Product Information TSBP   **PHARMA**

Temperature Sensor Big

PHARMadapt ep3   PHARMadapt esp

Application/Specified usage

· Temperature sensor in big housing for pharma applications
· Temperature measuring in pipes and vessels
· 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
· Temperature monitoring in pipes or vessels

Hygienic design/Process connection

· Hygienic process connection with CLEANadapt or PHARMadapt
· Versions available with EHEDG approval
· Versions available to conform to 3-A Standard 74-
· All wetted materials are FDA-conform
· Sensor completely made of stainless steel
· Complete overview of process connections: see order code
· The Anderson-Negele CLEANadapt and PHARMadapt 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

Options/Accessories

· 2x RTD
· 2x transmitter possible
· Programmable transmitters TTB.H and TTB.D using IO-Link; HART protocol
· Different RTDs (Pt100, Pt1000) and classes of accuracy (A, AA, AAA)
· Fast response sensor tip ø 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 TSMP
· Programmable with any IO-Link master
· Add-On Instructions are available at www.anderson-negele.com/aoi

Configurable design
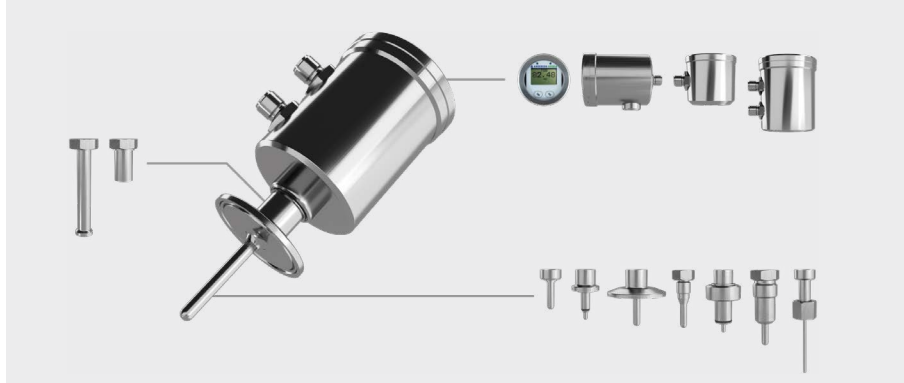
Communication

IO-Link   4...20 mA

Temperature sensor TSBP with Tri-Clamp

EHEDG CERTIFIED
TYPE EL CLASS I
JANUARY 2023

3-A 74-

Temperature sensor TSBP for PHARMadapt ESP System

TSB with display option

Temperature sensor		
Process connection	CLEANadapt PHARMadapt ESP G3/8" Sensor G3/8" PHARMadapt EPA Ingold (Fermenter) Tri-Clamp Thread Plain rod	M12, G1/2" Sensor with cap nut, sensor tip ø 3 mm Sensor with cap nut, sensor tip ø 4 mm 8, 18 46 mm, 52 mm 1/2", 3/4", DN10, 1", 1½", 2", 2½", 3" (DIN 32676) G1/4", G1/2" (DIN ISO 228)
Tightening torque	CLEANadapt M12 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 sealing ring PHARMadapt EPA, Ingold (Fermenter)	stainless steel 1.4301 / AISI 304 stainless steel 1.4435 / AISI 316L stainless steel 1.4404 / AISI 316L EPDM, USP Class VI, FDA 21 CFR 177.2600
Surface finish wetted parts	standard optional	$R_a ≤ 0.8$ μm / 32 μin electro-polished $R_a ≤ 0.6$ μm, 0.4 μm, 0.38 μm / 32 μin, 24 μin, 16 μin electro-polished, mechanically polished
Operating pressure	CLEANadapt PHARMadapt EPA, Ingold (Fermenter)	50 bar / 725 psi maximum 10 bar / 14.5 psi maximum
Process temperature	standard range	-50...250 °C / -58...482 °F
Resistance Temperature Detector (RTD)	accuracy classes	Class A: ±(0.15 + 0.002 × | t |) °C Class AA / 1/3 DIN B: ±(0.1 + 0.0017 × | t |) °C Class AAA / 1/10 DIN B: ±(0.03 + 0.0005 × | 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)

