

## TFRH

RTD temperature sensor for hygienic applications

TFRH-####.##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



### Technical data

#### Performance characteristics

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

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

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	$-30 \dots 80 \text{ }^{\circ}\text{C}$ , with DFON touch screen $-40 \dots 85 \text{ }^{\circ}\text{C}$ , with transmitter $-40 \dots 160 \text{ }^{\circ}\text{C}$ , with Pt100
Storage temperature range	$-30 \dots 80 \text{ }^{\circ}\text{C}$ , with DFON touch screen $-40 \dots 85 \text{ }^{\circ}\text{C}$ , without DFON touch screen
Degree of protection (EN 60529)	IP67 IP69K, with appropriate cable

#### Ambient conditions

Humidity	$< 98 \text{ \% RH}$ , 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 1G Ex ia IIC T4/T5

Maximum values for barrier selection, Ui	28 V DC
Maximum values for barrier selection, Ii	0.1 A
Maximum values for barrier selection, Pi	0.7 W
Internal capacitance, Ci	36 nF

## TFRH

RTD temperature sensor for hygienic applications

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

### Technical data

#### ATEX II 1G Ex ia IIC T4/T5

Internal inductance, Li	11 µH
Temperature class, T1 ... T4	-20 < Tamb < 65 °C
Temperature class, T1 ... T5	-20 < Tamb < 60 °C

#### ATEX II 3G Ex ec IIC T4/T5

Voltage supply range, Un	8 ... 30 V DC , with FlexTop 2202 / 2221 6.5 ... 30 V DC , with FlexTop 2211
Current rating, In	≤ 0.1 A
Temperature class, T1 ... T4	-20 < Tamb < 70 °C
Temperature class, T1 ... T5	-20 < Tamb < 60 °C

### 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 Ga ATEX II 3 G Ex ec IIC T5...T4 Ex ia Simple apparatus, gas and dust IECEx Ex ia IIC T6...T4 Ga

### Display

#### General information

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

#### Ambient conditions

Optimal readability temperature range	-10 ... 70 °C
Operating temperature range	-30 ... 80 °C
Degree of protection (EN 60529)	IP 67 IP 0

#### Input signal

Input signal from transmitter	FlexTop 2202 / 2211 / 2221: Analog, current loop FlexTop 2212 / 2222: Digital, 2-way for communication between transmitter and display
Update time	1 s , max. 0.3 s , typ.

### 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

### Relays

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

## TFRH

RTD temperature sensor for hygienic applications

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

### Transmitter

#### FlexTop 2202

Input Accuracy	$\leq \pm 0.25\text{ }^{\circ}\text{C}$
Min. measuring span	25 °C
Output	4 ... 20 mA , 2-wire
Output Accuracy	$\leq \pm 0.1\text{ }%$ , 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 2211

Input Accuracy	$\leq \pm 0.1\text{ }^{\circ}\text{C}$
Min. measuring span	25 °C
Output	4 ... 20 mA , 2-wire 20 ... 4 mA , programmable
Output Accuracy	$\leq \pm 0.1\text{ }%$ , 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 2211

#### FlexTop 2221

Input Accuracy	$\leq \pm 0.1\text{ }^{\circ}\text{C}$
Min. measuring span	25 °C
Output	4 ... 20 mA , 2-wire + HART® 20 ... 4 mA , programmable
Output Accuracy	$\leq \pm 0.1\text{ }%$ , measuring span $\leq \pm 0.016\text{ mA}$
Power supply	8 ... 35 V DC
Programmability	With FlexProgrammer 9701 With HART® modem
Please note	For further information please see data sheet for FlexTop 2221

#### FlexTop 2212

Input Accuracy	$\leq \pm 0.06\text{ }^{\circ}\text{C}$
Min. measuring span	10 °C
Output	4 ... 20 mA , 2-wire 20 ... 4 mA , programmable
Output Accuracy	$\leq \pm 0.025\text{ }%$ , 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 °C
Output	4 ... 20 mA , 2-wire + HART® 20 ... 4 mA , programmable
Output Accuracy	$\leq \pm 0.025\text{ }%$ , 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 °C
Damping	0 s
Output at sensor fault	23 mA

#### Factory settings FlexTop 2211

Output range	0 ... 100 °C
Damping	0 s
Output at sensor fault	23 mA

#### Factory settings FlexTop 2221

Output range	0 ... 100 °C
Damping	0 s
Output at sensor fault	23 mA

#### Factory settings FlexTop 2212

Output range	0 ... 100 °C
Damping	0 s
Output at sensor fault	23 mA

#### Factory settings FlexTop 2222

Output range	0 ... 100 °C
Damping	0 s
Output at sensor fault	23 mA

## TFRH

RTD temperature sensor for hygienic applications

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

### Operating conditions

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

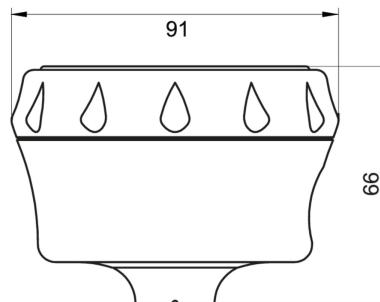
For further information on permissible process and ambient temperatures, please refer to the operating instructions.

