

TFRH

RTD temperature sensor for hygienic applications

TFRH-####-##0#.####.0##0.####

Overview

- Can be individually configured to your requirements
- Optionally available with touch screen
- Customized immersion depth 20 ... 3000 mm
- 4 ... 20 mA, HART or Pt100 output signal
- Convenient installation and easy operation
- 3-A sanitary standards and EHEDG-certified



Picture similar



Technical data

Performance characteristics

| | |
|---------------------------------|---|
| Pt100 accuracy class (EN 60751) | B ($\pm 0.3 \text{ }^\circ\text{C}$ at $0 \text{ }^\circ\text{C}$) $\pm (0.3 + 0.005 \times t)^\circ\text{C}$ A ($\pm 0.15 \text{ }^\circ\text{C}$ at $0 \text{ }^\circ\text{C}$) $\pm (0.15 + 0.002 \times t)^\circ\text{C}$ 1/3 B ($\pm 0.1 \text{ }^\circ\text{C}$ at $0 \text{ }^\circ\text{C}$) $\pm 1/3 \times (0.3 + 0.005 \times t)^\circ\text{C}$ 1/6 B ($\pm 0.05 \text{ }^\circ\text{C}$ at $0 \text{ }^\circ\text{C}$) $\pm 1/6 \times (0.3 + 0.005 \times t)^\circ\text{C}$ |
|---------------------------------|---|

| | |
|----------------------------|---|
| Thermal response time, T50 | < 1.5 s, $\varnothing 4 \text{ mm}$ < 6.1 s, $\varnothing 6 \text{ mm}$ < 7.6 s, $\varnothing 8 \text{ mm}$ |
|----------------------------|---|

Process pressure Refer to section "Operating conditions"

Process temperature Refer to section "Operating conditions"

Process connection

Connection variants Refer to section "Dimensional drawings"

Sensor length 20 ... 3000 mm

Sensor diameter outside $\varnothing 6 \text{ mm}$
 $\varnothing 8 \text{ mm}$

Mounting position Any, top, bottom, side

Standard response tip $\varnothing 6 \text{ mm}$
 $\varnothing 8 \text{ mm}$

Fast response tip $\varnothing 4 \text{ mm}$

Sensor tube material AISI 316L (1.4404)

Surface roughness wetted parts $R_a \leq 0.8 \text{ }\mu\text{m}$

Ambient conditions

Operating temperature range -30 ... 80 $^\circ\text{C}$, with DFON touch screen
-40 ... 85 $^\circ\text{C}$, without DFON touch screen

Storage temperature range -30 ... 80 $^\circ\text{C}$, with DFON touch screen
-40 ... 85 $^\circ\text{C}$, without DFON touch screen

Degree of protection (EN 60529) IP67
IP69K, with appropriate cable

Ambient conditions

Humidity < 98 % RH, condensing

Vibration (sinusoidal) (EN 60068-2-6) 1.6 mm p-p (2 ... 25 Hz), 4 g (25 ... 100 Hz), 1 octave / min.

Output signal

Without transmitter 1 x Pt100, 2-wire
1 x Pt100, 4-wire
2 x Pt100, 2-wire

With transmitter 4 ... 20 mA, 2-wire
4 ... 20 mA, 2-wire + HART®

Housing

Style Field housing, $\varnothing 55 \text{ mm}$
FlexHousing, $\varnothing 80 \text{ mm}$

Overall size Refer to section "Dimensional drawings"

Material AISI 304 (1.4301)

Electrical connection

Connector M12-A, 5-pin, stainless steel
M12-A, 8-pin, stainless steel

Cable M16 plastic, cable dia. 5 ... 10 mm
M16 stainless steel, cable dia. 5 ... 9 mm
M20 plastic, cable dia. 8 ... 13 mm
M20 stainless steel, cable dia. 9 ... 13 mm

Cable gland M16x1.5, plastic
M16x1.5, stainless steel
M20x1.5, plastic
M20x1.5, stainless steel

