

Resistance Thermometers Model TR10-L, EEx-d, for Additional Thermowell

WIKA Data Sheet TE 60.12



Applications

- Chemical industry
- Petrochemical industry
- Off-Shore

Special Features

- Type test certificate (ATEX)
- Measuring insert exchangeable
- For many thermowell designs

Description

Resistance thermometers in this series can be combined with a large number of thermowell designs. Operation without thermowell is not allowed.

An extensive range of sensors, connection heads, insertion lengths, neck lengths, thermowell connections etc. are available for these thermometers, so that they are suitable for almost every thermowell design.

The models of the TR10-L series are provided with a type examination certificate for „flameproof enclosure“ type of protection according to directive 94/9/EC (ATEX), EEx-d, for gases and dusts. Measuring insert, connection head (flameproof) and integrated flame path guarantee a safe operation.

Thermowells in different dimensions and materials provide the use in zone 0, 1 or 2.



Resistance Thermometer, Model TR10-L, EEx-d, for Additional Thermowell

Sensor

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

Sensor method of connection

- 2-wire The lead resistance of the measuring insert compounds the error.
- 3-wire With a cable length of approx. 30 m or longer measuring deviations can occur.
- 4-wire The inner lead resistance of the connecting wires is negligible.

Sensor limiting error

- Class B per DIN EN 60 751
- Class A per DIN EN 60 751 (-50 °C ... +450 °C)
- 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 of the measuring insert, over-rides the higher sensor accuracy.

Basic values and limiting errors

Basic values and limiting errors for the platinum measuring resistors 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:

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

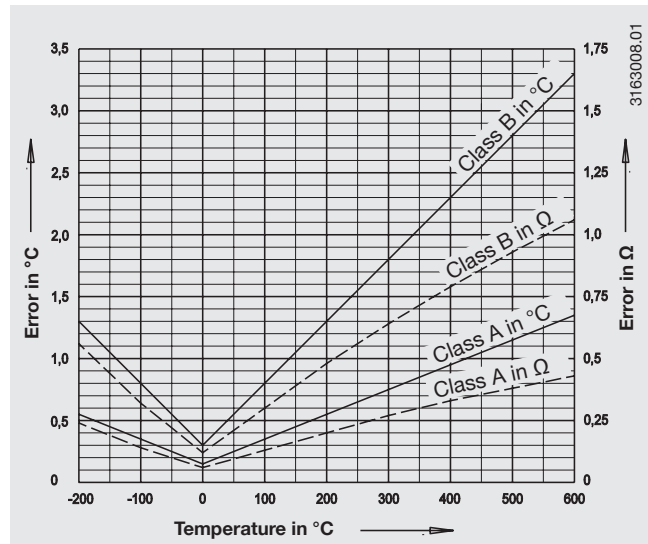
The relationship between the temperature and the electrical resistance is described by polynomes which are defined in DIN EN 60 751. Furthermore, this standard lays down the basic values in °C stages.

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

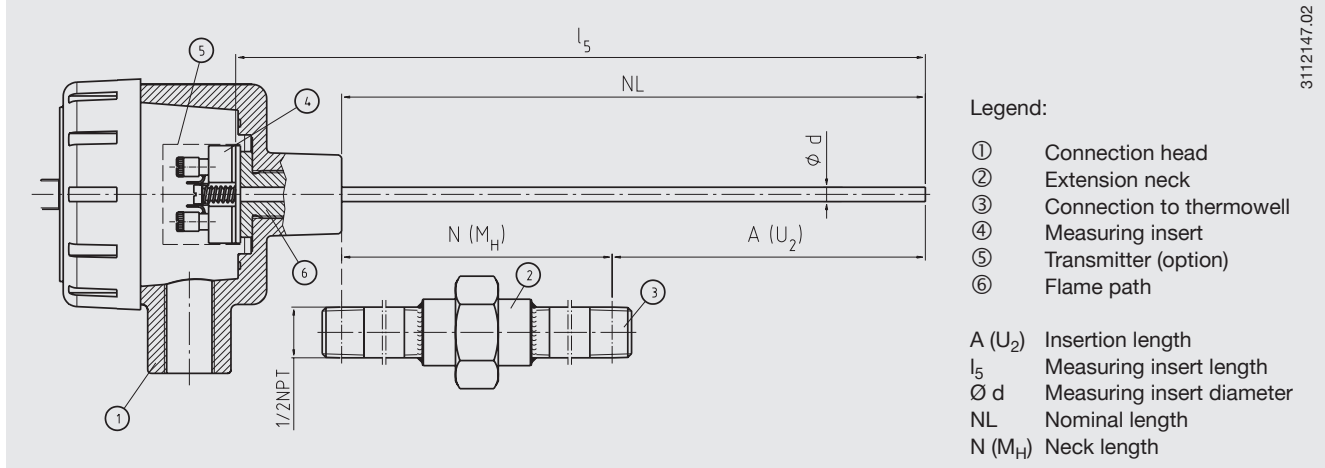
Temperature (ITS 90) °C	Basic value Ω	Limiting error DIN EN 60 751			
		Class A		Class B	
		°C	Ω	°C	Ω
-200	18.52	± 0.55	± 0.24	± 1.3	± 0.56
-100	60.26	± 0.35	± 0.14	± 0.8	± 0.32
-50	80.31	± 0.25	± 0.10	± 0.55	± 0.22
0	100	± 0.15	± 0.06	± 0.3	± 0.12
50	119.40	± 0.25	± 0.10	± 0.55	± 0.21
100	138.51	± 0.35	± 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

