High-pressure thermocouple
Model TC90

For further approvals,
see page 12

Applications

- Plastics manufacturing industry (LDPE/EVA)
- Hydrogen Refuelling Stations (HRS)
- Test benches for hydrogen systems
- Other compressed gases

Special features

- Various process connections, metal-to-metal sealing
- Short response times
- High pressure containment without thermowell/protection tube
- Robust, vibration-resistant design
- Compact design with short insertion lengths for small nominal pipe widths

High-pressure thermocouple, model TC90
Various process connections

Description

This high-pressure thermocouple is used for temperature measurement in industrial applications. The thermocouple is suitable for the highest process requirements and enables reliable temperature measurement, for example, in plastics production and processing.

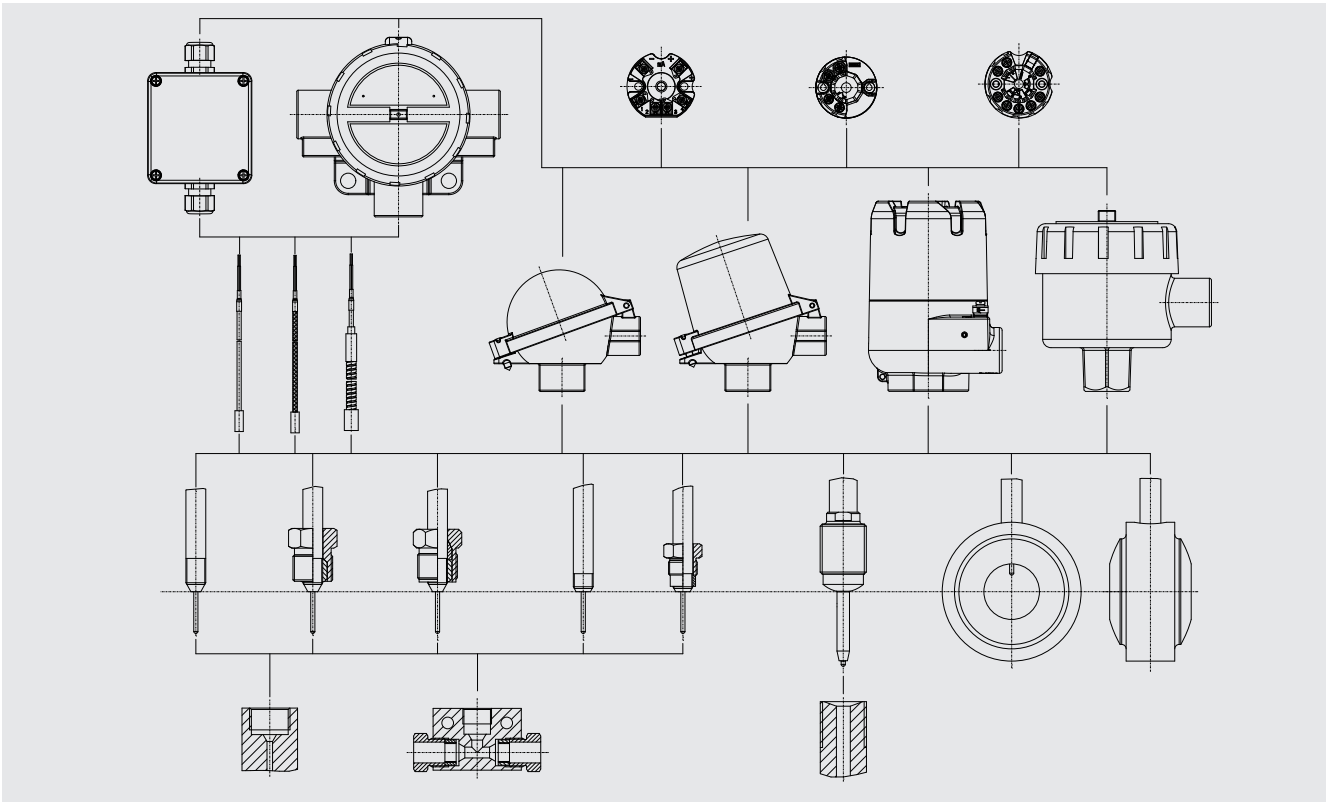
Each TC90 is designed and manufactured in accordance with individual customer specifications. These instruments are produced using special manufacturing processes and, in order to ensure their quality, special test arrangements and material tests are applied.

This measuring assembly is sealed by means of metal-to-metal sealing, high-pressure threaded connectors or lens-type sealing rings, which have both proven successful over many years.

Specifications

Overview of versions					
Version		**Description**	**Process connection**	**Pressure range**	**Application**
TC90-xxxx-A	Sealing contour and thread	Without pressure ring and male nut	Sealing bolt 58°	High pressure (max. 4,500 bar [65,266 psi])	LDPE/EVA
		With pressure ring and male nut			
		With anti-vibration gland			
TC90-xxxx-B	Pressure flange	Sealing bolt with radius and threads for flange	To customer specification		
TC90-xxxx-C	Lens-type sealing ring or sealing cone	Lens-type sealing ring / sealing cone			
TC90-xxxx-H	Sealing cone and thread	Without pressure ring and male nut	Sealing bolt 58°	Medium pressure (max. 1,550 bar [21,755 psi])	H2
		With pressure ring and male nut			
TC90-xxxx-S	Sealing cone and thread	Without pressure ring and male nut			Hydraulics
		With pressure ring and male nut			

Overview of variants



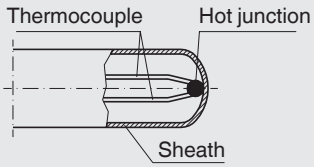
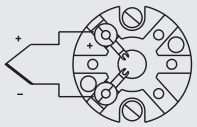
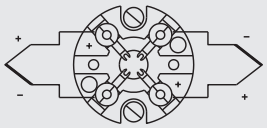
Overview of approvals for explosion protection

Approval	Explosion protection				
	Ex i (gas) Zone 0, 1, 2	Ex i (dust) Zone 20, 21, 22	Ex e (gas) Zone 1, 2	Ex t (dust) Zone 21, 22	Ex NI (gas) Zone 2
ATEX	x	x	x	x	-
IECEx	x	x	x	x	-
EAC Ex	x	x	x	-	-
Ex Ukraine	x	x	-	-	-
INMETRO	x	x	-	-	-
CCC	x	x	x	-	-
KCs	x	-	-	-	-
PESO	x	-	-	-	-
NEPSI	x	x	-	-	-
CSA	-	-	-	-	x
ECASEx	-	-	x	x	-

