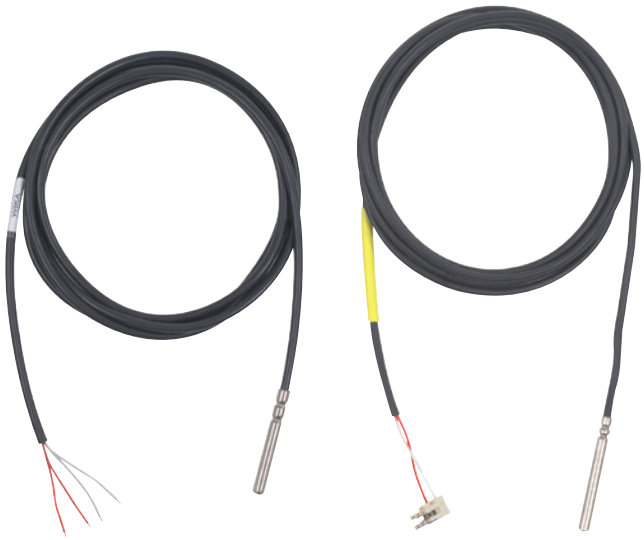
OEM insertion thermometer with connecting lead
Model TF45

Applications

- Solar heat, renewable energies
- Machine building
- Compressors
- Refrigeration technology, heating, air condition and ventilation
- Furnace and equipment construction

Special features

- Measuring ranges from -50 ... +260 °C
- Connecting lead made of PVC, silicon, PTFE
- In 2-, 3- or 4-wire connection
- With single or dual measuring element
- Thermowells made of stainless steel



Insertion thermometers with connecting lead, model TF45

Description

Measuring element, tolerance
WIKA uses the following standard elements in the TF45 series:

Single measuring element
- NTC, R_{25} = 2.5 kΩ ±5 %
- NTC, R_{25} = 10 kΩ ±5 %
- Pt100, class B per DIN EN 60751
- Pt1000, class B per DIN EN 60751
- Ni1000, DIN 43760
- KTY10-6
- KTY11-6
- KTY81-210

Others on request

Dual measuring element
- 2 x Pt100, class B per DIN EN 60751
- 2 x Pt1000, class B per DIN EN 60751
- 2 x Ni1000, DIN 43760

Others on request

Platinum elements offer the advantage of meeting international standards (IEC 751 / DIN EN 60751). Nickel elements are also standardised, but not international. Due to material- and production-specific criteria, an standardisation of semiconductor elements, e.g. NTC's and KTY, is not possible. For this reason their interchange ability 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 accuracy and linearity.

High accuracy and linearity are also possible with NTC's, but only in a limited temperature range.

Strengths and weaknesses of the different measuring elements:

	NTC	Pt100	Pt1000	Ni1000	KTY
Temperature range	-	++	++	+	-
Accuracy	-	++	++	+	-
Linearity	-	++	++	+	++
Long term stability	+	++	++	++	+
International standards	-	++	++	+	-
Temperature sensitivity [dR/dT]	++	-	+	+	+
Impact of connection cable	++	-	+	+	+

Wiring:
The resistance of the connecting leads affects the measurement value of 2-wire connections and must be taken into consideration.
For copper cable with cross section 0.22 mm² the following value applies: 0.162 Ω/m → 0.42 °C/m for Pt100
To avoid this, the connection leads can be designed in 3- or 4-wire connection.

Likewise a design with Pt1000 can be selected, with which the influence of the leads, with 0.04 °C/m, is smaller by a factor of around 10. This is also the case for a Ni1000 sensor element.

The lead resistance becomes still less significant in relation to the basic resistance R_{25} with an KTY or NTC element.

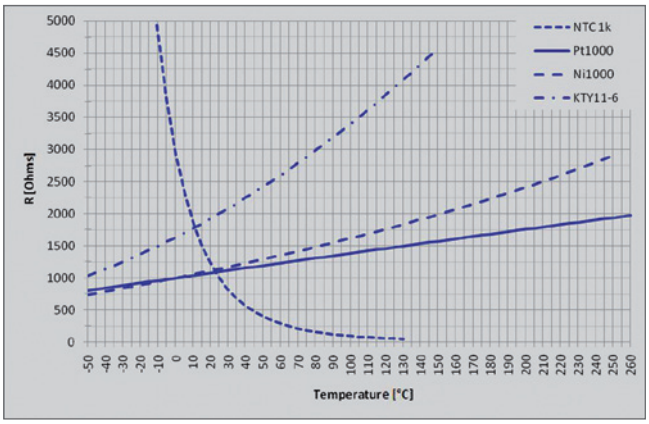
For single measuring elements Pt100, Pt1000 and Ni1000 it is possible to choose between 2-, 3- and 4-wire connection.

For all other versions, WIKA provides standard with 2-wire connection.

