Thermocouple
For additional thermowell, flameproof enclosure (Ex d)
Model TC10-L

for further approvals
see page 2

Applications

- Chemical industry
- Petrochemical industry
- Offshore

Special features

- Sensor ranges from -40 ... +1,200 °C (-40 ... +2,192 °F)
- Measuring insert replaceable
- For many thermowell designs

Fig. left: Model TC10-L with connection head 7/8000
Fig. right: Model TC10-L with connection head 1/4000

Description

Thermocouples in this series can be combined with a large number of thermowell designs. Use without a thermowell is not permitted.

A wide variety of possible combinations of sensor, connection head, insertion length, neck length, connection to thermowell etc. are available for the thermometers; suitable for almost any thermowell dimension.

Explosion protection (option)

The permissible power P_{max} as well as the permissible ambient temperature for the respective category can be seen on the EC-type examination certificate, the Ex certificate or in the operating instructions.

Attention:
Only with the correspondingly suitable protective components is operation in dust Ex hazardous areas permissible.

The built-in transmitter has its own certificate. The permissible ambient temperature ranges of the built-in transmitters can be taken from the corresponding transmitter approval.

Approvals (explosion protection, further approvals)

Logo	Description	Country
CE	**EU declaration of conformity** ■ EMC directive [1] EN 61326 emission (group 1, class B) and immunity (industrial application) ■ RoHS directive	European Union
Ex	■ ATEX directive (option) Hazardous areas - Ex d Zone 1 gas [II 2G Ex db IIC T1 ... T6 Gb] - with suitable solid-machined thermowell [II 2G Ex db IIB + H_2 T1 ... T6 Gb] Zone 21 dust [II 2D Ex tb IIIC T85 °C Db IP66]	
IEC IECEx	**IECEx (option)** (in conjunction with ATEX) Hazardous areas - Ex d Zone 1 gas [Ex db IIC T1 ... T6 Gb] - with suitable solid-machined thermowell [Ex db IIB + H_2 T1 ... T6 Gb] Zone 21 dust [Ex tb IIIC T85 °C Db IP66]	International
EAC Ex	**EAC (option)** Hazardous areas - Ex d Zone 1 gas [1 Ex d IIC T1 ... T6] Zone 21 dust [DIP A21 Ta 80 ... 440 °C]	Eurasian Economic Community
INMETRO	**INMETRO (option)** Hazardous areas - Ex d Zone 1 gas [Ex d IIC T* Gb IP66] [Ex d IIB + H_2 T* Gb IP66]	Brazil
	DNOP - MakNII (option) Hazardous areas - Ex d Zone 1 gas [II 2G Ex d IIB + H_2 T4 ... T6] + [II 2G Ex d IIC T4 ... T6] Zone 21 dust [II 2D Ex tD A21 IP66 T85 °C]	Ukraine
	GOST (option) Metrology, measurement technology	Russia
	KazInMetr (option) Metrology, measurement technology	Kazakhstan
-	**MTSCHS (option)** Permission for commissioning	Kazakhstan
	BelGIM (option) Metrology, measurement technology	Belarus
	UkrSEPRO (option) Metrology, measurement technology	Ukraine
	Uzstandard (option) Metrology, measurement technology	Uzbekistan

Manufacturer's information and certificates

Logo	Description
SIL	**SIL 2** Functional safety (only in conjunction with model T32 temperature transmitter)

1) Only for built-in transmitter

Sensor

Thermocouple per IEC 60584-1 or ASTM E230
Types K, J, E, N, T (single or dual thermocouple)

Measuring point
- Ungrounded (standard)
- Grounded

Sensor types

Type	Operating temperatures of the thermocouple			
	IEC 60584-1		ASTM E230	
	Class 2	Class 1	Standard	Special
K	-40 ... +1,200 °C	-40 ... +1,000 °C	0 ... 1,260 °C	
J	-40 ... +750 °C	-40 ... +750 °C	0 ... 760 °C	
E	-40 ... +900 °C	-40 ... +800 °C	0 ... 870 °C	
N	-40 ... +1,200 °C	-40 ... +1,000 °C	0 ... 1,260 °C	
T	-40 ... +350 °C		0 ... 370 °C	

The table shows the temperature ranges listed in the respective standards, in which the tolerance values (class accuracies) are valid.