→ For detailed specifications, see “Approvals” on page 14

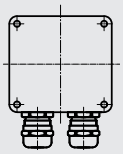
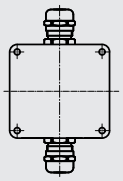
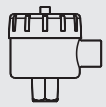
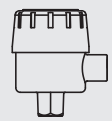
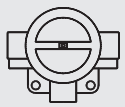
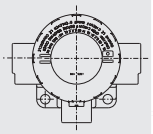
Basic information	
Material	
Sealing bolt / Lens-type sealing ring	■ Stainless steel 1.4545 ■ Stainless steel 1.4571 ■ Stainless steel 2.4816 ■ Stainless steel 316/316L ■ 15-5 PH
	→ Further materials on request
Male nut	■ Stainless steel 1.4545 ■ Stainless steel 1.4542 ■ Stainless steel 1.4404 ■ Stainless steel 1.4401 ■ Stainless steel 316/316L
	→ Further materials on request
Support tube	■ Stainless steel 1.4571 ■ Alloy 600 ■ Stainless steel 316L
	→ Further materials on request
Probe material	■ Alloy 600 ■ Stainless steel 316L ■ Stainless steel 1.4571
	→ Further materials on request

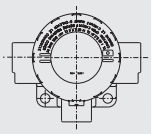
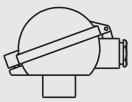
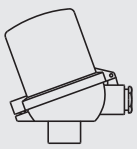
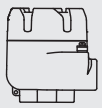
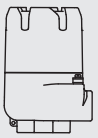
→ For customer-specific quotations, information on the type and temperature of the medium and the temperature at the process connection is required.

Measuring element		
Type of measuring element	Thermocouple per IEC 60584-1 or ASTM E230 Types K, J, E, T, N	
Probe diameter in mm [in]	■ 2.0 [0.08] ■ 2.5 [0.10] ■ 3.0 [0.12] ■ 3.17 [0.12] ■ 4.5 [0.18]	
	→ Further diameters on request	
Probe tip design (hot junction)	Grounded (hot junction not isolated, welded to the bottom) 	
Marking of the polarity	The colour code at the positive poles of the instrument decides the correlation of polarity and terminal	
Single thermocouple		
Dual thermocouple		
Validity limits of the class accuracy in accordance with IEC 60584-1		
Type K	Class 2	-40 ... +1,200 °C [-40 ... +2,192 °F]
	Class 1	-40 ... +1,000 °C [-40 ... +1,832 °F]
Type J	Class 2	-40 ... +750 °C [-40 ... +1,382 °F]
	Class 1	-40 ... +750 °C [-40 ... +1,382 °F]
Type E	Class 2	-40 ... +900 °C [-40 ... +1,652 °F]
	Class 1	-40 ... +800 °C [-40 ... +1,472 °F]
Type T	Class 2	-40 ... +350 °C [-40 ... +662 °F]
	Class 1	-40 ... +350 °C [-40 ... +662 °F]
Type N	Class 2	-40 ... +1,200 °C [-40 ... +2,192 °F]
	Class 1	-40 ... +1,000 °C [-40 ... +1,832 °F]
Validity limits of the class accuracy in accordance with ASTM E230		
Type K	Standard/Special	0 ... 1,260 °C [32 ... 2,300 °F]
Type J	Standard/Special	0 ... 760 °C [32 ... 1,400 °F]
Type E	Standard/Special	0 ... 870 °C [32 ... 1,598 °F]
Type T	Standard/Special	0 ... 370 °C [32 ... 698 °F]
Type N	Standard/Special	0 ... 1,260 °C [32 ... 2,300 °F]

Sensors

Although the thermocouple types used (K, J, E, T, N) have a much higher temperature range, the maximum temperature of use for high-pressure measurements is limited through the process to 350 °C [662 °F]. For all characteristic values of the thermocouples, see technical information IN 00.23.

International connection heads and cases								
Model		**Material**	**Thread size of cable inlet**	**Ingress protection (max.) [1] IEC/EN 60529**	**Cap**	**Surface**	**Connection to neck tube**	**Dimensions in mm [in]**
	Field case	Plastic (ABS)	■ M12 x 1.5 ■ ½ NPT ■ M16 x 1.5	IP65	Flat cover with 4 plug screws	Grey	-	82 x 80 x 55 [3.2 x 3.1 x 2.2] (L x W x H)
	Field case	Aluminium	■ M12 x 1.5 ■ ½ NPT ■ M16 x 1.5	IP65	Flat cover with 4 plug screws	Unpainted	-	80 x 75 x 57 [3.1 x 2.9 x 2.3] (L x W x H)
	Field case	Plastic (ABS)	■ M12 x 1.5 ■ ½ NPT ■ M16 x 1.5	IP65	Flat cover with 4 plug screws	Grey	-	82 x 80 x 55 [3.2 x 3.1 x 2.2] (L x W x H)
	Field case	Aluminium	■ M12 x 1.5 ■ ½ NPT ■ M16 x 1.5	IP65	Flat cover with 4 plug screws	Unpainted	-	80 x 75 x 57 [3.1 x 2.9 x 2.3] (L x W x H)
	1/4000	Aluminium	■ M20 x 1.5 ■ ½ NPT ■ ¾ NPT	IP66	Screw-on lid	Blue, painted [2]	½ NPT	-
	1/4000	Stainless steel	■ M20 x 1.5 ■ ½ NPT ■ ¾ NPT	IP66	Screw-on lid	Unpainted	½ NPT	-
	7/8000	Aluminium	■ M20 x 1.5 ■ ½ NPT ■ ¾ NPT	IP66	Screw-on lid	Blue, painted [1]	½ NPT	-
	7/8000	Stainless steel	■ M20 x 1.5 ■ ½ NPT ■ ¾ NPT	IP66	Screw-on lid	Unpainted	½ NPT	-
	7/8000	Aluminium	■ M20 x 1.5 ■ ½ NPT ■ ¾ NPT	IP66	Screw-on lid, with DIH50-B digital temperature display	Blue, painted [2]	½ NPT	-
	7/8000	Stainless steel	■ M20 x 1.5 ■ ½ NPT ■ ¾ NPT	IP66	Screw-on lid, with DIH50-B digital temperature display	Unpainted	½ NPT	-
	5/6000	Aluminium	■ 2 x M20 x 1.5 ■ 2 x ½ NPT ■ 2 x ¾ NPT	IP66	Screw-on lid	Blue, painted [2]	-	-
	5/6000	Stainless steel	■ 2 x M20 x 1.5 ■ 2 x ½ NPT ■ 2 x ¾ NPT	IP66	Screw-on lid	Unpainted	-	-
	5/6000	Aluminium	■ 2 x M20 x 1.5 ■ 2 x ½ NPT ■ 2 x ¾ NPT	IP66	Screw-on lid, with DIH50-B digital temperature display	Blue, painted [2]	-	-
	5/6000	Stainless steel	■ 2 x M20 x 1.5 ■ 2 x ½ NPT ■ 2 x ¾ NPT	IP66	Screw-on lid, with DIH50-B digital temperature display	Unpainted	-	-