ATEX II 1 G Ex ia IIC T6...T4

Maximum values for barrier selection, Ui 28 V DC, with FlexTop 2202
30 V DC, with FlexTop 2212
30 V DC, with FlexTop 2222

Maximum values for barrier selection, Ii 0.1 A, with FlexTop 2202
0.095 A, with FlexTop 2212
0.095 A, with FlexTop 2222

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ATEX II 1 G Ex ia IIC T6...T4

| | |
|--|--|
| Maximum values for barrier selection, Pi | 0.7 W , with FlexTop 2202 0.75 W , with FlexTop 2212 0.75 W , with FlexTop 2222 |
| Internal capacitance, Ci | 10 nF , with FlexTop 2202 25 nF , with FlexTop 2202 and display 11 nF , with FlexTop 2212 26 nF , with FlexTop 2212 and display 11 nF , with FlexTop 2222 26 nF , with FlexTop 2222 and display |
| Internal inductance, Li | 11 µH , with FlexTop 2202 20 µH , with FlexTop 2202 and display 24 µH , with FlexTop 2212 34 µH , with FlexTop 2212 and display 24 µH , with FlexTop 2222 34 µH , with FlexTop 2222 and display |
| Temperature class, T1 ... T4 | -20 < Tamb < 65 °C , with DFON touch screen -40 < Tamb < 80 °C , with FlexTop 2212 -40 < Tamb < 80 °C , with FlexTop 2222 |
| Temperature class, T5 | -20 < Tamb < 60 °C , with DFON touch screen -40 < Tamb < 71 °C , with FlexTop 2212 -40 < Tamb < 71 °C , with FlexTop 2222 |
| Temperature class, T1 ... T5 | -40 < Tamb < 85 °C , with FlexTop 2202 |
| Temperature class, T6 | -40 < Tamb < 50 °C , with FlexTop 2202 -40 < Tamb < 56 °C , with FlexTop 2212 -40 < Tamb < 56 °C , with FlexTop 2222 |

ATEX II 3 G Ex ec IIC T5...T4

| | |
|------------------------------|--|
| Voltage supply range, Un | 8 ... 30 V DC , with FlexTop 2202 6.5 ... 30 V DC , with FlexTop 2212 6.5 ... 30 V DC , with FlexTop 2222 |
| Current rating, In | ≤ 0.1 A |
| Temperature class, T1 ... T4 | -20 < Tamb < 70 °C , with DFON touch screen |
| Temperature class, T1 ... T5 | -20 < Tamb < 60 °C , with DFON touch screen |
| Temperature class, T1 ... T5 | -40 < Tamb < 80 °C , with FlexTop 2202 -40 < Tamb < 80 °C , with FlexTop 2212 -40 < Tamb < 80 °C , with FlexTop 2222 |

Compliance and approvals

| | |
|----------------------|---|
| EMC | EN 61000-6-2 EN 61000-6-3 EN 61326-1 |
| Hygiene | EHEDG EL Class I 3-A (74-07) |
| Explosion protection | ATEX II 1 G Ex ia IIC T6...T4 IECEx Ex ia IIC T6...T4 ATEX II 3 G Ex ec IIC T5...T4 Ex ia Simple apparatus, gas and dust |

Display

General information

| | |
|-------------------|--------------------|
| Panel type | FSTN Graphical LCD |
| Display range | -9999 ... 99999 |
| Max. digit height | 22 mm |
| Material | Polycarbonate |

Input signal

| | |
|-------------------------------|---|
| Input signal from transmitter | FlexTop 2202: Analog, current loop FlexTop 2212 / 2222: Digital, 2-way for communication between transmitter and display |
| Update time | 1 s , max. 0.3 s , typ. |

Relays

| | |
|------------------------|------------------------|
| Contacts | 2 x solid state relays |
| Max. load current | 75 mA |
| Max. switching voltage | 60 V |

User configurable data

| | |
|-----------------------------|--|
| Error- / Warning-indication | Individually configurable display and backlight indication in white, green or red colour, steady or flashing light. Configurable limits over the range |
| Measuring unit | °C °F K |
| User defined measuring unit | 8 × 20 pixel matrix |

