

TFRH

Hygienic - RTD temperature sensor

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



Technical data

Performance characteristics

Pt100 accuracy class (EN 60751)	B ($\pm 0.3\text{ °C at }0\text{ °C}$) $\pm (0.3 + 0.005 \times t)\text{ °C}$ A ($\pm 0.15\text{ °C at }0\text{ °C}$) $\pm (0.15 + 0.002 \times t)\text{ °C}$ 1/3 B ($\pm 0.1\text{ °C at }0\text{ °C}$) $\pm 1/3 \times (0.3 + 0.005 \times t)\text{ °C}$ 1/6 B ($\pm 0.05\text{ °C at }0\text{ °C}$) $\pm 1/6 \times (0.3 + 0.005 \times t)\text{ °C}$
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Thermal response time, T50	$< 1.5\text{ s, } \varnothing 4\text{ mm}$ $< 6.1\text{ s, } \varnothing 6\text{ mm}$ $< 7.6\text{ s, } \varnothing 8\text{ mm}$
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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	$-30 \dots 80\text{ °C}$, with DFON touch screen $-40 \dots 85\text{ °C}$, with transmitter $-40 \dots 160\text{ °C}$, with Pt100
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Storage temperature range	$-30 \dots 80\text{ °C}$, with DFON touch screen $-40 \dots 85\text{ °C}$, without DFON touch screen
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Degree of protection (EN 60529)	IP 67 IP 69K, with appropriate cable
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Humidity	$< 98\text{ \% RH}$, condensing
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Ambient conditions

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
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 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
Internal inductance, Li	11 μH
Temperature class, T1 ... T4	$-20 < T_{amb} < 65\text{ °C}$
Temperature class, T1 ... T5	$-20 < T_{amb} < 60\text{ °C}$

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Technical data

ATEX II 3G Ex nA 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	3-A (74-07)
Explosion protection	ATEX II 1G Ex ia IIC T4/T5 ATEX II 3G Ex nA IIC T4/T5 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 69K

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 °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

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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

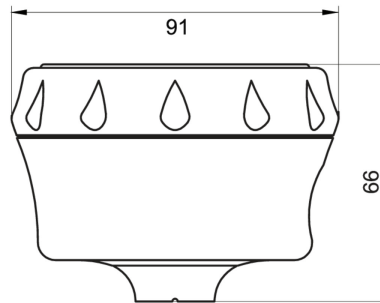
For further information on permissible process and ambient temperatures, please refer to the operating instructions.

Dimensional drawings (mm)

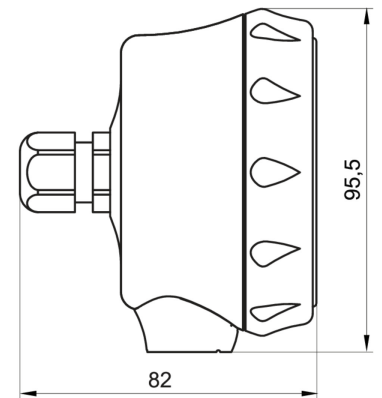
Housing



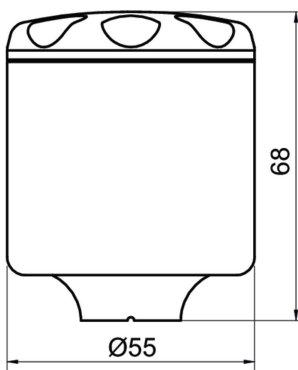
FlexHousing front view



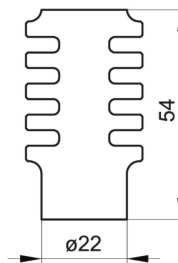
FlexHousing with rear process connection