International connection heads and cases								
Model		**Material**	**Thread size of cable inlet**	**Ingress protection (max.) [1] IEC/EN 60529**	**Cap**	**Surface**	**Connection to neck tube**	**Dimensions in mm [in]**
	TIF50 field transmitter [3]	Aluminium	■ 2 x M20 x 1.5 ■ 2 x ½ NPT ■ 2 x ¾ NPT	IP66	-	-	-	-
	TIF50 field transmitter [2]	Stainless steel	■ 2 x M20 x 1.5 ■ 2 x ½ NPT ■ 2 x ¾ NPT	IP66	-	-	-	-
	TIF52 field transmitter [2]	Aluminium	■ 2 x M20 x 1.5 ■ 2 x ½ NPT ■ 2 x ¾ NPT	IP66	-	-	-	-
	TIF52 field transmitter [2]	Stainless steel	■ 2 x M20 x 1.5 ■ 2 x ½ NPT ■ 2 x ¾ NPT	IP66	-	-	-	-
	KN4-A [2]	Aluminium	■ M20 x 1.5 ■ ½ NPT ■ ¾ NPT	IP65	Screw-on lid	Blue, painted [2]	■ ½ NPT ■ M24 x 1.5	-
	KN4-P [2]	Polypropylene	■ M20 x 1.5 ■ ½ NPT ■ ¾ NPT	IP65	Screw-on lid	White	½ NPT	-
	BSZ [4]	Aluminium	■ M20 x 1.5 ■ ½ NPT	IP65	Spherical, hinged cover with plug screw	Blue, painted [1]	■ ½ NPT ■ M24 x 1.5	-
	BSZ-H [3] [5]	Aluminium	■ M20 x 1.5 ■ ½ NPT	IP65	High hinged cover with plug screw	Blue, painted [2]	■ ½ NPT ■ M24 x 1.5	-
	PIH-L	Aluminium	■ ½ NPT / closed ■ M20 x 1.5 / closed ■ 2 x ½ NPT ■ 2 x M20 x 1.5	IP66 [3]	Screw-on lid, flat	Blue lid, painted Grey lower body, painted	■ ½ NPT ■ M20 x 1.5	-
	PIH-H [6]	Aluminium	■ ½ NPT ■ M20 x 1.5 ■ 2 x ½ NPT ■ 2 x M20 x 1.5	IP66 [3]	Screw-on lid, high	Blue lid, painted Grey lower body, painted	■ ½ NPT ■ M20 x 1.5	-

1) IP ingress protection of the connection head The IP ingress protection of the complete TC90 instrument does not necessarily have to correspond to that of the connection head. Ingress protections describing temporary or permanent immersion, on request
2) RAL 5022
3) Not permissible with Ex e
4) Not permissible with IECEx Ex e
5) With DIH10 or TND display, on request
6) With display as PIH-W version, on request

→ Further thread sizes on request

Connection head	Explosion protection				
	Without	Ex i (gas) Zone 0, 1, 2	Ex i (dust) Zone 20, 21, 22	Ex e (gas) Zone 1, 2	Ex t (dust) Zone 21, 22
Field case, plastic (ABS)	x	-	-	-	-
Field case, aluminium	x	x	x	x	x
BS	x	x	x	-	-
BSZ	x	x	x	x [2)]	x [2)]
BSZ-H	x	x	x	x [2)]	x [2)]
BSZ-H / DIH10 [1) 2)]	x	x	-	-	-
BSZ-H/TND [3)]	x	x	x	-	-
BSS	x	x	-	-	-
BSS-H	x	x	-	-	-
BVS	x	x	-	-	-
BSZ-K	x	x	-	-	-
BSZ-HK	x	x	-	-	-
PIH-L / PIH-H	x	x	x	x	x
PIH-W/TND [3)]	x	x	x	x	x

1) LED display, loop-powered indicator, a transmitter with 4 ... 20 mA interface is required for operation (e.g. WIKA T16)
2) Only ATEX
3) For operation of an LC display, a model T38 transmitter is required

Transmitter models	Model T16	Model T38
Transmitter data sheet	TE 16.01	TE 38.01
Figure		
Output		
4 ... 20 mA	x	x
HART® protocol	-	x
Input	■ Type K ■ Type J ■ Type E ■ Type N ■ Type T	■ Type K ■ Type J ■ Type E ■ Type N ■ Type T
Explosion protection	Ex version possible	

Possible mounting position for transmitter	Model T16	Model T38
BS	○	-
BSZ	○	○
BSZ-H	●	●
BSZ-H / DIH10	○	○
BSZ-H / TND	-	●
BSS	○	○
BSS-H	●	●
BVS	○	○
BSZ-K	○	○
BSZ-HK	●	●
KN4-A	○	○
1/4000	○	○
7/8000	○	○
7/8000 / DIH50	○	○
PIH-L / PIH-H	○	○
PIH-W	-	○

Legend:
○ Mounted instead of terminal block
● Mounted within the cover of the connection head
- Mounting not possible

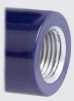
Functional safety version possible with model T38 temperature transmitter

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 devices.

Selected TC90 thermocouples, in conjunction with a suitable temperature transmitter (e.g. model T38, TÜV-certified SIL version for protection systems developed in accordance with IEC 61508), are suitable as sensors for safety functions to SIL 2.

For SIL 3 applications, WIKA recommends the use of two individual TC90 with one SIL-certified T38 transmitter connected to each.

→ Functional safety: safety-relevant temperature measurement per IEC 61508 available at www.wika.de.

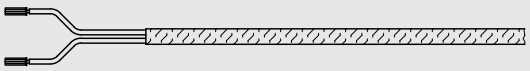
Cable inlet		Colour	Ingress protection (max.) IEC/EN 60529 [1]	Thread size of cable inlet	Min./Max. ambient temperature
	Standard cable inlet [2]	Unpainted	IP65	■ M20 x 1.5 ■ ½ NPT	-40 ... +80 °C [-40 ... +176 °F]
	Plastic cable gland (cable Ø 6 ... 10 mm) [2]	■ Black ■ Grey	IP66 [1]	■ M20 x 1.5 ■ ½ NPT	-40 ... +80 °C [-40 ... +176 °F]
	Plastic cable gland (cable Ø 6 ... 10 mm), Ex e [2]	■ Light blue ■ Black	IP66 [1]	■ M20 x 1.5 ■ ½ NPT	■ -20 ... +80 °C [-4 ... +176 °F] ■ -40 ... +70 °C [-40 ... +158 °F]
	Nickel-plated brass cable gland (cable Ø 6 ... 12 mm)	Unpainted	IP66 [1]	■ M20 x 1.5 ■ ½ NPT	-60 [3] / -40 ... +80 °C [-76 / -40 ... +176 °F]
	Nickel-plated brass cable gland (cable Ø 6 ... 12 mm), Ex e	Unpainted	IP66 [1]	■ M20 x 1.5 ■ ½ NPT	-60 [3] / -40 ... +80 °C [-76 / -40 ... +176 °F]
	Stainless steel cable gland (cable Ø 7 ... 12 mm)	Unpainted	IP66 [1]	■ M20 x 1.5 ■ ½ NPT	-60 [3] / -40 ... +80 °C [-76 / -40 ... +176 °F]
	Stainless steel cable gland (cable Ø 7 ... 12 mm), Ex e	Unpainted	IP66 [1]	■ M20 x 1.5 ■ ½ NPT	-60 [3] / -40 ... +80 °C [-76 / -40 ... +176 °F]
	Plain threaded	-	IP00	■ M20 x 1.5 ■ ½ NPT	-
	2 x plain threaded [4]	-	IP00	■ 2 x M20 x 1.5 ■ 2 x ½ NPT	-
	Sealing plugs for shipping	Transparent	-	■ M20 x 1.5 ■ ½ NPT	-40 ... +80 °C [-40 ... +176 °F]

