 13,5 mm x 2,3 mm                                 |  |    | B6 |    |    |
| 13,7 mm x 2,24 mm                                |  |    | B2 |    |    |
| 14 mm x 2,5 mm                                   |  |    | A4 |    |    |
| 15 mm x 2 mm                                     |  |    | A7 |    |    |
| 16 mm x 3 mm                                     |  |    | A8 |    |    |
| 22 mm x 2 mm                                     |  |    | B1 |    |    |
| Andere   |  |    | Z9 |    |    |
| <b>Immersion Length</b>                          |  |    |    |    |    |
| U = 100 mm                                       |  |    |    | U1 |    |
| U = 160 mm                                       |  |    |    | U3 |    |
| U = 250 mm                                       |  |    |    | U5 |    |
| U = 400 mm                                       |  |    |    | U7 |    |
| Customer specific length                         |  |    |    | Z9 |    |
| <b>Nominal Length</b>                            |  |    |    |    |    |
| N = 230 mm (9.1 in.)                             |  |    |    |    | N1 |
| N = 290 mm (11.4 in.)                            |  |    |    |    | N3 |
| N = 380 mm (15 in.)                              |  |    |    |    | N5 |
| N = 530 mm (20.9 in.)                            |  |    |    |    | N7 |
| Customer specific length                         |  |    |    |    | Z9 |

# SensyTemp TSW200, TSW300

## Welded and drilled thermowells

### Additional ordering information SensyTemp TSW220

|  | XX | XX | XX | XX |
|--|----|----|----|----|
| <b>Thermowell Options</b>  |    |    |    |    |
| Thermowell stainless steel with additional tantalum sleeve                                 | S1 |    |    |    |
| Thermowell coated with 0.5 mm (0.02 in.) E-CTFE / Halar, wetted parts incl. flange surface | S2 |    |    |    |
| Thermowell coated with 0.5 mm (0.02 in.) PFA, wetted parts incl. flange surface            | S3 |    |    |    |
| Thermowell coated with 1 mm (0.04 in.) NiCrB / META 43                                     | S4 |    |    |    |
| Thermowell coated with 0.5 mm (0.02 in.) NiZrO2 / PL1312                                   | S5 |    |    |    |
| Thermowell incl. tests and certificates AD-2000 standard for austenitic steel              | S6 |    |    |    |
| Thermowell clean for oxygen service  | S9 |    |    |    |
| Thermowell stress calculation according Dittrich / Kohler                                  | SD |    |    |    |
| Others   | SZ |    |    |    |
| <b>Flange Connection Options</b>   |    |    |    |    |
| Flange raised face form RF, ASME B16.5   |    | F6 |    |    |
| Flange raised face form B1 acc. EN 1092-1  |    | F7 |    |    |
| Flange raised face form B2 acc. EN 1092-1  |    | F8 |    |    |
| Flange facing with tongue form C EN 1092-1   |    | F1 |    |    |
| Flange facing with groove form D acc. EN 1092-1  |    | F2 |    |    |
| Flange facing with RTJ surface acc. ASME B16.5   |    | F3 |    |    |
| Flange full penetration welded   |    | F4 |    |    |
| Others   |    | FZ |    |    |
| <b>Certificates</b>  |    |    |    |    |
| Test report according EN 10204-2.2, material monitoring for wetted parts                   |    |    |    | C1 |
| Inspection certificate according EN 10204-3.1, material monitoring for wetted parts        |    |    |    | C2 |
| Inspection certificate according EN 10204-3.2, material monitoring for wetted parts        |    |    |    | C3 |
| Inspection certificate according EN 10204-3.1, visual, dimensional and functional test     |    |    |    | C6 |
| Inspection certificate according EN 10204-3.1, helium leakage test                         |    |    |    | C7 |
| Inspection certificate according EN 10204-3.1, dye penetration test                        |    |    |    | C9 |
| Inspection certificate according EN 10204-3.1, Positive Material Identification (PMI)      |    |    |    | CA |
| Inspection certificate according EN 10204-3.1, pressure test on thermowell                 |    |    |    | CB |
| <b>Documentation Language</b>  |    |    |    |    |
| German   |    |    |    | M1 |
| English  |    |    |    | M5 |

