

# Insertion thermometer With connection lead Model TF45

WIKA data sheet TE 67.15

## Applications

- Solar thermal systems, renewable energies
- Machine building
- Compressors
- Cooling, heating, ventilation and air-conditioning
- Furnace and equipment manufacturing

## Special features

- Measuring ranges from -50 ... +260 °C [-58 ... +500 °F]
- Connection lead from PVC, silicone, PTFE
- In 2- or 4-wire connection
- Probe sleeve from stainless steel
- Dust and splash-proof IP65



Insertion thermometer, model TF45

## Description

The model TF45 insertion thermometer is mainly used to measure the temperature of gaseous substances and also the surfaces of solids in the range of -50 ... +260 °C [-58 ... +500 °F]. In conjunction with an additional thermowell, the insertion thermometer can also be used for temperature measurement in liquid media.

The measuring element is connected to a connection lead and built into a heat-conducting probe sleeve made of stainless steel. The probe sleeve is proof against dust and jets of water and compressed onto the connection lead.

Depending on the version, the connection leads are suited to different temperature ranges and operating conditions.

## Measuring element

WIKA standardly uses the following measuring elements for the model TF45 insertion thermometer:

- Pt1000, class F 0.3 per IEC/EN 60751
- Pt100, class F 0.3 per IEC/EN 60751
- NTC 10kOhm, B(25/85) = 3976
- NTC 5kOhm, B(25/85) = 3976
- KTY81-210

Others on request

Platinum elements offer the advantage of meeting international standards (IEC/EN 60751). Nickel elements are also standardised, but not internationally. Due to material- and production-specific criteria, a standardisation of semiconductor elements, e.g. NTCs and KTY, is not possible. For this reason their interchangeability is limited.

Further advantages of platinum elements are: better long-term stability and better behaviour over temperature cycles, a wider temperature range as well as a high measurement accuracy and linearity.

High measurement accuracy and linearity are also possible with NTCs, but only in a very limited temperature range.

### Strengths and weaknesses of the different measuring elements

	Pt1000	Pt100	NTC	KTY
Temperature range	++	++	-	-
Accuracy	++	++	-	-
Linearity	++	++	-	++
Long-term stability	++	++	+	+
International standards	++	++	-	-
Temperature sensitivity [dR/dT]	+	-	++	+
Impact of the connection lead	+	-	++	+

### Connection method

For all versions of the model TF45 insertion thermometer, WIKA offers a 2-wire connection as standard.

With this connection method, the lead resistance of the connection lead affects the measured value and must be taken into consideration.

For copper cable with cross-section 0.22 mm<sup>2</sup> the following value applies: 0.162 Ω/m → 0.42 °C/m for Pt100

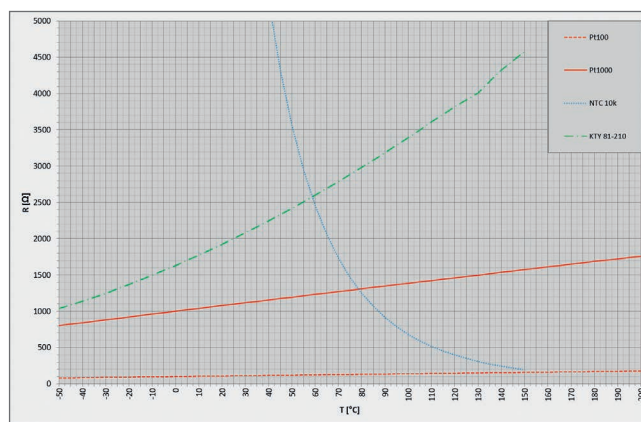
With a Pt1000 measuring element, the influence of the connection lead of 0.04 °C/m is a factor of 10 lower. The lead resistance becomes still less significant in relation to the basic resistance R<sub>25</sub> with a NTC or KTY element.

With a Pt100 measuring element, there is the additional possibility of selecting a 4-wire connection, thus eliminating the influence of the lead resistance on the measuring result.

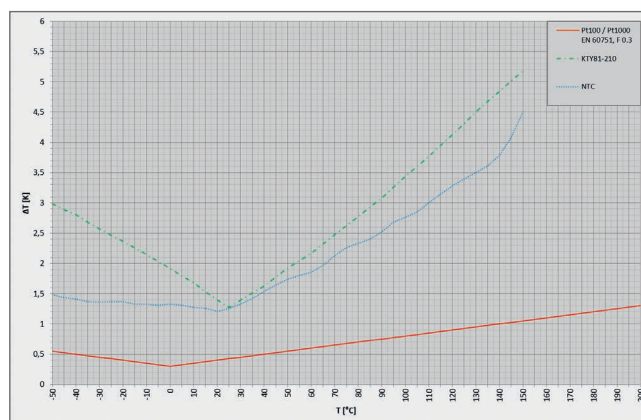
### Characteristic curves

The following characteristic curves show the typical curve shapes for the standard WIKA measuring elements, depending on the temperature and the typical tolerance curves.

