

Product Information TSBF**FOOD**

Temperature Sensor Big

**Application/Specified usage**

- Temperature sensor in big housing for food applications
- Aseptic temperature process connections without product contact for inline, precise and fast measurement. Prefabricated thermowells and build-in systems avoid opening process.
- Demounting the sensor without opening the process and without electrical disconnection avoid downtime of the equipment at calibration and maintenance.

Application examples

- Monitoring of CIP-/SIP-process
- Safe temperature measurement in hot steam and pressurized pipes
- Measurement in vessels with agitators with front flush version
- Temperature monitoring in vessels or pipes

Hygienic design/Process connection

- Hygienic process connection with CLEANadapt or FLEXadapt
- Versions available to conform to 3-A Standard 74-
- All wetted materials are FDA-conform
- Sensor completely made of stainless steel or stainless steel and PEEK
- Complete overview of process connections: see order code
- The Anderson-Negele CLEANadapt and FLEXadapt system offers a flow-optimized, hygienic and easily sterilizable installation solution for sensors.

Features/Advantages

- High accuracy and high ambient temperature resistance
- Customer offset and slope adjustment
- Flex hybrid mode with digital IO-Link or analog 4...20 mA
- Process temperature range -50...250 °C (-58...482 °F)
- Extended temperature range -200...400 °C (-328...752 °F)

Options/Accessories

- 2x RTD
- Front flush mounting
- 2x transmitter possible
- Programmable transmitters TTB.H and TTB.D using IO-Link
- Different RTDs (Pt100, Pt1000) and classes of accuracy (A, AA, AAA)
- Fast response sensor tip \varnothing 3 mm (0.12 in)
- Spacers for high process temperature up to 250 °C (482 °F)
- Pre-assembled connecting cable for M12 plug
- Available also as mini version with head 18 mm: See TSMF

Configurable design**Communication**

IO-Link

4...20 mA
Temperature sensor TSB with Tri-Clamp**Temperature sensor TSB with CLEANadapt with PEEK sealing ring**

Temperature sensor		
Process connection	CLEANadapt FLEXadapt ESF G3/8" Sensor G3/8" Tri-Clamp Varivent Thread Plain rod	M12, G1/2", G1/2"-P, G1/2"-SP Sensor with cap nut, sensor tip \varnothing 3 mm Sensor with cap nut, sensor tip \varnothing 4 mm 1/2", 3/4", DN10, 1", 1½", 2", 2½", 3" (DIN 32676) DN10/15 (type B), DN25 (type F), DN40/50 (type N) G1/4", G1/2" (DIN ISO 228)
Tightening torque	CLEANadapt M12, G1/2"-P, G1/2"-SP CLEANadapt G1/2"	10 Nm 20 Nm
Dimensions	insertion length probe diameter sensor tip diameter	0...2000 mm (0...78.74 in) 3, 4, 6, 8, 10, 12 mm (0.12, 0.16, 0.24, 0.31, 0.39, 0.47 in) 3, 4, 6 mm (0.12, 0.16, 0.24 in), see dimensional drawings
Materials	connecting head, spacer wetted parts CLEANadapt G1/2"-P, G1/2"-SP	stainless steel 1.4301 (AISI 304) stainless steel 1.4404 (AISI 316L), $R_a \leq 0.8 \mu\text{m}$ (32 μin) PEEK, FDA 21 CFR 177.2415
Surface finish		$R_a \leq 0.8 \mu\text{m}$ (32 μin)
Operating pressure	CLEANadapt CLEANadapt G1/2"-P, G1/2"-SP	50 bar maximum 10 bar maximum
Process temperature	standard range extended range	-50...250 °C (-58...482 °F) -200...400 °C (-328...752 °F)
Resistance Temperature Detector (RTD)	accuracy classes	Class A: $\pm(0.15 + 0.002 \times t)$ °C Class AA / 1/3 DIN B: $\pm(0.1 + 0.0017 \times t)$ °C Class AAA / 1/10 DIN B: $\pm(0.03 + 0.0005 \times t)$ °C
Electrical connection	plug connection cable gland	M12 plug 1.4301 (AISI 304) M16 x 1.5
Protection class		IP 69 K (with electrical connection M12 plug)