Please take the maximum permissible temperature values of the „Explosion protection“ table, page 6, into account as well!

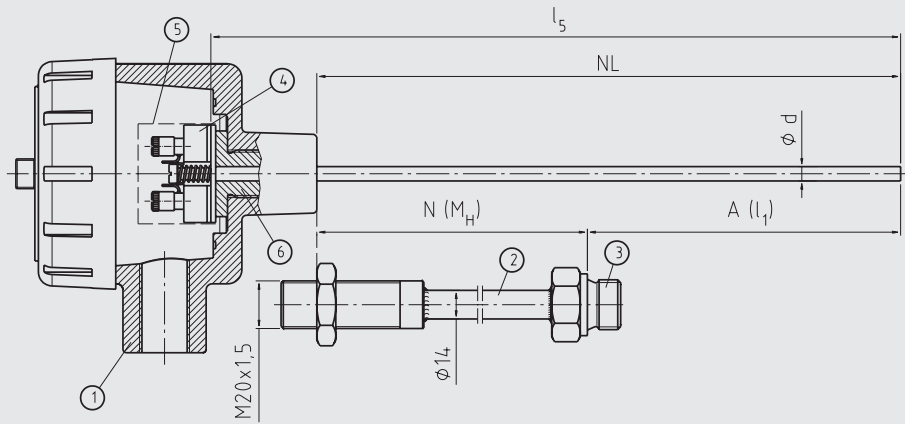


TR10-L components

Conical thread



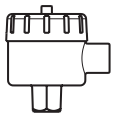
Cylindrical thread



Legend:

- ① Connection head
 - ② Extension neck
 - ③ Connection to thermowell
 - ④ Measuring insert
 - ⑤ Transmitter (option)
 - ⑥ Flame path
- $A (l_1)$ Insertion length
 l_5 Measuring insert length
 ϕd Measuring insert diameter
 NL Nominal length
 $N (M_H)$ Neck length

Connection head



7000 W

Model	Material	Cable entry	Ingress protection	Cap	Surface finish
7000 W	Aluminium	½ NPT, ¾ NPT or M20 x 1.5	IP 65	Screw cover	blue, painted ¹⁾

1) RAL5022, polyester paint saltwater-proof

Measuring insert

The measuring insert is made of a vibration-resistant sheathed measuring cable (MI cable). The diameter of the measuring insert shall be approx. 1 mm smaller than the hole diameter of the thermowell.

Gaps of more than 0.5 mm between thermowell and measuring insert will have a negative effect on the heat transfer, and they will result in an unfavourable response behaviour of the thermometer.

When fitting the measuring insert with a thermowell, it is very important to determine the correct insertion length (= thermowell length with bottom thicknesses of ≤ 5.5 mm). In this connection the fact that the measuring insert is spring-loaded (spring travel: max. 10 mm) has to be taken into account in order to ensure that the measuring insert presses against the bottom of the thermowell. Furthermore we recommend that a neck length be selected so that a standard length measuring insert can be used. Measuring inserts for TR10-L are produced with a fit below the terminal block. This guarantees a defined gap between measuring insert and integrated flame path according to the certificate.

Due to the use of a flame path and its fit tolerances it is not permissible to use standard measuring inserts as replacement parts!

Replacement measuring insert with type examination certificate: Model TR10-K.

Extension neck (option)

The extension neck is screwed to the connection head. Connection to head: M20 x 1.5 or ½ NPT. The length of the extension neck depends on the application. The extension neck generally serves for bridging insulation. In many applications it is also used as a part cooling element between connection head and medium in order to protect any head mount transmitters from high medium temperatures.

