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Operating Instructions

TF04

Temperature sensor with installation armature

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1.Introduction

The resistance thermometers TF04 are noted for their reliable function and easy operation. To obtain the greatest benefit from this device, please observe the following cautionary statement: **Persons who are responsible for setting up or operating this device must be sure to read the and understand the operating instructions and the safety information pertaining to it.**

2.Safety Information

2.1 General Instructions

To ensure safe operation, the device must only be operated according to the information in the operating instructions. When the device is in use, the regulations and safety standards applicable to the specific application must also be observed. This statement also applies to the use of accessories.

2.2 Proper Usage

The resistance thermometers TF04 are used for monitor the level of liquid media. Any application extending beyond this specific intended use does not constitute proper usage. The resistance thermometers TF04 must not be employed as the sole means of avoiding hazardous conditions in machinery and installations. The machinery and installations must be designed in such a manner that faulty conditions and malfunctions will not present hazardous situations for operating personnel.

2.3 Qualified Personnel

The resistance thermometers TF04 must only be used by qualified, knowledgeable personnel trained in correct use of these devices. Qualified personnel are those persons familiar with setting up and assembling these devices, placing them in service and operating them. addition, such personnel must also be qualified to perform the work associated with the application for which the device is being used.

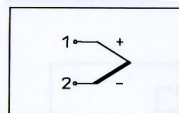
3. Installation

For installation please observe the following points:

- If possible, the devices should be installed at the most advantageous location in the process.
- If possible, the place of installation should be free of vibrations.

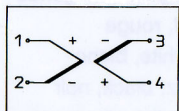
Attention : If it is a requirement that the sensor should be quickly and easily replaced, a sensor that allows replacement should be chosen. In this case, select sensors with a measuring insert that can be exchanged. With these designs the process must not be opened to replace the sensor element.

4. Terminal Plan Thermocouples



1 x Thermoelement

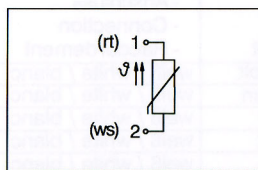
Thermoelemente / Thermocouples / Thermocouples			IEC 584-1
Element Element Élément	max.	+ Anschluss + Connection + Raccordement	- Anschluss - Connection - Raccordement
Typ J (Fe-CuNi)	750°C	schwarz / black / noir	weiß / white / blanc
Typ T (Cu-CuNi)	350°C	braun / brown / brun	weiß / white / blanc
Typ K (NiCr-Ni)	1200°C	grün / green / vert	weiß / white / blanc
Typ E (NiCr-CuNi)	900°C	violett / violet / violet	weiß / white / blanc
Typ N (NiCrSi-NiSi)	1200°C	lila / lilac / lilas	weiß / white / blanc
Typ S (Pt10Rh-Pt)	1600°C	orange / orange / orange	weiß / white / blanc
Typ R (Pt13Rh-Pt)	1600°C	orange / orange / orange	weiß / white / blanc
Typ B (Pt30Rh-Pt6Rh)	1700°C	grau / grey / gris	weiß / white / blanc



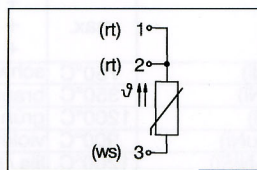
2 x Thermoelement

Thermoelemente / Thermocouples / Thermocouples			DIN 43710
Element Element Élément	max.	+ Anschluss + Connection + Raccordement	- Anschluss - Connection - Raccordement
Typ L (Fe-CuNi)	600°C	rot / red / rouge	blau / blue / bleu
Typ U (Cu-CuNi)	900°C	rot / red / rouge	braun / brown / brun