## Main ordering information SensyTemp TSW230 tubular

| Base model  | TSW230 | XX | XX | XX | XX | XX  | XX | XX |
|---|--------|----|----|----|----|-----|----|----|
| SensyTemp TSW230 Thermowell, tubular, screw in                              |        |    |    |    |    |     |    |    |
| <b>Thermowell Type</b>  |        |    |    |    |    |     |    |    |
| Screwed tubular thermowell with straight shaft (DIN 43772, Form 2G)         |        | A3 |    |    |    |     |    |    |
| Screwed tubular thermowell, stepped tip (ABB Form 2GS)                      |        | B3 |    |    |    |     |    |    |
| Screwed tubular thermowell, tapered (DIN 43772, Form 3G)                    |        | C3 |    |    |    |     |    |    |
| Screwed tubular thermowell without extension, straight shaft (ABB Form 2G0) |        | A4 |    |    |    |     |    |    |
| Screwed tubular thermowell without extension, stepped tip (ABB Form 2GS0)   |        | B4 |    |    |    |     |    |    |
| Screwed tubular thermowell, stepped tip 9 mm (0.36 in.) (ABB Form 2GS/9)    |        | K3 |    |    |    |     |    |    |
| Screwed tubular thermowell, stepped tip 9 mm (0.36 in.) with fit 14f 85 mm  |        | K4 |    |    |    |     |    |    |
| Screwed tubular thermowell, stepped tip 9 mm (0.36 in.) with fit 14f 320 mm |        | K5 |    |    |    |     |    |    |
| <b>Wetted thermowell material</b>   |        |    |    |    |    |     |    |    |
| Stainless steel ASTM 316L (1.4404)  |        |    |    |    |    | S1  |    |    |
| Stainless steel ASTM 316Ti (1.4571)   |        |    |    |    |    | S2  |    |    |
| Stainless steel ASTM 904L (CrNi, 1.4539); (Uranus B6)                       |        |    |    |    |    | S4  |    |    |
| Duplex stainless steel (CrNi, 1.4462)                                       |        |    |    |    |    | S9  |    |    |
| Heat resistant steel ASTM A446 (1.4762)                                     |        |    |    |    |    | H2  |    |    |
| Heat resistant steel ASTM A314 (CrNi, 1.4841)                               |        |    |    |    |    | H3  |    |    |
| Ni-Alloy Hastelloy C-276 (2.4819)   |        |    |    |    |    | N1  |    |    |
| Ni-Alloy Hastelloy C-4 (2.4610)   |        |    |    |    |    | N2  |    |    |
| Highly heat-resistant stainless steel, Ni-Alloy Inconel 600 (2.4816)        |        |    |    |    |    | N5  |    |    |
| Others  |        |    |    |    |    | Z9  |    |    |
| <b>Process Connection</b>   |        |    |    |    |    |     |    |    |
| Cylindrical thread G 3/8 A  |        |    |    |    |    | S15 |    |    |
| Cylindrical thread G 1/2 A  |        |    |    |    |    | S01 |    |    |
| Cylindrical thread G 3/4 A  |        |    |    |    |    | S02 |    |    |
| Cylindrical thread G 1 A  |        |    |    |    |    | S03 |    |    |
| Cylindrical thread M20 x 1.5  |        |    |    |    |    | S07 |    |    |
| Cylindrical thread M27 x 2  |        |    |    |    |    | S08 |    |    |
| Conical thread 1/2 in. NPT  |        |    |    |    |    | S04 |    |    |
| Conical thread 3/4 in. NPT  |        |    |    |    |    | S05 |    |    |
| Conical thread 1 in. NPT  |        |    |    |    |    | S06 |    |    |
| Conical thread 1/2 in. BSPT   |        |    |    |    |    | S09 |    |    |
| Conical thread 3/4 in. BSPT   |        |    |    |    |    | S10 |    |    |
| Conical thread 1 in. BSPT   |        |    |    |    |    | S11 |    |    |
| Others  |        |    |    |    |    | Z99 |    |    |
| <b>Thermowell Connection</b>  |        |    |    |    |    |     |    |    |
| Extension tube with Cylindrical thread M24 x 1,5                            |        |    |    |    |    |     | M4 |    |
| Others  |        |    |    |    |    |     | Z9 |    |

Continued see next page

# SensyTemp TSW200, TSW300

## Welded and drilled thermowells

| Main ordering information SensyTemp TSW230 | XX | XX | XX |
|--|----|----|----|
| <b>Thermowell Diameter</b>                 |    |    |    |
| 6 mm x 1 mm                                | A9 |    |    |
| 8 mm x 2 mm                                | A5 |    |    |
| 9 mm x 1 mm                                | A1 |    |    |
| 10 mm x 1,5 mm                             | A6 |    |    |
| 11 mm x 2 mm                               | A2 |    |    |
| 12 mm x 2,5 mm                             | A3 |    |    |
| 13,5 mm x 2,3 mm                           | B6 |    |    |
| 13,7 mm x 2,24 mm                          | B2 |    |    |
| 14 mm x 2,5 mm                             | A4 |    |    |
| 15 mm x 2 mm                               | A7 |    |    |
| 16 mm x 3 mm                               | A8 |    |    |
| 22 mm x 2 mm                               | B1 |    |    |
| Andere                                     | Z9 |    |    |
| <b>Immersion Length</b>                    |    |    |    |
| U = 100 mm                                 |    | U1 |    |
| U = 160 mm                                 |    | U3 |    |
| U = 250 mm                                 |    | U5 |    |
| U = 400 mm                                 |    | U7 |    |
| Customer specific length                   |    | Z9 |    |
| <b>Nominal Length</b>                      |    |    |    |
| N = 230 mm (9.1 in.)                       |    |    | N1 |
| N = 290 mm (11.4 in.)                      |    |    | N3 |
| N = 380 mm (15 in.)                        |    |    | N5 |
| N = 530 mm (20.9 in.)                      |    |    | N7 |
| Customer specific length                   |    |    | Z9 |