Transmitter TTB.H, TTB.D		
Temperature ranges	ambient (with Display) storage	-40...85 °C (-40...185 °F) 0...70 °C (32...158 °F) -55...90 °C (-67...194 °F)
Measuring ranges		standard °C: -10...40, 0...50 / 100 / 150 / 200 °C standard °F: 0...100, 0...150, 0...200, 30...230, 0...250 °F custom ranges programmable
Accuracy	input repeatability	≤ 0.1 K (at ambient ≤ 85 °C (185 °F)) ≤ 0.05 K
Temperature drift	typical maximum	5 mK/K (at 25 °C (77 °F)) 10 mK/K (at 25 °C (77 °F))
Adjustments	damping offset slope	0...120 s $\leq \pm 10$ K $\leq \pm 25$ %
Digital output	digital resolution master cycle time power supply	IO-Link 0.01 K ≥ 51.2 ms 18...30 V DC according to IO-Link
Analog output	signal accuracy temperature drift typical temperature drift max effect of supply voltage variations maximum load resistance power supply	4...20 mA, 2 wire ≤ 0.05 % of upper range limit 0.0005 %/K (at 25 °C (77 °F)) 0.003 %/K (at 25 °C (77 °F)) < 0.001 %/V (at 24 V DC) $R \leq (V_{DC} - 12 V) : 0.024$ A (at 25 °C (77 °F)), see diagram 12...30 V DC

Accuracy classes of temperature sensors | Tolerances for Pt100 acc. to DIN EN 60751

Pt100	Class A	Class AA / 1/3 DIN B	Class AAA / 1/10 DIN B
0 °C / 100 Ω	±0.15 K / ±0.06 Ω	±0.10 K / ±0.04 Ω	±0.03 K / ±0.01 Ω
100 °C / 138.5 Ω	±0.35 K / ±0.13 Ω	±0.27 K / ±0.10 Ω	±0.08 K / ±0.03 Ω

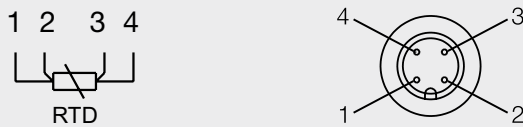
Accuracy classes of temperature sensors | Tolerances for Pt1000 acc. to DIN EN 60751

Pt1000	Class A	Class AA / 1/3 DIN B	Class AAA / 1/10 DIN B
0 °C / 1000 Ω	±0.15 K / ±0.6 Ω	±0.10 K / ±0.4 Ω	±0.03 K / ±0.1 Ω
100 °C / 1385.1 Ω	±0.35 K / ±1.3 Ω	±0.27 K / ±1.0 Ω	±0.08 K / ±0.3 Ω

Electrical connection without transmitter

With 1x or 2x M12 plug

same connection for 2nd M12 plug (2 x RTD)

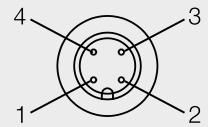


Electrical connection with transmitter

1x or 2x RTD with M12 plug for analog operation

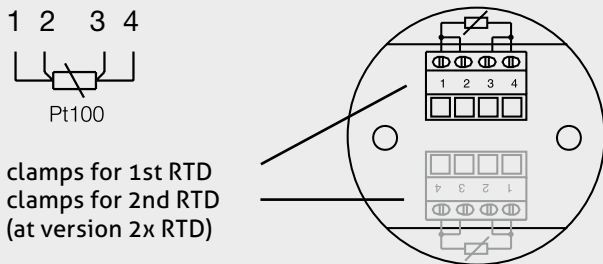
same connection for 2nd M12 plug (2 x RTD)

- 1: + power supply
- 2: - power supply 4...20 mA
- 3: not connected
- 4: not connected