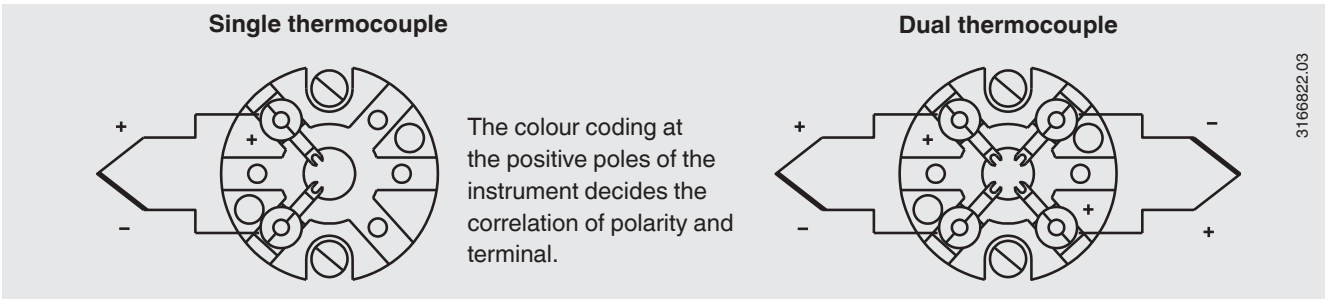
The actual operating temperature of the thermometer is limited both by the maximum permissible working temperature and the diameter of the thermocouple and the sheathed cable, as well as by the maximum permissible working temperature of the thermowell material.

Listed models are available both as single or dual thermocouples. The thermocouple will be delivered with an ungrounded measuring point.

For detailed specifications for thermocouples, see IEC 60584-1 or ASTM E230 and Technical information IN 00.23 at www.wika.com.

Tolerance value
For the tolerance value of thermocouples, a cold junction temperature of 0 °C has been taken as the basis.

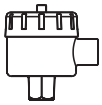
Electrical connection



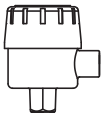
For the electrical connections of built-in temperature transmitters see the corresponding data sheets or operating instructions.

Connection head

1/4000 F
1/4000 S



7/8000 W
7/8000 S



7/8000 W / DIH50
7/8000 S / DIH50

Model	Material	Cable entry thread size	Ingress protection (max.) [1]	Cover / Cap	Surface	Connection to neck tube
1/4000 F	Aluminium	½ NPT, ¾ NPT, M20 x 1.5	IP66 [4]	Screw-on lid	Blue, lacquered [2]	½ NPT
1/4000 S	Stainless steel	½ NPT, ¾ NPT, M20 x 1.5	IP66 [4]	Screw-on lid	Blank	½ NPT
7/8000 W	Aluminium	½ NPT, ¾ NPT, M20 x 1.5	IP66 [4]	Screw-on lid	Blue, lacquered [2]	½ NPT
7/8000 S	Stainless steel	½ NPT, ¾ NPT, M20 x 1.5	IP66 [4]	Screw-on lid	Blank	½ NPT
7/8000 W / DIH50 [3]	Aluminium	½ NPT, ¾ NPT, M20 x 1.5	IP66 [4]	Screw-on lid	Blue, lacquered [2]	½ NPT
7/8000 S / DIH50 [3]	Stainless steel	½ NPT, ¾ NPT, M20 x 1.5	IP66 [4]	Screw-on lid	Blank	½ NPT

1) The ingress protection refers to the connection head, for information on the cable glands, see page 5
2) RAL 5022
3) DIH50 LC display
4) Suitable seal/cable gland required

Connection head with digital display

Connection head 7/8000 W with LC display model DIH50
see data sheet AC 80.10

To operate the digital display, a transmitter with a 4 ... 20 mA output is always required.