1) IP ingress protection of the connection head The IP ingress protection of the complete TC90 instrument does not necessarily have to correspond to that of the connection head. Ingress protections describing temporary or permanent immersion, on request
2) Not available for field cases, PIH, 1/4000, 5/6000, 7/8000
3) Special version on request (explosion-protected versions only available with specific approvals)
4) Only for BSZ-H connection head

Cable inlet	Explosion protection				
	Without	Ex i (gas) Zone 0, 1, 2	Ex i (dust) Zone 20, 21, 22	Ex e (gas) Zone 1, 2	Ex t (dust) Zone 21, 22
Standard cable inlet [1]	x	x	-	-	-
Plastic cable gland [1]	x	x	-	-	-
Plastic cable gland (light blue), Ex e [1]	x	x	x	-	-
Plastic cable gland (black), Ex e [1]	x	x	x	x	x
Brass cable gland, nickel-plated	x	x	x	-	-
Brass cable gland, nickel-plated, Ex e	x	x	x	x	x
Stainless steel cable gland	x	x	x	-	-
Stainless steel cable gland, Ex e	x	x	x	x	x
Plain threaded	x	x [5]	x [5]	x [5]	x [5]
2 x plain threaded [2]	x	x [5]	x [5]	x [5]	x [5]
Junction box M12 x 1 (4-pin) [3]	x	x [4]	x [4]	-	-
Sealing plugs for shipping	Not applicable, transport protection [5]				

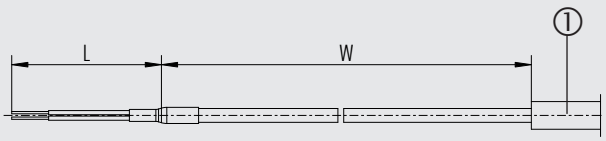
1) Not available for BVS connection head
2) Only for BSZ-H connection head
3) Not available for ½ NPT thread size of cable inlet
4) With appropriate mating connector connected
5) Suitable cable gland required for operation

Lead ends

Version	Representation	
End splices		With end splices Cable and probe are permanently connected to each other. Cable length and insulation materials to customer specification. Number of leads dependent on the number of sensors and the sensor connection method, bare wire ends

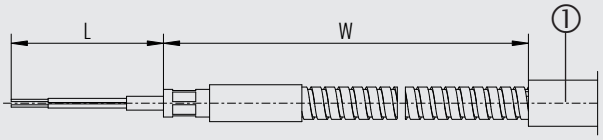
With connection cable

Standard version



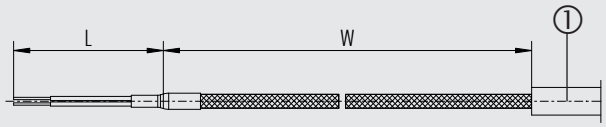
① Probe

Connection cable with protective metal armouring



① Probe

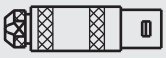
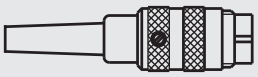
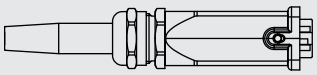
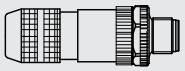
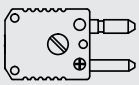
Connection cable with stainless steel braid



① Probe

Connector

High-pressure thermocouples can be supplied with connectors fitted.
The following connectors can be selected:

Representation	Model
	LEMO connector (male)
	Binder/Amphenol screw-in/plug connector (male)
	Harting connector (male)
	Binder screw-in/plug connector, M12 x 1 (male)
	Thermo-connector (male)

The figures are not to scale.

Standard versions of the shield electrical connection

- Not attached to the probe, led out at the cable end (standard)
- Attached to the probe, led out at the cable end
- Not attached to the probe, led out at the case or screw-in/plug connector

→ Further versions on request

Bend protection

A bend protection (spring) is used to protect the transition point from rigid probe to flexible connection lead. This should always be used when a relative movement between the connection lead and the thermometer mounting location is expected. For designs in accordance with Ex e, the use of bend protection is mandatory.

Bend protection spring

Cable sheath

Material	Range of use in °C [°F] 1)
Silicone, 0.22 mm²	-50 ... +180 [-58 ... +356]
PTFE, 0.22 mm²	-50 ... +250 [-58 ... +482]
PTFE, 0.22 mm², shielded	-50 ... +250 [-58 ... +482]
PTFE, 0.22 mm², with stainless steel braid	-50 ... +250 [-58 ... +482]
PTFE stranded wires, 0.22 mm²	-50 ... +250 [-58 ... +482]
Silicone, 0.22 mm², with protective metal armouring	-50 ... +180 [-58 ... +356]
PTFE, 0.22 mm², with protective metal armouring	-50 ... +250 [-58 ... +482]
PTFE, 0.22 mm², protective metal armouring, shielded	-50 ... +250 [-58 ... +482]
PTFE, 0.22 mm², with protective metal armouring and stainless steel braid	-50 ... +250 [-58 ... +482]
PTFE stranded wires, 0.22 mm², with protective metal armouring	-50 ... +250 [-58 ... +482]

1) Minimum/Maximum temperatures valid for stationary cable. The actual temperature of use (process temperature) of the thermometer can deviate.