| 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

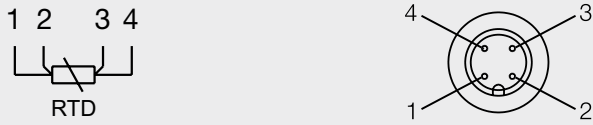| Transmitter TTB.H, TTB.D and HART protocol		
Temperature ranges	ambient (with display) storage (HART protocol)	-40...85 °C / -40...185 °F 0...70 °C / 32...158 °F -55...90 °C / -67...194 °F -50...85 °C / -58...185 °F
Measuring ranges		standard °C: -10...40, 0...50 / 100 / 150 / 200 °C standard °F: 0...100, 0...150, 0...200, 30...230, 0...250 °F custom ranges programable
Accuracy	input (HART protocol) repeatability	≤ 0.1 K (at ambient ≤ 85 °C / 185 °F) ±5 K (at 23 °C / 73,4 °F, 20 V DC power supply) ≤ 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 ≤ ±10 K ≤ ±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 (TTB.H and HART protocol only)	signal accuracy temperature drift typical (HART protocol) temperature drift max effect of supply voltage variations maximum load resistance power supply	4...20 mA, 2 wire; HART protocol ≤ 0.05 % of upper range limit 0.0005 %/K (at 25 °C / 77 °F) ±0,05 % 0.003 %/K (at 25 °C / 77 °F) < 0.001 %/V (at 24 V DC) R ≤ (V DC - 12 V) : 0.024 A (at 25 °C / 77 °F), see diagram 12...30 V DC

**Load resistance diagram
at ambient temperature 85 °C / 185 °F**

Load resistance [Ω] vs. Power supply [V DC]

— Rmax
— Rmin (85 °C / 185 °F ambient temperature)
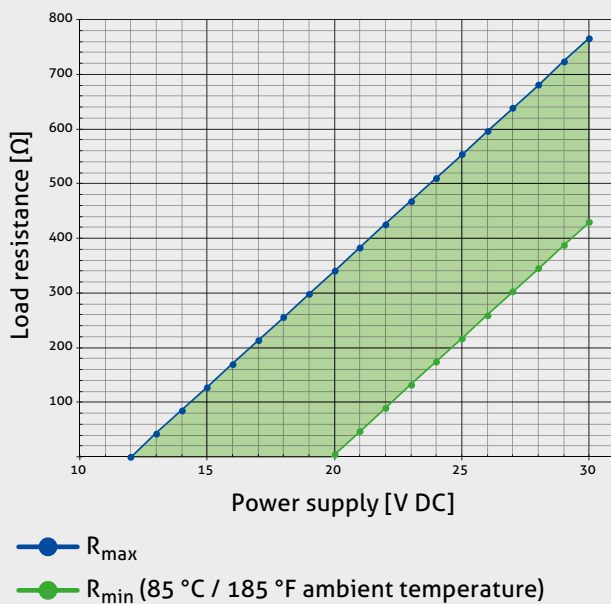
Electrical connection without transmitter

With 1x or 2x M12 plug

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

With 1x or 2x cable gland

Configuration strip terminal 1x RTD

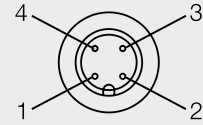Configuration strip terminal 2x RTD

Electrical connection with transmitter
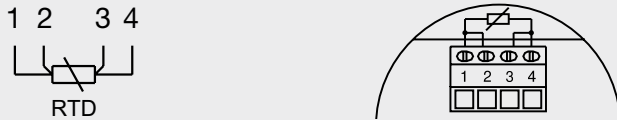
1x or 2x RTD with M12 plug for analog operation

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

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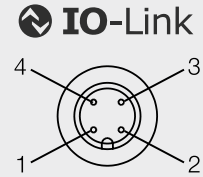3: not connected
4: not connected

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
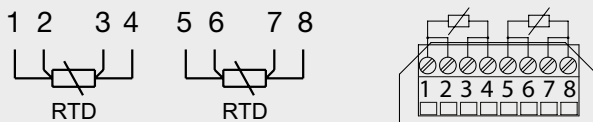
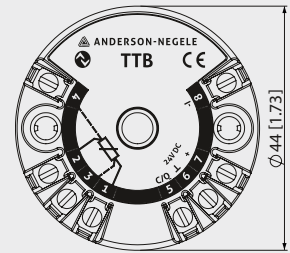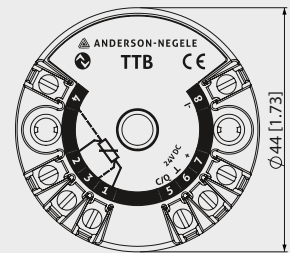### Connection with IO-Link output