Flame path fitting

A flame path fitting is built into the connection head which, in conjunction with the measuring insert, generates a flame-proof gap.

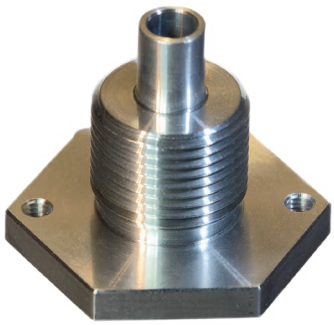


Fig. left: Flame path fitting for model 1/4000 connection head
Fig. right: Flame path fitting for 7/8000 and 7/8000 connection heads with DIH50

Cable entry

Ex d cable gland stainless steel

Plain threaded

Sealing plugs for transport

The figures show examples of threaded connections and connection heads.

Cable entry	Cable entry thread size
Ex d cable gland stainless steel	M20 x 1.5 or ½ NPT
Plain threaded	M20 x 1.5 or ½ NPT
Sealing plugs for shipping	M20 x 1.5 or ½ NPT

Cable entry	Colour	Ingress protection (max.)	Min./max. ambient temperature
Ex d cable gland stainless steel	Blank	IP66	-60 [1] / -40 ... +80 °C
Plain threaded	-	IP00	-
Sealing plugs for transport	Transparent	-	-40 ... +80 °C

1) Special version on request (only available with selected approvals), other temperatures on request

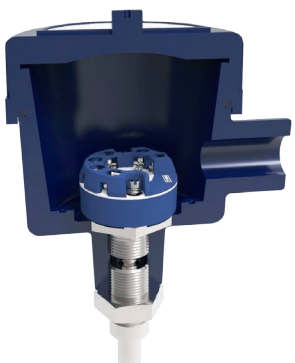
Ingress protection

to IP66 per IEC/EN 60529 under the following conditions:
- Use of a suitable cable gland
- Use of a cable cross-section appropriate for the gland or select the appropriate cable gland for the available cable
- Adhere to the tightening torques for all threaded connections

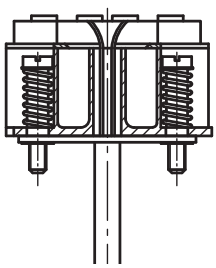
Transmitter

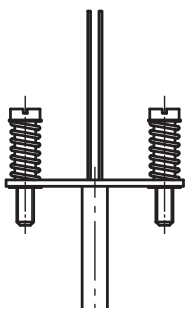
Mounting onto the measuring insert

With mounting on the measuring insert, the transmitter replaces the terminal block and is fixed directly to the terminal plate of the measuring insert.



Measuring insert with mounted transmitter (here: model T32)





Measuring insert prepared for transmitter mounting

Transmitter models

Output signal 4 ... 20 mA, HART® protocol, FOUNDATION™ Fieldbus and PROFIBUS® PA			
Transmitter (selectable versions)	**Model T16**	**Model T32**	**Model T53**
Data sheet	**TE 16.01**	**TE 32.04**	**TE 53.01**
Output			
■ 4 ... 20 mA	x	x	
■ HART® protocol		x	
■ FOUNDATION™ Fieldbus and PROFIBUS® PA			x
Input			
■ Thermocouples IEC 60584-1	K, J, E, N, T	K, J, E, N, T	K, J, E, N, T
Explosion protection	Optional	Optional	Standard

Possible mounting positions for transmitters

Connection head	T16	T32	T53
1/4000 F, 1/4000 S	○	○	○
7/8000 W, 7/8000 S	○	○	○
7/8000 W / DIH50, 7/8000 S / DIH50	○	○	-

○ Mounted instead of terminal block – Mounting not possible

The mounting of a transmitter on the measuring insert is possible with all the connection heads listed here. The fitting of a transmitter in the (screw) cap of a North American design connection head is not possible.
Mounting of 2 transmitters on request.
For a correct determination of the overall measuring deviation, the sensor and transmitter measuring deviations must be added.