With 1x or 2x cable gland

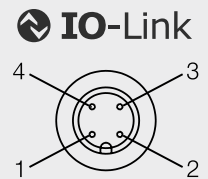
Configuration strip terminal



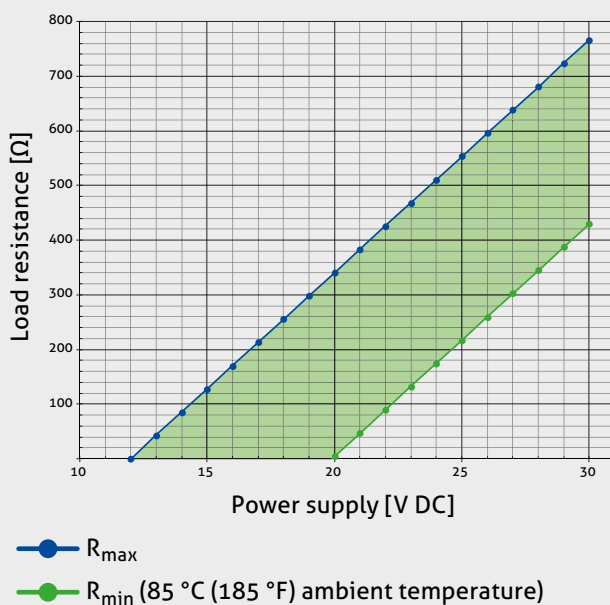
1x or 2x RTD with M12 plug for IO-Link operation

same connection for 2nd M12 plug

- 1: + power supply 24 V DC
- 2: not connected
- 3: - power supply
- 4: IO-Link

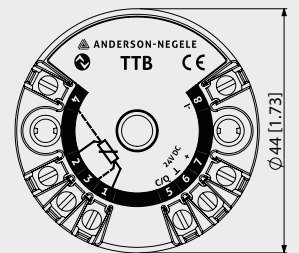


Load resistance diagram at ambient temperature 85 °C



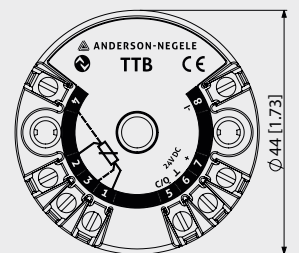
Connection with IO-Link output

- 1: RTD
- 2: RTD
- 3: RTD
- 4: RTD
- 5: IO-Link
- 6: - power supply (4...20 mA)
- 7: + power supply (24 V DC)
- 8: not connected



Connection with 4...20 mA output

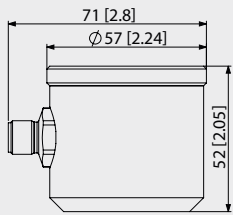
- 1: RTD
- 2: RTD
- 3: RTD
- 4: RTD
- 5: not connected
- 6: not connected
- 7: + power supply (24 V DC)
- 8: - power supply (4...20 mA)



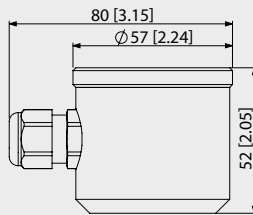
Electrical connection | Head Big



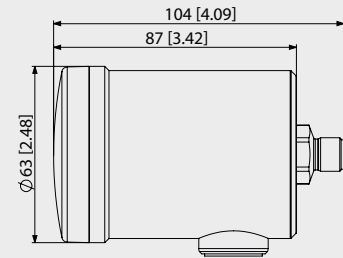
Head unit with 1 transmitter (no display) and M12 plug



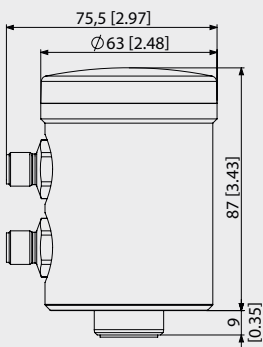
Head unit with 1 transmitter (no display) and cable gland