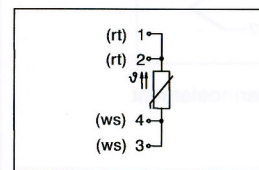
5. Terminal Plan PT-100



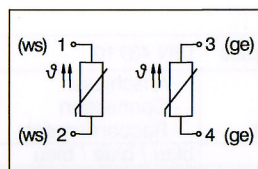
1 x Pt100 / 2-Leiter / wire / fils



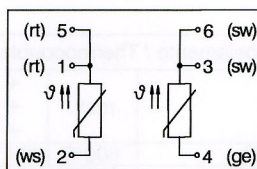
1 x Pt100 / 3-Leiter / wire / fils



1 x Pt100 / 4-Leiter / wire / fils



2 x Pt100 / 2-Leiter / wire / fils



2 x Pt100 / 3-Leiter / wire / fils

Legende / Legend / Légende
rt = rot, red, rouge
ws = weiß, white, blanc
sw = schwarz, black, noir
ge = gelb, yellow, jaune

6. General Instructions

Generally, resistance thermometers conform to the DIN IEC 751 standard.

Generally, thermocouples conform to the DIN IEC 584 standard.

With resistance thermometers, a measuring current of 2 mA should not be exceeded, as otherwise the characteristic heat increase of the measuring resistor would cause incorrect measurements. Typically a measuring current of 1 mA is used in practice.

The type of connection has a significant impact on measuring accuracy. The two-wire circuit and a trimming resistor compensate a static instrument lead resistance. Temperature-dependent changes to the resistance of the device leads are not compensated. The three-wire circuit compensates the instrument lead resistance and its variations with greater accuracy.

Three similar device leads are needed for the connection, preferably three strands of the same cable. The 4-wire circuit compensates all errors caused by instrument lead resistances.

If it is a requirement that the sensor should be quickly and easily replaced, a sensor that allows replacement should be chosen. In this case, select sensors with a measuring insert that can be exchanged. With these designs the process must not be opened to replace the sensor element.

The length of the sensing section (the temperature-sensitive part) of a resistance thermometer is max. 30 mm at the lower end of the stem; it is on the order of a few millimeters for thermocouples. In the case of process liquids/gases with temperature layering, only the temperature at the elevation of the immersion tube is measured. Special designs are required to measure the average temperature, – please contact us for more details.

The smaller the sensor dimension, the quicker it responds to temperature changes. The reaction time improves best if the sensor diameter is reduced.

In the case of surface probes and protective tubes, the heat transfer and thus the reaction time can be improved by using heat-conductive paste.

Attention: A protective tube should always be used for high pressures, high flow rates and where there is a lot of chemical corrosion.

7.Accuracy

Resistance thermometers and thermocouples are divided in accuracy classes. They are defined in the DIN IEC 751 and 584 standards. Resistance thermometers are divided in Class A, B and **fractions** of B (e.g. 1/5 DIN Class B). Thermocouples are divided in three classifications with different service temperature ranges – Class 1, 2, 3

8.Calibration

The recalibration period is specified by the customer. We recommend that, for normal operation, the instruments be calibrated every 2 years. If invalid deviations (to be specified by the customer) occur during recalibration, the recalibration period should be shortened. In the case of continuously high alternating thermal stress loads, this period should be shortened, as the sensors will age quicker. When in doubt, the device should be recalibrated

9.Maintenance

The instruments require no maintenance. Spare parts are not required.

TF04

Temperature Probes with Interchangeable Measuring Insert acc. to DIN 43735

- Resistance thermometer or thermocouples
- With replaceable measuring insert
- Protective tube with threaded or weld-on connection, or with sliding flange
- Measuring ranges: resistance thermometer
-200 °C ... +600 °C
- Thermocouples
-40 °C ... +1100 °C
- Optional with transmitter output
4(0) ... 20 mA, 0 ... 10 V



Description:

The resistance thermometers and thermocouples are manufactured to DIN 43770 and are made of a sturdy, heavy duty stainless steel protective tube, a replaceable measuring insert and a connecting head. The standard protective tubes are available with a male-threaded fitting, sliding flange or for welding on. Other options are available with fixed flange, sanitary flange or clamp connection.

