

Resistance Thermometers Straight Design Model TR501, for Flue Gas Measurement

WIKA Data Sheet TE 60.30

Applications

- Blast furnaces, air heaters
- Red-heat and heat treatment processes
- Combustion of waste and special waste products
- Major heating plants, heat generation

Special Features

- Application ranges up to +600 °C
- Thermowell made of heat resistant steel
- Measuring insert exchangeable
- Gastight process connection

Description

These straight resistance thermometers have a connection head form B. The thermowell is plugged into the connection head. Form 1 DIN-thermowells as well as thermowells with customer specific design are available.

Process connection is done via stop flange or pipe coupling, the latter type gives a gastight connection.

These temperature probes are suitable for gaseous media in low pressure ranges (up to approx. 1 bar). Various thermowell materials are used with or without enamelling to meet the requirements of thermal stress.

The exchangeable measuring insert can be dismantled. This makes inspection and, when servicing is necessary, replacement possible during operation and while the plant is running.

Selection of normal or standard lengths enables short delivery time and the possibility of stocking spare components.

Thermowell material, connection head and sensor can be selected individually for the respective application.



Resistance Thermometer Straight Design, Model TR501

Optionally analogue or digital transmitters from the WIKA range can be fitted into the connection head of the TR501.

Sensor

The sensor is located in the measuring insert, which is exchangeable and spring loaded.

Sensor method of connection

- 2 wire
- 3 wire
- 4 wire

With 2-wire connection the lead resistance of the measuring insert compounds the error.

Sensor limiting error

- class B to DIN EN 60 751
- class A to DIN EN 60 751
- 1/3 DIN B at 0 °C

It makes no sense to combine 2-wire connection with class A or 2-wire connection with 1/3 DIN B, because the lead resistance error of the measuring insert over-rides the higher sensor accuracy.

Basic values and limiting errors

Basic values and limiting errors for the platinum measurement resistances are laid down in DIN EN 60 751. The nominal value of Pt 100 sensors is 100 Ω at 0 °C. The temperature coefficient α can be stated simply to be between 0 °C and 100 °C with:

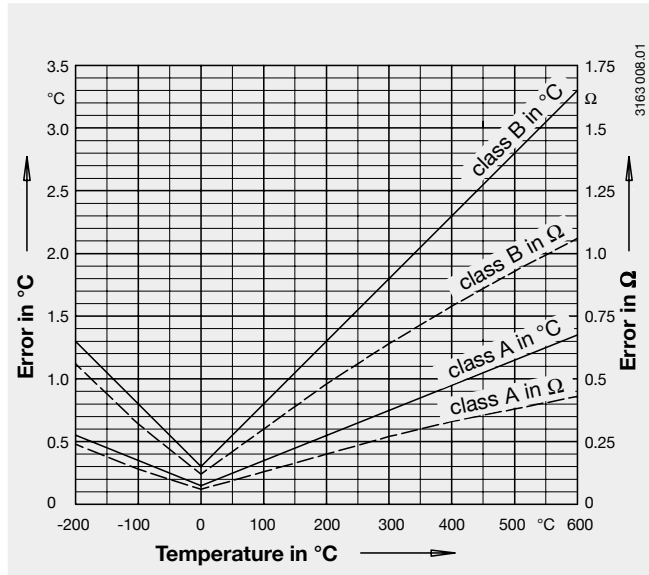
$$\alpha = 3.85 \cdot 10^{-3} \text{ } ^\circ\text{C}^{-1}$$

The relationship between the temperature and the electrical resistance is characterised by polynomials which are defined in DIN EN 60 751. Furthermore, this standard lays down the basic values in °C stages.