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Transmitter

FlexTop 2202

| | |
|---------------------|---|
| Input Accuracy | $\leq \pm 0.25 \text{ }^\circ\text{C}$ |
| Min. measuring span | 25 $^\circ\text{C}$ |
| Output | 4 ... 20 mA , 2-wire |
| Output Accuracy | $\leq \pm 0.1 \%$, measuring span $\leq \pm 0.016 \text{ mA}$ |
| Power supply | 8 ... 35 V DC |
| Programmability | With FlexProgrammer 9701 |
| Please note | For further information please see data sheet for FlexTop 2202 |

FlexTop 2212

| | |
|---------------------|---|
| Input Accuracy | $\leq \pm 0.06 \text{ }^\circ\text{C}$ |
| Min. measuring span | 10 $^\circ\text{C}$ |
| Output | 4 ... 20 mA , 2-wire 20 ... 4 mA , programmable |
| Output Accuracy | $\leq \pm 0.025 \%$, measuring span $\leq \pm 0.004 \text{ mA}$ |
| Power supply | 7 ... 40 V DC |
| Programmability | With FlexProgram |
| Please note | For further information please see data sheet for FlexTop 2212 |

FlexTop 2222

| | |
|---------------------|---|
| Input Accuracy | $\leq \pm 0.06 \text{ }^\circ\text{C}$ |
| Min. measuring span | 10 $^\circ\text{C}$ |
| Output | 4 ... 20 mA , 2-wire + HART® 20 ... 4 mA , programmable |
| Output Accuracy | $\leq \pm 0.025 \%$, measuring span $\leq \pm 0.004 \text{ mA}$ |
| Power supply | 7 ... 40 V DC |
| Programmability | With FlexProgram With HART® modem |
| Please note | For further information please see data sheet for FlexTop 2222 |

Factory settings FlexTop 2202

| | |
|------------------------|----------------------------|
| Output range | 0 ... 120 $^\circ\text{C}$ |
| Damping | 0 s |
| Output at sensor fault | 23 mA |

Factory settings FlexTop 2212

| | |
|------------------------|----------------------------|
| Output range | 0 ... 100 $^\circ\text{C}$ |
| Damping | 0 s |
| Output at sensor fault | 23 mA |

Factory settings FlexTop 2222

| | |
|------------------------|----------------------------|
| Output range | 0 ... 100 $^\circ\text{C}$ |
| Damping | 0 s |
| Output at sensor fault | 23 mA |

Operating conditions

| Ordering key | Process connection | BCID | Process pressure (bar) | Continuous | Process temperature |
|------------------------|--|------|---------------------------|--|---|
| | | | | Process temperature Standard @ Tamb $\leq 20 \text{ }^\circ\text{C}$ ($^\circ\text{C}$) | Process temperature With cooling neck @ Tamb $\leq 20 \text{ }^\circ\text{C}$ ($^\circ\text{C}$) |
| TFRH-####.#51.####.#0# | G 1/2 A hygienic | A03 | -1 ... 100 | -50 ... 250 | -50 ... 400 |
| TFRH-####.#60.####.#0# | BHC 3A DN 38 | B01 | -1 ... 40 | -50 ... 250 | -50 ... 400 |
| TFRH-####.#65.####.#0# | ISO 2852 (Tri-Clamp), DN 33.7; 38, $\varnothing 50.5$ | C04 | -1 ... 40 | -50 ... 250 | -50 ... 400 |
| TFRH-####.#66.####.#0# | ISO 2852 (Tri-Clamp), DN 40; 51, $\varnothing 64.0$ | C05 | -1 ... 40 | -50 ... 250 | -50 ... 400 |
| TFRH-####.#70.####.#0# | Varivent® DN 32 ... 125; 1 1/2" ... 6" (Type N), $\varnothing 68$ | V02 | -1 ... 16 | -50 ... 250 | -50 ... 400 |

For further information on permissible process and ambient temperatures, please refer to the operating instructions.