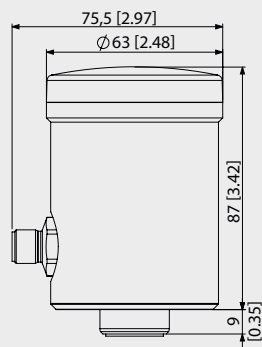
Head unit horizontal with 1 or 2 transmitter and display



Head unit with 2 transmitter (display optional)



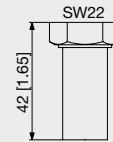
Head unit with 1 transmitter, display and M12 plug



Spacer extension



Short



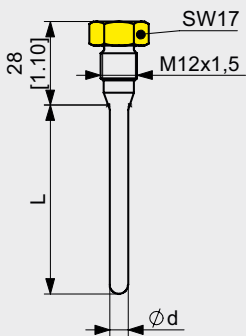
Long



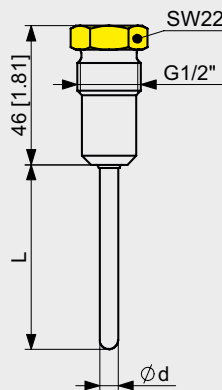
Process connection



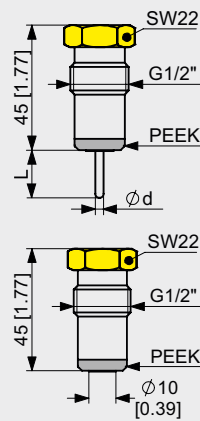
C01 | CLEANadapt M12



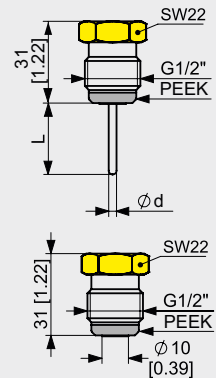
C02 | CLEANadapt G1/2"



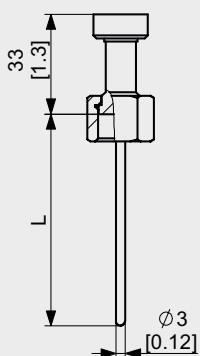
C03 | CLEANadapt G1/2"-P



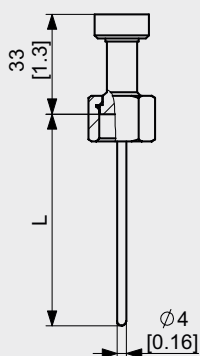
C04 | CLEANadapt G1/2"-SP



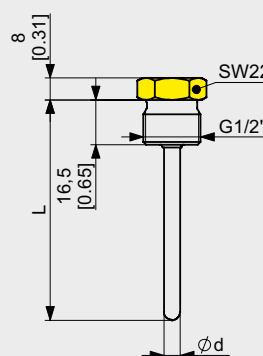
M02 | FLEXadapt G3/8" cap nut, Ø 3 mm



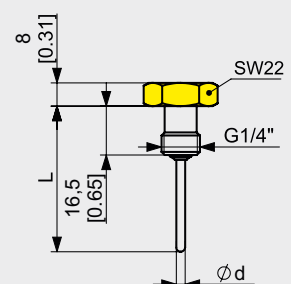
M03 | Sensor G3/8" cap nut, Ø 4 mm



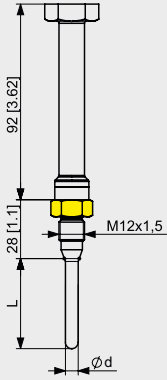
G01 | Thread G1/2"



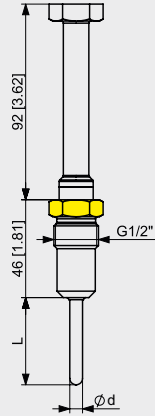
G02 | Thread G1/4"