## Additional ordering information SensyTemp TSW230

|  | XX | XX | XX |
|--|----|----|----|
| <b>Thermowell Options</b>  |    |    |    |
| Thermowell coated with 0.5 mm (0.02 in.) E-CTFE / Halar, wetted parts incl. flange surface | S2 |    |    |
| Thermowell coated with 0.5 mm (0.02 in.) PFA, wetted parts incl. flange surface            | S3 |    |    |
| Thermowell coated with 1 mm (0.04 in.) NiCrB / META 43                                     | S4 |    |    |
| Thermowell coated with 0.5 mm (0.02 in.) NiZrO <sub>2</sub> / PL1312                       | S5 |    |    |
| Thermowell incl. tests and certificates AD-2000 standard for austenitic steel              | S6 |    |    |
| Thermowell clean for oxygen service  | S9 |    |    |
| Thermowell stress calculation according Dittrich / Kohler                                  | SD |    |    |
| Others   | SZ |    |    |
| <b>Certificates</b>  |    |    |    |
| Test report according EN 10204-2.2, material monitoring for wetted parts                   | C1 |    |    |
| Inspection certificate according EN 10204-3.1, material monitoring for wetted parts        | C2 |    |    |
| Inspection certificate according EN 10204-3.2, material monitoring for wetted parts        | C3 |    |    |
| Inspection certificate according EN 10204-3.1, visual, dimensional and functional test     | C6 |    |    |
| Inspection certificate according EN 10204-3.1, helium leakage test                         | C7 |    |    |
| Inspection certificate according EN 10204-3.1, dye penetration test                        | C9 |    |    |
| Inspection certificate according EN 10204-3.1, Positive Material Identification (PMI)      | CA |    |    |
| Inspection certificate according EN 10204-3.1, pressure test on thermowell                 | CB |    |    |
| <b>Documentation Language</b>  |    |    |    |
| German   |    |    | M1 |
| English  |    |    | M5 |

# SensyTemp TSW200, TSW300

## Welded and drilled thermowells

### Main ordering information SensyTemp TSW310 Thermowell

| Base model   | TSW310 | XX | XX | XX | XX | XX  | XX | XX                            |
|--|--------|----|----|----|----|-----|----|-------------------------------|
| SensyTemp TSW310 Thermowell, drilled, weld in  |        |    |    |    |    |     |    |                               |
| <b>Thermowell Type</b>   |        |    |    |    |    |     |    | Continued<br>see next<br>page |
| Weld-in thermowell from bar stock material, diameter F2 = 24 mm (DIN 43772, Form 4)                            |        | D1 |    |    |    |     |    |                               |
| Weld-in thermowell from bar stock material, quick response, diameter F2 = 18 mm (ABB-Form 4S)                  |        | D2 |    |    |    |     |    |                               |
| Weld-in thermowell from bar stock material, diameter F2 = 26 mm (DIN 43772, Form 4)                            |        | D5 |    |    |    |     |    |                               |
| Weld-in thermowell from bar stock material, diameter F2 = 24 mm (0.95 in.), tip 11 mm (0.44 in.)(ABB, Form DR) |        | R1 |    |    |    |     |    |                               |
| Weld-in thermowell from bar stock material, diameter F2 = 25 mm (1 in.), ( ABB, Form RD )                      |        | R3 |    |    |    |     |    |                               |
| Weld-in thermowell from bar stock material, diameter F2 = 32 mm (1.26 in.), (ABB, Form PW)                     |        | P1 |    |    |    |     |    |                               |
| <b>Wetted thermowell material</b>  |        |    |    |    |    |     |    |                               |
| Stainless steel ASTM 316L (1.4404)   |        |    | S1 |    |    |     |    |                               |
| Stainless steel ASTM 316Ti (1.4571)  |        |    | S2 |    |    |     |    |                               |
| Stainless steel ASTM 904L (CrNi, 1.4539); (Uranus B6)  |        |    | S4 |    |    |     |    |                               |
| Stainless steel ASTM 304 (CrNi, 1.4301)  |        |    | S5 |    |    |     |    |                               |
| Stainless steel ASTM 321 (CrNi, 1.4541)  |        |    | S6 |    |    |     |    |                               |
| Duplex stainless steel (CrNi, 1.4462)  |        |    | S9 |    |    |     |    |                               |
| Highly heat-resistant stainless steel ASTM A446-1 (1.4749)   |        |    | H1 |    |    |     |    |                               |
| Heat resistant steel ASTM A446 (1.4762)  |        |    | H2 |    |    |     |    |                               |
| Heat resistant steel ASTM A314 (CrNi, 1.4841)  |        |    | H3 |    |    |     |    |                               |
| Highly heat-resistant stainless steel ASTM A347 H (1.4961)   |        |    | W4 |    |    |     |    |                               |
| Ni-Alloy Incoloy 800 (1.4876)  |        |    | H4 |    |    |     |    |                               |
| Ni-Alloy Hastelloy C-276 (2.4819)  |        |    | N1 |    |    |     |    |                               |
| Ni-Alloy Hastelloy C-4 (2.4610)  |        |    | N2 |    |    |     |    |                               |
| NiCu-Alloy Monel 400 (2.4360)  |        |    | N4 |    |    |     |    |                               |
| Highly heat-resistant stainless steel , Ni-Alloy Inconel 600 (2.4816)  |        |    | N5 |    |    |     |    |                               |
| Others   |        |    | Z9 |    |    |     |    |                               |
| <b>Process Connection</b>  |        |    |    |    |    |     |    |                               |
| Without process connection (weld-in type)  |        |    |    |    |    | Y00 |    |                               |
| Others   |        |    |    |    |    | Z99 |    |                               |
| <b>Thermowell Connection</b>   |        |    |    |    |    |     |    |                               |
| Extension tube with Cylindrical thread M14 x 1,5   |        |    |    |    |    |     | M1 |                               |
| Extension tube with Cylindrical thread M18 x 1,5   |        |    |    |    |    |     | M2 |                               |
| Extension tube with Cylindrical thread M20 x 1,5   |        |    |    |    |    |     | M3 |                               |
| Extension tube with Cylindrical thread M24 x 1,5   |        |    |    |    |    |     | M4 |                               |
| Extension tube with Cylindrical thread G 3/8 A   |        |    |    |    |    |     | G3 |                               |
| Extension tube with Cylindrical thread G 1/2 A   |        |    |    |    |    |     | G1 |                               |
| Extension tube with conycaal thread 1/2 in. NPT  |        |    |    |    |    |     | N1 |                               |
| Others   |        |    |    |    |    |     | Z9 |                               |