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

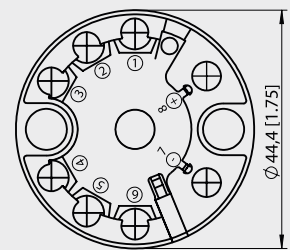### Connection with 4...20 mA output

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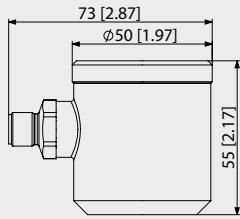8: - power supply (4...20 mA)

Connection with Hart transmitter

1: RTD
2: RTD
3: RTD
4: RTD
5: + voltage input
    (Thermocouple)
6: - voltage input
    (Thermocouple)
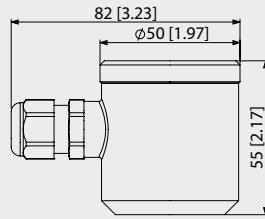7: - power supply (4...20 mA)
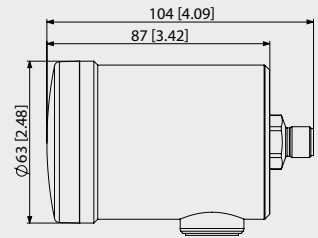8: + power supply (24 V DC)

Electrical connection | Head Big

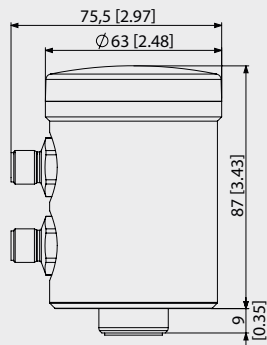### Head unit with 1 transmitter (no display) and M12 plug

73 [2.87]
Ø50 [1.97]
55 [2.17]

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

82 [3.23]
Ø50 [1.97]
55 [2.17]

Head unit horizontal with 1 transmitter and M12 (display optional)

104 [4.09]
87 [3.42]
Ø63 [2.48]

Head unit with 2 transmitter (display optional)

75,5 [2.97]
Ø63 [2.48]
87 [3.43]
9 [0.35]

Head unit with 1 transmitter, display and M12 plug

75,5 [2.97]
Ø63 [2.48]
87 [3.42]
9 [0.35]
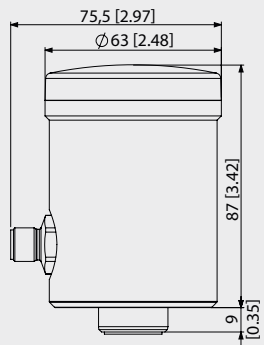
Spacer extension

Short

SW22
42 [1.65]

Long

SW22
92 [3.62]
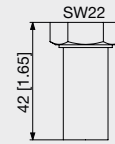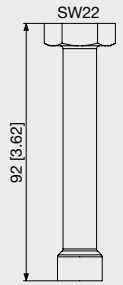
Process connection

C01 | CLEANadapt M12

SW17
M12x1,5
28 [1.10]
L
Ø d

C02 | CLEANadapt G1/2"

SW22
G1/2"
46 [1.81]
L
Ø d

E08 | PHARMadapt EPA-8

36 [1.41]
L
Ø 25 [0.98]
Ø d

E18 | PHARMadapt EPA-18

43 [1.68]
L
Ø 34 [1.34]
Ø d
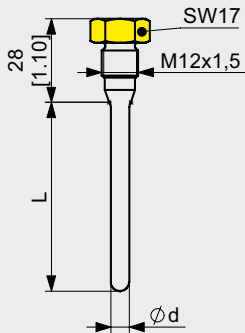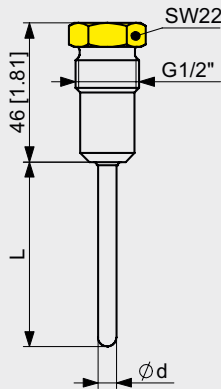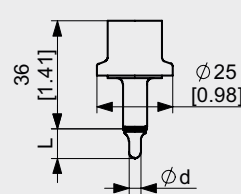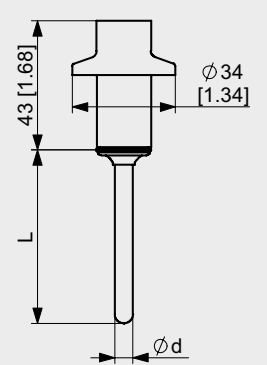
M01 | PHARMadapt ESP G3/8" cap nut, ø 3 mm