→ Further conductor cross-sections and sheath materials on request

Colour code of cable

Sensor type	Standard	Thermocouple cable, compensating cable		
		Outer sheath	Positive	Negative
K	IEC 60584-3	Green	Green	White
J	IEC 60584-3	Black	Black	White
E	IEC 60584-3	Violet	Violet	White
T	IEC 60584-3	Brown	Brown	White
N	IEC 60584-3	Pink	Pink	White

Sensor type	Standard	Thermocouple cable			Compensating cable		
		Outer sheath	Positive	Negative	Outer sheath	Positive	Negative
K	ASTM E230	Brown	Yellow	Red	Yellow	Yellow	Red
J	ASTM E230	Brown	White	Red	Black	White	Red
E	ASTM E230	Brown	Violet	Red	Violet	Violet	Red
T	ASTM E230	Brown	Blue	Red	Blue	Blue	Red
N	ASTM E230	Brown	Orange	Red	Orange	Orange	Red

→ For further information on colour codes, see technical information IN 00.23 at www.wika.com.

Operating conditions		
Process temperature	Ni alloy sheath material: alloy 600	Up to 1,200 °C [2,192 °F] (air)
	Stainless steel sheath material	Up to 850 °C [1,562 °F] (air)
Storage temperature range	■ -40 ... +80 °C [-40 ... +176 °F] ■ -60 °C [-76 °F]	
	→ Others on request	

IP ingress protection per IEC/EN 60529

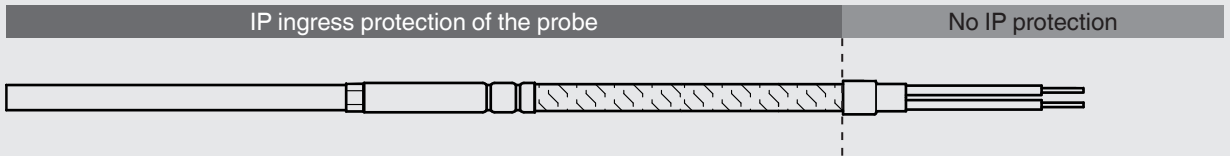
First numeral	Degree of protection / Short description	Test parameters
Degrees of protection against solid foreign bodies (defined by the 1st numeral)		
5	Dust-protected	Per IEC/EN 60529
6	Dust-tight	Per IEC/EN 60529
Degrees of protection against water (defined by the 2nd numeral)		
4	Protected against splash water	Per IEC/EN 60529
5	Protected against water jets	Per IEC/EN 60529
6	Protected against powerful water jets	Per IEC/EN 60529
7 [1)]	Protected against the effects of temporary immersion in water	Per IEC/EN 60529
8 [1)]	Protected against the effects of permanent immersion in water	As agreed upon

1) Ingress protections, describing temporary or permanent immersion, on request.

Standard ingress protection of the model TC90 is IP65.

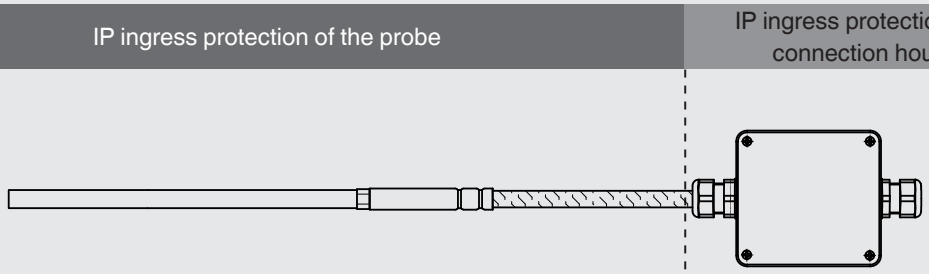
The specified degrees of protection apply under the following conditions:
- Use a suitable cable gland
- Use a cable cross-section appropriate for the gland or select the appropriate cable gland for the available cable
- Adhere to the tightening torques for all threaded connections

Classification of the IP ingress protection type zones of the probe
Version with connection cable

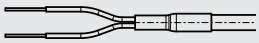


→ Version with connector, on request
→ For connection cables, see page 20

Version with connection housing, fitted at the cable end



Please note:
IP ingress protection of the cable gland / connection housing:
The lowest IP ingress protection applies.

Version with connection cable [1]	
Cable ends	**Polarity**
	+
	-
	+
	-
	+
	-

1) See table „Colour code of cable“

Approvals

Logo	Description	Region
CE	**EU declaration of conformity**	European Union
	EMC Directive [1] EN 61326 emission (group 1, class B) and immunity (industrial environments)	
	RoHS directive	

1) Only for built-in transmitter

Optional approvals

Logo	Description			Region
Ex	**EU declaration of conformity** ATEX directive Hazardous areas			European Union
	- Ex i	Zone 0 gas	II 1G Ex ia IIC T6 ... T1 Ga	
		Zone 1 gas	II 2G Ex ia IIC T6 ... T1 Gb	
		Zone 20 dust	II 1D Ex ia IIIC T200X°C Da	
		Zone 21 dust	II 2D Ex ia IIIC X°C Db	
	- Ex e [1]	Zone 1 gas	II 2G Ex eb IIC T6 ... T1 Gb [3]	
		Zone 2 gas	II 3G Ex ec IIC T6 ... T1 Gc X	
	- Ex t [1]	Zone 21 dust	II 2D Ex tb IIIC TX °C Db [3]	
		Zone 22 dust	II 3D Ex tc IIIC TX °C Dc X	
IEC IECEx	**IECEx** Hazardous areas			International
	- Ex i	Zone 0 gas	Ex ia IIC T6 ... T1 Ga	
		Zone 1 gas	Ex ia IIC T6 ... T1 Gb	
		Zone 20 dust	Ex ia IIIC T200X°C Da	
		Zone 21 dust	Ex ia IIIC X°C Db	
	- Ex e [2]	Zone 1 gas	Ex eb IIC T6 ... T1 Gb [3]	
		Zone 2 gas	Ex ec IIC T6 ... T1 Gc	
	- Ex t [2]	Zone 21 dust	Ex tb IIIC TX °C Db [3]	
		Zone 22 dust	Ex tc IIIC TX °C Dc	
c SP us	**CSA** Hazardous areas			USA and Kanada
	- Ex NI	Zone 2 gas	Class I, division 2, groups B, C & C; enclosure type 4 or 4X	
	Ex Ukraine Hazardous areas			Ukraine
	- Ex i	Zone 0 gas	II 1G Ex ia IIC T6 ... T1 Ga	
		Zone 1 gas	II 2G Ex ia IIC T6 ... T1 Gb	
		Zone 20 dust	II 1D Ex ia IIIC T65°C Da	
		Zone 21 dust	II 2D Ex ia IIIC T65°C Db	
INMETRO	**INMETRO** Hazardous areas			Brazil
	- Ex i	Zone 0 gas	Ex ia IIC T3 ... T6 Ga	
		Zone 20 dust	Ex ia IIIC T125 ... T65 °C Da	
	CCC [3] Hazardous areas			China
	- Ex i	Zone 0 gas	Ex ia IIC T6 ... T1 Ga	
		Zone 1 gas	Ex ia IIC T6 ... T1 Gb	
		Zone 20 dust	Ex ia IIIC T_{200}65°C/T_{200}95°C/T_{200}125°C Da	
		Zone 21 dust	Ex ia IIIC T65°C/T95°C/T125°C Db	
		Zone 21 dust	Ex ib IIIC T65°C/T95°C/T125°C Db	
	- Ex e [2]	Zone 1 gas	Ex eb IIC T6 ... T1 Gb	
		Zone 2 gas	Ex ec IIC T6 ... T1 Gc	
Ex NEPSI	**NEPSI** [4] Hazardous areas			China
	- Ex i	Zone 0 gas	Ex ia IIC T1 ~ T6 Ga	
		Zone 1 gas	Ex ia IIC T1 ~ T6 Gb	
		Zone 20 dust	Ex iaD 20 T65/T95/T125°C	
		Zone 21 dust	Ex iaD 21 T65/T95/T125°C	

