

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



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"
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Process temperature	Refer to section "Operating conditions"
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Process connection

Connection variants	Refer to section "Dimensional drawings"
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Sensor length	20 ... 3000 mm
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Sensor diameter outside	$\varnothing 6 \text{ mm}$ $\varnothing 8 \text{ mm}$
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Mounting position	Any, top, bottom, side
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Standard response tip	$\varnothing 6 \text{ mm}$ $\varnothing 8 \text{ mm}$
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Fast response tip	$\varnothing 4 \text{ mm}$
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Sensor tube material	AISI 316L (1.4404)
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Surface roughness wetted parts	$R_a \leq 0.8 \text{ }\mu\text{m}$
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Ambient conditions

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

Humidity	< 98 % RH, condensing
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Vibration (sinusoidal) (EN 60068-2-6)	1.6 mm p-p (2 ... 25 Hz), 4 g (25 ... 100 Hz), 1 octave / min.
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Output signal

Without transmitter	1 x Pt100, 2-wire 1 x Pt100, 4-wire 2 x Pt100, 2-wire
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With transmitter	4 ... 20 mA, 2-wire 4 ... 20 mA, 2-wire + HART®
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Housing

Style	Field housing, $\varnothing 55 \text{ mm}$ FlexHousing, $\varnothing 80 \text{ mm}$
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Overall size	Refer to section "Dimensional drawings"
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Material	AISI 304 (1.4301)
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Electrical connection

Connector	M12-A, 5-pin, stainless steel M12-A, 8-pin, stainless steel
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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
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Cable gland	M16x1.5, plastic M16x1.5, stainless steel M20x1.5, plastic M20x1.5, stainless steel
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ATEX II 1G Ex ia IIC T4/T5

Maximum values for barrier selection, U _i	28 V DC
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Maximum values for barrier selection, I _i	0.1 A
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Maximum values for barrier selection, P _i	0.7 W
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Internal capacitance, C _i	36 nF
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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

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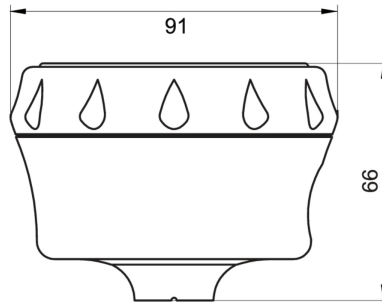
TFRH-####.#0#.#0#.#0#.#0#.#0#

Dimensional drawings (mm)

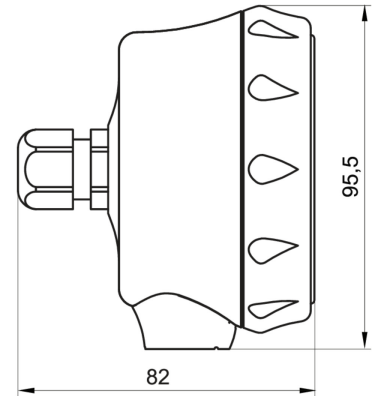
Housing



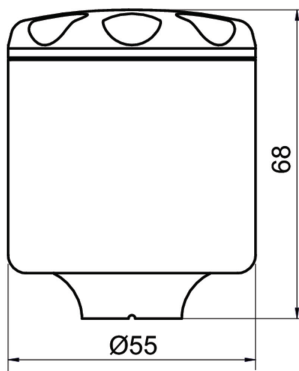
FlexHousing front view



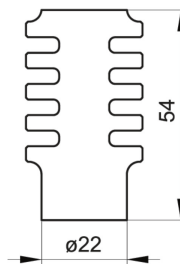
FlexHousing with rear process connection



FlexHousing with bottom process connection

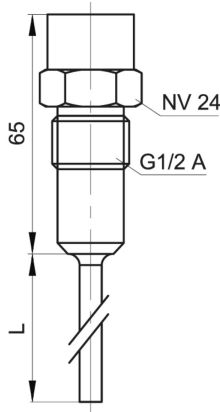


Field housing, Ø55 mm

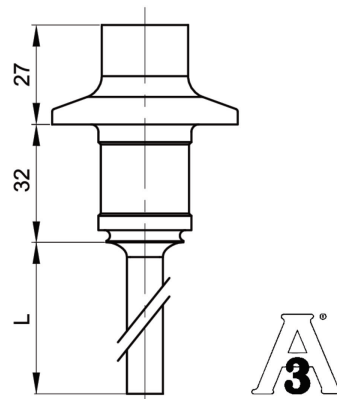


Cooling neck

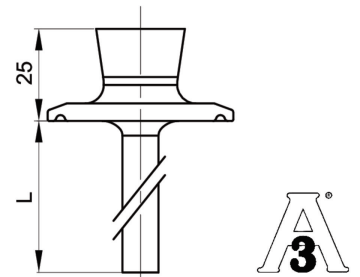
Process connection



G 1/2 A hygienic (BCID: A03)



BHC 3A DN 38 (BCID: B01)



Tri-Clamp Ø 50.5 (BCID: C04)

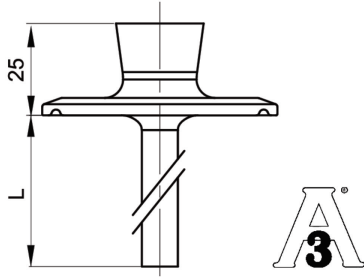
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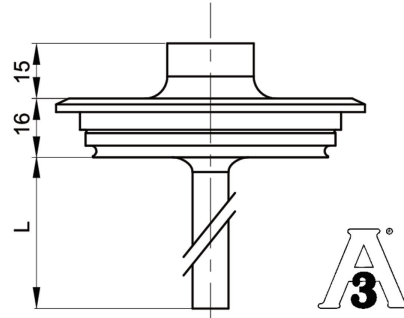
TFRH-####.#0#.####.0#0.####

Dimensional drawings (mm)

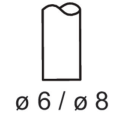
Process connection



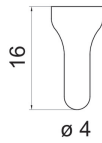
Tri-Clamp Ø 64.0 (BCID: C05)



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	1, 2
			Pt100 12	3, 4
			Pt100 11	1, 2
			Pt100 12	3, 4
			N.C.	5
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

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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-pins																					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	.	####	
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 seal																					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																					####