33 [1.3]
L
±2 [0.08]
Ø 3 [0.12]
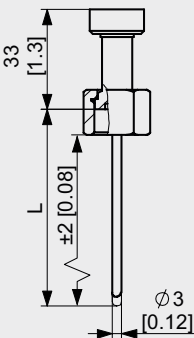
M04 | Sensor G3/8" cap nut, ø 4mm

33 [1.3]
L
±2 [0.08]
Ø 4 [0.16]

N01 | Plain rod

8 [0.31]
L
Ø d

G03 | Thread G1/4", ø 3 mm

8 [0.31]
SW22
G1/4"
L
16,5 [0.65]
±1 [0.04]
3 [0.12]
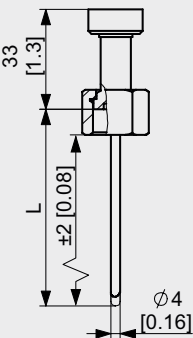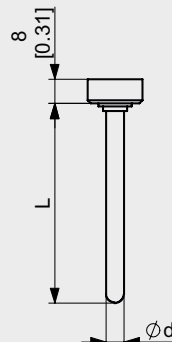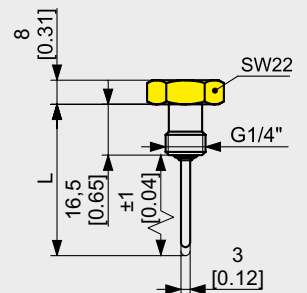
T05 | Tri-Clamp 1/2", 1/4"
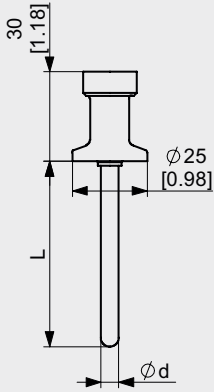
Txx | Tri-Clamp
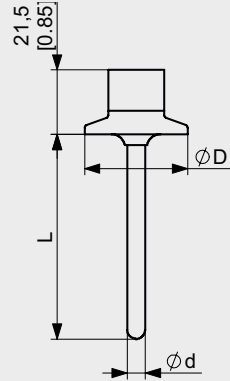
Ixx | Ingold (Fermenter)
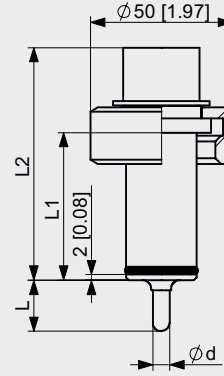
Tri-Clamp size

Type	ø D [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 Ingold (Fermenter)

Type	Ingold	L1 [mm / inch]	L2 [mm / inch]
I46	Ingold 46	46.0 / 1.81	76.0 / 2.99
I52	Ingold 52	52.0 / 2.05	82.0 / 3.23

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 emersing 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.

ø 6 mm

$t_{50} \leq 1.8$ s
$t_{90} \leq 5.2$ s
D: 8, 10, 12 mm
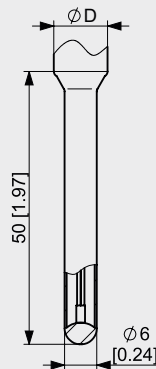
ø 4 mm

$t_{50} \leq 1.2$ s
$t_{90} \leq 3.5$ s
D: 6, 8, 10 mm
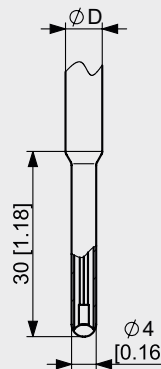
ø 3 mm

$t_{50} \leq 0.8$ s
$t_{90} \leq 2.2$ s
D: 6 mm
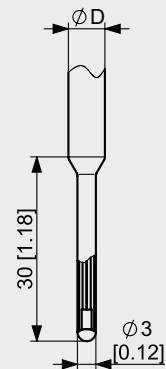
Note on 3-A Sanitary Standard 74-   ⚠

Information on installation according to 3-A standard is available on our website:
www.anderson-negele.com/3A74.pdf

Click on the PDF icon to download the document.

Note on EHEDG Hygienic Standard Type EL Class I   ⚠

Information on installation according to EHEDG standard is available on our website:
www.anderson-negele.com/EHEDG.pdf

Click on the PDF icon to download the document.

Mechanical connection/Installation

· Use Negele CLEANadapt or PHARMadapt 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!