Apart from the Form B connecting head, other designs like Form A, stainless steel field housing etc., are available. The measuring insert is a Pt 100 sensor, Class B (optional Class A) or a model K (NiCr-Ni) thermocouple. Alternatively, other resistance sensors or thermocouples can be supplied.

As an option, these temperature probes can be fitted with a transmitter, which can be set at the factory to customer specification for a specific measuring range.

Typical applications:

Resistance thermometers and thermocouples as per DIN 43770 are very suitable for use in heavy industrial machinery and systems, installations and plants, tanks and piping systems, in the chemical industry and in food applications and are the devices of choice for measuring temperature in liquids and gases.

Models:



TF04.A...:
with sliding flange
protection tube form A
acc. to DIN 43772



TF04.C...:
with G 1 male thread
protection tube form C
acc. to DIN 43772



TF04.E...:
smooth shaft
without additional
protection tube



TF04.B...:
with G 1/2 male thread
protection tube form B
acc. to DIN 43772



TF04.D...:
with weld on
connection
protection tube form D
acc. to DIN 43772

Technical Data:

Connecting head: Form B acc. to DIN 43729 made of
aluminium metric conduit PG 16
others available on request

Protection class: IP 54 acc. to EN 60529

Terminal block: Ceramics (without transmitter)

Resistance thermometer:

Meas. element: 1x Pt 100, 3-wire, Class A acc. to
DIN IEC 751, others available on request

Insert tube: st. steel 1.4571

Protection tube: st. steel 1.4571

Temp. range: -200 °C ... +600 °C

**Measuring range
selection:** 0...50 °C/100/150/200/300/400/500 °C

All quoted measuring ranges can be altered by $\pm 10\%$
e.g. -10...90°

**Additional zero
setting:** -50...50 °C, e.g. -50...100 °C

Thermocouple:

Meas. element: 1x thermocouple model K
NiCr-Ni acc. to DIN IEC 584
class 2, acc. to DIN EN 60584
others available on request

Insert tube: Inconel 600 2.4816

Protection tube: steel 1.4841, optional: 1.4749 ceramic

Temp. range: -40 °C ... +1100 °C

Measuring range: min. 0 ... 246 °C to max. 0 ... 1232 °C

Zero setting: $\pm 10\%$ of measuring range,
e.g. -50 ... 500 °C

Order Code:

Order number: TF04. B. P. B0120. 0. 0

Temperature Probes with install. fitting

Models:

A = sliding Flange
B = G 1/2 male thread
C = G 1 male thread
D = weld-on protective tube
E = smooth shaft

Measuring element:

P = resistance thermometer 1x Pt 100
K = thermocouple 1x type K

Model and installation length:

A0200 - C1870 = see table 1
D1065 - D6125 = see table 2
E0050 - E2000 = see table 3
S = special version on request

Transmitter: (please specify measuring range) see below

0 = without

1 = output 4...20 mA, 2-wire

Options:

0 = without

xx = See table „Options“

Options:

Description:	Code
Double measuring element	1
Without protective tube, TF04.B(C)... only	2
Shortened neck extension (30, 60 or 90 mm), TF04.B(C) only	3
Terminal connector head Form A	4
Terminal connector head field housing, aluminium, IP 68	5
Terminal connector head field housing, st. steel, IP 68	6
Terminal connector head with screwed cover Form GT	7
Resistance element Pt 500, 3-wire	8
Resistance element Pt 1000, 3-wire	9
Resistance element 4-wire	10
Thermocouple Fe-CuNi, model J	11
Thermocouple Pt13Rh-Pt, model R	12
Thermocouple Pt-RhPt, model S	13
Flange DIN 43734, DN 15 for protective tube Form A	14
fixed flange DN 15...50, please specify in writing	15
sanitary flange, please specify in writing	16
Clamp- flange, please specify in writing	17
Protective tube reduced in diameter to 6 mm at the bottom, 60 mm long	18
Protective tube perforated for liquids	19
Protective tube perforated for gases	20
Connecting head with HAN-7-D plug	21