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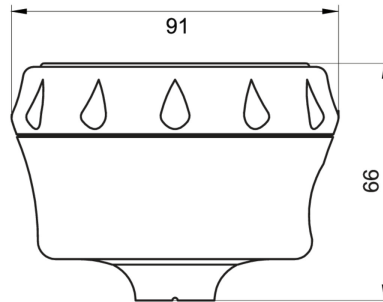
TFRH-####.#0#.#0#.#0#.#0#.#0#

Dimensional drawings (mm)

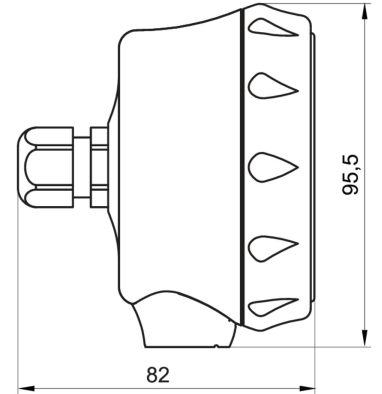
Housing



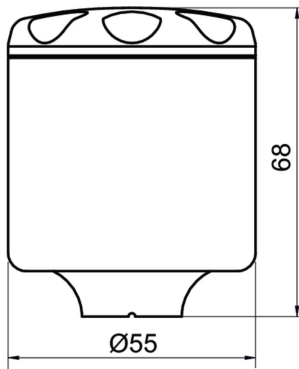
FlexHousing front view



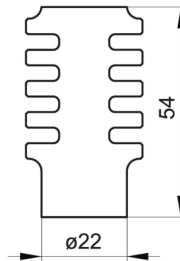
FlexHousing with rear process connection



FlexHousing with bottom process connection

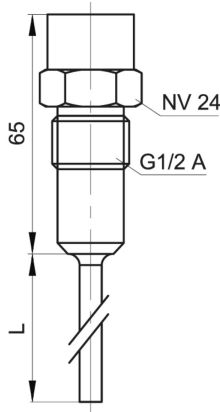


Field housing, Ø55 mm

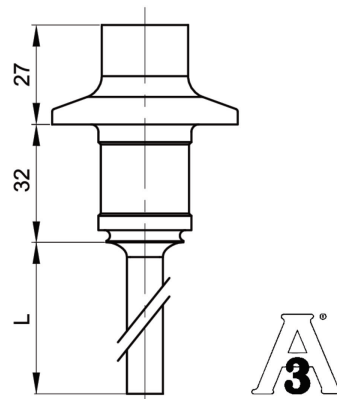


Cooling neck

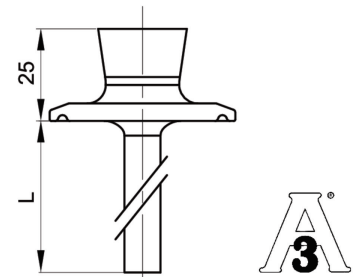
Process connection



G 1/2 A hygienic (BCID: A03)



BHC 3A DN 38 (BCID: B01)



Tri-Clamp Ø 50.5 (BCID: C04)

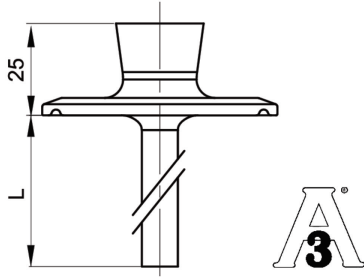
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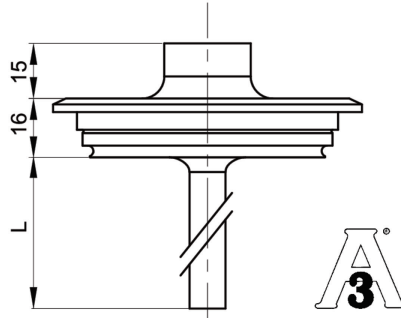
TFRH-####.#0#.####.0#0.####

