

TW50..59 || Flange Resistance Thermometer

Application

Resistance thermometers are suited for direct temperature measurement of gaseous and liquid media.

The applications for the measuring inserts are not limited to the specified resistance thermometers. They are adapted to the given request with regard to temperature, length, bending property, vibration resistance and accuracy. In addition to our standard models we provide a lot of special types for special applications.

Construction and Operation

All flange resistance thermometers presented in this data sheet are built acc. to DIN 43765 and some are further developments.

Standard features

- Protective tube acc. to DIN 43772
- Connection head acc. to DIN EN 50446
- exchangeable measuring inset acc. to DIN 43762

Specifications

The accuracy classes acc. to DIN EN 60751 are distinguished as follows:

- class B (1/3; 1/10 DIN possible)
- class A (1/2 DIN possible)

All measuring inlets contain a standard measuring resistance acc. to DIN EN 60751 class B.

Please see the end of this data sheet for basic values and deviations of limit values.

The protective tube is designed as flange-type for this type series.

It protects the measuring insert and consequently the measuring resistance against pressure, flow and possible damages. It remains installed and assures the continuation of process during an exchange of the measuring insert.

The construction of the protective tube depends on the pressure and temperature of the medium on site. See the load diagrams for the necessary specifications.



Main Features

- high accuracy
- easy to exchange
- easy data processing
- economic measuring principle
- application possible even for great distance measurement
- easy installation of double Pt 100

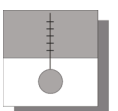
Typical Applications

- boiler and furnace construction
- heating, ventilation and air technology

The connection head consists mainly of light metal acc. to DIN EN 50446 type B. Other connection heads are indicated at the end of this data sheet.

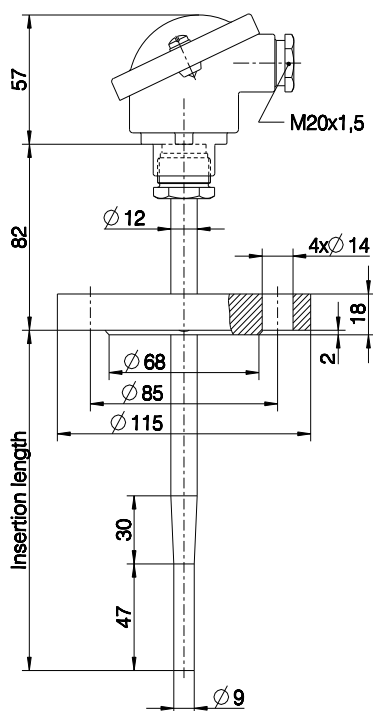
The resistance thermometers are also available with integrated 2-wire transmitter.

See the data sheets TE41 and TE42 for details!



Flange Resistance Thermometer TW50

Type F DIN 43771, for temperature measurement during high pressure and flow



Measuring element	Measuring insert acc. to DIN 43762 Inset tube of stainless steel 1.4571 Measuring resistance 1 or 2 Pt100 acc. to DIN EN 60751
Protective tube	like DIN 43772 type 3F ø 12 mm; 2,751 mm wall thickness; material: 1.4571; measuring point reduced to ø 9 mm
Neck pipe	ø 12 mm; length: 82 mm lang; material: 1.4571
Mounting	flange DN25 PN40 acc. to DIN EN 1092-1
Connection	Standard connection head type B of light metal acc. to DIN EN 50446
max. measuring temp.	400°C

Ordering Code

Flange Resistance
Thermometer

TW50

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Standard Type

Inset tube with 1x Pt100, 2-wire	> A
Inset tube with 1x Pt100, 3-wire	> B
Inset tube with 1x Pt100, 4-wire	> C
Inset tube with 2x Pt100, 2-wire	> D
Inset tube with 2x Pt100, 3-wire	> E