Standard material of the extension neck is stainless steel.

Other extension neck designs and materials on request.

Transmitter (option)

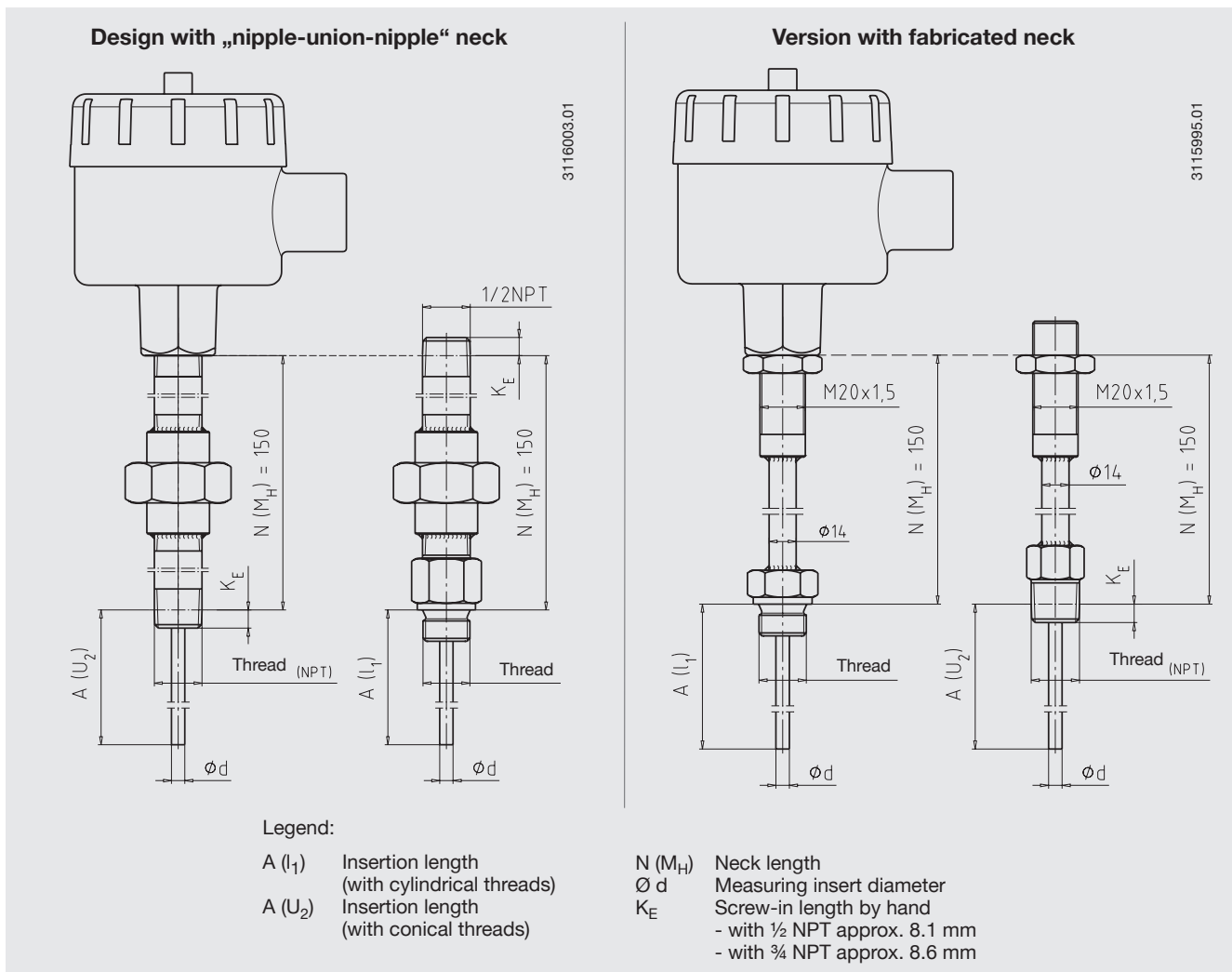
An optional transmitter can be mounted inside the connection head. (Note: Only on connection plate of the measuring insert). A certification of the built-in transmitter is not necessary. (Use in accordance with EN 50 018 and in accordance with intended use).

The thermometer has to be operated with a power limitation circuit that limits P_{max} in category 1 applications with a two fault safety and in category 2 applications with a one fault safety (e.g. intrinsically safe circuits of ia resp. ib).