Dimensional drawings (mm)

Process connection



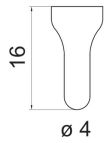
Tri-Clamp Ø 64.0 (BCID: C05)



Varivent® DN 32 ... 125; 1 1/2" ... 6" (Type N),
Ø 68 (BCID: V02)



Standard response tip



Fast response tip

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Electrical connection

| Output type | Equivalent circuit | Electrical connection | Function | Pin assignment |
|------------------------|--------------------|-----------------------|----------|----------------|
| Pt100 (Single element) | | | Pt100 11 | Long |
| | | | Pt100 12 | Short |
| | | | Pt100 11 | 1, 2 |
| | | | Pt100 12 | 3, 4 |
| | | | Pt100 11 | 1, 2 |
| | | | Pt100 12 | 3, 4 |
| Pt100 (Double element) | | | Pt100 11 | Long |
| | | | Pt100 12 | Long |
| | | | Pt100 21 | Short |
| | | | Pt100 22 | Short |
| | | | Pt100 11 | 1 |
| | | | Pt100 12 | 2 |
| | | | Pt100 21 | 3 |
| | | | Pt100 22 | 4 |
| | | | Pt100 11 | 1 |
| | | | Pt100 12 | 2 |
| Pt100 21 | 3 | | | |
| Pt100 22 | 4 | | | |
| N.C. | 5 | | | |
| Frame ground | Plug thread | | | |

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Electrical connection

| Output type | Equivalent circuit | Electrical connection | Function | Pin assignment |
|---------------------|--------------------|-----------------------|--------------------------|----------------|
| 4 ... 20 mA, 2-wire | | | +Vs | 1 |
| | | | lout | 2 |
| | | | +Vs | 1 |
| | | | Common for relays 11, 21 | 2 |
| | | | lout | 3 |
| | | | Relay 22 | 4 |
| | | | Relay 12 | 5 |
| | | | Frame ground | Plug thread |
| | | | N.C. | 1 |
| | | | +Vs | 2 |
| Relay 21 | 3 | | | |
| Relay 22 | 4 | | | |
| Relay 11 | 5 | | | |
| Relay 12 | 6 | | | |
| lout | 7 | | | |
| N.C. | 8 | | | |
| Frame ground | Plug thread | | | |

| | | | | |
|-------------------------|--|--|--------------|-------------|
| 2 x 4 ... 20 mA, 2-wire | | | +Vs1 | 1 |
| | | | lout1 | 2 |
| | | | +Vs2 | 3 |
| | | | lout2 | 4 |
| | | | +Vs1 | 1 |
| | | | lout1 | 2 |
| | | | lout2 | 3 |
| | | | +Vs2 | 4 |
| | | | N.C. | 5 |
| | | | Frame ground | Plug thread |

Ordering information

Ordering key - Configuration possibilities see website

| Product | TFRH | - | # | # | # | # | . | # | # | # | . | # | # | ## | . | 0 | # | # | 0 | . | #### |
|--|------|---|---|---|---|---|---|---|---|---|---|---|---|----|---|---|---|---|---|---|------|
| Housing | TFRH | | | | | | | | | | | | | | | | | | | | |
| FlexHousing Ø80 Stainless steel 1.4301 / AISI304 Bottom process connection | | | | | | | | | | | | | | | | | | | | | 5 |
| FlexHousing Ø80 Stainless steel 1.4301 / AISI304 Rear process connection | | | | | | | | | | | | | | | | | | | | | 6 |
| Field housing Ø55 Stainless steel 1.4301 / AISI304 | | | | | | | | | | | | | | | | | | | | | 7 |
| Electrical connection | | | | | | | | | | | | | | | | | | | | | |
| M12-A, 5-pin | | | | | | | | | | | | | | | | | | | | | 1 |
| M12-A, 8-pin | | | | | | | | | | | | | | | | | | | | | 3 |
| M16x1.5 cable gland | | | | | | | | | | | | | | | | | | | | | 5 |
| M20x1.5 cable gland | | | | | | | | | | | | | | | | | | | | | B |