| Main ordering information SensyTemp TSW310                  |  | XX | XX | XX |
|---|--|----|----|----|
| <b>Thermowell Diameter</b>                                  |  |    |    |    |
| 18 mm / 9 mm  |  | C2 |    |    |
| 23 mm / 13,5 mm   |  | C4 |    |    |
| 24 mm / 12,5mm  |  | C5 |    |    |
| 24 mm / 11 mm   |  | C8 |    |    |
| 25 mm / 16 mm   |  | C6 |    |    |
| 26 mm / 12,5 mm   |  | C9 |    |    |
| Others  |  | Z9 |    |    |
| <b>Immersion Length</b>                                     |  |    |    |    |
| Without fixed immersion length                              |  |    | Y0 |    |
| <b>Thermowell Length</b>                                    |  |    |    |    |
| L = 110 mm (4.4 in.), C = 65 mm (2.5 in.)                   |  |    |    | D1 |
| L = 115 mm (4.6 in.), C = 40 mm (1.5 in.)                   |  |    |    | D2 |
| L = 140 mm (5.6 in.), C = 65 mm (2.5 in.)                   |  |    |    | D3 |
| L = 200 mm (8 in.), C = 65 mm (2.5 in.)                     |  |    |    | D4 |
| L = 200 mm (8 in.), C = 125 mm (5 in.)                      |  |    |    | D5 |
| L = 260 mm (10.3 in.), C = 125 mm (5 in.)                   |  |    |    | D6 |
| L = 410 mm (16.2 in.), C = 275 mm (10.9 in.)                |  |    |    | D7 |
| L = 146 mm (5.8 in.)  |  |    |    | R1 |
| L = 175 mm (6.9 in.)  |  |    |    | R2 |
| L = 265 mm (10.5 in.)                                       |  |    |    | R3 |
| L = 415 mm (16.4 in.)                                       |  |    |    | R4 |
| According ABB-standard (immersion length + 65 mm (2,5 in.)) |  |    |    | P1 |
| According customer specification                            |  |    |    | D9 |
| According customer specification                            |  |    |    | Z9 |

# SensyTemp TSW200, TSW300

## Welded and drilled thermowells

### Additional ordering information SensyTemp TSW310

|  | XX | XX | XX |
|--|----|----|----|
| <b>Thermowell Options</b>  |    |    |    |
| Thermowell coated with 1 mm (0.04 in.) NiCrB / META 43                                 | S4 |    |    |
| Thermowell coated with 0.5 mm (0.02 in.) NiZrO2 / PL1312                               | S5 |    |    |
| Thermowell incl. tests and certificates AD-2000 standard for austenitic steel          | S6 |    |    |
| Thermowell incl. tests and certificates AD-2000 standard for high temperature steel    | S7 |    |    |
| Thermowell clean for oxygen service  | S9 |    |    |
| Thermowell electropolished   | SA |    |    |
| Thermowell stress calculation according ASME 19.3-TW 2010 (Murdock)                    | SM |    |    |
| Thermowell with plug, gasket and chain   | SP |    |    |
| Thermowell with plug and gasket  | SR |    |    |
| Thermowell single packed   | ST |    |    |
| Others   | SZ |    |    |
| <b>Certificates</b>  |    |    |    |
| Test report according EN 10204-2.2, material monitoring for wetted parts               | C1 |    |    |
| Inspection certificate according EN 10204-3.1, material monitoring for wetted parts    | C2 |    |    |
| Inspection certificate according EN 10204-3.2, material monitoring for wetted parts    | C3 |    |    |
| Inspection certificate according EN 10204-3.1, visual, dimensional and functional test | C6 |    |    |
| Inspection certificate according EN 10204-3.1, helium leakage test                     | C7 |    |    |
| Inspection certificate according EN 10204-3.1, dye penetration test                    | C9 |    |    |
| Inspection certificate according EN 10204-3.1, Positive Material Identification (PMI)  | CA |    |    |
| Inspection certificate according EN 10204-3.1, pressure test on thermowell             | CB |    |    |
| Inspection certificate according EN 10204-3.1, x-ray- test for weldings                | CU |    |    |
| Inspection certificate according EN 10204-3.1, x-ray- test for bore concentricity      | CV |    |    |
| Inspection certificate according EN 10204-3.1, ultrasonic- test for bore concentricity | CW |    |    |
| <b>Documentation Language</b>  |    |    |    |
| German   |    |    | M1 |
| English  |    |    | M5 |