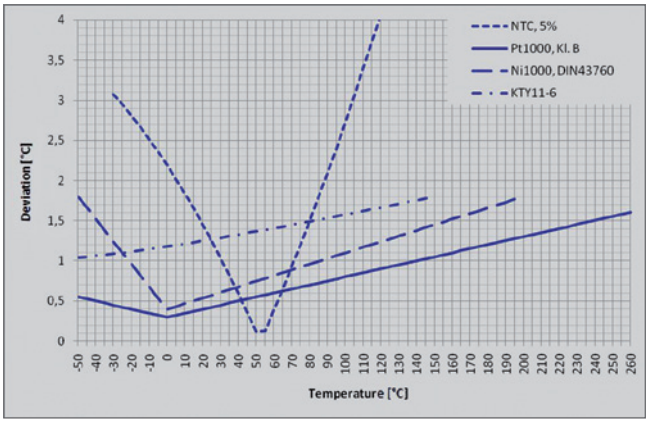
Characteristic curves

The following characteristic curves show the typical curve progressions for the WIKA standard measuring elements over temperature as well as the typical tolerance curves.

Typical characteristic progressions



Typical tolerance curves



Temperature ranges

■ Medium temperature (measuring range)
The measuring range mainly depends on the insulation material of the connecting lead and on the measuring element:

Insulation material of the connecting lead	Measuring range
PVC	-20 ... +105 °C
Silikon	-50 ... +200 °C
PTFE	-50 ... +260 °C

Measuring element	Measuring range
NTC	-30 ... +130 °C
Pt100	-50 ... +400 °C
Pt1000	-50 ... +400 °C
Ni1000	-50 ... +250 °C
KTY	-50 ... +150 °C

■ Ambient temperature
The max. permissible ambient temperature depends on the insulation material of the connecting lead.

Thermowell

Material
- Stainless steel 1.4571

Others on request

Diameter d
- 6.0 mm
- 5.0 mm
- 4.0 mm

Others on request

Insertion length A
- 50 mm

Others on request

Response time

The response time is mainly affected by
- the thermowell used (diameter, material)
- the heat transmission from thermowell to measuring element
- the flow rate of the medium

WIKA has optimised the design of the TF45 insertion thermometers for an optimal heat transmission.

The table shows typical response times for WIKA TF45 insertion thermometers:

Thermowell		Response time	
Material	Diameter	$t_{0.5}$	$t_{0.9}$
Stainless steel	6.0 mm	2.7 s	7 s
Stainless steel	5.0 mm	2.2 s	6 s
Stainless steel	4.0 mm	2.0 s	5 s

Connecting lead

In order to be matched to the prevailing environmental conditions, connecting cables are available with different insulation materials.
The lead ends can also be supplied with stripped wires, end splices or ready-made with customer-specific plug connector.

The following table gives an overview of the main characteristics of insulation materials available from WIKA. The values given in the tables are only given as guide values, and are not to be used as the minimum requirements in specifications.

Insulation material		PVC	Silicon	PTFE
Highest operating temperature		105 °C	200 °C	260 °C
Inflammability		self-extinguishing	self-extinguishing	not inflammable
Water absorption		low	low	none
Suitability for steam good limited very good		good	limited	very good
Chemical resistance against	dilute alkalis	+	+	+
	dilute acids	+	+	+
	Alcohol	+	+	+
	Benzine	+	-	+
	Benzol	-	-	+
	Mineral oil	+	+	+

Legend:
+ resistant
- not resistant

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 developed in such a way that those acceleration values, defined in DIN EN 60751 (IEC 751), of 3 g for higher demands, are usually still exceeded. Depending upon the version, installation 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

- Bare connection wires
- End splice
- Connectors according to specification

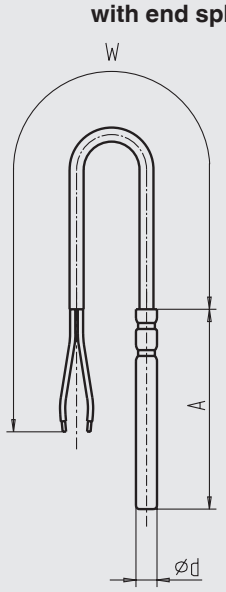
Other connections on request

Ingress protection

IP 65

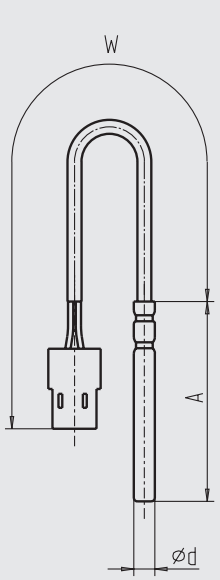
Dimensions in mm

Model TF45 with bare connection wires/ with end splice



Legend:
Ø d Thermowell diameter
A Insertion length
W Lead length

Model TF45 with connector



Legend:
Ø d Thermowell diameter
A Insertion length
W Lead length

Ordering information

Model / Measuring range / Measuring element / Wiring / Tolerance / Thermowell material, diameter and length / Insulation and length of the connecting lead / Electrical connection

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