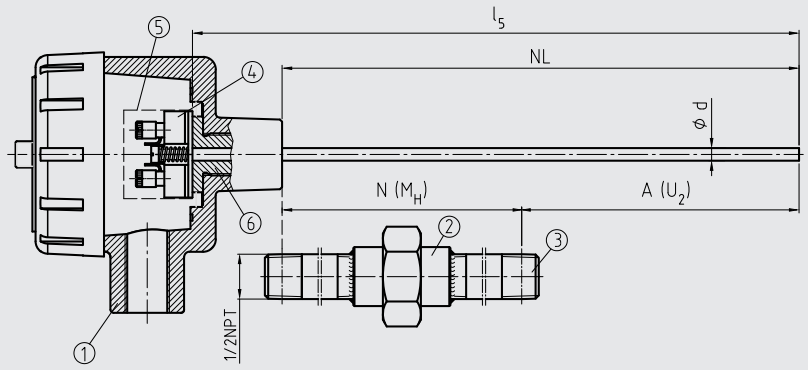
Functional safety (option)
with temperature transmitter model T32

In safety-critical applications, the entire measuring chain must be taken into consideration in terms of the safety parameters. The SIL classification allows the assessment of the risk reduction achieved by the safety installations.

Selected TC10-L thermocouples, in combination with a suitable temperature transmitter (e.g. model T32.1S, TÜV certified SIL version for protection systems developed in accordance with IEC 61508), are suitable as sensors for safety functions to SIL 2.

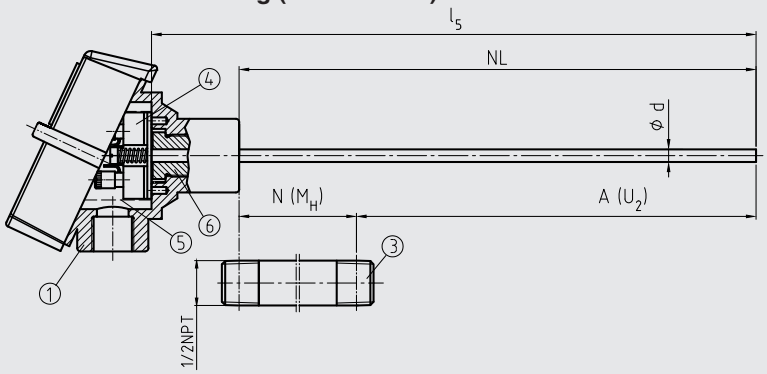
Components model TC10-L

“Nipple-union-nipple” neck tube

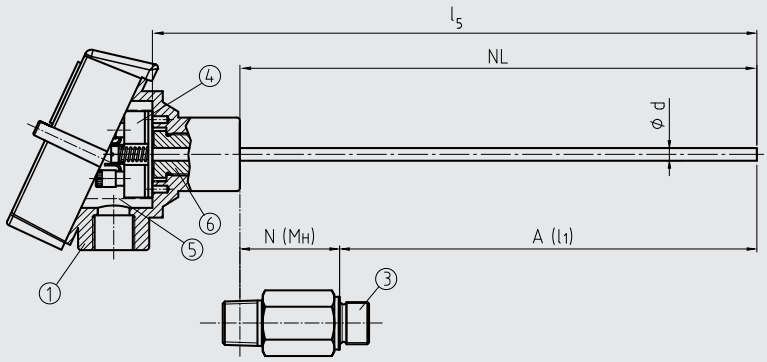


3112147.04

Double threaded hex bushing (tube section)



Double threaded hex bushing (with hexagonal spanner flats)