## Main ordering information SensyTemp TSW320 Thermowell

| Base model  | TSW320 | XX | XX | XX | XX | XX | XX | XX |
|---|--------|----|----|----|----|----|----|----|
| SensyTemp TSW320 Thermowell, drilled, flanged   |        |    |    |    |    |    |    |    |
| <b>Thermowell Type</b>  |        |    |    |    |    |    |    |    |
| Flanged thermowell from bar stock material, diameter F2 = 24 mm (DIN 43772, Form 4F)                              |        | D3 |    |    |    |    |    |    |
| Flanged thermowell from bar stock material, quick response, diameter F2 = 18 mm (DIN 43772, Form 4FS)             |        | D4 |    |    |    |    |    |    |
| Flanged thermowell from bar stock material, diameter F2 = 26 mm (DIN 43772, Form 4F)                              |        | D6 |    |    |    |    |    |    |
| Flanged thermowell from bar stock material, diameter F2 = 24 mm (0.95 in.), tip 11 mm (0.44 in.) (ABB, Form DRF ) |        | R2 |    |    |    |    |    |    |
| Flanged thermowell from bar stock material, diameter F2 = 25 mm (1 in.), ( ABB, Form RDF )                        |        | R4 |    |    |    |    |    |    |
| Flansch-Schutzrohr mit abgesetzter Spitze 9 mm (0,36 in.) (ABB-Form 2FS/9)  |        | P2 |    |    |    |    |    |    |
| <b>Wetted thermowell material</b>   |        |    |    |    |    |    |    |    |
| Stainless steel ASTM 316L (1.4404)  |        |    | S1 |    |    |    |    |    |
| Stainless steel ASTM 316Ti (1.4571)   |        |    | S2 |    |    |    |    |    |
| Stainless steel ASTM 904L (CrNi, 1.4539); (Uranus B6)   |        |    | S4 |    |    |    |    |    |
| Stainless steel ASTM 304 (CrNi, 1.4301)   |        |    | S5 |    |    |    |    |    |
| Stainless steel ASTM 321 (CrNi, 1.4541)   |        |    | S6 |    |    |    |    |    |
| Duplex stainless steel (CrNi, 1.4462)   |        |    | S9 |    |    |    |    |    |
| Highly heat-resistant stainless steel ASTM A446-1 (1.4749)  |        |    | H1 |    |    |    |    |    |
| Heat resistant steel ASTM A446 (1.4762)   |        |    | H2 |    |    |    |    |    |
| Heat resistant steel ASTM A314 (CrNi, 1.4841)   |        |    | H3 |    |    |    |    |    |
| Highly heat-resistant stainless steel ASTM A347 H (1.4961)  |        |    | W4 |    |    |    |    |    |
| Ni-Alloy Incoloy 800 (1.4876)   |        |    | H4 |    |    |    |    |    |
| Ni-Alloy Hastelloy C-276 (2.4819)   |        |    | N1 |    |    |    |    |    |
| Ni-Alloy Hastelloy C-4 (2.4610)   |        |    | N2 |    |    |    |    |    |
| NiCu-Alloy Monel 400 (2.4360)   |        |    | N4 |    |    |    |    |    |
| Highly heat-resistant stainless steel , Ni-Alloy Inconel 600 (2.4816)   |        |    | N5 |    |    |    |    |    |
| Others  |        |    | Z9 |    |    |    |    |    |

Continued see  
next page

# SensyTemp TSW200, TSW300

## Welded and drilled thermowells

| Main ordering information SensyTemp TSW320  | XX  | XX | XX | XX | XX |
|---|-----|----|----|----|----|
| <b>Process Connection</b>                   |     |    |    |    |    |
| Flange DN 25 PN 10 ... PN 40, EN 1092-1     | F03 |    |    |    |    |
| Flange DN 25 PN 63 ... PN100, EN 1092-1     | F29 |    |    |    |    |
| Flange DN 32 PN 16 ... PN 40, EN 1092-1     | F30 |    |    |    |    |
| Flange DN 40 PN 10 ... PN 40, EN 1092-1     | F04 |    |    |    |    |
| Flange DN 40 PN 63 ... PN 100, EN 1092-1    | F37 |    |    |    |    |
| Flange DN 50 PN 6, EN 1092-1                | F06 |    |    |    |    |
| Flange DN 50 PN 10 ... PN 40, EN 1092-1     | F05 |    |    |    |    |
| Flange DN 50 PN 63, EN 1092-1               | F33 |    |    |    |    |
| Flange DN 50 PN 100, EN 1092-1              | F34 |    |    |    |    |
| Flange DN 80 PN 16, EN 1092-1               | F35 |    |    |    |    |
| Flange DN 100 PN 40, EN 1092-1              | F36 |    |    |    |    |
| Flange 1 in. 150 lbs, ASME B16.5            | F07 |    |    |    |    |
| Flange 1 in. 300 lbs, ASME B16.5            | F08 |    |    |    |    |
| Flange 1 in. 600 lbs, ASME B16.5            | F09 |    |    |    |    |
| Flange 1 in. 900 / 1500 lbs, ASME B16.5     | F10 |    |    |    |    |
| Flange 1-1/2 in. 150 lbs, ASME B16.5        | F11 |    |    |    |    |
| Flange 1-1/2 in. 300 lbs, ASME B16.5        | F12 |    |    |    |    |
| Flange 1-1/2 in. 600 lbs, ASME B16.5        | F13 |    |    |    |    |
| Flange 1-1/2 in. 900 / 1500 lbs, ASME B16.5 | F14 |    |    |    |    |
| Flange 2 in. 150 lbs, ASME B16.5            | F15 |    |    |    |    |
| Flange 2 in. 300 lbs, ASME B16.5            | F16 |    |    |    |    |
| Flange 2 in. 600 lbs, ASME B16.5            | F17 |    |    |    |    |
| Flange 2 in. 900 / 1500 lbs, ASME B16.5     | F18 |    |    |    |    |
| Others                                      | Z99 |    |    |    |    |