Setting range for transmitter:

factory preset to the specified measuring range

Transmitter:

Housing: aluminium

Electr. connection: terminals

Input signals: Pt 100, 3-wire
NiCr-Ni (K), Fe-CuNi (J), Pt-RhPt (S)

Storage temp.: -40 °C ... +100 °C

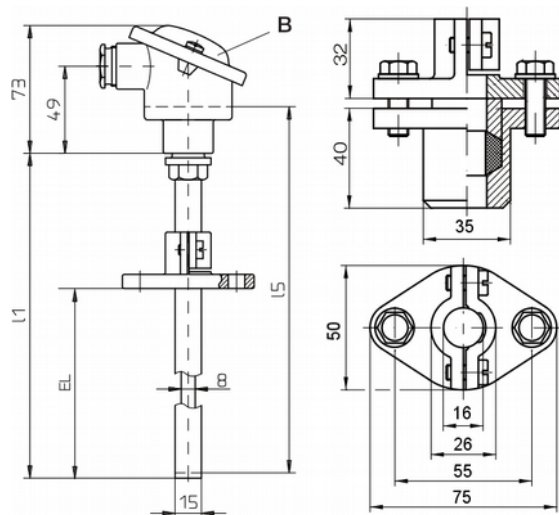
Operating temp.: -20 °C ... + 85 °C

Supply voltage: 12 ... 30 VDC

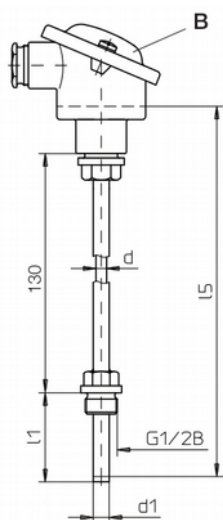
Output: 4 ... 20 mA, 2-wire (others on request)

Dimensions:

Protective tube Form A acc. to DIN 43764:

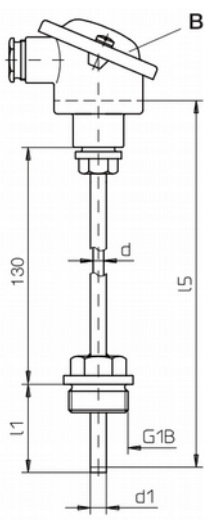


Protective tube Form B acc. to DIN 43772

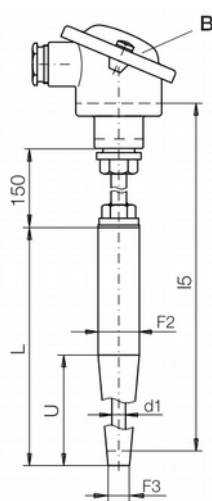


(with neck extension, length 120 mm)

Protective tube Form C acc. to DIN 43772



Protective tube Form D acc. to DIN 43772



(with neck extension, length 120 mm)

Form E: smooth shaft, without prot. tube

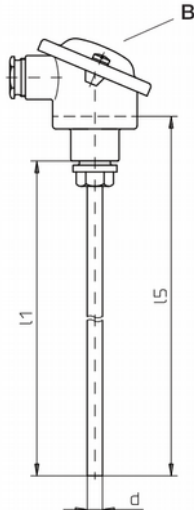


Table 1:

Form A			Form B and C				Meas. insert
L1 ¹⁾	d	d1	L1 ¹⁾	L1 ¹⁾	d	d1	L5
[mm]							
-	8	15	B0065	C0065	6	Form B9 Form C 11	220
A0200*			B0070	C0070			225
A0250			B0120	C0120			275
A0290			B0160	C0160			315
A0350			B0220	C0220			375
A0380			B0250	C0250			405
-			B0275	C0275			430
A0410			B0280	C0280			435
A0500			B0370	C0370			525
A0530			B0400	C0400			555
A0630			B0500	C0500			655
A0710			B0580	C0580			735
A0800			B0670	C0670			825
A1000			B0870	C0870	8	Form B11 Form C14	1.025
A1250			B1120	C1120			1.275
A1400			B1270	C1270			1.425
A1600			B1470	C1470			1.625
A1800			B1670	C1670			1.825
A2000			B1870	C1870			2.025

