Threaded Thermocouples
Model TC10-D, Miniature Design

Applications

- Machine building, plant and tank construction
- Power transmission engineering
- Air-conditioning and refrigeration systems

Special Features

- Application ranges from -200 °C to +600 °C
- Compact design
- Universal application
- Direct installation in the process
- Explosion-protected versions Ex-i, Ex-n and NAMUR NE24

Threaded Thermocouple, Miniature Design
Model TC10-D

Description

This series of thermocouples is designed for the measurement of liquid or gaseous media at low and medium pressures.

The thermocouple is screwed directly into the process and the terminals in the connection head are used for electrical connection (protected against water splashes). For the measuring inserts, they are available in two variants, depending upon the application. The choice is between a replaceable, spring-loaded miniature measuring insert and a non-replaceable design.

Insertion length, process connection and sensor can be selected for the respective application from the order information sheet.

Intrinsically safe designs are available for applications in hazardous areas.
The models of the TC10-D series are provided with a type examination certificate for "intrinsically safe" protection in accordance with Directive 94/9/EC (ATEX) for gases and dust. Manufacturer's Declarations in accordance with NAMUR NE24 are also available.

Data Sheets showing similar devices:
Resistance Thermometers for Additional Thermowell; Model TR10-B; see data sheet TE 60.02
Cable Thermocouples; Model TC40; see data sheet TE 65.40

Sensor

Sensor type

Type	Recommended max. operating temperature
K (NiCr-Ni)	1200 °C
J (Fe-CuNi)	800 °C
E (NiCr-CuNi)	800 °C
T (Cu-CuNi)	400 °C
N (NiCrSi-NiSi)	1200 °C

In the case of type K there is a risk of blue mould between 850 °C and 950 °C . We recommend the use of a sensor type N, if the working temperature fluctuates continuously in this range.

The application range of these thermometers is limited by the permissible max. temperature of the thermocouple as well as the max. temperature of the thermowell material.

Listed sensor types are available both as simplex or duplex thermocouples.
The measuring point (hot junction) of the probe is supplied as ungrounded unless specified otherwise.

Sensor limiting error

A cold junction temperature of 0 °C is taken as basis with the definition of the sensor limiting error of thermocouples.

Type K

Class	Temperature range	Limiting error
DIN EN 60 584 part 2		
1	-40 °C ... +375 °C	± 1.5 °C
1	+375 °C ... +1000 °C	± 0.0040 · | t | [1]
2	-40 °C ... +333 °C	± 2.5 °C
2	+333 °C ... +1200 °C	± 0.0075 · | t | [1]
ISA (ANSI) MC96.1-1982		
Standard	0 °C ... +1250 °C	± 2.2 °C or [2] ± 0.75 %
Special	0 °C ... +1250 °C	± 1.1 °C or [2] ± 0.4 %

Type J

Class	Temperature range	Limiting error
DIN EN 60 584 part 2		
1	-40 °C ... +375 °C	± 1.5 °C
1	+375 °C ... +750 °C	± 0.0040 · | t | [1]
2	-40 °C ... +333 °C	± 2.5 °C
2	+333 °C ... +750 °C	± 0.0075 · | t | [1]
ISA (ANSI) MC96.1-1982		
Standard	0 °C ... +750 °C	± 2.2 °C or [2] ± 0.75 %
Special	0 °C ... +750 °C	± 1.1 °C or [2] ± 0.4 %

Type E

Class	Temperature range	Limiting error
DIN EN 60 584 part 2		
1	-40 °C ... +375 °C	± 1.5 °C
1	+375 °C ... +800 °C	± 0.0040 · | t | [1]
2	-40 °C ... +333 °C	± 2.5 °C
2	+333 °C ... +900 °C	± 0.0075 · | t | [1]

Type T

Class	Temperature range	Limiting error
DIN EN 60 584 part 2		
1	-40 °C ... +125 °C	± 0.5 °C
1	+125 °C ... +350 °C	± 0.0040 · | t | [1]
2	-40 °C ... +133 °C	± 1.0 °C
2	+133 °C ... +350 °C	± 0.0075 · | t | [1]

Type N

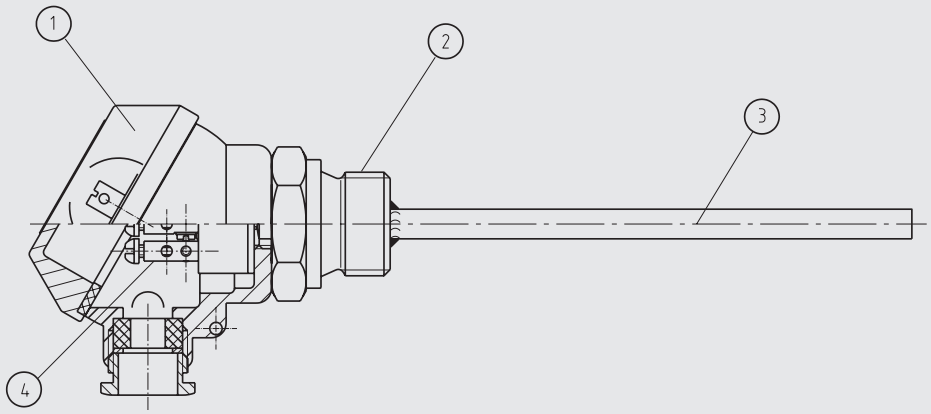
Class	Temperature range	Limiting error
DIN EN 60 584 part 2		
1	-40 °C ... +375 °C	± 1.5 °C
1	+375 °C ...+1000 °C	± 0.0040 · | t | [1]
2	-40 °C ... +333 °C	± 2.5 °C
2	+333 °C ...+1200 °C	± 0.0075 · | t | [1]