### Dimensional drawings (mm)

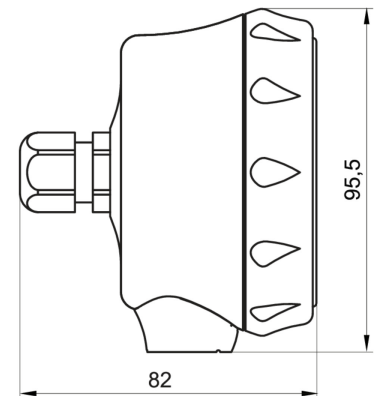
#### Housing



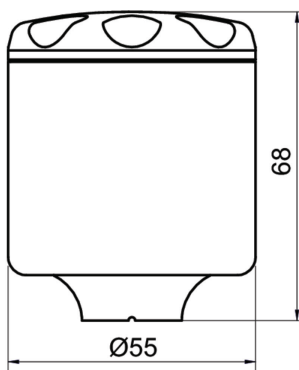
FlexHousing front view



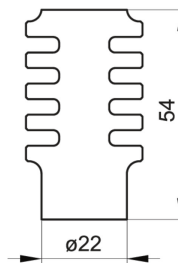
FlexHousing with rear process connection



FlexHousing with bottom process connection



Field housing, Ø55 mm



Cooling neck

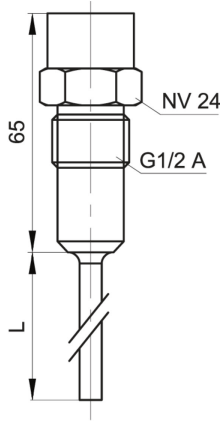
## TFRH

RTD temperature sensor for hygienic applications

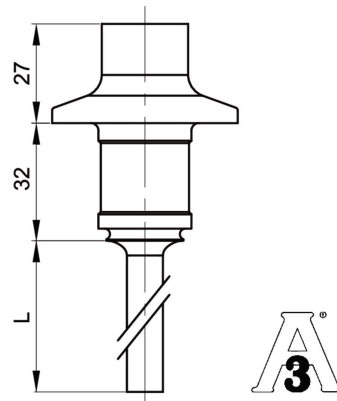
TFRH-####.##0#.####.0###.####

### Dimensional drawings (mm)

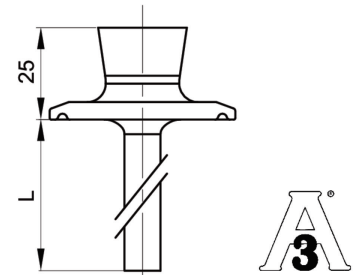
#### Process connection



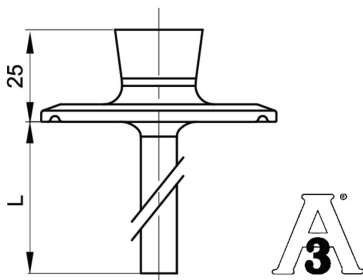
G 1/2 A hygienic (BCID: A03)



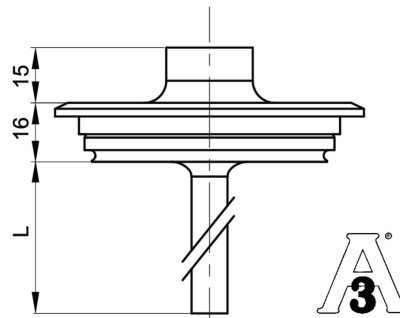
BHC 3A DN 38 (BCID: B01)



Tri-Clamp Ø 50.5 (BCID: C04)



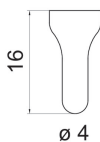
Tri-Clamp Ø 64.0 (BCID: C05)



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



Standard response tip



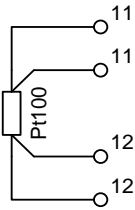
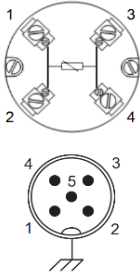
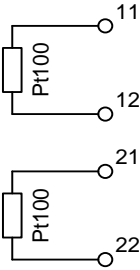
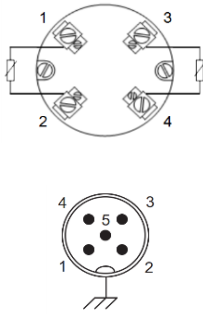
Fast response tip

TFRH

RTD temperature sensor for hygienic applications

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

Electrical connection

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

## TFRH

RTD temperature sensor for hygienic applications

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

### Electrical connection

Output type	Equivalent circuit	Electrical connection	Function	Pin assignment
4 ... 20 mA, 2-wire			+Vs	1
			Iout	2
			+Vs	1
			Common for relays 11, 21	2
			Iout	3
			Relay 22	4
			Relay 12	5
			Frame ground	Plug thread
			N.C.	1
			+Vs	2
2 x 4 ... 20 mA, 2-wire			+Vs1	1
			Iout1	2
			+Vs2	3
			Iout2	4
			+Vs1	1
			Iout1	2
			Iout2	3
			+Vs2	4
			N.C.	5
			Frame ground	Plug thread

