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

Technical data

Performance characteristics	
Pt100 accuracy class (EN 60751)	B (± 0.3 °C at 0 °C) ± (0.3 + 0.005 × t)°C A (± 0.15 °C at 0 °C) ± (0.15 + 0.002 × t)°C 1/3 B (± 0.1 °C at 0 °C) ± 1/3 × (0.3 + 0.005 × t)°C 1/6 B (± 0.05 °C at 0 °C) ± 1/6 × (0.3 + 0.005 × t)°C
Thermal response time, T50	< 1.5 s , Ø4 mm < 6.1 s , Ø6 mm < 7.6 s , Ø8 mm
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	ø 6 mm ø 8 mm
Mounting position	Any, top, bottom, side
Standard response tip	ø 6 mm ø 8 mm
Fast response tip	ø 4 mm
Sensor tube material	AISI 316L (1.4404)
Surface roughness wetted parts	Ra ≤ 1.6 µm
Ambient conditions	
Operating temperature range	-30 … 80 °C , with DFON touch screen -40 … 85 °C , with transmitter -40 … 160 °C , with Pt100
Storage temperature range	-30 … 80 °C , with DFON touch screen -40 … 85 °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, Ø55 mm FlexHousing, Ø80 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 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

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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
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	≤ ± 0.25 °C
Min. measuring span	25 °C
Output	4 … 20 mA , 2-wire
Output Accuracy	≤ ± 0.1 % , measuring span ≤ ± 0.016 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	≤ ± 0.06 °C
Min. measuring span	10 °C
Output	4 … 20 mA , 2-wire 20 … 4 mA , programmable
Output Accuracy	≤ ± 0.025 % , measuring span ≤ ± 0.004 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	≤ ± 0.06 °C
Min. measuring span	10 °C
Output	4 … 20 mA , 2-wire + HART® 20 … 4 mA , programmable
Output Accuracy	≤ ± 0.025 % , measuring span ≤ ± 0.004 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 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

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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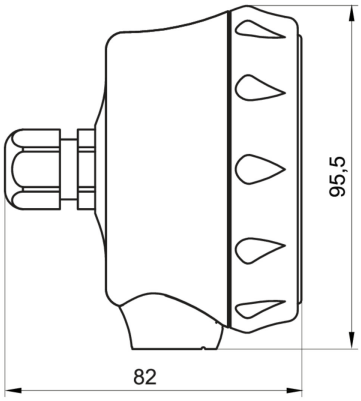
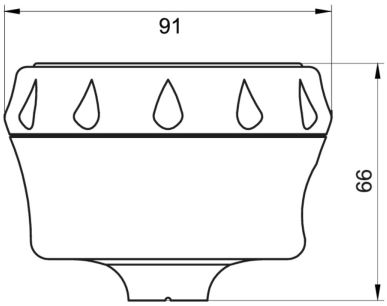
Dimensional drawings (mm)

Housing

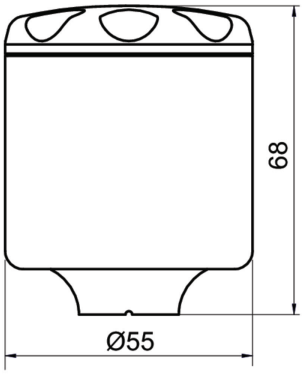
FlexHousing front view



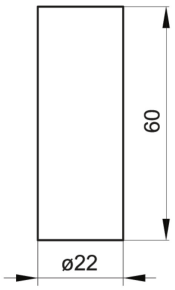
FlexHousing with bottom process connection



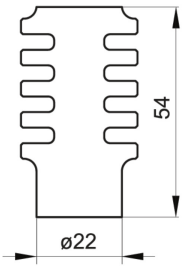
FlexHousing with rear process connection



Field housing, Ø55 mm

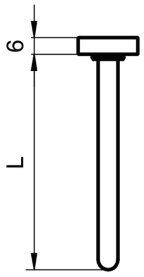


Spacer

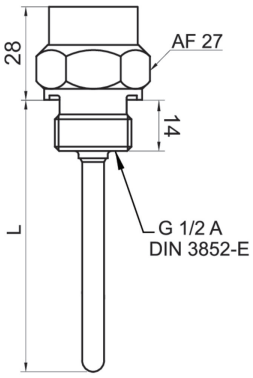


Cooling neck

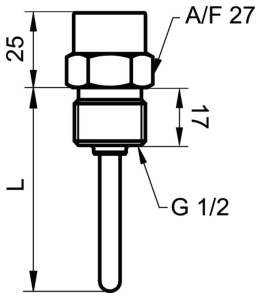
Process connection



Without thread (BCID: T65)