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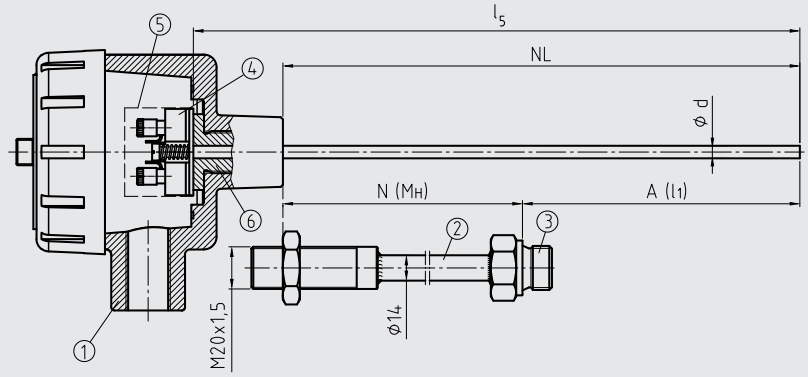
Neck tube with counter nut to head



Legend:

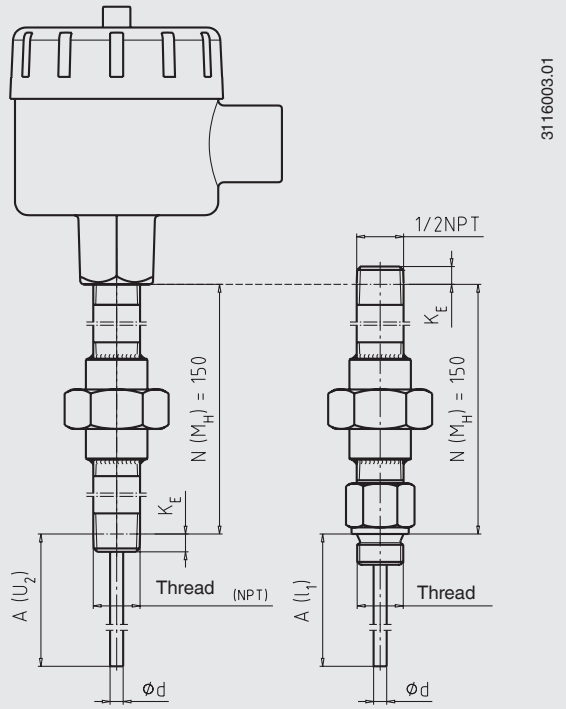
① Connection head
② Neck tube
③ Connection to thermowell
④ Measuring insert
⑤ Transmitter (option)
⑥ Flame path fitting

A (l_1)	Insertion length (with parallel threads)
A (U_2)	Insertion length (with tapered threads)
l_5	Measuring insert length
Ø d	Measuring insert diameter
NL	Nominal length
N (M_H)	Neck length