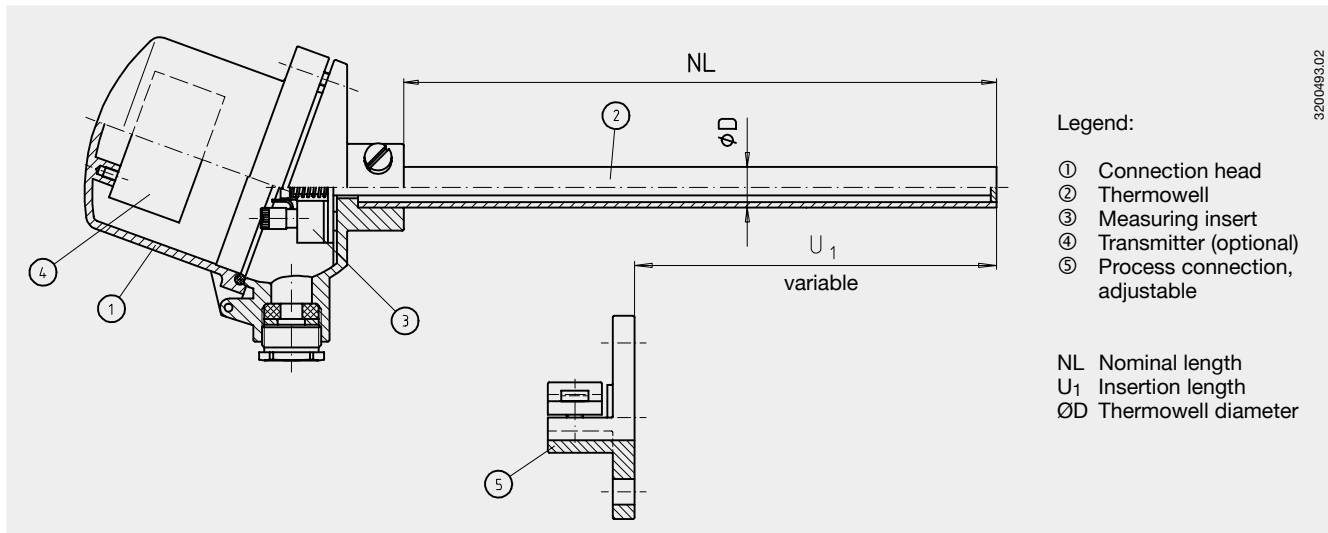
Class	Limiting error in °C
A	$0.15 + 0.002 \cdot t ^{1)}$
B	$0.3 + 0.005 \cdot t $

1) |t| is the value of the temperature in °C without consideration of the sign

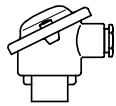
Temperature (ITS 90) °C	Basic value Ω	Limiting error DIN EN 60 751			
		Class A		Class B	
		°C	Ω	°C	Ω
-200	18.52	± 0.55	± 0.24	± 1.3	± 0.56
-100	60.26	± 0.35	± 0.14	± 0.8	± 0.32
-50	80.31	± 0.25	± 0.09	± 0.55	± 0.21
0	100	± 0.15	± 0.06	± 0.3	± 0.12
50	119.40	± 0.25	± 0.09	± 0.55	± 0.21
100	138.51	± 0.35	± 0.13	± 0.8	± 0.30
200	175.86	± 0.55	± 0.2	± 1.3	± 0.48
300	212.05	± 0.75	± 0.27	± 1.8	± 0.64
400	247.09	± 0.95	± 0.33	± 2.3	± 0.79
500	280.98	± 1.15	± 0.38	± 2.8	± 0.93
600	313.71	± 1.35	± 0.43	± 3.3	± 1.06



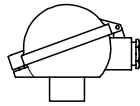
TR501 components



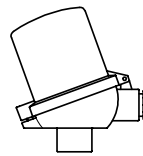
Connection head



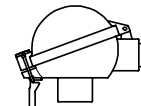
BS



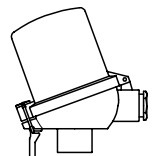
BSZ



BSZ-H



BSS



BSS-H

Model	Material	Cable entry	Ingress protection	Cap	Surface finish
BS	aluminium	M20 x 1.5	IP53	cap with 2 screws	silver bronze, painted
BSZ	aluminium	M20 x 1.5	IP53	flap cap with screw	silver bronze, painted
BSZ-H	aluminium	M20 x 1.5	IP53	flap cap with screw	silver bronze, painted
BSS	aluminium	M20 x 1.5	IP53	flap cap with clip	silver bronze, painted
BSS-H	aluminium	M20 x 1.5	IP53	flap cap with clip	silver bronze, painted

Transmitter (option)

Depending on used connection head a transmitter can be mounted into the thermometer (head mount).

- mounted instead of connection socket
- mounted within the cap of the connection head
- mounting not possible

Mounting of two transmitters on request.

Connection head	Transmitter						
	T12	T19	T24	T31	T32	T42	T5350
BS	–	○	○	○	–	–	–
BSZ	○	○	○	○	○	○	○
BSZ-H	●	●	●	●	●	●	●
BSS	○	○	○	○	○	○	○
BSS-H	●	●	●	●	●	●	●

Model	Description	Data sheet
T19	Analogue transmitter, configurable	TE 19.01
T24	Analogue transmitter, PC configurable	TE 24.01
T31	Analogue transmitter, fixed range	TE 31.01
T12	Digital transmitter, PC configurable	TE 12.01
T32	Digital transmitter, HART protocol	TE 32.01
T42	Digital transmitter, PROFIBUS PA	TE 42.01
T5350	Digital transmitter FOUNDATION Fieldbus and PROFIBUS PA	TE 53.01

Thermowell

The thermowells are made of tube. The bottom of the thermowell is either flat or dished (technically equivalent), in the case of enamelled thermowells it is always dished. The thermowell is plugged into the connection head and compression fitted. The slideable process connection is compression fitted on the thermowell, thus allowing a variable insertion length. Preference is to be given to standard nominal lengths to DIN Standards.