FlexHousing with bottom process connection



Field housing, Ø55 mm



Cooling neck

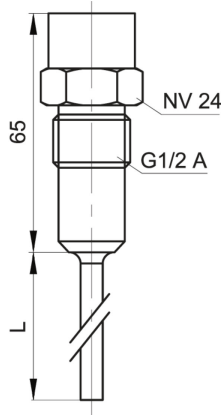
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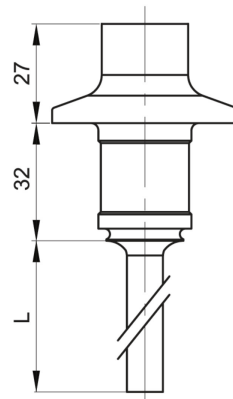
TFRH-####.##0#.####.0###.####

Dimensional drawings (mm)

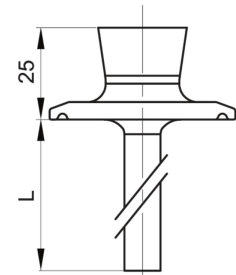
Process connection



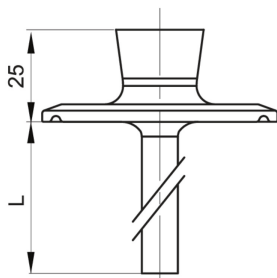
G 1/2 A hygienic (BCID: A03)



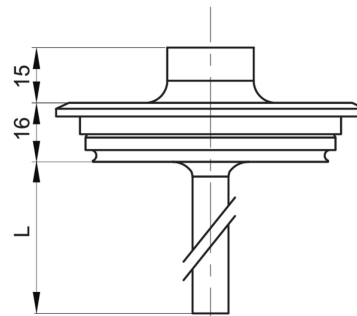
BHC 3A DN 38 (BCID: B01)



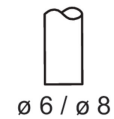
Tri-Clamp Ø 50.5 (BCID: C04)



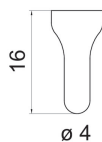
Tri-Clamp Ø 64.0 (BCID: C05)



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



Standard response tip

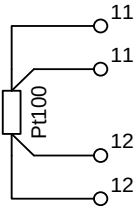
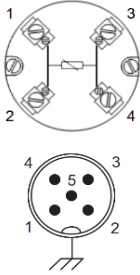
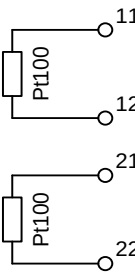
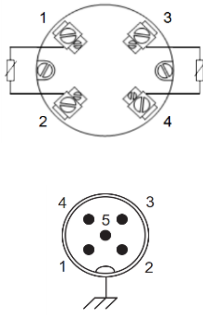


Fast response tip

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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
			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

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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
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	#	#	#	.	####
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-pins																					
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	#	#	#	.	####
Material el. connection																					
Plastic																					
Stainless steel AISI 304 (1.4301)																					
Display																					
Without display, Ø55 housing																					
Without display, Ø80 housing																					
With display, relays not activated																					
With display, relays activated																					
Transmitter / socket																					
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																					
Safety																					
Standard																					
Ex ia IIC T4/T5 1G (Gas)																					
Ex nA II T4/T5 3G (Gas)																					
Ex ia Simple apparatus, gas and dust																					
Configuration																					
No configuration																					
Configuration of temperature range																					
Configuration of Range + Display																					
Configuration of Range																					
+ Display incl. 2 x relays																					
Sensor element																					
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																					

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Ordering information

Ordering key - Configuration possibilities see website

	TFRH	-	#	#	#	#	.	#	#	#	.	#	#	##	.	0	#	#	#	.	####
Sensor insert type																					
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 2-wire																					
Spring loaded insert 4-wire																					
Spring loaded insert 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																					
Cooling neck																					
Without																					
With cooling neck																					
Process connection																					
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)																					
Seal																					
Without seal																					
Sensor diameter																					
Ø 6 mm, AISI 316L																					
Ø 8 mm, AISI 316L																					
Sensor tip																					
Standard response tip																					
Fast response tip, Ø 4 mm tip																					
Approvals																					
Standard approvals																					
EAC (TR CU 020/2011)																					
Sensor tube length (mm)																					
20 - 3000																					