1) | t | is the value of the temperature in °C without consideration of the sign
2) Whichever is larger.

Limiting error with selected temperatures in °C for thermocouples type K and type J

Temperature (ITS 90) °C	Limiting error DIN EN 60 751 Class 1 °C	Class 2 °C
0	± 1.5	± 2.5
100	± 1.5	± 2.5
200	± 1.5	± 2.5
300	± 1.5	± 2.5
400	± 1.6	± 3
500	± 2	± 3.75
600	± 2.4	± 4.5

TC10-D components



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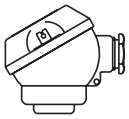
Legend:

① Connection head
② Process connection
③ Thermowell
④ Terminal block

Connection head



JS

Model	Material	Cable entry	Ingress protection	Cap	Surface finish
JS	Aluminium	M16 x 1.5 [1]	IP 54	Cap with 2 screws	blue, painted [2]

1) Standard
2) RAL5022, polyester paint saltwater-proof

Transmitter (option)

In the model JS connection head a model T91.20 analogue temperature transmitter can be factory-fitted. It is fitted in place of the terminal block.

The variant with temperature transmitter is not suitable for use in hazardous areas.

For further technical data on the model T91.20 temperature transmitter, please refer to WIKA data sheet TE 91.01.

Measuring insert

Removable design
The measuring insert can be mounted, replaceable and spring-loaded into the thermowell, in a connection head (Form J), using two screws and springs.

Fixed design
The measuring insert is manufactured, as a tube assembly in a thermowell, as a unit, and thus cannot be replaced. With this design, the temperature is limited to a max. of 250 °C.

Thermowell

■ Material: Stainless steel

Thermowell Ø in mm	Insertion length U_1 in mm						
	50	75	100	150	160	250	400
6	x	x	x	x	x	x	x
8	-	-	x	x	x	x	x

Permissible temperature

- Application ranges (sensor): -50 °C ... +450 °C
- At the head: -40 °C ... +125 °C
- At the transmitter (optional): -40 °C ... +85 °C
- Storage: -40 °C ... +60 °C

Process connection

All process connections are manufactured in stainless steel. Other materials are available on request.

The insertion length A (U_1 or U_2) can be specified to customer-specific requirements.

The neck length N (M_H) depends on the type of process connection specified.

Extended process connection

Connection heads, connecting lines/wires and the optional transmitter must only be used within the above-mentioned temperature ranges.

If the thermometer will operate at a temperature outside of the temperature limits, clearance between the connection head and hot or cold surfaces must be increased.

This neck length is dependent upon the intended application and generally serves as isolation or as a cooling element between the process and the connection head.

Permanent connection

The connection is permanently fixed to the thermowell..
The standard neck length is N (M_H) = 55 mm

Compression fitting

The compression fitting enables the simple, in-situ adjustment to the required insertion length.

The self-extending nature of the compression fitting results in the smallest possible neck length, N, of around 55 mm.

Since the compression fitting is adjustable on the thermowell, the size of the insertion length, A, and the neck length, N, are stated as the values for the delivered item.

- Sealing ring material: Stainless-steel or Teflon®

Sealing rings from stainless-steel are only adjustable once, once the fitting has been loosened it can no longer be tightened to the thermowell.

Sealing rings from Teflon® can be adjusted numerous times, once the fitting has been loosened it can again be tightened to the thermowell.

- Max. temperature at the process connection 150 °C

Double nipple

Via a two-sided threaded nipple, the thermometer can be screwed directly into the process. Fo this way, the permitted temperature ranges must be followed.

As a result of the parallel threads the neck length, N (M_H), is the height of the hex nut. This is 10 mm.