Logo	Description	Region
	KCs Hazardous areas - Ex i Zone 0 gas — Ex ia IIC T4 ... T6 Zone 1 gas — Ex ib IIC T4 ... T6	South Korea
-	**PESO** Hazardous areas - Ex i Zone 0 gas — Ex ia IIC T1 ... T6 Ga Zone 1 gas — Ex ia IIC T1 ... T6 Gb	India
	EAC Hazardous areas - Ex i Zone 0 gas — 0 Ex ia IIC T6 ... T1 Ga X Zone 1 gas — 1 Ex ia IIC T6 ... T1 Gb X Zone 20 dust — Ex ia IIIC T80 …T125 °C Da X	Eurasian Economic Community
-	**ECASEx** Hazardous areas - Ex e 2) Zone 1 gas — Ex eb IIC T6...T1 Gb 3) Zone 2 gas — Ex ec IIC T6...T1 Gc - Ex t 2) Zone 21 dust — Ex tb IIIC TX °C Db Zone 22 dust — Ex tc IIIC TX °C Dc	United Arab Emirates
	PAC Kazakhstan Metrology, measurement technology	Kazakhstan
-	**MchS** Permission for commissioning	Kazakhstan
	PAC Uzbekistan Metrology, measurement technology	Uzbekistan

1) Only for connection head model BSZ, BSZ-H, 1/4000, 5/6000, 7/8000 or PI housing (see “Connection head”)
2) Only for connection head, model 1/4000, 5/6000, 7/8000 or PI housing (see “Connection head”)
3) Only without transmitter
4) Only with transmitter

Manufacturer’s information and certificates

Logo	Description
	SIL 2 Functional safety
-	**China RoHS directive**

Test report

Description	
Pressure test	Each model TC90 high-pressure thermocouple is subjected to 1.5 x PN or a hydrostatic pressure test to customer specification, with test pressures to a max. 5,400 bar (78,320 psi). Furthermore, for example, liquid penetrant inspection of surfaces or X-ray testing of components are possible in accordance with national or international standards (performance, evaluation).

Certificates

Description	
Certificates	■ 2.2 test report per EN 10204 (e.g. state-of-the-art manufacturing, material proof, indication accuracy) ■ 3.1 inspection certificate per EN 10204 (e.g. material proof for wetted metal parts, indication accuracy, calibration certificate)
Calibration	DAkkS calibration certificate (traceable and accredited in accordance with ISO/IEC 17025), depending on the selected design and probe size
Recommended calibration interval	1 year (dependent on conditions of use)

Dimensions

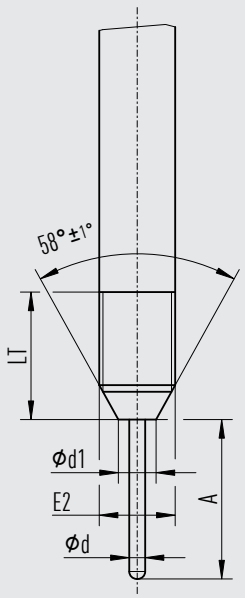
Each TC90 high-pressure thermocouple is designed and manufactured in accordance with individual customer specifications. The specifications contained in the tables are not binding and only constitute examples.
The responsibility for the tolerance and durability of the material with the medium lies with the operator.

Legend

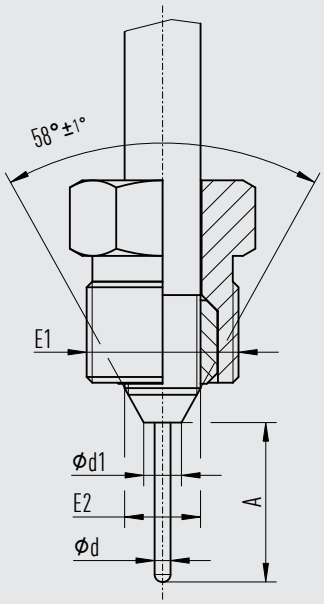
E	Slip-on flange thread	Ø d1	Sealing cone tip diameter	LT	Length of sealing bolt thread
E1	Male nut thread	Ø d2	Support tube diameter	L1	Thermocouple length
E2	Sealing bolt thread	Ø d3	Outer diameter	L2	Cone length
SR	Lens-type sealing ring radius	Ø d4	Cone diameter	W	Cable length
S1	Ring thickness	Ø d5	Lens-type sealing ring outer diameter	L	Length of the stranded wires
S	Lens-type sealing ring length	Ø d6	Inner diameter	N (MH)	Neck tube length
Ø d	Probe diameter	A	Insertion length	X-length	Length between insertion length A and cable length W

Version TC90-xxxx-A, high-pressure thermocouple with sealing contour and thread, up to 4,500 bar [66,268 psi]