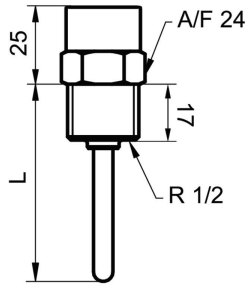
G 1/2 A DIN 3852-E (BCID: G51)



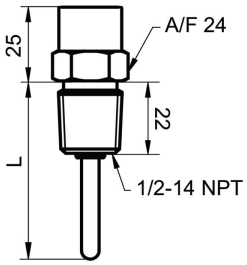
G 1/2 A DIN 3852-A (BCID: G44)

Dimensional drawings (mm)

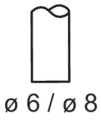
Process connection



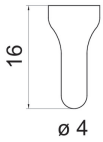
R 1/2 ISO 7/1 (BCID: R06)



1/2-14 NPT (BCID: N02)



Standard response tip



Fast response tip

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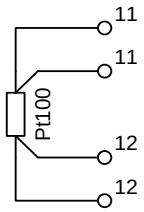
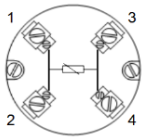
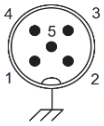
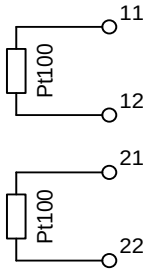
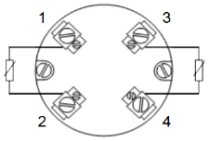
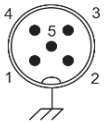
Electrical connection

Output type	Equivalent circuit	Electrical connection	Function	Pin assignment
Pt100 (Single element)			Pt100 11 Pt100 12	1, 2 3, 4
			Pt100 11 Pt100 12 N.C. Frame ground	1, 2 3, 4 5 Plug thread
Pt100 (Double element)			Pt100 11 Pt100 12 Pt100 21 Pt100 22	1 2 3 4
			Pt100 11 Pt100 12 Pt100 21 Pt100 22 N.C. Frame ground	1 2 3 4 5 Plug thread

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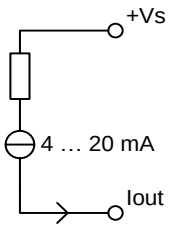
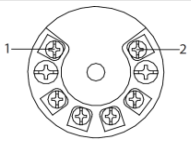
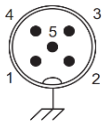
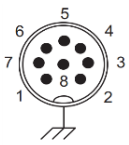
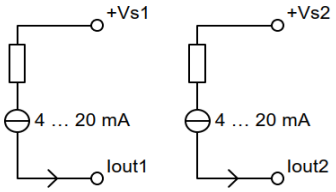
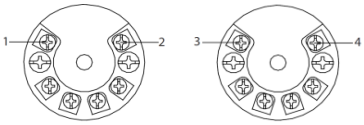
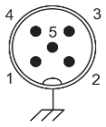
Electrical connection

Output type	Equivalent circuit	Electrical connection	Function	Pin assignment
4 … 20 mA, 2-wire			+Vs	1
			Iout	2
			+Vs	1
			Common for relays 11, 21	2
			Iout	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
			Iout	7
			N.C.	8
			Frame ground	Plug thread
2 x 4 … 20 mA, 2-wire			+Vs1	1
			Iout1	2
			+Vs2	3
			Iout2	4
			+Vs1	1
			Iout1	2
			Iout2	3
			+Vs2	4
			N.C.	5
			Frame ground	Plug thread

Ordering information

Ordering key - Configuration possibilities see website

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

	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 4 ... 20 mA, accuracy ±0,25 °C							2															
Transmitter 2212 4 ... 20 mA, accuracy < ±0.06°C							6															
Transmitter 2222 4 ... 20 mA + HART®, accuracy < ±0.06°C							7															
2 x Transmitter 2212 4 ... 20 mA, accuracy < ±0.06°C							D															
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 2×2-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															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 seal																	0					
Seal NBR																	1					
Seal EPDM																	2					
Seal FKM (Viton®)																	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																						####