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RTD temperature sensor for hygienic applications

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Ordering information

Ordering key - Configuration possibilities see website

| | TFRH | - | # | # | # | . | # | # | # | . | # | # | ## | . | 0 | # | # | 0 | . | #### | |
|---|------|---|---|---|---|---|---|---|---|---|---|---|----|---|---|---|---|---|---|------|---|
| Material el. connection | | | | | | | | | | | | | | | | | | | | | |
| Plastic | | | | | | | | | | | | | | | | | | | | | 1 |
| Stainless steel AISI 304 (1.4301) | | | | | | | | | | | | | | | | | | | | | 3 |
| Display | | | | | | | | | | | | | | | | | | | | | |
| Without display, Ø55 housing | | | | | | | | | | | | | | | | | | | | | 0 |
| Without display, Ø80 housing | | | | | | | | | | | | | | | | | | | | | 1 |
| With display, relays not activated | | | | | | | | | | | | | | | | | | | | | 2 |
| With display, relays activated | | | | | | | | | | | | | | | | | | | | | 4 |
| Transmitter / socket | | | | | | | | | | | | | | | | | | | | | |
| Flying leads | | | | | | | | | | | | | | | | | | | | | 0 |
| Ceramic socket Pt100 | | | | | | | | | | | | | | | | | | | | | 1 |
| Transmitter 2202 | | | | | | | | | | | | | | | | | | | | | 2 |
| 4 ... 20 mA, accuracy ±0,25 °C | | | | | | | | | | | | | | | | | | | | | |
| Transmitter 2212 | | | | | | | | | | | | | | | | | | | | | 6 |
| 4 ... 20 mA, accuracy < ±0.06°C | | | | | | | | | | | | | | | | | | | | | |
| Transmitter 2222 | | | | | | | | | | | | | | | | | | | | | 7 |
| 4 ... 20 mA + HART®, accuracy < ±0.06°C | | | | | | | | | | | | | | | | | | | | | |
| 2 x Transmitter 2212 | | | | | | | | | | | | | | | | | | | | | D |
| 4 ... 20 mA, accuracy < ±0.06°C | | | | | | | | | | | | | | | | | | | | | |
| Safety | | | | | | | | | | | | | | | | | | | | | |
| Standard | | | | | | | | | | | | | | | | | | | | | 0 |
| Ex ia IIC T6/T5...T4 (Gas) | | | | | | | | | | | | | | | | | | | | | 1 |
| Ex ec IIC T5...T4 (Gas) | | | | | | | | | | | | | | | | | | | | | 3 |
| Ex ia Simple apparatus, gas and dust | | | | | | | | | | | | | | | | | | | | | 9 |
| Configuration | | | | | | | | | | | | | | | | | | | | | |
| No configuration | | | | | | | | | | | | | | | | | | | | | 0 |
| Configuration of temperature range | | | | | | | | | | | | | | | | | | | | | 1 |
| Configuration of Range + Display | | | | | | | | | | | | | | | | | | | | | 2 |
| Configuration of Range + Display incl. 2 x relays | | | | | | | | | | | | | | | | | | | | | 3 |
| Sensor element | | | | | | | | | | | | | | | | | | | | | |
| None | | | | | | | | | | | | | | | | | | | | | 0 |
| 1 x Pt100, 1/1 B EN 60751 | | | | | | | | | | | | | | | | | | | | | 1 |
| 2 x Pt100, 1/1 B EN 60751 | | | | | | | | | | | | | | | | | | | | | 2 |
| 1 x Pt100, 1/3 B EN 60751 | | | | | | | | | | | | | | | | | | | | | 5 |
| 2 x Pt100, 1/3 B EN 60751 | | | | | | | | | | | | | | | | | | | | | 6 |
| 1 x Pt100, 1/6 B EN 60751 | | | | | | | | | | | | | | | | | | | | | 7 |
| 2 x Pt100, 1/6 B EN 60751 | | | | | | | | | | | | | | | | | | | | | 8 |
| 1 x Pt100, 1/1 A EN 60751 | | | | | | | | | | | | | | | | | | | | | A |
| 2 x Pt100, 1/1 A EN 60751 | | | | | | | | | | | | | | | | | | | | | B |