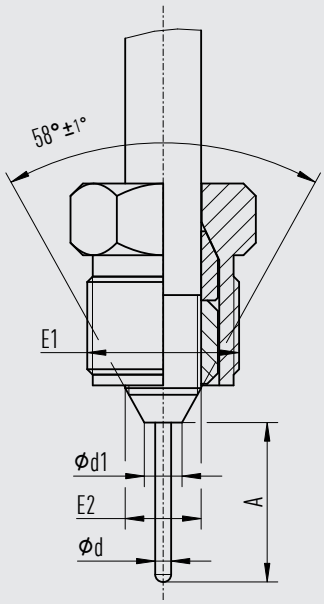
Without pressure ring and male nut



With pressure ring and male nut



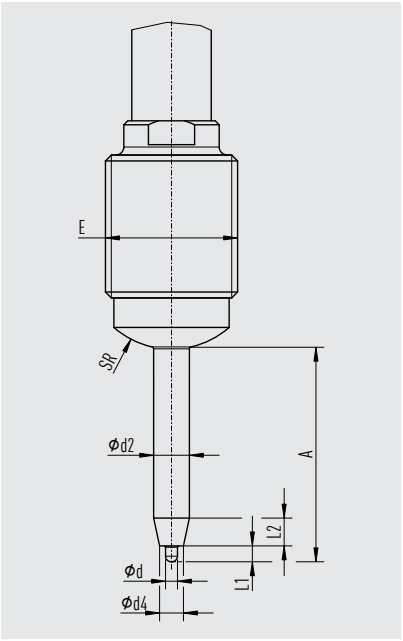
With anti-vibration gland



Dimensions	
Process connection of male nut [E1]	■ 9/16-18 UNF ■ 3/4-16 UNF ■ 1 1/8-12 UNF
Pressure ring thread [E2]	■ 1/4-28 UNF-LH ■ 3/8-24 UNF-LH ■ 9/16-18 UNF-LH
Sealing contour	■ 58° ■ 59°
Probe diameter [d] in mm [in]	■ 3.0 [0.12] ■ 3.17 [0.12] ■ 4.5 [0.18]
Pressure ring thread length LT	
1/4-28 UNF-LH	14.5 mm [0.57 in]
3/8-24 UNF-LH	19 mm [0.75 in]
9/16-18 UNF-LH	24 mm [0.94 in]
Sealing contour diameter Ø d1	Dependent on selected pressure ring thread E2 and sealing contour
Insertion length A	Freely selectable between 5 mm [0.20 in] and 1,000 mm [39.37 in]

→ Other threads and dimensions on request. The combinations must be checked when preparing quotations.

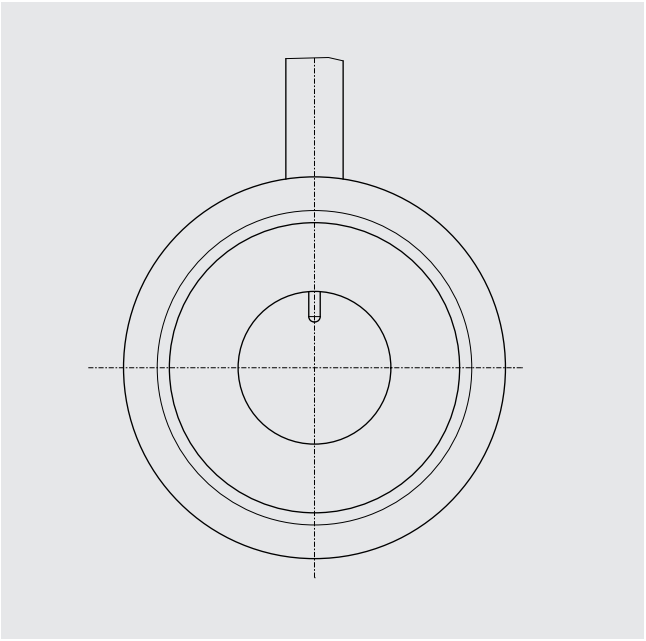
Version TC90-xxxx-B, high-pressure thermocouple for pressure flanges up to 4,500 bar [66,268 psi]

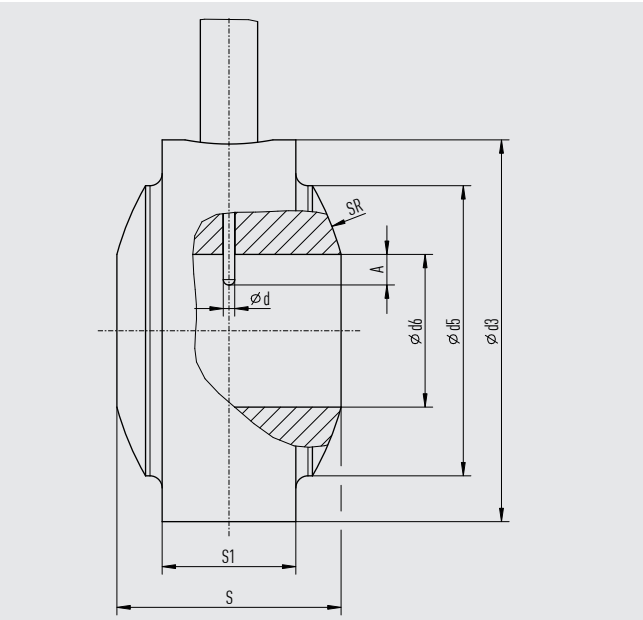


Dimensions	
Slip-on flange thread [E]	■ M24 x 2 ■ M30 x 2 ■ G1
Lens-type sealing ring radius (SR) in mm [in]	■ 20 [0.79] ■ 22 [0.87]
Support tube diameter [d2] in mm [in]	■ 4.5 [0.18] ■ 5.4 [0.21] ■ 9.0 [0.35]
	→ Further diameters on request
Probe diameter [d] in mm [in]	■ 3.0 [0.12] ■ 3.17 [0.12] ■ 4.5 [0.18]
Thermocouple length L1	Freely selectable between 5 mm [0.20 in] and 1,000 mm [39.37 in]
Insertion length A	Freely selectable between 30 mm [1.18 in] and 1,000 mm [39.37 in]

→ Other threads and dimensions on request. The combinations must be checked when preparing quotations.

Version TC90-xxxx-C, high-pressure thermocouple with lens-type sealing ring or sealing cone up to 4,500 bar [66,268 psi]



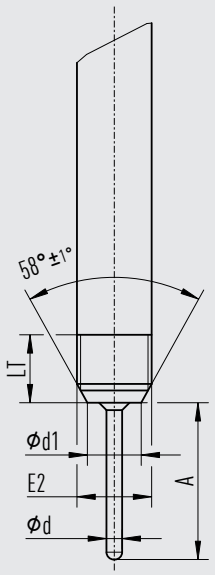


Dimensions	
Probe diameter [d] in mm [in]	■ 3.0 [0.12] ■ 3.17 [0.12] ■ 4.5 [0.18]
Lens-type sealing ring radius [SR]	Freely selectable
Insertion length A	
Outer diameter Ø d3	
Lens-type sealing ring outer diameter Ø d5	
Inner diameter Ø d6	
Ring thickness S1	
Lens-type sealing ring length S	

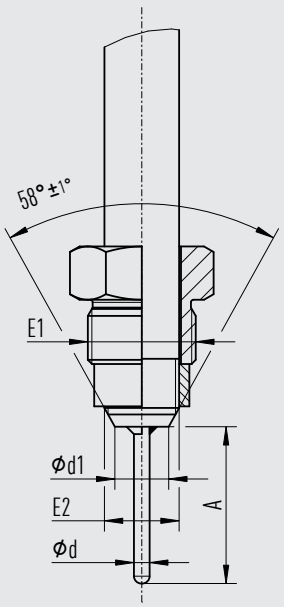
→ Other threads and dimensions on request. The combinations must be checked when preparing quotations.