### Ordering information

Ordering key - Configuration possibilities see website

Product	TFRH	-	#	#	#	#	.	#	#	#	.	#	#	##	.	0	#	#	#	.	####
<b>Housing</b>	TFRH																				
FlexHousing Ø80																					
Stainless steel 1.4301 / AISI304																					
Bottom process connection																					
FlexHousing Ø80																					
Stainless steel 1.4301 / AISI304																					
Rear process connection																					
Field housing Ø55																					
Stainless steel 1.4301 / AISI304																					
<b>Electrical connection</b>																					
M12-A, 5-pins																					
M12-A, 8-pin																					
M16x1.5 cable gland																					
M20x1.5 cable gland																					

## TFRH

RTD temperature sensor for hygienic applications

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

### Ordering information

Ordering key - Configuration possibilities see website

	TFRH	-	#	#	#	#	.	#	#	#	.	#	#	##	.	0	#	#	#	.	####
<b>Material el. connection</b>																					
Plastic																					
Stainless steel AISI 304 (1.4301)																					
<b>Display</b>																					
Without display, Ø55 housing																					
Without display, Ø80 housing																					
With display, relays not activated																					
With display, relays activated																					
<b>Transmitter / socket</b>																					
Flying leads																					
Ceramic socket Pt100																					
Transmitter 2202																					
4 ... 20 mA, accuracy ±0,25 °C																					
Transmitter 2211																					
4 ... 20 mA, accuracy ±0,10 °C																					
Transmitter 2221																					
4 ... 20 mA + HART®, accuracy ±0,10 °C																					
Transmitter 2212																					
4 ... 20 mA, accuracy < ±0.06°C																					
Transmitter 2222																					
4 ... 20 mA + HART®, accuracy < ±0.06°C																					
2 x Transmitter 2212																					
4 ... 20 mA, accuracy < ±0.06°C																					
2 x Transmitter 2222																					
4 ... 20 mA + HART®, accuracy < ±0.06°C																					
<b>Safety</b>																					
Standard																					
Ex ia IIC T6/T5...T4 (Gas)																					
Ex ec IIC T5...T4 (Gas)																					
Ex ia Simple apparatus, gas and dust																					
<b>Configuration</b>																					
No configuration																					
Configuration of temperature range																					
Configuration of Range + Display																					
Configuration of Range																					
+ Display incl. 2 x relays																					
<b>Sensor element</b>																					
None																					
1 x Pt100, 1/1 B EN 60751																					
2 x Pt100, 1/1 B EN 60751																					
1 x Pt100, 1/3 B EN 60751																					
2 x Pt100, 1/3 B EN 60751																					
1 x Pt100, 1/6 B EN 60751																					
2 x Pt100, 1/6 B EN 60751																					
1 x Pt100, 1/1 A EN 60751																					
2 x Pt100, 1/1 A EN 60751																					



## TFRH

RTD temperature sensor for hygienic applications

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

### Ordering information

Ordering key - Configuration possibilities see website

	TFRH	-	#	#	#	#	.	#	#	#	.	#	#	##	.	0	#	#	#	.	####
<b>Sensor insert type</b>																					
Sensor tube with embedded sensor element 2-wire																					
Sensor tube with embedded sensor element 4-wire																					
Sensor tube with embedded 2x2-wire sensor element																					
Spring loaded insert, DIN 43762, 2-wire																					
Spring loaded insert, DIN 43762, 4-wire																					
Spring loaded insert, DIN 43762, 2x2-wire																					
Cable sensor Pt100 1/1 B EN 60751																					
Cable sensor Pt100 1/3 B EN 60751																					
Cable sensor Pt100 1/6 B EN 60751																					
Cable sensor Pt100 1/1 A EN 60751																					
<b>Cooling neck</b>																					
Without																					
With cooling neck																					
<b>Process connection</b>																					
G 1/2 A hygienic (A03)																					
BHC 3A DN 38 (B01)																					
ISO 2852 (Tri-Clamp), DN 25; 33.7; 38, Ø 50.5 (C04)																					
ISO 2852 (Tri-Clamp), DN 40; 51, Ø 64.0 (C05)																					
Varivent® DN 32 ... 125; 1 1/2 ... 6 (Type N), Ø 68 (V02)																					
<b>Seal</b>																					
Without seal																					
<b>Sensor diameter</b>																					
Ø 6 mm, AISI 316L																					
Ø 8 mm, AISI 316L																					
<b>Sensor tip</b>																					
Standard response tip																					
Fast response tip, Ø 4 mm tip																					
<b>Approvals</b>																					
Standard approvals																					
EAC (TR CU 020/2011)																					
<b>Sensor tube length (mm)</b>																					
20 - 3000																					