Connection Head

Type B (standard)	> 1
Type BBK	> 2
Type S79	> 3
Type BUSH	> 4
Type BUS	> 5

Fitting Length

225 mm	> 3
285 mm	> 5
345 mm	> 7
Other lengths on request	> 9

Output

Resistance on terminal strip	> K
2-wire transmitter output signal 4...20 mA (only for inset tube with 1x Pt100)	> L

Measuring Range Transmitter (°C)

Without transmitter	> 0	0
-50 .. 0	> 1	0
-50 .. +50	> 2	0
0 .. 50	> 3	0
0 .. 100	> 4	0
0 .. 150	> 5	0
0 .. 200	> 6	0
0 .. 300	> 7	0
0 .. 400	> 8	0

Other measuring ranges on request

Mechanical and thermal load of protective tube

Type 3F, DIN 43772

Diagram 1

Material 1.4571
(X6CrNiMoTi17122)

Allowable flow rate:

for air 25 m/s

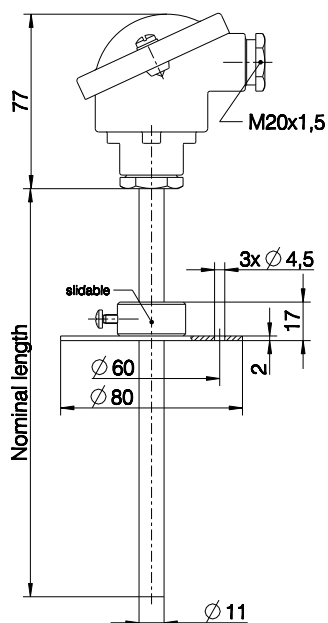
for water 5 m/s

max. pressure 40 bar

max. pressure 40 bar

Flange Resistance Thermometer TW56

for temperature measurement during moderate flow and at zero pressure



Measuring element	Measuring insert acc. to DIN 43762 Inset tube of stainless steel 1.4571 Measuring resistance 1 or 2 Pt100 acc. to DIN EN 60751
Protective tube	ø 11 mm; 1 mm wall thickness; material: 1.4571 mechanical load for temperature measurement at zero pressure
Neck pipe	variable because of movable metal flange
Mounting	movable metal flange acc. to dimensional drawing
Connection	Standard connection head type B of light metal acc. to DIN EN 50446
max. measuring temp.	400°C

Ordering Code

Flange Resistance Thermometer

TW56

			0		0		
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Standard Type

Inset tube with 1x Pt100, 2-wire	> A
Inset tube with 1x Pt100, 3-wire	> B
Inset tube with 1x Pt100, 4-wire	> C
Inset tube with 2x Pt100, 2-wire	> D
Inset tube with 2x Pt100, 3-wire	> E

Connection Head

Type B (standard)	> 1
Type BBK	> 2
Type S79	> 3
Type BUSH	> 4
Type BUS	> 5

Fitting Length

200 mm	> 3
300 mm	> 7
400 mm	> 8
othe lengths on request	> 9

Output

Resistance on terminal strip	> K
2-wire transmitter output signal 4..20 mA (only for inset tube with 1x Pt100)	> L

Measuring Range Transmitter (°C)

Without transmitter	> 0	0
-50 .. 0	> 1	0
-50 .. +50	> 2	0
0 .. 50	> 3	0
0 .. 100	> 4	0
0 .. 150	> 5	0
0 .. 200	> 6	0
0 .. 300	> 7	0
0 .. 400	> 8	0

Other measuring ranges on request

Basic Values and Limit Value Deviation for Pt100 Resistance Thermometers

Calculation equations for the basic values

The following calculation equations apply to the basic value calculation of Pt100 resistance thermometers acc. to DIN EN 60751. In this equation resistance = R in ohm at temperature t and temperature = t in °C.

For Pt100 in temperature ranges of 0 to 850°C:

$$R_t = 100 (1 + 3.90802 \cdot 10^{-3} \cdot t - 0.5802 \cdot 10^{-6} \cdot t^2)$$

For Pt100 in temperature ranges of -200 to 0°C:

$$R_t = 100 (1 + 3.90802 \cdot 10^{-3} \cdot t - 0.5802 \cdot 10^{-6} \cdot t^2 + 0.42735 \cdot 10^{-9} \cdot t^3 - 4.2735 \cdot 10^{-12} \cdot t^4)$$

As simplification we provide the values for the range of -200 to +850°C in the following table.