#### ■ Typical characteristic curves



#### ■ Typical tolerance curves



## Temperature ranges

### Medium temperature (measuring range)

Since the measuring element is in direct contact with the connection lead, the measuring range of the insertion thermometer is dependent, on one hand, on the measuring element and, on the other, on the insulation material of the connection lead.

Measuring element	Connection lead		
	PVC	Silicone	PTFE
Pt1000	-20 ... +105 °C [-4 ... +221 °F]	-50 ... +200 °C [-58 ... +392 °F]	-50 ... +260 °C [-58 ... +500 °F]
Pt100	-20 ... +105 °C [-4 ... +221 °F]	-50 ... +200 °C [-58 ... +392 °F]	-50 ... +260 °C [-58 ... +500 °F]
NTC	-20 ... +105 °C [-4 ... +221 °F]	-30 ... +130 °C [-22 ... +266 °F]	-30 ... +130 °C [-22 ... +266 °F]
KTY	-20 ... +105 °C [-4 ... +221 °F]	-50 ... +150 °C [-58 ... +302 °F]	-50 ... +150 °C [-58 ... +302 °F]

### Ambient temperature

The maximum permissible ambient temperature depends on the insulation material of the connection lead. For a version with fitted connector the maximum allowed temperature of the connector must be taken into account.

Connection lead	Ambient temperature
PVC	-20 ... +105 °C [-4 ... +221 °F]
Silicone	-50 ... +200 °C [-58 ... +392 °F]
PTFE	-50 ... +260 °C [-58 ... +500 °F]

## Probe sleeve

To protect against moisture and mechanical loads, the measuring element and the connection point are protected by a stainless steel probe sleeve.

The following diameters and sleeve lengths are available as standard:

Sleeve diameter in mm	Standard length A in mm
6	32, 40, 50, 80, 110, 135
5	50

## Response time

The response time of the thermometer is strongly influenced by

- the probe sleeve (diameter, material)
- the heat transfer to the measuring element
- the flow rate of the medium

WIKA has optimised the design of the model TF45 insertion thermometers for an optimal heat transmission from the medium to the measuring element.

The following table shows the typical response times for the model TF45 insertion thermometers:

Probe sleeve		Response time	
Material	Diameter	t <sub>0,5</sub>	t <sub>0,9</sub>
Stainless steel	6.0 mm	2.7 s	7 s
Stainless steel	5.0 mm	2.2 s	6 s

## Connection lead

In order to be matched to the prevailing environmental conditions, connection leads are available with different insulation materials.

The lead end is supplied as standard with stripped wires. In addition, there is the possibility to fit end splices or customer-specific connectors.

The following table gives an overview of the main characteristics of insulation materials available for the TF45.

Insulation material		PVC	Silicone	PTFE
<b>Highest working temperature</b>		105 °C	200 °C	260 °C
<b>Flammability</b>		self-extinguishing	self-extinguishing	not flammable
<b>Water absorption</b>		slight	slight	none
<b>Suitability for steam</b>		good	limited	very good
<b>Chemical resistance against</b>	Dilute bases	+	+	+
	Dilute acids	+	+	+
	Alcohol	+	+	+
	Petrol	+	-	+
	Benzene	-	-	+
	Mineral oil	+	+	+

Legend:

+ resistant

- not resistant

The values given in the table are only given as guide values, and are not to be used as the minimum requirements in specifications.

For the model TF45 insertion thermometer, as standard, we offer PVC or silicone-insulated connection leads with a cross-section of 0.22 mm<sup>2</sup> (24 AWG).

## Vibration resistance

The typical uses for the model TF45 insertion thermometers are those areas where only low to medium vibration levels occur. Nevertheless, the thermometers have been designed in such a way that the acceleration values, defined in IEC/EN 60751, of 3 g can be exceeded for higher demands.

Depending on the version, the mounting situation, medium and temperature, the vibration resistance can be up to 6 g.

## Shock resistance

Up to 100 g, depending on version, installation situation and temperature

## Electrical connection

- Stripped wires
- End splices

Customer-specific connectors available on request

## Ingress protection per IEC/EN 60529

The specification of the ingress protection refers to the thermowell/connection lead transition. This is dependent on the insulation material of the connection lead.

Insulation material	Ingress protection
PVC	IP65
Silicone	IP66, IP67
PTFE	IP65

## Accessories

### Thermowell

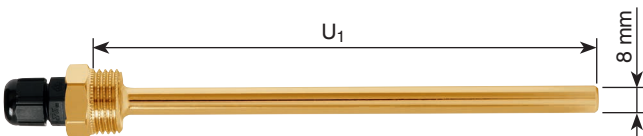
To use the model TF45 insertion thermometer in liquid media, thermowells with a G ½ mounting thread (material: brass) are available in four insertion lengths.

For safely fixing the thermometer a cable gland is part of the thermowell.

The thermowells are designed for static operating pressures up to a maximum of 16 bar. The cable gland is suitable for ambient temperatures from -40 ... +100 °C [-40 ... +212 °F].

On ordering, please give the order number!