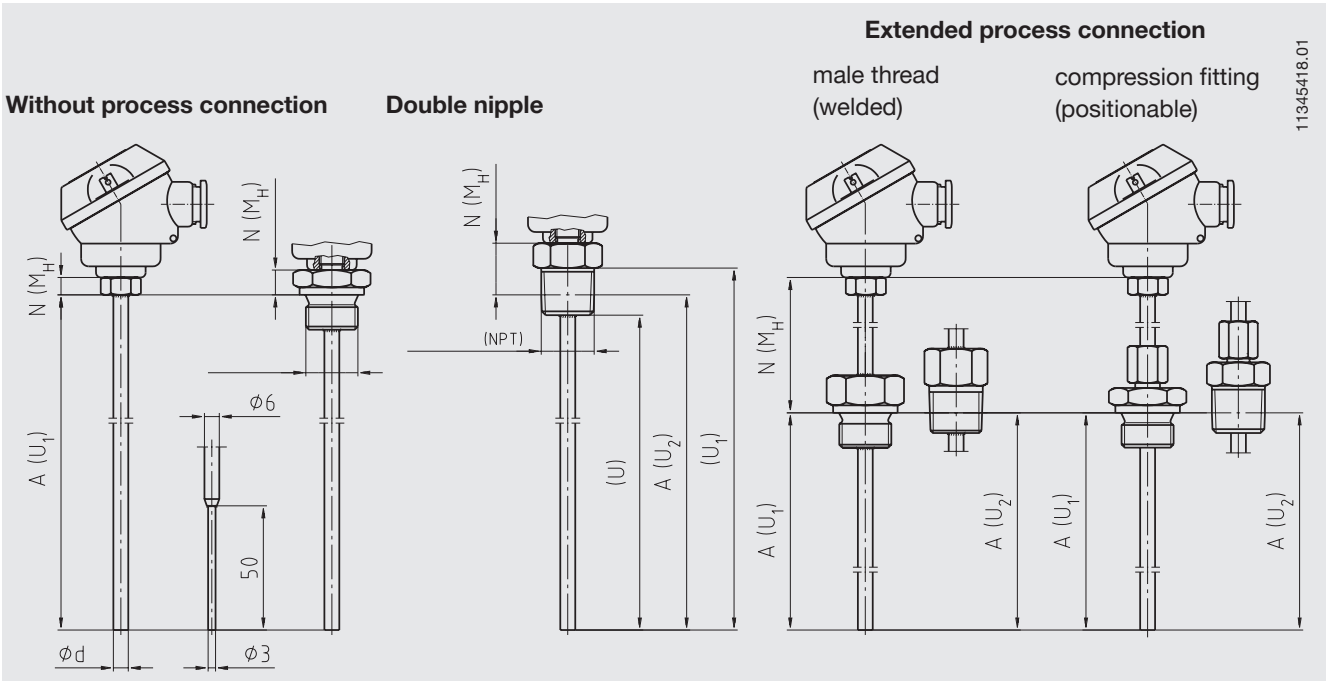
For NPT threads, the length, N, includes half of the thread length, as well as the hex nut height. Thus the neck length, N (M_H), is around 19 mm.

Without process connection

This design is intended primarily for assembly in an already-existing compression fitting.

The neck length, N, here is only the height of the hex nut at the top of the thermowell.
N (M_H) is always 7mm.

Dimensions in mm



Legend:

A (U_1)	Insertion length (with parallel threads)	N (M_H)	Neck length
A (U_2)	Insertion length (with conical threads)	(U)	Insertion length per DIN 43 772
		(U_1)	Insertion length per international standards
		Ø d	Measuring insert Ø

Explosion protection (option)

Thermocouples of the TC10-D series are available with a type examination certificate for ”intrinsically safe“ ignition protection (TÜV 02 ATEX 1793 X).
These thermometers comply with the requirements of directive 94/9/EC (ATEX), EEx-i, for gases and dust. Manufacturer’s Declarations in accordance with NAMUR NE24 are also available.

The classification / suitability of the instrument (permissible power P_{max} , minimum neck length and permissible ambient temperature) for the respective category can be seen on the type examination certificate and in the operating instructions.

Expolsion protection for model TC10-D with connection head model JS		
	Zone	**Supply circuit**
Gases	0	ia
	1	ib
	2	ib
Dusts	20	-
	21	-
	22	-

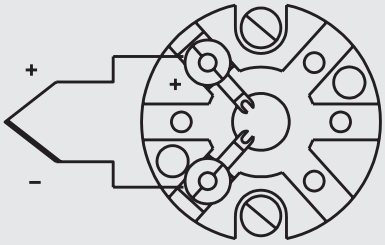
Instrument designs with non-adjustable measuring inserts are not suitable for use in Zone 0.

The minimum neck length is defined as the distance between the lower edge of the connection head and the heat-radiating surface and is to be selected according to the table ”instrument classification” of the type examination certificate / operating instructions.

Built-in transmitters have their own approval.
The permissible ambient temperature ranges of the built-in transmitters can be taken from the corresponding transmitter approval.

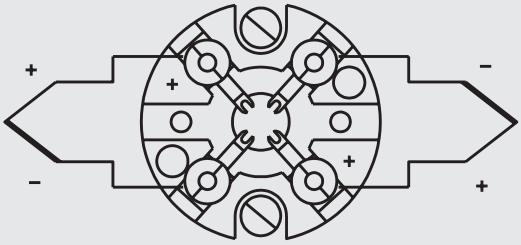
Electrical connection

Simplex thermocouple



The colour coding at the plus pole of the device is always deciding the correlation of polarity and connection terminal.

Duplex thermocouple



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