| Main ordering information SensyTemp TSW320                  | XX | XX | XX | XX |
|---|----|----|----|----|
| <b>Thermowell Connection</b>                                |    |    |    |    |
| Extension tube with Cylindrical thread M14 x 1,5            | M1 |    |    |    |
| Extension tube with Cylindrical thread M18 x 1,5            | M2 |    |    |    |
| Extension tube with Cylindrical thread M20 x 1,5            | M3 |    |    |    |
| Extension tube with Cylindrical thread M24 x 1,5            | M4 |    |    |    |
| Extension tube with Cylindrical thread G 3/8 A              | G3 |    |    |    |
| Extension tube with Cylindrical thread G 1/2 A              | G1 |    |    |    |
| Extension tube with conycal thread 1/2 in. NPT              | N1 |    |    |    |
| Others  | Z9 |    |    |    |
| <b>Thermowell Diameter</b>                                  |    |    |    |    |
| 18 mm / 9 mm  |    | C2 |    |    |
| 23 mm / 13,5 mm   |    | C4 |    |    |
| 24 mm / 12,5mm  |    | C5 |    |    |
| 24 mm / 11 mm   |    | C8 |    |    |
| 25 mm / 16 mm   |    | C6 |    |    |
| 26 mm / 12,5 mm   |    | C9 |    |    |
| 26 mm / 15 mm   |    | C7 |    |    |
| Others  |    | Z9 |    |    |
| <b>Immersion Length</b>                                     |    |    |    |    |
| U = 100 mm  |    |    | P1 |    |
| U = 130 mm  |    |    | D1 |    |
| U = 150 mm  |    |    | P2 |    |
| U = 190 mm  |    |    | D2 |    |
| U = 200 mm  |    |    | P3 |    |
| U = 250 mm  |    |    | P4 |    |
| U = 300 mm  |    |    | P5 |    |
| U = 340 mm  |    |    | D3 |    |
| U = 350 mm  |    |    | P6 |    |
| Customer specific length                                    |    |    | Z9 |    |
| <b>Thermowell Length</b>                                    |    |    |    |    |
| L = 110 mm (4.4 in.), C = 65 mm (2.5 in.)                   |    |    |    | D1 |
| L = 115 mm (4.6 in.), C = 40 mm (1.5 in.)                   |    |    |    | D2 |
| L = 140 mm (5.6 in.), C = 65 mm (2.5 in.)                   |    |    |    | D3 |
| L = 200 mm (8 in.), C = 65 mm (2.5 in.)                     |    |    |    | D4 |
| L = 200 mm (8 in.), C = 125 mm (5 in.)                      |    |    |    | D5 |
| L = 260 mm (10.3 in.), C = 125 mm (5 in.)                   |    |    |    | D6 |
| L = 410 mm (16.2 in.), C = 275 mm (10.9 in.)                |    |    |    | D7 |
| L = 146 mm (5.8 in.)  |    |    |    | R1 |
| L = 175 mm (6.9 in.)  |    |    |    | R2 |
| L = 265 mm (10.5 in.)                                       |    |    |    | R3 |
| L = 415 mm (16.4 in.)                                       |    |    |    | R4 |
| According ABB-standard (immersion length + 65 mm (2,5 in.)) |    |    |    | P1 |
| According customer specification                            |    |    |    | D9 |
| According customer specification                            |    |    |    | Z9 |

