

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 $0 \text{ }^\circ\text{C}$) $\pm (0.3 + 0.005 \times t) \text{ }^\circ\text{C}$ 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 $0 \text{ }^\circ\text{C}$) $\pm 1/6 \times (0.3 + 0.005 \times t) \text{ }^\circ\text{C}$
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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

Ambient conditions

Optimal readability temperature range	-10 ... 70 °C
Operating temperature range	-30 ... 80 °C
Degree of protection (EN 60529)	IP 67 IP 69 K

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.

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

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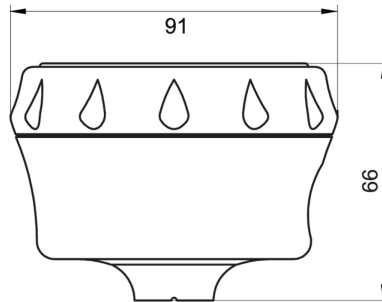
TFRH-####.#0#.#0#.#0#.#0#

Dimensional drawings (mm)

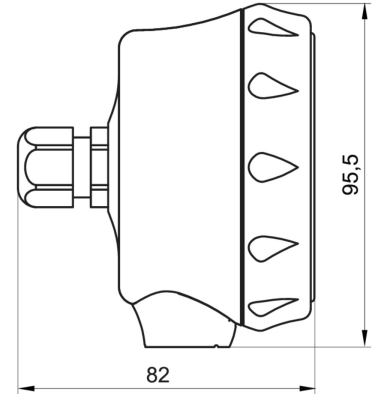
Housing



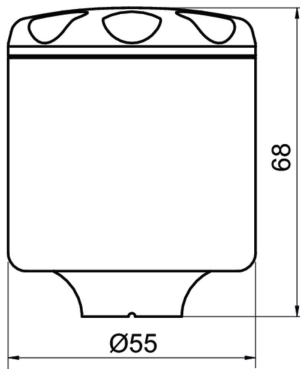
FlexHousing front view



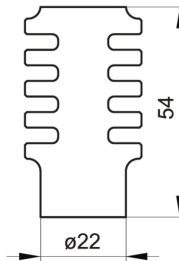
FlexHousing with rear process connection



FlexHousing with bottom process connection

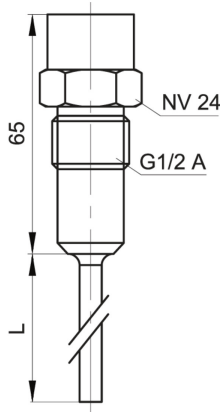


Field housing, Ø55 mm

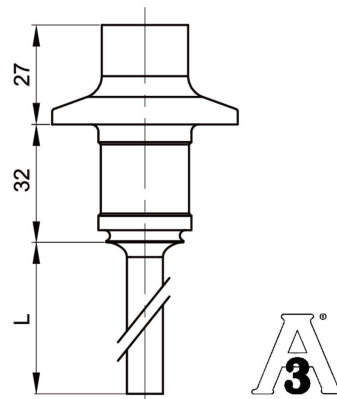


Cooling neck

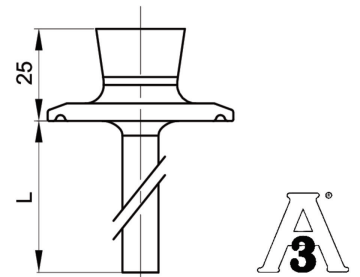
Process connection



G 1/2 A hygienic (BCID: A03)



BHC 3A DN 38 (BCID: B01)



Tri-Clamp Ø 50.5 (BCID: C04)

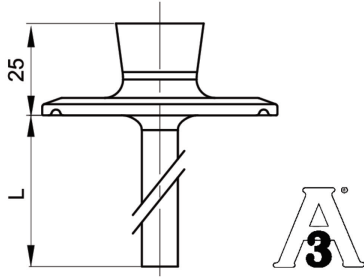
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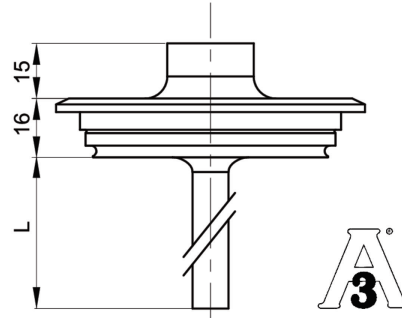
TFRH-####.#0#.#0#.#0#.#0#.#0#

Dimensional drawings (mm)

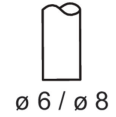
Process connection



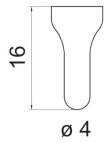
Tri-Clamp Ø 64.0 (BCID: C05)



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																					
FlexHousing Ø80 Stainless steel 1.4301 / AISI304 Rear process connection																					
Field housing Ø55 Stainless steel 1.4301 / AISI304																					
Electrical connection																					
M12-A, 5-pin																					
M12-A, 8-pin																					
M16x1.5 cable gland																					
M20x1.5 cable gland																					

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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																					####