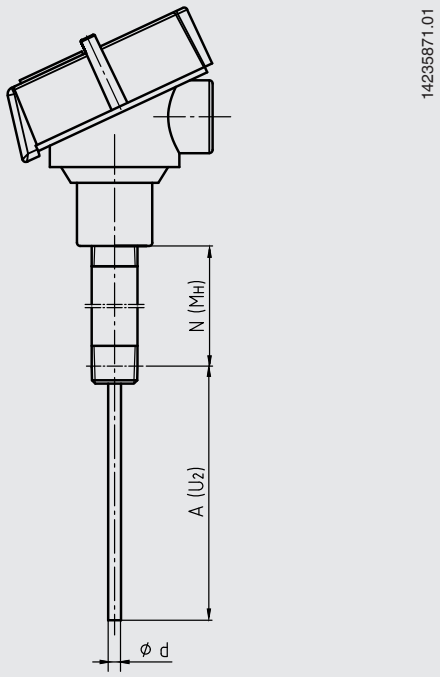
Neck tube

Neck tube designs

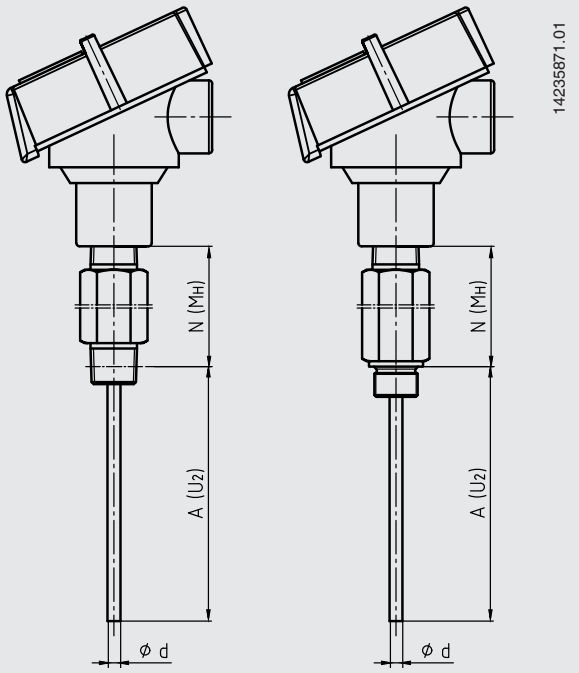
"Nipple-union-nipple" neck tube



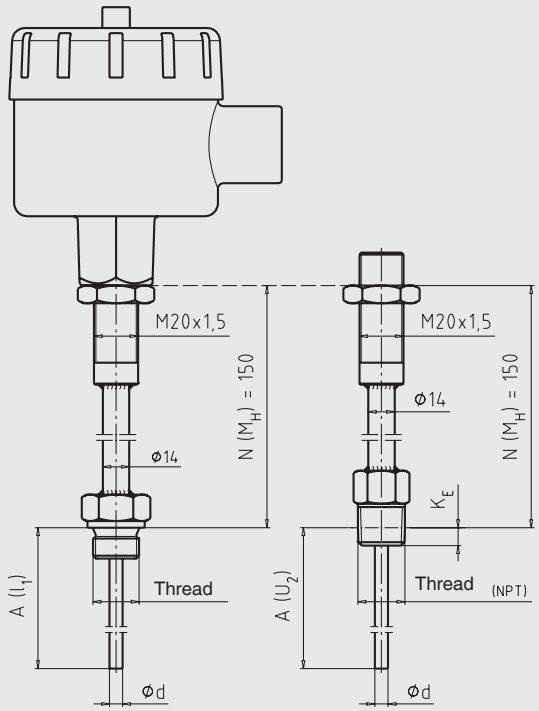
Double threaded hex bushing (tube section)



Double threaded hex bushing (with hexagonal spanner flats)



Neck tube with counter nut to head



Legend:

A (l_1)	Insertion length (with parallel threads)	Ø d	Measuring insert diameter
A (U_2)	Insertion length (with tapered threads)	K_E	Screw-in length by hand - with ½ NPT approx. 8.1 mm - with ¾ NPT approx. 8.6 mm
N (M_H)	Neck length		

Neck tube versions

Neck tube design	Diameter	Connection to head	Connection to thermowell	Material
“Nipple-union-nipple” neck tube	~ 22 mm	½ NPT	Mounting thread	316
	~ 27 mm	¾ NPT		
Double threaded hex bushing (tube section)	~ 22 mm	½ NPT	Mounting thread	316
	~ 27 mm	¾ NPT		
Double threaded hex bushing (with hexagonal spanner flats)	-	M24 x 1.5 / ½ NPT	Mounting thread	1.4571
Neck tube with counter nut to head	14 x 2.5 mm	M20 x 1.5 (with counter nut)	Mounting thread	1.4571

Thread sizes

Neck tube design	Diameter	Thread to the thermowell
“Nipple-union-nipple” neck tube	~ 22 mm	½ NPT
	~ 27 mm	¾ NPT
Double threaded hex bushing (tube section)	~ 22 mm	½ NPT
	~ 27 mm	¾ NPT
Double threaded hex bushing (with hexagonal spanner flats)	-	G ½ B
		G ¾ B
		G ¼ B
		½ NPT
		¾ NPT
		M14 x 1.5
		M18 x 1.5
		M20 x 1.5
Neck tube with counter nut to head	14 x 2.5 mm	½ NPT
		¾ NPT
		G ½ B
		G ¾ B
		G ¼ B
		M14 x 1.5
		M18 x 1.5
		M20 x 1.5