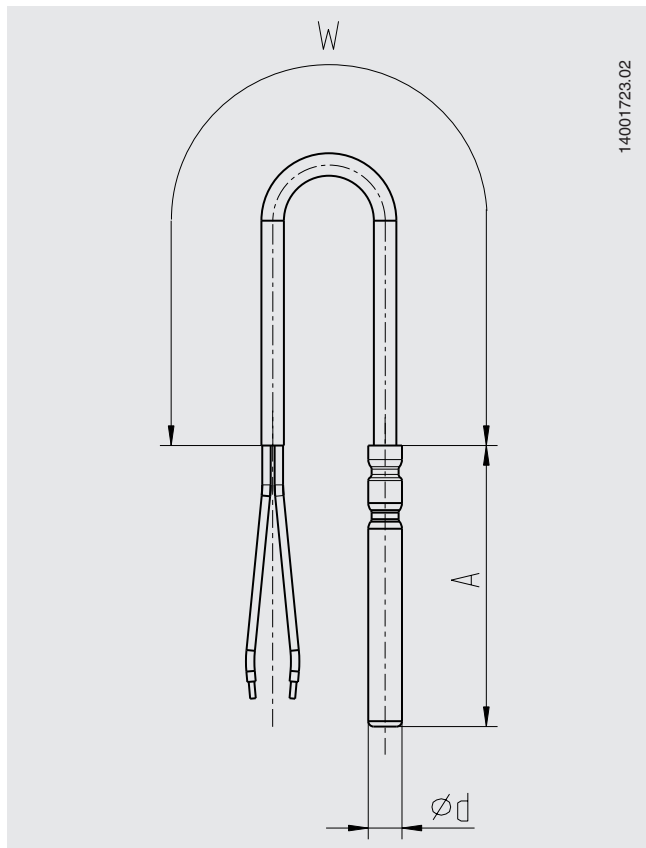
Thermowell	Order number
Insertion length $U_1 = 50 \text{ mm}$	14238211
Insertion length $U_1 = 100 \text{ mm}$	14238212
Insertion length $U_1 = 150 \text{ mm}$	14238213
Insertion length $U_1 = 200 \text{ mm}$	14238214



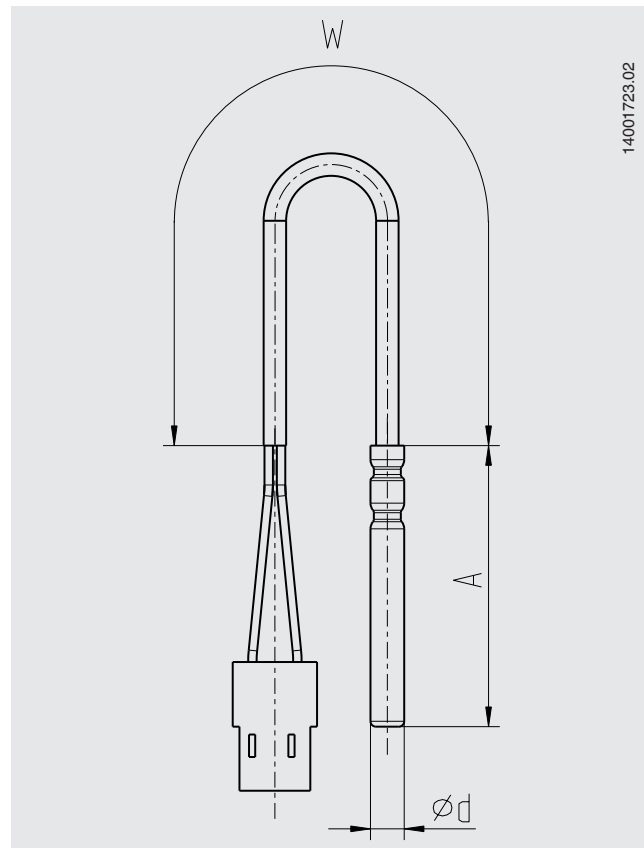
Brass thermowell for TF45

## Dimensions in mm

Model TF45 with stripped wires, with end splices



Model TF45 with connector









Legend:

Ø d Probe sleeve diameter

A Sleeve length

W Cable length

## Approvals

Logo	Description	Country
	<b>EU declaration of conformity</b> RoHS directive	European Union
	<b>EAC (option)</b> Import certificate	Eurasian Economic Community
	<b>GOST (option)</b> Metrology, measurement technology	Russia
	<b>KazInMetr (option)</b> Metrology, measurement technology	Kazakhstan
-	<b>MTSCHS (option)</b> Permission for commissioning	Kazakhstan
	<b>UkrSEPRO (option)</b> Metrology, measurement technology	Ukraine
	<b>Uzstandard (option)</b> Metrology, measurement technology	Uzbekistan

Approvals and certificates, see website

## Manufacturer's information and certificates

Logo	Description
-	China RoHS directive

### Ordering information

Model / Measuring range / Measuring element / Connection method / Tolerance / Material, diameter and length of the probe sleeve / Insulation and length of the connection lead / Cable length W / Electrical connection

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