

## 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 $0 \text{ }^\circ\text{C}$ ) $\pm 1/6 \times (0.3 + 0.005 \times t)^\circ\text{C}$
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Thermal response time, T50	< 1.5 s, $\varnothing 4 \text{ mm}$ < 6.1 s, $\varnothing 6 \text{ mm}$ < 7.6 s, $\varnothing 8 \text{ mm}$
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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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## Technical data

### 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
				Process temperature Standard @ Tamb $\leq 20 \text{ }^\circ\text{C}$ ( $^\circ\text{C}$ )	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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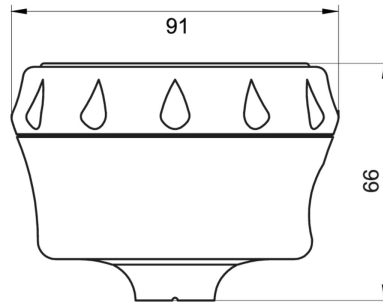
TFRH-####.#0#.#0#.#0#.#0#.#0#

## Dimensional drawings (mm)

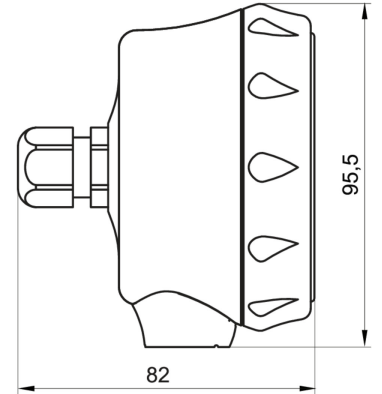
### Housing



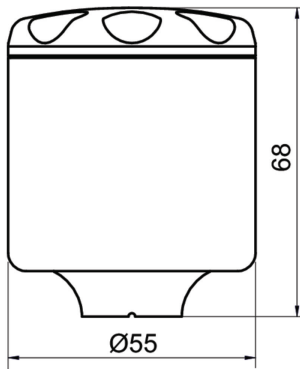
FlexHousing front view



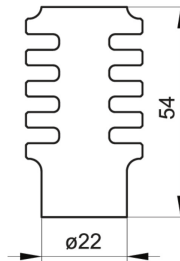
FlexHousing with rear process connection



FlexHousing with bottom process connection

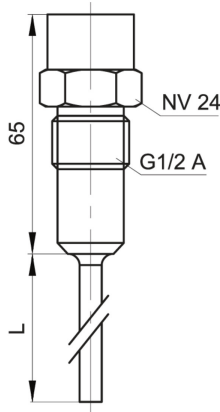


Field housing, Ø55 mm

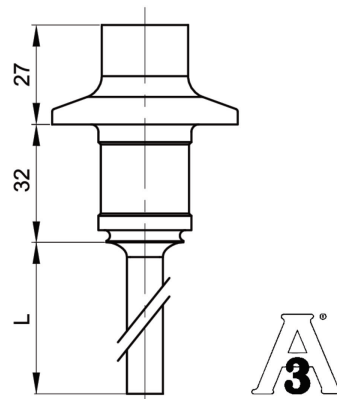


Cooling neck

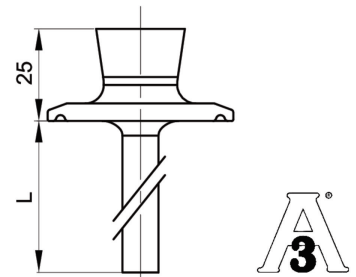
## Process connection



G 1/2 A hygienic (BCID: A03)



BHC 3A DN 38 (BCID: B01)



Tri-Clamp Ø 50.5 (BCID: C04)

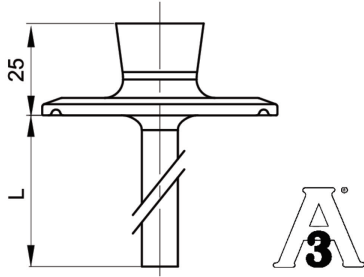
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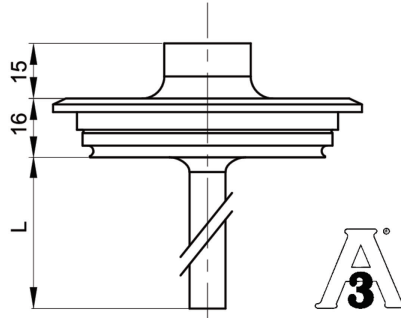
TFRH-####.#0#.####.0#0.####

## Dimensional drawings (mm)

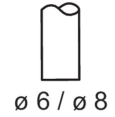
### Process connection



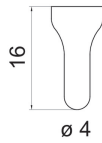
Tri-Clamp Ø 64.0 (BCID: C05)



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	.	####
<b>Housing</b>	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
<b>Electrical connection</b>																					
M12-A, 5-pin																					1
M12-A, 8-pin																					3
M16x1.5 cable gland																					5
M20x1.5 cable gland																					B

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## Ordering information

Ordering key - Configuration possibilities see website

	TFRH	-	#	#	#	.	#	#	#	.	#	#	##	.	0	#	#	0	.	####	
<b>Material el. connection</b>																					
Plastic																					1
Stainless steel AISI 304 (1.4301)																					3
<b>Display</b>																					
Without display, Ø55 housing																					0
Without display, Ø80 housing																					1
With display, relays not activated																					2
With display, relays activated																					4
<b>Transmitter / socket</b>																					
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																					
<b>Safety</b>																					
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
<b>Configuration</b>																					
No configuration																					0
Configuration of temperature range																					1
Configuration of Range + Display																					2
Configuration of Range + Display incl. 2 x relays																					3
<b>Sensor element</b>																					
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	.	####
<b>Sensor insert type</b>																					
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
<b>Cooling neck</b>																					
Without																					0
With cooling neck																					4
<b>Process connection</b>																					
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
<b>Seal</b>																					
Without																					0
<b>Sensor diameter</b>																					
ø 6 mm, AISI 316L																					1
ø 8 mm, AISI 316L																					2
<b>Sensor tip</b>																					
Standard response tip																					1
Fast response tip, ø 4 mm tip																					2
<b>Approvals</b>																					
Standard approvals																					0
<b>Sensor tube length (mm)</b>																					
20 - 3000																					####

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