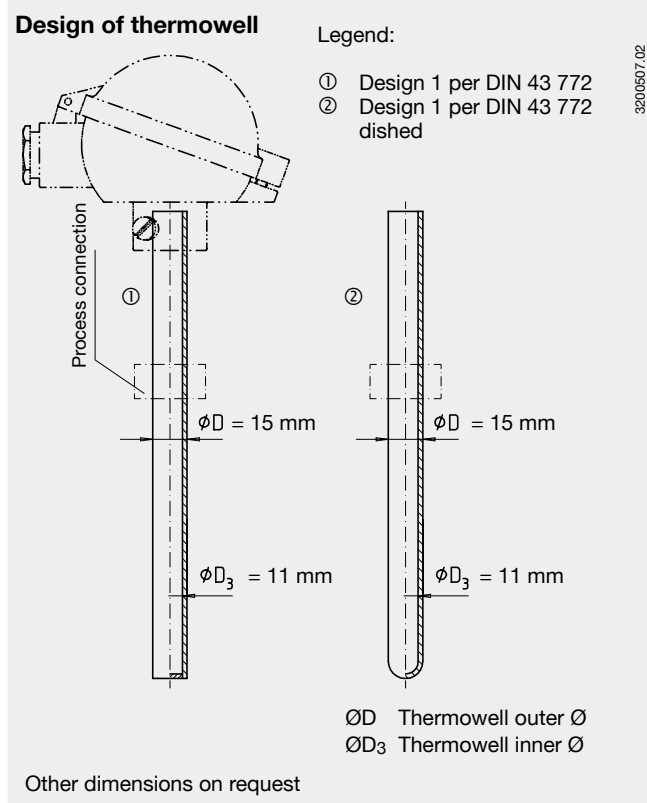
Designs to DIN Standards as well as special designs (for example, with tapered thermowell, etc.) are available in standard or special materials.

Nominal lengths

500, 710, 1000 and 1400 mm,
other lengths on request

Material of thermowell

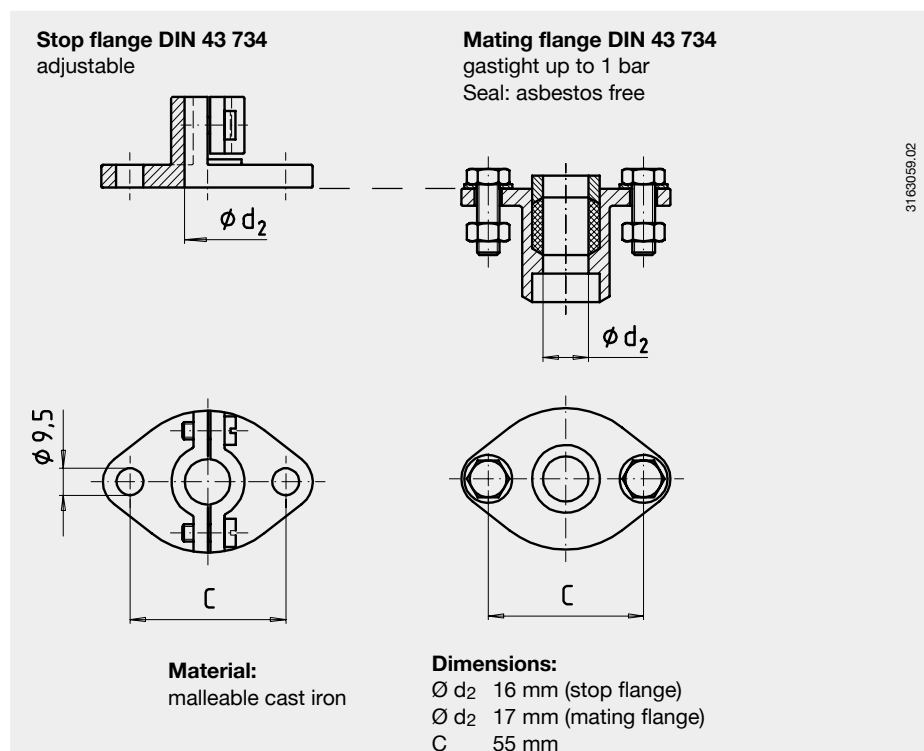
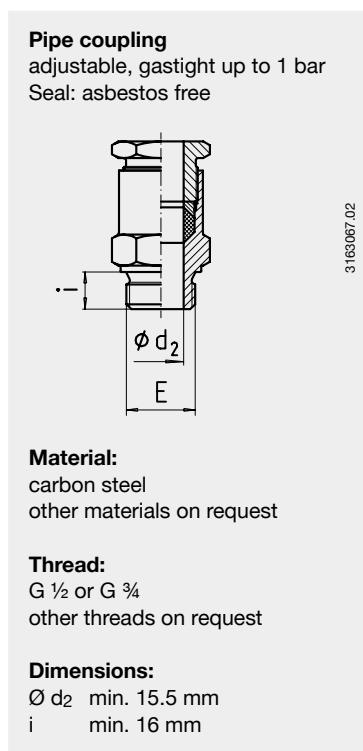
- Carbon steel 1.0305
up to 550 °C (air), low corrosion resistance to sulphurous gases, medium corrosion resistance to nitrogenous gases
 - Carbon steel 1.0305, enamelled
up to 550 °C, resistant to a max. applied pressure of 1 bar, for the low pressure range in furnaces and flue gas ducts
 - Stainless steel 1.4571
up to 700 °C (air), good corrosion resistance to aggressive media
- other materials on request