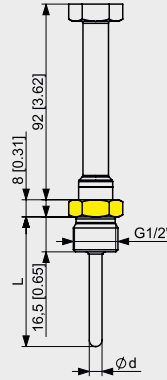
CH1 | CLEANadapt M12



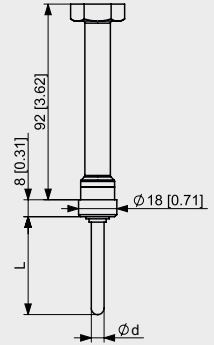
CH2 | CLEANadapt G1/2"



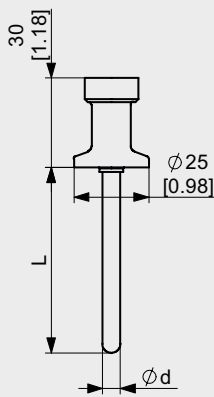
GH1 | Thread G1/2"



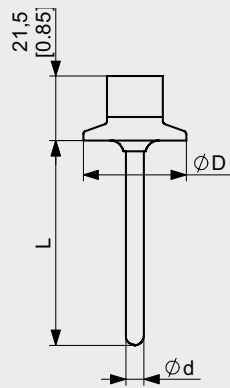
NH1 | Plain rod



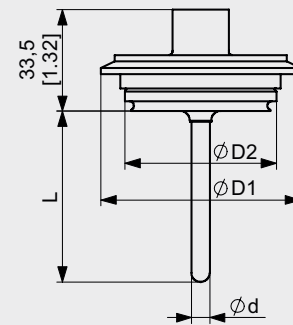
T05 | Tri-Clamp 1/2", 1/4"



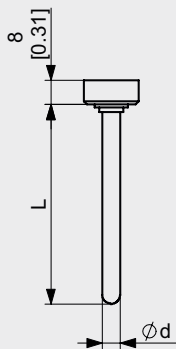
Txx | Tri-Clamp



Vxx | Varivent



N01 | Plain rod



Tri-Clamp size

Type	ϕD [mm / inch]
T10	34.0 / 1.34
TC1	50.5 / 1.99
TC2	64.0 / 2.52
T25	77.5 / 3.05
TC3	91.0 / 3.58

Dimensions table Varivent

Type	Varivent type	$\phi D1$ [mm / inch]	$\phi D2$ [mm / inch]
V10	B	52.7 / 2.09	31.0 / 1.22
V25	F	66.0 / 2.60	50.0 / 1.97
V40	N	84.0 / 3.31	68.0 / 2.68

Advice

Tighten the sensor only at the lower, marked in yellow spanner flat!

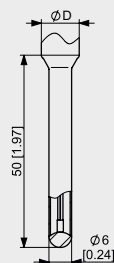


Sensor tip diameter and response time

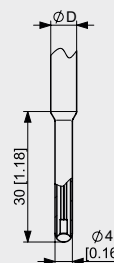
All temperature sensors are available with smaller sensor tips, to ensure a shorter response time. The mentioned times were measured by emerging a temperature sensor from room temperature into boiling water. The response times given are typical measured values and may vary due to factors such as process connection, immersion length and medium.

 $\phi 6$ mm

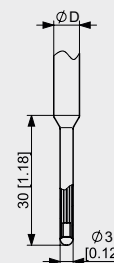
$t_{50} \leq 1.8$ s
 $t_{90} \leq 5.2$ s
 D: 8, 10, 12 mm

 $\phi 4$ mm

$t_{50} \leq 1.2$ s
 $t_{90} \leq 3.5$ s
 D: 6, 8, 10 mm

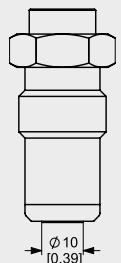
 $\phi 3$ mm

$t_{50} \leq 0.8$ s
 $t_{90} \leq 2.2$ s
 D: 6 mm



Frontflush

$t_{50} \leq 4$ s
 $t_{90} \leq 30$ s



Mechanical connection/Installation

- Use Negele CLEANadapt or FLEXadapt system for safe operation of measuring point!