Model	Description	Explosion protection	Data sheet
T19	Analogue transmitter, configurable	without	TE 19.03
T24	Analogue transmitter, PC-configurable	optional	TE 24.01
T12	Digital transmitter, PC-configurable	optional	TE 12.03
T32	Digital transmitter, HART protocol	optional	TE 32.03
T53	Digital transmitter FOUNDATION Fieldbus and PROFIBUS PA	standard	TE 53.01

Connection to thermowell

Many possible designs ensure that the resistance thermometer, Model TR10-L, can be combined with almost all thermowells. The most common designs of connection are shown in the following drawings. Others are available on request.



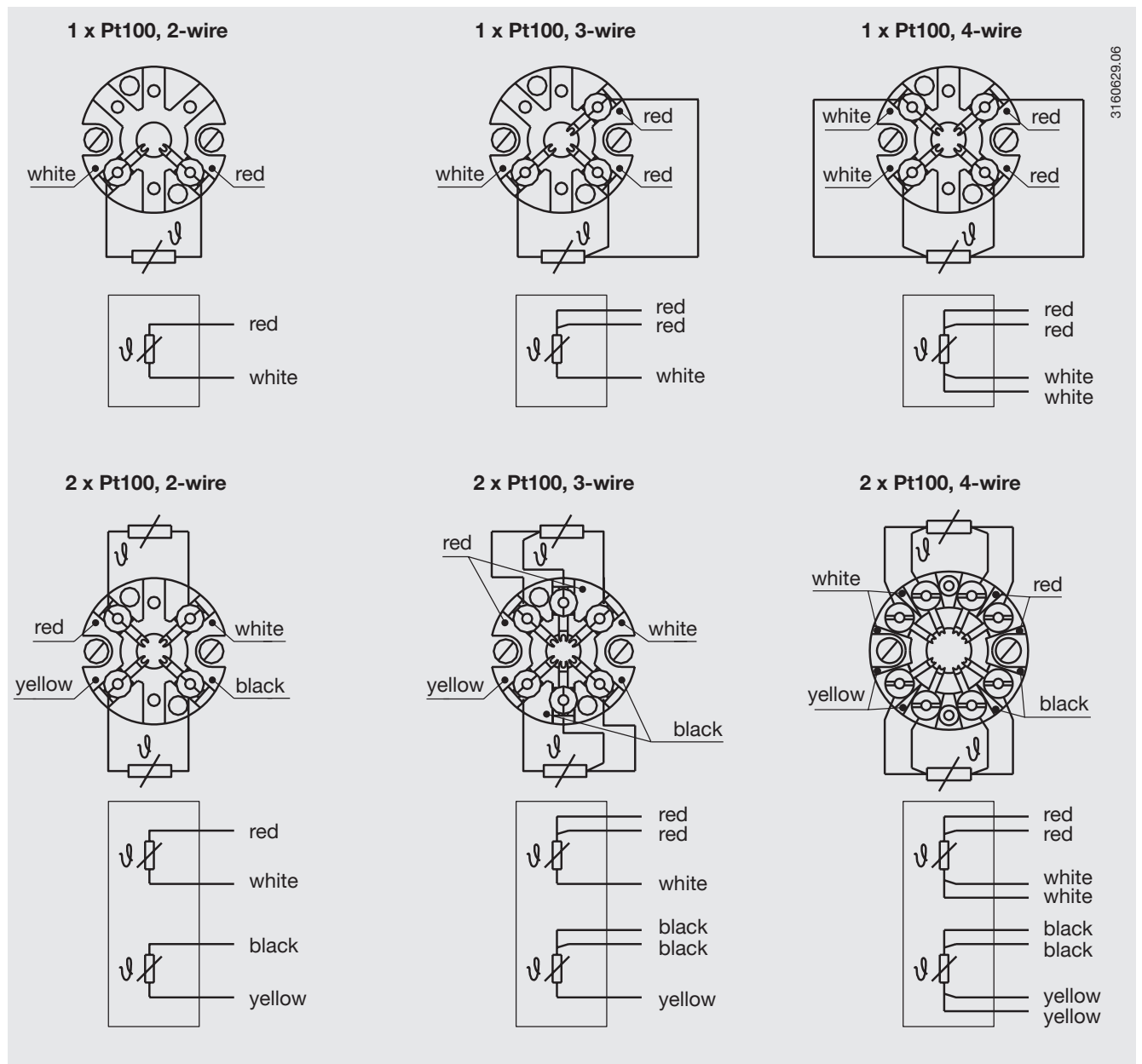
Possible combinations of measuring insert diameter, number sensor and sensor method of connection

Measuring insert Ø in mm	Sensor / sensor method of connection 1 x Pt100			Sensor / sensor method of connection 2 x Pt100		
	2-wire	3-wire	4-wire	2-wire	3-wire	4-wire
3	x	x	x	x	x	-
6	x	x	x	x	x	x

Possible thread sizes of the male thread at the extension neck

Thread to the thermowell	Thread to the head
G ½ B	M20 x 1.5
G ¾ B	½ NPT
M14 x 1.5	
M18 x 1.5	
½ NPT	
¾ NPT	

Electrical connection



Explosion protection

Resistance thermometers TR10-L are available with a type examination certificate for „flameproof enclosure“ type of ignition protection (TÜV 02 ATEX 1858 X). These thermometers comply with the requirements of directive 94/9/EC (ATEX).