Neck lengths

Neck tube design	Neck length	Min. / Max. neck length
“Nipple-union-nipple” neck tube	150 mm (approx. 6 inch)	75 mm (approx. 3 inch) / 250 mm (approx. 10 inch)
Double threaded hex bushing (tube section)	50 mm (approx. 2 inch)	50 mm (approx. 2 inch) / 250 mm (approx. 10 inch)
Double threaded hex bushing (with hexagonal spanner flats)	25 mm	
Neck tube with counter nut to head	150 mm (approx. 6 inch)	75 mm (approx. 3 inch) / 250 mm (approx. 10 inch)

The neck tube is screwed into the connection head. The neck length depends on the intended use. Usually an isolation is bridged by the neck tube. Also, in many cases, the neck tube serves as a cooling extension between the connection head and the medium, in order to protect a possible built-in transmitter from high medium temperatures.

Other versions on request

Measuring insert

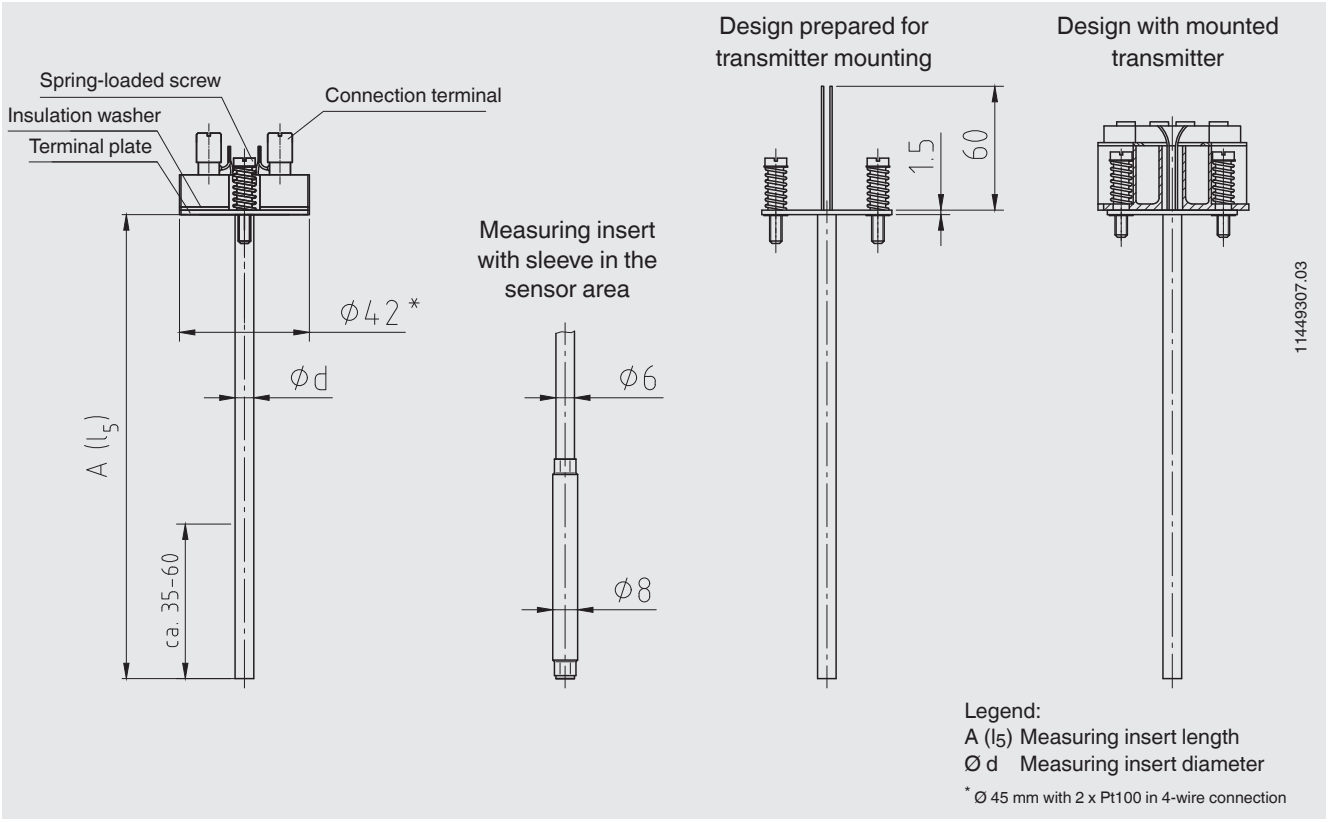
Within the TC10-L, the measuring insert of model TC10-K is fitted.
The replaceable measuring insert is made of a vibration-resistant, sheathed measuring cable (MI cable).