Accessories

**PVC-cable with M12 connection, brass nickel-plated,
IP69K, shielded**

M12-PVC/5G-8m	5 pin, length 8 m
M12-PVC/5G-15m	5 pin, length 15 m
M12-PVC/5G-30m	5 pin, length 30 m
M12-EVK	M12 plug screw cap made of stainless steel (1.4305 / AISI 303) with o-ring

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 com-
  pany and do not use municipal collection points.

Note on IO-Link

Information on parameters and
events are available on our website:

www.anderson-negele.com/iodd

Click on the IO-Link icon to open the
website.

Order code

TSBP   Temperatur Sensor Big for Pharma Applications, material wetted parts 1.4435 / AISI 316L

Process connection (Ⓐ: 3-A conform, Ⓔ: EHEDG approval)
T05	Tri-Clamp 1/2" and 3/4" (Ⓐ and Ⓔ only for 3/4")
T10	Tri-Clamp DN10
TC1	Tri-Clamp 1" and 1½" Ⓐ Ⓔ
TC2	Tri-Clamp 2" Ⓐ Ⓔ
T25	Tri-Clamp 2½" Ⓐ Ⓔ
TC3	Tri-Clamp 3" Ⓐ Ⓔ
C01	CLEANadapt M12
C02	CLEANadapt G1/2"
N01	Plain rod
I46	Ingold 46 mm (Fermenter)
I52	Ingold 52 mm (Fermenter)
E08	PHARMadapt EPA-8 Ⓐ
E18	PHARMadapt EPA-18 Ⓐ

Without media contact
G03	Thread G1/4", sensor tip ø 3 mm, spring loaded
M01	PHARMadapt ESP G3/8" with cap nut, sensor tip ø 3 mm, spring loaded
M04	Sensor G3/8" with cap nut, sensor tip ø 4 mm, spring loaded

Spacer extension
X	Without spacer (permanent process temperature ≤ 100 °C / 212 °F)
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 (probe length ≥ 50 mm)
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 (probe length ≥ 50 mm)
A	1x Pt1000 A, 2 wire
B	1x Pt1000 AA, 2 wire
C	2x Pt1000 A, 2 wire
D	2x Pt1000 AA, 2 wire

Order code

Variable probe length [mm] - for process connections not listed separately
10...150   In steps of 5 mm,
                 process connection N01: min. length 30 mm
160...500   In steps of 10 mm
550...1000   In steps of 50 mm
1100...2000 In steps of 100 mm

Intermediate   Not for G03, M01, M04, E08, E18
lengths   (Minimum order quantity: 3 pieces)

Probe lengths [mm] for different process connections

For process connection E08	**For process connection E18**
10	**20**
25	**50**
50	
100	

For process connection without media contact M01	**For process connection without media contact G03**
37	**36**
59	**61**
83	**75**
97	**93**
160	**100**
	105
For process connection without media contact M04	**115**
	120
68	**130**
148	**140**
198	**160**
234	
238	
249	

Probe diameter
03   3 mm (standard for G03, M01)
04   4 mm (standard for M04)
06   6 mm (not for E08)
08   8 mm (not for T05, C01, E08, E18)
10   10 mm (not for Txx, C01, E08, E18)
12   12 mm (not for Txx, C01, E08, E18)

Sensor tip diameter, only for probe length ≥ 50 mm
X   Without reduction (standard for G03, M01, M04)
3   For probe diameter ø 6 mm
4   For probe diameter ø 6, 8, 10 mm
6   For probe diameter ø 8, 10, 12 mm

Material
0   1.4404 / AISI 316L without certificate
        (standard for G03, M01, M04)
3   1.4435 / AISI 316L incl. material certificate
        (standard for Txx, Cxx, Ixx, Exx, N01)

Order code

Surface finish

0	$R_a \leq 0.8$ µm / 32 µin (standard for G03, M01, M04)
1	$R_a \leq 0.8$ µm / 32 µin electro-polished
2	$R_a \leq 0.6$ µm / 24 µin mechanically polished
3	$R_a \leq 0.6$ µm / 24 µin electro-polished
4	$R_a \leq 0.4$ µm / 16 µin mechanically polished
5	$R_a \leq 0.38$ µm / 15 µin electro-polished

Transmitter

0	Without transmitter
H	TTB.H (hybrid: analog and IO-Link)
D	TTB.D (hybrid: analog and IO-Link, display optional)
Z	TTB.Z (1st transmitter TTB.H, 2nd transmitter TTB.D)
Y	TTB.Y (1st transmitter TTB.H, 2nd transmitter TTB.H)
A	HART protocol

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	TTB custom configuration

Electrical connection

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

Enclosure

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

Orientation/display

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

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