

TFRN

RTD temperature sensor for industrial applications

TFRN-####-##0#.####-###0.####

Overview

- User-configurable according to individual requirements
- Optional with touch display
- Immersion depth 20 ... 3000 mm
- 4 ... 20 mA, HART or Pt100 output
- Convenient installation and reliable operation



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"
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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	$R_a \leq 1.6 \text{ } \mu\text{m}$
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Ambient conditions

Operating temperature range	-30 ... 80 $^\circ\text{C}$, with DFON touch screen -40 ... 85 $^\circ\text{C}$, without DFON touch screen
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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 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
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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

ATEX II 1 G Ex ia IIC T6...T4

Temperature class, T6	-40 < Tamb < 50 °C , with FlexTop 2202 -40 < Tamb < 56 °C , with FlexTop 2212 -40 < Tamb < 56 °C , with FlexTop 2222
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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
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
Voltage drop	4 ... 6.5 V , depending on backlight intensity

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	Continuous		
				Process temperature Standard @ Tamb ≤ 20 °C	Process temperature With cooling neck @ Tamb ≤ 20 °C	Process temperature With cooling neck and spacer @ Tamb ≤ 60 °C
			(bar)	(° C)	(° C)	(° C)
TFRN-####.####.##10.####.####	Sleeve Ø 6	T65	-1 ... 40	-50 ... 250	-50 ... 400	-50 ... 400
TFRN-####.####.##11.####.####	G 1/2 A DIN 3852-E	G51	-1 ... 100	-50 ... 250	-50 ... 400	-50 ... 400
TFRN-####.####.##12.####.####	G 1/2 A DIN 3852-A	G44	-1 ... 100	-50 ... 250	-50 ... 400	-50 ... 400
TFRN-####.####.##13.####.####	R 1/2 ISO 7-1	R06	-1 ... 100	-50 ... 250	-50 ... 400	-50 ... 400
TFRN-####.####.##30.####.####	1/2-14 NPT	N02	-1 ... 100	-50 ... 250	-50 ... 400	-50 ... 400

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

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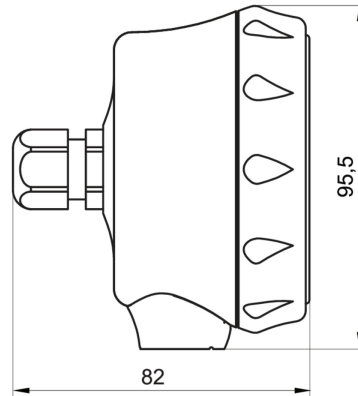
TFRN-####.#0#.#000.#000.####

Dimensional drawings (mm)

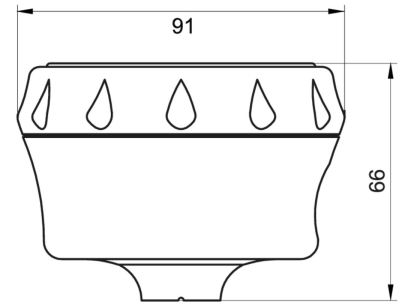
Housing



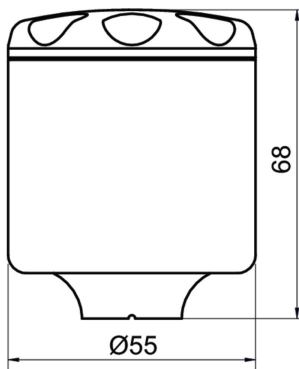
FlexHousing front view



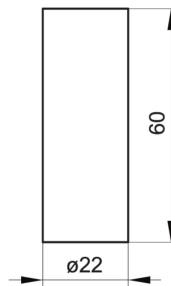
FlexHousing with bottom process connection



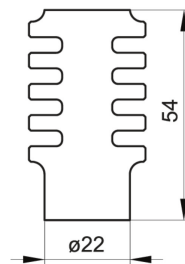
FlexHousing with rear process connection



Field housing, Ø55 mm

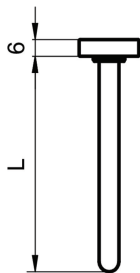


Spacer

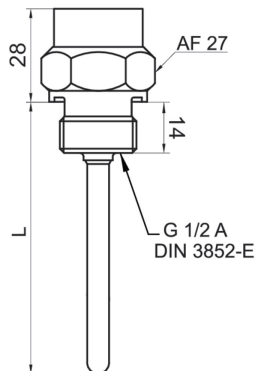


Cooling neck

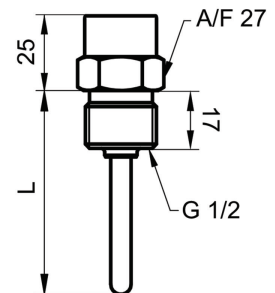
Process connection



Without thread (BCID: T65)



G 1/2 A DIN 3852-E (BCID: G51)



G 1/2 A DIN 3852-A (BCID: G44)

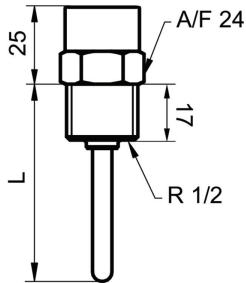
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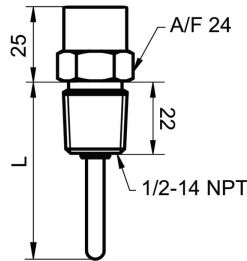
TFRN-####-##0#-####-###0-####

Dimensional drawings (mm)

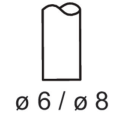
Process connection



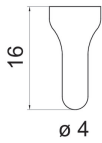
R 1/2 ISO 7/1 (BCID: R06)



1/2-14 NPT (BCID: N02)



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	TFRN	-	#	#	#	#	.	#	#	#	.	#	#	##	.	#	#	#	0	.	####
Housing	TFRN																				
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-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

	TFRN	-	#	#	#	.	#	#	#	.	#	##	.	#	#	#	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
1 x Pt100, 1/1 B EN 60751, < 600°C																				C

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Ordering information

Ordering key - Configuration possibilities see website

	TFRN	-	#	#	#	#	.	#	#	#	.	#	#	#	#	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
With cooling neck + 1 spacer																			5
With cooling neck + 2 spacers																			6
Process connection																			
Tube without connection (T65)																			10
G 1/2 A DIN 3852-E (G51)																			11
G 1/2 A DIN 3852-A (G44)																			12
R 1/2 ISO 7/1 (R01)																			13
1/2-14 NPT (N02)																			30
Seal																			
Without																			0
NBR																			1
EPDM																			2
FKM																			3
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																			####

2024-04-25 The product features and technical data specified do not express or imply any warranty. Technical modifications subject to change.