Basic Values (Ohm) for Pt100 Resistance Thermometers acc. to DIN EN 60751

Temp. °C	0	-10	-20	-30	-40	-50	-60	-70	-80	-90	-100
-200	18.49										
-100	60.25	56.19	52.11	48.00	43.87	39.71	35.53	31.32	27.08	22.80	18.49
0	100.00	96.09	92.16	88.22	84.27	80.31	76.33	72.33	68.33	64.30	60.25
Temp. °C	0	10	20	30	40	50	60	70	80	90	100
0	100.00	103.90	107.79	111.67	115.54	119.40	123.24	127.07	130.89	134.70	138.50
100	138.50	142.29	146.06	149.82	153.58	157.31	161.04	164.76	168.46	172.16	175.84
200	175.84	179.51	183.17	186.82	190.45	194.07	197.69	201.29	204.88	208.45	212.02
300	212.02	215.57	219.12	222.65	226.17	229.67	233.17	236.65	240.13	243.59	247.04
400	247.04	250.48	253.90	257.32	260.72	264.11	267.49	270.86	274.22	277.56	280.90
500	280.90	284.22	287.53	290.83	294.11	297.39	300.65	303.91	307.15	310.38	313.59
600	313.59	316.80	319.99	323.18	326.35	329.51	332.66	335.79	338.92	342.03	345.13
700	345.13	348.22	351.30	354.37	357.42	360.47	363.50	366.52	369.53	372.52	375.51
800	375.51	378.48	381.45	384.40	387.34	390.26					

Limit Value Deviations for Pt100 Resistance Thermometers acc. to DIN EN 60751

Temp.	Kl. B DIN		Kl. B1/2 DIN		Kl. B1/3 DIN		Kl. B1/10 DIN		Kl. A DIN		Kl. A1/2 DIN	
[°C]	[°C]	Ω	[°C]	Ω	[°C]	Ω	[°C]	Ω	[°C]	Ω	[°C]	Ω
-200	1.30	0.56	1.15	0.50	1.10	0.48	1.03	0.45	0.55	0.24	0.48	0.21
-100	0.80	0.32	0.65	0.26	0.60	0.24	0.53	0.21	0.35	0.14	0.28	0.11
-50	0.55	0.21	0.40	0.15	0.35	0.13	0.28	0.10	0.25	0.10	0.18	0.07
0	0.30	0.12	0.15	0.06	0.10	0.04	0.03	0.01	0.15	0.06	0.08	0.03
50	0.55	0.21	0.40	0.15	0.35	0.13	0.28	0.10	0.25	0.10	0.18	0.07
100	0.80	0.30	0.65	0.24	0.60	0.22	0.53	0.19	0.35	0.13	0.28	0.10
150	1.05	0.39	0.90	0.33	0.85	0.31	0.78	0.28	0.45	0.17	0.38	0.14
200	1.30	0.48	1.15	0.42	1.10	0.40	1.03	0.37	0.55	0.20	0.48	0.17
300	1.80	0.64	1.65	0.58	1.60	0.56	1.53	0.53	0.75	0.27	0.68	0.24
400	2.30	0.79	2.15	0.73	2.10	0.71	2.03	0.68	0.95	0.33	0.88	0.30
600	3.30	1.06	3.15	1.00	3.10	0.98	3.03	0.95	1.35	0.43	1.28	0.40
800	4.30	1.28	-	-	-	-	-	-	-	-	-	-

The given limit value deviations for Pt100 resistance thermometers are defined by the following calculation equations:

Limit value deviations in °C

= ± (0.30 + 0.005 * t) for class B DIN

= ± (0.15 + 0.005 * t) for class B1/2 DIN

= ± (0.10 + 0.005 * t) for class B1/3 DIN

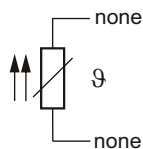
= ± (0.03 + 0.005 * t) for class B1/10 DIN

= ± (0.15 + 0.002 * t) for class A DIN

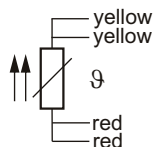
= ± (0.08 + 0.002 * t) for class A1/2 DIN

Connection Diagrams

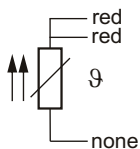
Single Pt100
2-wire circuit



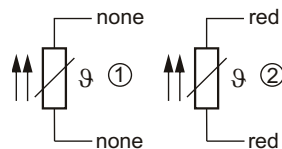
Single Pt100
4-wire circuit



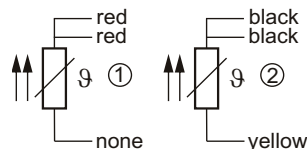
Single Pt100
3-wire circuit



Double Pt100
2-wire circuit



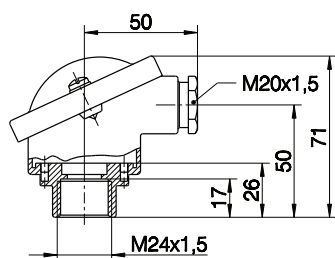
DoublePt100
3-wire circuit



Standard Connecting Heads (Connecting dimensions acc. to DIN EN 50446)

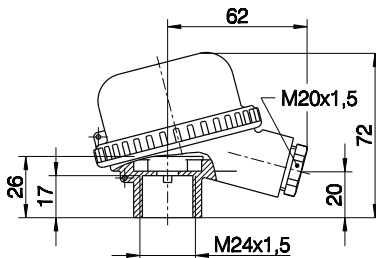
Type B DIN EN 50446

Material: diecast light metal
Protection class: IP54



Type BBK

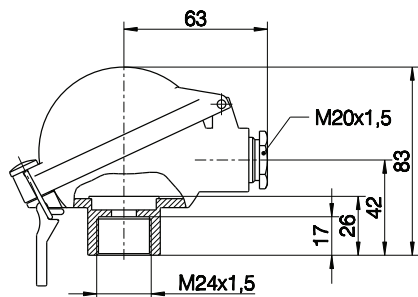
Material: Polyamide (max. 120°C=)
Protection class: IP54



Other Possible Connecting Heads (Connecting dimensions acc. to DIN EN 50446)

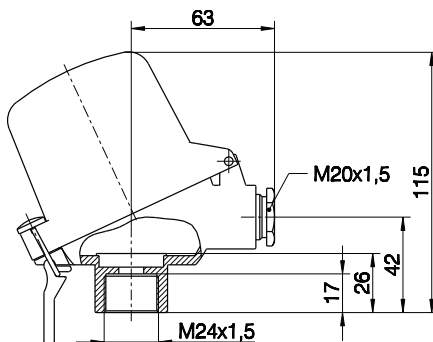
Type BUS

Material: diecast light metal
Protection class: IP65



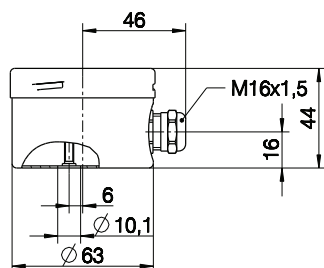
Type BUSH

Material: diecast light metal
Protection class: IP65



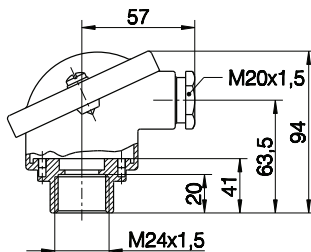
Type S79

Material: stainless steel 1.4301
Protection class: IP65



Type A DIN EN 50446

Material: diecast light metal
Protection class: IP54



Type F

Material: cast light metal
Protection class: IP54