# SensyTemp TSW200, TSW300

## Welded and drilled thermowells

### Additional ordering information SensyTemp TSW320

|  | XX | XX | XX | XX |
|--|----|----|----|----|
| <b>Thermowell Options</b>  |    |    |    |    |
| Thermowell coated with 0.5 mm (0.02 in.) E-CTFE / Halar, wetted parts incl. flange surface | S2 |    |    |    |
| Thermowell coated with 0.5 mm (0.02 in.) PFA, wetted parts incl. flange surface            | S3 |    |    |    |
| Thermowell coated with 1 mm (0.04 in.) NiCrB / META 43                                     | S4 |    |    |    |
| Thermowell coated with 0.5 mm (0.02 in.) NiZrO2 / PL1312                                   | S5 |    |    |    |
| Thermowell incl. tests and certificates AD-2000 standard for austenitic steel              | S6 |    |    |    |
| Thermowell clean for oxygen service  | S9 |    |    |    |
| Thermowell electropolished   | SA |    |    |    |
| Thermowell stress calculation according ASME 19.3-TW 2010 (Murdock)                        | SM |    |    |    |
| Thermowell with plug, gasket and chain   | SP |    |    |    |
| Thermowell with plug and gasket  | SR |    |    |    |
| Thermowell single packed   | ST |    |    |    |
| Others   | SZ |    |    |    |
| <b>Flange Connection Options</b>   |    |    |    |    |
| Flange raised face form RF, ASME B16.5   |    | F6 |    |    |
| Flange raised face form B1 acc. EN 1092-1  |    | F7 |    |    |
| Flange raised face form B2 acc. EN 1092-1  |    | F8 |    |    |
| Flange facing with tongue form C EN 1092-1   |    | F1 |    |    |
| Flange facing with groove form D acc. EN 1092-1  |    | F2 |    |    |
| Flange facing with RTJ surface acc. ASME B16.5   |    | F3 |    |    |
| Flange full penetration welded   |    | F4 |    |    |
| Others   |    | FZ |    |    |
| <b>Certificates</b>  |    |    |    |    |
| Test report according EN 10204-2.2, material monitoring for wetted parts                   |    |    |    | C1 |
| Inspection certificate according EN 10204-3.1, material monitoring for wetted parts        |    |    |    | C2 |
| Inspection certificate according EN 10204-3.2, material monitoring for wetted parts        |    |    |    | C3 |
| Inspection certificate according EN 10204-3.1, visual, dimensional and functional test     |    |    |    | C6 |
| Inspection certificate according EN 10204-3.1, helium leakage test                         |    |    |    | C7 |
| Inspection certificate according EN 10204-3.1, dye penetration test                        |    |    |    | C9 |
| Inspection certificate according EN 10204-3.1, Positive Material Identification (PMI)      |    |    |    | CA |
| Inspection certificate according EN 10204-3.1, pressure test on thermowell                 |    |    |    | CB |
| Inspection certificate according EN 10204-3.1, x-ray- test for weldings                    |    |    |    | CU |
| Inspection certificate according EN 10204-3.1, x-ray- test for bore concentricity          |    |    |    | CV |
| Inspection certificate according EN 10204-3.1, ultrasonic- test for bore concentricity     |    |    |    | CW |
| <b>Documentation Language</b>  |    |    |    |    |
| German   |    |    |    | M1 |
| English  |    |    |    | M5 |

## Main ordering information SensyTemp TSW330 Thermowell

| Base model   | TSW330 | XX | XX | XX | XX | XX | XX | XX                            |
|--|--------|----|----|----|----|----|----|-------------------------------|
| SensyTemp TSW330 Thermowell, drilled, screw in   |        |    |    |    |    |    |    |                               |
| <b>Thermowell Type</b>   |        |    |    |    |    |    |    |                               |
| Screwed thermowell from bar stock material, tapered tip, (ABB, Form PS)                |        | P3 |    |    |    |    |    | Continued<br>see next<br>page |
| Screwed tubular thermowell from bar stock material, straight shaft (DIN 43772, Form 6) |        | S1 |    |    |    |    |    |                               |
| <b>Wetted thermowell material</b>  |        |    |    |    |    |    |    |                               |
| Carbon steel ASTM A105 (1.0460)  |        |    |    |    |    |    |    |                               |
| Stainless steel ASTM 316L (1.4404)   |        |    |    |    |    |    |    |                               |
| Stainless steel ASTM 316Ti (1.4571)  |        |    |    |    |    |    |    |                               |
| Stainless steel ASTM 904L (CrNi, 1.4539); (Uranus B6)                                  |        |    |    |    |    |    |    |                               |
| Stainless steel ASTM 304 (CrNi, 1.4301)  |        |    |    |    |    |    |    |                               |
| Stainless steel ASTM 321 (CrNi, 1.4541)  |        |    |    |    |    |    |    |                               |
| Duplex stainless steel (CrNi, 1.4462)  |        |    |    |    |    |    |    |                               |
| Highly heat-resistant stainless steel ASTM A446-1 (1.4749)                             |        |    |    |    |    |    |    |                               |
| Heat resistant steel ASTM A446 (1.4762)  |        |    |    |    |    |    |    |                               |
| Heat resistant steel ASTM A314 (CrNi, 1.4841)  |        |    |    |    |    |    |    |                               |
| Heat-resistant stainless steel ASTM A182 F12 (1.7335)                                  |        |    |    |    |    |    |    |                               |
| Heat-resistant stainless steel ASTM A182 F22 (1.7380)                                  |        |    |    |    |    |    |    |                               |
| Heat-resistant stainless steel ASTM A182 F1 (1.5415)                                   |        |    |    |    |    |    |    |                               |
| Highly heat-resistant stainless steel ASTM A347 H (1.4961)                             |        |    |    |    |    |    |    |                               |
| Highly heat-resistant stainless steel ASTM A182 F91 (1.4903)                           |        |    |    |    |    |    |    |                               |
| Ni-Alloy Incoloy 800 (1.4876)  |        |    |    |    |    |    |    |                               |
| Ni-Alloy Hastelloy C-276 (2.4819)  |        |    |    |    |    |    |    |                               |
| Ni-Alloy Hastelloy C-4 (2.4610)  |        |    |    |    |    |    |    |                               |
| NiCu-Alloy Monel 400 (2.4360)  |        |    |    |    |    |    |    |                               |
| Highly heat-resistant stainless steel , Ni-Alloy Inconel 600 (2.4816)                  |        |    |    |    |    |    |    |                               |
| Others   |        |    |    |    |    |    |    | Z9                            |
| <b>Process Connection</b>  |        |    |    |    |    |    |    |                               |
| Cylindrical thread G 1/2 A   |        |    |    |    |    |    |    | S01                           |
| Conical thread 1/2 in. NPT   |        |    |    |    |    |    |    | S04                           |
| Conical thread 3/4 in. NPT   |        |    |    |    |    |    |    | S05                           |
| Conical thread 1 in. NPT   |        |    |    |    |    |    |    | S06                           |
| Others   |        |    |    |    |    |    |    | Z99                           |
| <b>Thermowell Connection</b>   |        |    |    |    |    |    |    |                               |
| Extension tube with Cylindrical thread M18 x 1,5                                       |        |    |    |    |    |    |    | M2                            |
| Extension tube with Cylindrical thread M20 x 1,5                                       |        |    |    |    |    |    |    | M3                            |
| Extension tube with Cylindrical thread G 3/8 A   |        |    |    |    |    |    |    | G3                            |
| Extension tube with Cylindrical thread G 1/2 A   |        |    |    |    |    |    |    | G1                            |
| Extension tube with conycal thread 1/2 in. NPT   |        |    |    |    |    |    |    | N1                            |
| Others   |        |    |    |    |    |    |    | Z9                            |