¹⁾ Example: A0200 = design A, L1 = 200 mm

Table 2:

Form D				Measuring insert	
U ²⁾ [mm]	L [mm]	F2 [mm]	F3 [mm]	L5 [mm]	d1 [mm]
D1065	140	24	12,5	315	6
D2125	200			375	
D4065		26	15,0		8
D3125	430				
D6125		255	24	12,5	435
D5125	260				

²⁾ Example: D1065 = design D, L1 = 65 mm

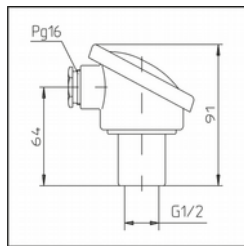
Table 3:

Form E		Meas. insert	Form E		Meas. insert
l1 ³⁾ [mm]	D [mm]	l5 [mm]	l1 ³⁾ [mm]	D [mm]	l5 [mm]
E0050	6	75	E0530	6	555
E0100		125	E0630		655
E0150		175	E0710		735
E0200		225	E0800		825
E0250		275	E1000	8	1025
E0290		315	E1250		1275
E0350		375	E1400		1425
E0380		405	E1600		1625
E0410		435	E1800		1825
E0500		525	E2000		2025

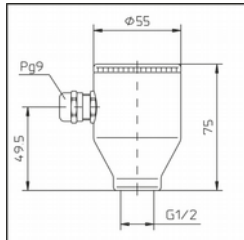
³⁾ Bsp: E0050 = Bauform E, l1 = 50 mm

Models:

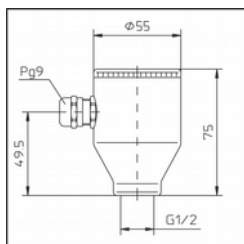
Connecting heads with screw plug



Form: DIN 43729 / Form A
Material: Aluminium
Protection class: IP 54

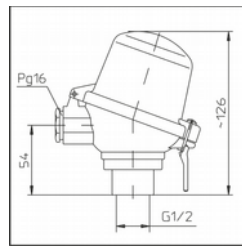


Form: Field housing
Material: Aluminium
Protection class: IP 68

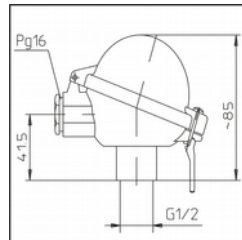


Form: Field housing
Material: St. steel 1.4301
Protection class: IP 68

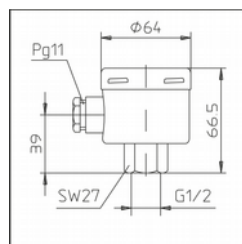
Connecting heads with quick-release connection



Form: Form DANW
Material: Aluminium
Protection class: IP 65

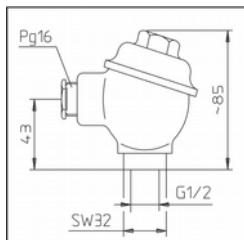


Form: DAN
Material: Aluminium
Protection class: IP 65

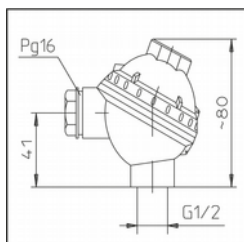


Form: Form C
Material: St. steel 1.4301/ 1.4571
Protection class: IP 65

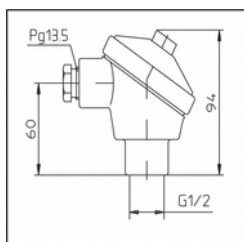
Connecting heads with screw cap



Form: Form GT
Material: Cast iron
Protection class: IP 54



Form: Form NS
Material: ITAMID /NORYL
Protection class: IP 45



Form: Form D
Material: Aluminium
Protection class: IP 65