Version TC90-xxxx-H, medium-pressure thermocouple with sealing cone and thread (hydrogen applications) up to 1,550 bar [22,481 psi]

Without pressure ring and male nut



With pressure ring and male nut

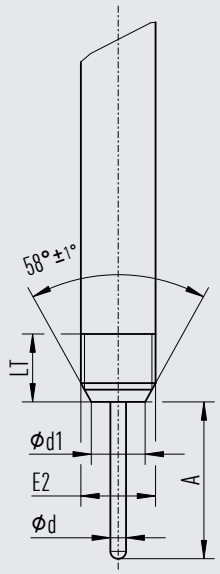


Dimensions	
Process connection of male nut [E1]	■ 7/16-20 UNF ■ 9/16-18 UNF ■ 13/16-16 UNF
Pressure ring thread [E2]	■ 1/4-28 UNF-LH ■ 3/8-24 UNF-LH ■ 9/16-18 UNF-LH
Sealing contour	■ 58° ■ 59°
Probe diameter [d] in mm [in]	■ 1.5 [0.06] ■ 2.5 [0.10] ■ 3.0 [0.12] ■ 3.17 [0.12] ■ 4.5 [0.18]
Pressure ring thread length LT	
1/4-28 UNF-LH	9 mm [0.35 in]
3/8-24UNF-LH	11 mm [0.43 in]
9/16-18UNF-LH	13 mm [0.51 in]
Sealing contour diameter Ø d1	Dependent on selected pressure ring thread E2 and sealing contour
Insertion length A	Freely selectable between 5 mm [0.20 in] and 1,000 mm [39.37 in]

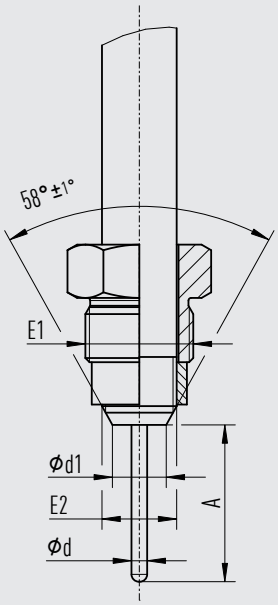
→ Other threads and dimensions on request. The combinations must be checked when preparing quotations.

Version TC90-xxxx-S, medium-pressure thermocouple with sealing cone and thread (hydraulic applications) up to 1,550 bar [22,481 psi]

Without pressure ring and male nut



With pressure ring and male nut



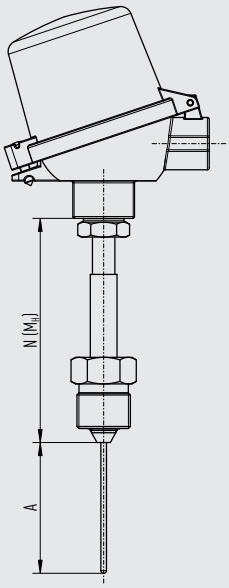
Dimensions	
Process connection of male nut [E1]	■ 7/16-20 UNF ■ 9/16-18 UNF ■ 13/16-16 UNF
Pressure ring thread [E2]	■ 1/4-28 UNF-LH ■ 3/8-24 UNF-LH ■ 9/16-18 UNF-LH
Sealing contour	■ 58° ■ 59°
Probe diameter [d] in mm [in]	■ 1.5 [0.06] ■ 2.5 [0.10] ■ 3.0 [0.12] ■ 3.17 [0.12] ■ 4.5 [0.18]
Pressure ring thread length LT	
1/4-28 UNF-LH	9 mm [0.35 in]
3/8-24UNF-LH	11 mm [0.43 in]
9/16-18UNF-LH	13 mm [0.51 in]
Sealing contour diameter Ø d1	Dependent on selected pressure ring thread E2 and sealing contour
Insertion length A	Freely selectable between 5 mm [0.20 in] and 1,000 mm [39.37 in]

→ Other threads and dimensions on request. The combinations must be checked when preparing quotations.

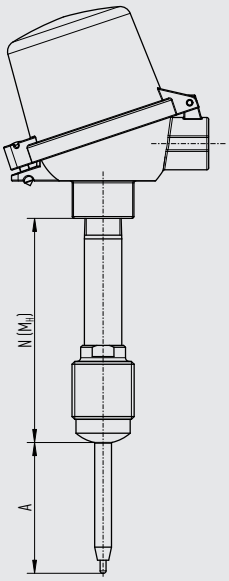
Neck tube lengths

Dimensioning of the neck tube lengths N (MH) with different versions.

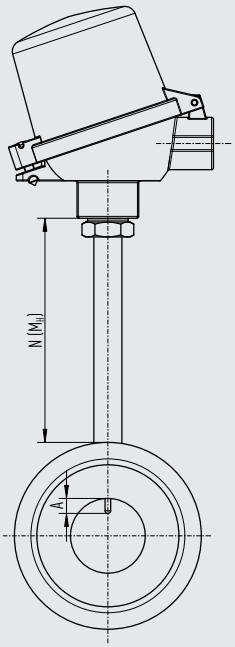
TC90-xxxx-A/H/S



TC90-xxxx-B



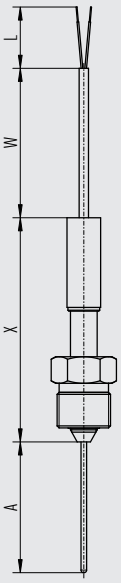
TC90-xxxx-C



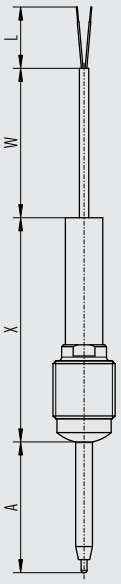
Cable lengths

Dimensioning of the cable lengths and stranded wires with different versions.

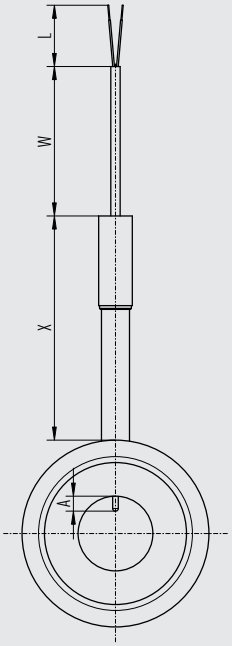
TC90-xxxx-A/H/S



TC90-xxxx-B



TC90-xxxx-C



Ordering information

Model / Version / Connection cable / Nominal pressure / Medium temperature / Number of thermocouples / Class accuracy / Hot junction / Neck tube / Transition sleeve / Connection cable / Jacket / Cable version / Lead end / Shielding / Process connection / Material / Male nut / Sealing contour / Male nut / Support tube / Sensor diameter / Sheath material / Neck length / Insertion length / Cable length / Stranded wire length / Options

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