Transport/Storage

- Do not store outside
- Store in an area that is dry and dust-free
- Do not expose to corrosive media
- Protect against solar radiation
- Avoid mechanical shock and vibration
- Storage temperature -55...90 °C (-67...194 °F)
- Relative humidity max. 98 %

Cleaning/Maintenance

- When using a pressure washer, do not point the nozzle directly at the electrical connections.

Reshipment

- Sensors shall be clean and free of media or heat-conductive paste and must not be contaminated with dangerous media!
- Use suitable transport packaging only to avoid damage of the equipment!

Note on 3-A Sanitary Standard 74-

For more information about 3-A conform installation please visit our webpage:
www.anderson-negele.com/3A74.pdf

Click on the PDF icon to download the document.

Accessories

PVC-cable with M12 connection made of 1.4305 (AISI 303), IP 69 K, unshielded

- M12-PVC / 4-5 m 4 pin, length 5 m
- M12-PVC / 4-10 m 4 pin, length 10 m
- M12-PVC / 4-25 m 4 pin, length 25 m

TPE-cable with M12 connection made of 1.4571 (AISI 316Ti), IP 69, shielded

- M12-TPE / 8-5 m 8 pin, length 5 m
- M12-TPE / 8-10 m 8 pin, length 10 m

IOM-1 Anderson-Negele USB IO-Link Master for IO-Link Sensors incl. power supply, USB cable, M12 connection cable (1.5 m/59.1 inch)

Conventional usage

- Not suitable for applications in explosive areas.
- Not suitable for applications in safety-relevant system parts (SIL).

Standards and guidelines

- Compliance with the applicable regulations and directives is mandatory.

Note on CE

- Applicable directives: Electromagnetic Compatibility Directive 2014/30/EU
- Compliance with the applicable EU directives is identified by the CE label on the product.
- The operating company is responsible for complying with the guidelines applicable to the entire installation.

Disposal

- Electrical devices should not be disposed of with household trash. They must be recycled in accordance with national laws and regulations.
- Take the device directly to a specialized recycling company and do not use municipal collection points.

IOM-1, PVC-cable with M12-connection

Order code

TSBF Temperatur Sensor Big for Food Applications, material wetted parts 1.4404 (AISI 316L)

Standard temperature range (-50...250 °C / -58...482 °F)

Process connection (A): 3-A conform)

T05 Tri-Clamp 1/2" and 3/4" (A only for 3/4")

T10 Tri-Clamp DN10

TC1 Tri-Clamp 1" and 1½" (A)

TC2 Tri-Clamp 2" (A)

T25 Tri-Clamp 2½" (A)

TC3 Tri-Clamp 3" (A)

V10 Varivent type B DN10/15

V25 Varivent type F DN25 (A)

V40 Varivent type N DN40/50 (A)

C01 CLEANadapt M12

C02 CLEANadapt G1/2"

C03 CLEANadapt G1/2"-P (PEEK) (A)

C04 CLEANadapt G1/2"-SP (short version, PEEK) (A)

N01 Plain rod

G01 Thread G1/2"

G02 Thread G1/4"

Ext. temperature range (-200...400 °C / -328...752 °F)

Process connection

CH1 CLEANadapt M12 (incl. spacer)

CH2 CLEANadapt G1/2" (incl. spacer)

GH1 Thread G1/2" (incl. spacer)

NH1 Plain rod (incl. spacer)

Process connection without media contact

M01 FLEXadapt ESF G3/8" with cap nut, sensor tip ø 3 mm, spring loaded

M02 FLEXadapt ESF G3/8" with cap nut, sensor tip ø 3 mm

M03 Sensor G3/8" with cap nut, sensor tip ø 4 mm

M04 FLEXadapt ESF G3/8" with cap nut, sensor tip ø 4 mm, spring loaded

Spacer extension

X Without spacer (perm. process temp. ≤ 100 °C (212 °F), standard for extended temperatur range)

S Short spacer (permanent process temperature ≤ 150 °C (305 °F))

H Long spacer (permanent process temperature ≤ 250 °C (482 °F))

RTD type

0 1x Pt100 A, 2-wire (probe length ≤ 250 mm)