The classification / suitability of the instrument for the respective category can be seen from the table. The responsibility for using suitable thermowells rests with the user.

Marking	Temperature maximum in °C at the thermowell / measuring insert				Neck length minimum N (M _H) ²⁾	Temperature range ambient T _{amb} ³⁾
	Power P _{max} at the sensor ¹⁾					
2 fault safety (e. g. with sensor supply circuit ia)	50 mW	100 mW	250 mW	500 mW		
II ½ GD EEx-d IIC T80 °C IP 65 or II ½ G EEx-d IIC T6	63	61	56	46		-20 °C ... 55 °C
II ½ GD EEx-d IIC T95 °C IP 65 or II ½ G EEx-d IIC T5	75	73	68	58		-20 °C ... 70 °C
II ½ GD EEx-d IIC T130 °C IP 65 or II ½ G EEx-d IIC T4	103	101	96	86	20 mm	-20 °C ... 100 °C
II ½ GD EEx-d IIC T195 °C IP 65 or II ½ G EEx-d IIC T3	155	153	148	138	50 mm	-20 °C ... 100 °C
II ½ GD EEx-d IIC T290 °C IP 65 or II ½ G EEx-d IIC T2	231	229	224	214	100 mm	-20 °C ... 100 °C
II ½ GD EEx-d IIC T440 °C IP 65 or II ½ G EEx-d IIC T1	351	349	344	334	100 mm	-20 °C ... 100 °C
1 fault safety with power reduction (e. g. with sensor supply circuit ib)	50 mW	100 mW				
II ½ GD EEx-d IIC T80 °C IP 65 or II ½ G EEx-d IIC T6	56	46				-20 °C ... 55 °C
II ½ GD EEx-d IIC T95 °C IP 65 or II ½ G EEx-d IIC T5	68	58				-20 °C ... 70 °C
II ½ GD EEx-d IIC T130 °C IP 65 or II ½ G EEx-d IIC T4	96	86			20 mm	-20 °C ... 100 °C
II ½ GD EEx-d IIC T195 °C IP 65 or II ½ G EEx-d IIC T3	148	138			50 mm	-20 °C ... 100 °C
II ½ GD EEx-d IIC T290 °C IP 65 or II ½ G EEx-d IIC T2	224	214			100 mm	-20 °C ... 100 °C
II ½ GD EEx-d IIC T440 °C IP 65 or II ½ G EEx-d IIC T1	344	334			100 mm	-20 °C ... 100 °C
1 fault safety (e. g. with sensor supply circuit ib)	50 mW	100 mW	250 mW	500 mW		
II 2 GD EEx-d IIC T80 °C IP 65 or II 2 G EEx-d IIC T6	78	75	68	59		-20 °C ... 55 °C
II 2 GD EEx-d IIC T95 °C IP 65 or II 2 G EEx-d IIC T5	93	90	83	74		-20 °C ... 70 °C
II 2 GD EEx-d IIC T130 °C IP 65 or II 2 G EEx-d IIC T4	128	125	118	109	20 mm	-20 °C ... 100 °C
II 2 GD EEx-d IIC T195 °C IP 65 or II 2 G EEx-d IIC T3	193	190	183	174	50 mm	-20 °C ... 100 °C
II 2 GD EEx-d IIC T290 °C IP 65 or II 2 G EEx-d IIC T2	288	285	278	269	100 mm	-20 °C ... 100 °C
II 2 GD EEx-d IIC T440 °C IP 65 or II 2 G EEx-d IIC T1	438	435	428	419	100 mm	-20 °C ... 100 °C

Further information see Ex operating instructions

- 1) When using multiple sensor resistors (or several single resistors) and operating them simultaneously, the sum of the individual power values must not exceed the value of the max. permissible power specified in the table.
- 2) The minimum neck length is to be defined as the distance between the lower edge of the connection head and the heat-emitting surface.
- 3) When using a transmitter, the permissible ambient temperature range is to be taken from the corresponding approval.

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