Process connection

Stop flange (also with mating flange) or pipe coupling are used as the process connection. For enamelled thermowells the pipe coupling is to be used to prevent the enamel layer from being damaged. Both versions are slideable on the thermowell. Therefore, the insertion length of the thermometer is variable and can

be easily adapted at the installation point. For applications in which a gastight process connection is not required, a stop flange is sufficient. A gastight process connection up to 1 bar is provided by a pipe coupling or a combination of stop flange and mating flange.

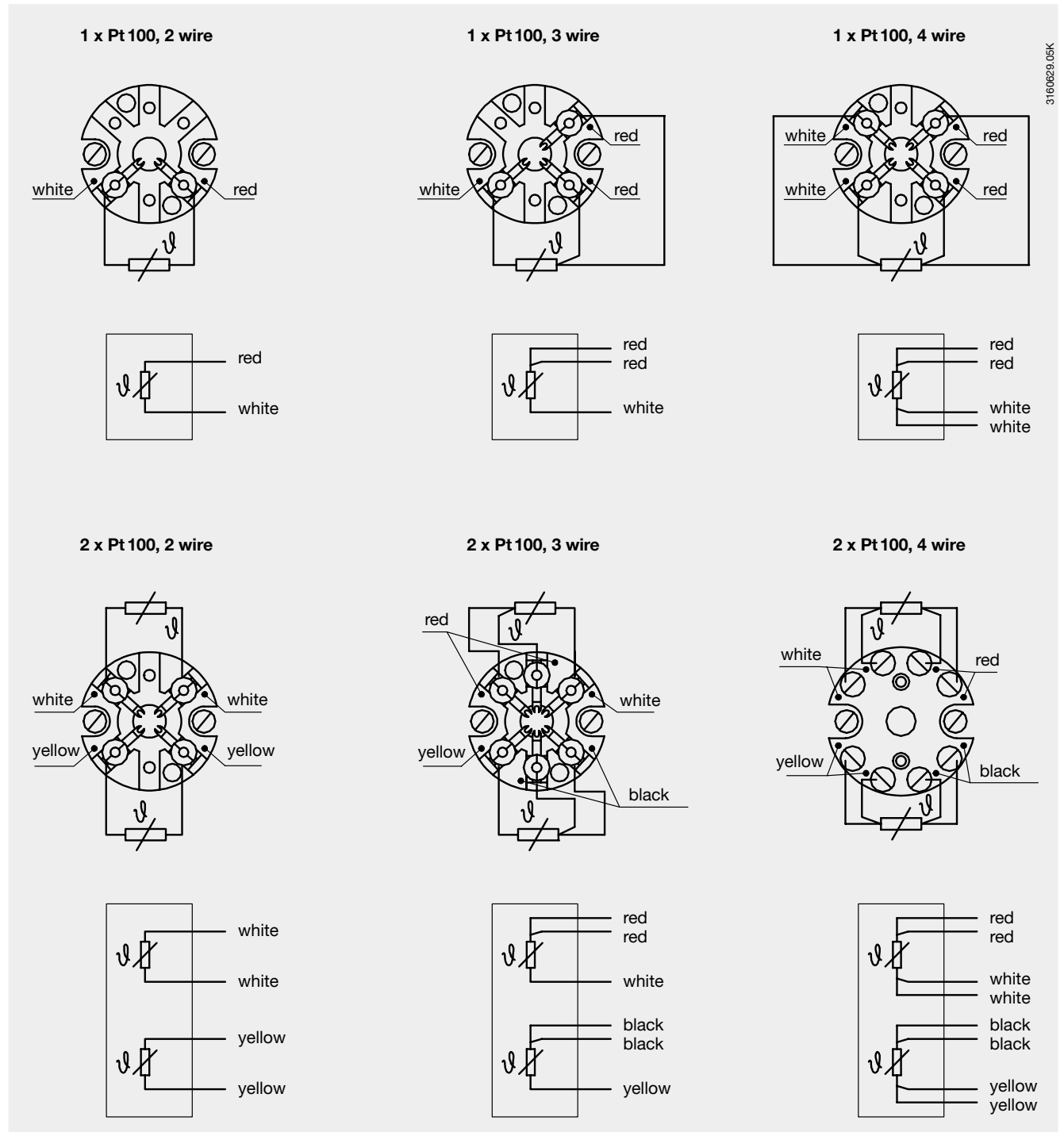


Measuring insert

The measuring insert is made of a vibration-resistant sheathed measuring cable (MI cable). In order to ensure that the measuring insert is firmly pressed down on the thermowell bottom the insert is spring-loaded (spring travel: max 10 mm).

The standard material used for the measuring insert sheath is stainless steel.

Electrical connection



Ordering information

Field No.	Code	Features
		Type and number of sensors
	R	1 x Pt100 application range -50 °C ... +450 °C
	S	2 x Pt100 application range -50 °C ... +450 °C ¹⁾
	5	1 x Pt100 application range -200 °C ... +450 °C
	6	2 x Pt100 application range -200 °C ... +450 °C ¹⁾
	3	1 x Pt100 application range -200 °C ... +600 °C
	4	2 x Pt100 application range -200 °C ... +600 °C ¹⁾
1	?	other <i>please state as additional text</i>
		Sensor method of connection
	2	2 wire
	3	3 wire
2	4	4 wire
		Sensor limiting error
	B	class B per DIN EN 60751
	A	class A per DIN EN 60751 (-50 °C ... +450 °C) <i>not with 2-wire connection</i>
	C	1/3 DIN B at 0 °C <i>not with 2-wire connection</i>
3	?	other <i>please state as additional text</i>
		Process connection