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Ordering information

Ordering key - Configuration possibilities see website

| | TFRH | - | # | # | # | # | . | # | # | # | . | # | # | ## | . | 0 | # | # | 0 | . | #### |
|---|------|---|---|---|---|---|---|---|---|---|---|---|---|----|---|---|---|---|---|---|------|
| Sensor insert type | | | | | | | | | | | | | | | | | | | | | |
| Sensor tube with embedded sensor element 2-wire | | | | | | | | | | | | | | | | | | | | | 1 |
| Sensor tube with embedded sensor element 4-wire | | | | | | | | | | | | | | | | | | | | | 2 |
| Sensor tube with embedded 2x2-wire sensor element | | | | | | | | | | | | | | | | | | | | | 4 |
| Spring loaded insert, DIN 43762, 2-wire | | | | | | | | | | | | | | | | | | | | | 5 |
| Spring loaded insert, DIN 43762, 4-wire | | | | | | | | | | | | | | | | | | | | | 6 |
| Spring loaded insert, DIN 43762, 2x2-wire | | | | | | | | | | | | | | | | | | | | | 7 |
| Cable sensor Pt100 1/1 B EN 60751 | | | | | | | | | | | | | | | | | | | | | A |
| Cable sensor Pt100 1/3 B EN 60751 | | | | | | | | | | | | | | | | | | | | | B |
| Cable sensor Pt100 1/6 B EN 60751 | | | | | | | | | | | | | | | | | | | | | C |
| Cable sensor Pt100 1/1 A EN 60751 | | | | | | | | | | | | | | | | | | | | | D |
| Cooling neck | | | | | | | | | | | | | | | | | | | | | |
| Without | | | | | | | | | | | | | | | | | | | | | 0 |
| With cooling neck | | | | | | | | | | | | | | | | | | | | | 4 |
| Process connection | | | | | | | | | | | | | | | | | | | | | |
| G 1/2 A hygienic (A03) | | | | | | | | | | | | | | | | | | | | | 51 |
| BHC 3A DN 38 (B01) | | | | | | | | | | | | | | | | | | | | | 60 |
| ISO 2852 (Tri-Clamp), DN 25; 33.7; 38, Ø 50.5 (C04) | | | | | | | | | | | | | | | | | | | | | 65 |
| ISO 2852 (Tri-Clamp), DN 40; 51, Ø 64.0 (C05) | | | | | | | | | | | | | | | | | | | | | 66 |
| Varivent® DN 32 ... 125; 1 1/2 ... 6 (Type N), Ø 68 (V02) | | | | | | | | | | | | | | | | | | | | | 70 |
| Seal | | | | | | | | | | | | | | | | | | | | | |
| Without | | | | | | | | | | | | | | | | | | | | | 0 |
| Sensor diameter | | | | | | | | | | | | | | | | | | | | | |
| ø 6 mm, AISI 316L | | | | | | | | | | | | | | | | | | | | | 1 |
| ø 8 mm, AISI 316L | | | | | | | | | | | | | | | | | | | | | 2 |
| Sensor tip | | | | | | | | | | | | | | | | | | | | | |
| Standard response tip | | | | | | | | | | | | | | | | | | | | | 1 |
| Fast response tip, ø 4 mm tip | | | | | | | | | | | | | | | | | | | | | 2 |
| Approvals | | | | | | | | | | | | | | | | | | | | | |
| Standard approvals | | | | | | | | | | | | | | | | | | | | | 0 |
| Sensor tube length (mm) | | | | | | | | | | | | | | | | | | | | | |
| 20 - 3000 | | | | | | | | | | | | | | | | | | | | | #### |

2024-04-24 The product features and technical data specified do not express or imply any warranty. Technical modifications subject to change.