# SensyTemp TSW200, TSW300

## Welded and drilled thermowells

| Main ordering information SensyTemp TSW330                  | XX | XX | XX |
|---|----|----|----|
| <b>Thermowell Diameter</b>                                  |    |    |    |
| 15 mm x 2 mm  | A7 |    |    |
| 17 mm x 4 mm  | B7 |    |    |
| 17 mm / 13,5 mm   | C1 |    |    |
| 20 mm / 13,5 mm   | C3 |    |    |
| 25 mm / 16 mm   | C6 |    |    |
| 26 mm / 12,5 mm   | C9 |    |    |
| Andere  | Z9 |    |    |
| <b>Immersion Length</b>                                     |    |    |    |
| U = 100 mm  |    | P1 |    |
| U = 150 mm  |    | P2 |    |
| U = 200 mm  |    | P3 |    |
| U = 250 mm  |    | P4 |    |
| U = 300 mm  |    | P5 |    |
| U = 350 mm  |    | P6 |    |
| Customer specific length                                    |    | Z9 |    |
| <b>Thermowell Length</b>                                    |    |    |    |
| According ABB-standard (immersion length + 65 mm (2,5 in.)) |    |    | P1 |
| According customer specification                            |    |    | Z9 |

## Additional ordering information SensyTemp TSW330

|  | XX | XX | XX |
|--|----|----|----|
| <b>Thermowell Options</b>  |    |    |    |
| Thermowell coated with 0.5 mm (0.02 in.) E-CTFE / Halar, wetted parts incl. flange surface | S2 |    |    |
| Thermowell coated with 0.5 mm (0.02 in.) PFA, wetted parts incl. flange surface            | S3 |    |    |
| Thermowell coated with 1 mm (0.04 in.) NiCrB / META 43                                     | S4 |    |    |
| Thermowell coated with 0.5 mm (0.02 in.) NiZrO <sub>2</sub> / PL1312                       | S5 |    |    |
| Thermowell incl. tests and certificates AD-2000 standard for austenitic steel              | S6 |    |    |
| Thermowell incl. tests and certificates NACE MR 01-75                                      | S8 |    |    |
| Thermowell clean for oxygen service  | S9 |    |    |
| Thermowell electropolished   | SA |    |    |
| Thermowell stress calculation according ASME 19.3-TW 2010 (Murdock)                        | SM |    |    |
| Thermowell with plug, gasket and chain   | SP |    |    |
| Thermowell with plug and gasket  | SR |    |    |
| Thermowell single packed   | ST |    |    |
| Others   | SZ |    |    |
| <b>Certificates</b>  |    |    |    |
| Test report according EN 10204-2.2, material monitoring for wetted parts                   | C1 |    |    |
| Inspection certificate according EN 10204-3.1, material monitoring for wetted parts        | C2 |    |    |
| Inspection certificate according EN 10204-3.2, material monitoring for wetted parts        | C3 |    |    |
| Inspection certificate according EN 10204-3.1, visual, dimensional and functional test     | C6 |    |    |
| Inspection certificate according EN 10204-3.1, helium leakage test                         | C7 |    |    |
| Inspection certificate according EN 10204-3.1, dye penetration test                        | C9 |    |    |
| Inspection certificate according EN 10204-3.1, Positive Material Identification (PMI)      | CA |    |    |
| Inspection certificate according EN 10204-3.1, pressure test on thermowell                 | CB |    |    |
| Inspection certificate according EN 10204-3.1, x-ray- test for weldings                    | CU |    |    |
| Inspection certificate according EN 10204-3.1, x-ray- test for bore concentricity          | CV |    |    |
| Inspection certificate according EN 10204-3.1, ultrasonic- test for bore concentricity     | CW |    |    |
| <b>Documentation Language</b>  |    |    |    |
| German   |    |    | M1 |
| English  |    |    | M5 |

### Trademarks

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