	ZZ	without
	P1	pipe coupling G 1/2, carbon steel <i>adjustable</i>
	P2	pipe coupling G 3/4, carbon steel <i>adjustable</i>
	A1	stop flange DIN 43734, malleable cast iron <i>adjustable</i>
	A5	stop flange with mating flange DIN 43734, malleable cast iron <i>adjustable</i>
4	??	other <i>please state as additional text</i>
		Thermowell outer diameter
	8	15 mm <i>metal</i>
5	?	other <i>please state as additional text</i>
		Thermowell material
	B	carbon steel 1.0305
	C	carbon steel 1.0305, enamelled
	1	stainless steel 1.4571
6	?	other <i>please state as additional text</i>
		Nominal length
	0500	500 mm
	0710	710 mm
	1000	1000 mm
	1400	1400 mm
7		length in mm, e.g. 0850 for 850 mm
		Connection head
	1	model BS (aluminium) <i>only transmitter T19/T24/T31 as option possible</i>
	2	model BSZ (aluminium)
	3	model BSZ-H (aluminium) <i>mounting of an optional transmitter in the cap possible</i>
	4	model BSS (aluminium)
	5	model BSS-H (aluminium) <i>mounting of an optional transmitter in the cap possible</i>
8	?	other <i>please state as additional text</i>
		Cable entry to connection head
	4	M20 x 1.5
9	?	other <i>please state as additional text</i>
		Transmitter
	ZZ	without
	TA	mounted on the measuring insert
10	TB	mounted in the cap of the connection head
		Additional order info
	YES	NO
11	T	Z quality certificates <i>see price list</i>
12	T	Z additional text <i>Please state as clearly understandable text!</i>

1) 2 x Pt100 in combination with 2 transmitters on request.

OBSOLETE

Specifications and dimensions given in this leaflet represent the state of engineering at the time of printing.
Modifications may take place and materials specified may be replaced by others without prior notice.



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