1 1x Pt100 AA, 2-wire (probe length ≤ 150 mm)

2 2x Pt100 A, 2-wire (probe length ≤ 250 mm)

3 2x Pt100 AA, 2-wire (probe length ≤ 150 mm)

4 1x Pt100 A, 4-wire (probe length ≥ 50 mm)

5 1x Pt100 AA, 4-wire (probe length ≥ 50 mm)

6 1x Pt100 AAA, 4-wire

7 2x Pt100 A, (3-) 4-wire (probe length ≥ 50 mm, 3-wire with sensor tip ø 3 mm)

8 2x Pt100 AA, (3-) 4-wire (probe length ≥ 50 mm, 3-wire with sensor tip ø 3 mm)

9 2x Pt100 AAA, 4-wire

A 1x Pt1000 A, 2-wire

B 1x Pt1000 AA, 2-wire

C 2x Pt1000 A, 2-wire

D 2x Pt1000 AA, 2-wire

Variable probe length [mm]

0 Only for C03, C04

10...50 In steps of 5 mm

51...250 In steps of 5 mm

251...500 In steps of 10 mm

501...1000 In steps of 50 mm

1001...2000 In steps of 100 mm

Intermediate lengths Not for M0x

Probe length for process connection [mm]

M01, M03,

M02 M04

37 68

59 148

83 198

97 234

160 238

249

Probe diameter

03 3 mm (standard for M01, M02, not for xHx)

04 4 mm (standard for M03, M04)

06 6 mm (standard for C03, C04)

08 8 mm (not for T05, V10, C01, CH1)

10 10 mm (not for Txx, Vxx, C01, C03, C04, G02, CH1)

12 12 mm (not for Txx, Vxx, C01, C03, C04, G02, CH1)

Order code

Sensor tip diameter, only for probe length ≥ 50 mm

- X** Without reduction (standard for MOx)
- 3** For probe diameter 6 mm
- 4** For probe diameter 6 mm, 8 mm, 10 mm
- 6** For probe diameter 8 mm, 10 mm, 12 mm

Material

- 0** 1.4404 (AISI 316L) without certificate (standard for CO3, CO4, GO1, GO2, MOx)
- 1** 1.4404 (AISI 316L) incl. material certificate

Surface finish

- 0** $R_a \leq 0.8 \mu\text{m}$ (32 μin)

Transmitter

- 0** Without transmitter
- H** TT.B.H (hybrid: analog and IO-Link)
- D** TT.B.D (hybrid: analog and IO-Link, display optional)
- Z** TT.B.Z (1st transmitter TT.B.H, 2nd transmitter TT.B.D)
- Y** TT.B.Y (1st transmitter TT.B.H, 2nd transmitter TT.B.H)

Measurement range

- 000** Without transmitter
- 00C** Unit °C (only with transmitter)
- 00F** Unit °F (only with transmitter)
- 00K** Unit K (only with transmitter)
- 04C** -10...40 °C
- 05C** 0...50 °C
- 10C** 0...100 °C
- 15C** 0...150 °C
- 20C** 0...200 °C
- 25C** 0...250 °C
- 10F** 0...100 °F
- 15F** 0...150 °F
- 20F** 0...200 °F
- 23F** 30...230 °F
- 25F** 0...250 °F
- M00** TT.B custom configuration

Electrical connection

- 1** 1x cable gland (only with RTD type 2, 3, 7, 8, 9, B, C, D)
- 2** 2x cable gland
- 4** 1x M12 plug (4 pin, only with RTD type 2, 3, 7, 8, 9, B, C, D)
- 5** 2x M12 plug (4 pin)

Enclosure

- X** Opaque plastic cap
- P** Clear plastic cap
- M** Stainless steel cap without control window
- W** Stainless steel with control window

Orientation/display

- 0** Vertical no display
- 1** Vertical with display
- 2** Horizontal with display

TSBF / C01 / X / 0 / 100 / 06 / 4 / 0 / 0 / 0 / 000 / 4 / X / 0