Pay special attention to the assembly/disassembly of the measuring insert. The surface of the sheathed cable of the measuring insert must not be damaged! (No creases, grooves, scratches etc.). Any damaged measuring insert must be replaced. It is advisable to renew the corresponding flame path fitting in this case.

Attention:
Only correct measuring insert length and correct measuring insert diameter ensure sufficient heat transfer from thermowell to the measuring insert. The bore diameter of the thermowell should be a max. 1 mm larger than the measuring insert diameter. Gaps of more than 0.5 mm between thermowell and the measuring insert will have a negative effect on the heat transfer, and they will result in unfavourable response behaviour of the thermometer.

When fitting the measuring insert into a thermowell, it is very important to determine the correct insertion length (= thermowell length for bottom thicknesses of ≤ 5.5 mm). In order to ensure that the measuring insert is firmly pressed down onto the bottom of the thermowell, the measuring insert must be spring-loaded (spring travel: max. 10 mm).

Dimensions in mm



Measuring insert diameter Ø d in mm	Sheath material
3 [1)]	1.4571, 316L [1)]
6	1.4571, 316L [1)]
8 (6 mm with sleeve)	1.4571

1) Not possible with 2 x 4-wire versions

Thermowell selection

TW10

Data sheets:
TW 95.10
TW 95.11
TW 95.12

TW15

Data sheet:
TW 95.15

TW20

Data sheet:
TW 95.20

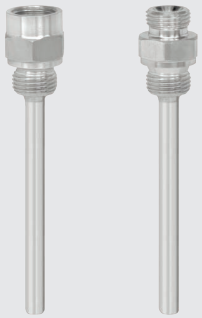
TW25

Data sheet:
TW 95.25

TW30

Data sheet:
TW 95.30

TW45



Data sheet:
TW 95.45

TW50

Data sheet:
TW 95.50

TW55

Data sheet:
TW 95.55

Special thermowells on request

Operating conditions

Mechanical requirements

Version	
Standard	6 g peak-to-peak, wire-wound measuring resistor or thin film
Option	Vibration-resistant probe tip, max. 20 g peak-to-peak, thin-film measuring resistor
	Highly vibration-resistant probe tip, max. 50 g peak-to-peak, thin-film measuring resistor

The information on vibration resistance refers to the tip of the measuring insert.

For detailed specifications on the vibration resistance of Pt100 sensors, see Technical information IN 00.17 at www.wika.com.

Ambient and storage temperature

-60 [1] / -40 ... +80 °C

1) Special version on request (only available with specific approvals)

Other ambient and storage temperatures on request

Certificates

Certification type	Measurement accuracy	Material certificate [2]
2.2 test report	x	x
3.1 inspection certificate	x	x
DKD/DAkkS calibration certificate	x	-

The different certifications can be combined with each other.

2) Thermowells have their own material certificates

Ordering information

Model / Explosion protection / Process connection / Version and material of threaded connection / Thread size / Measuring element / Connection method / Temperature range / Probe diameter / Insertion length A / Neck length N(M_H) / Certificates / Options