

## Application

- For direct installation into the process
- General industrial services

## Features

- Single and double sensing element
- Sensor ranges from -50 .. +400°C
- Connection line 2-, 3-, 4-wire
- Versions with/without connector
- Cable from PVC, silicone, PFA or other materials

## Options

- Cable material according to customer's specification
- Reduced diameter of the thermowell
- Spring protection at cable relief
- ATEX, IECEx certification

## Description

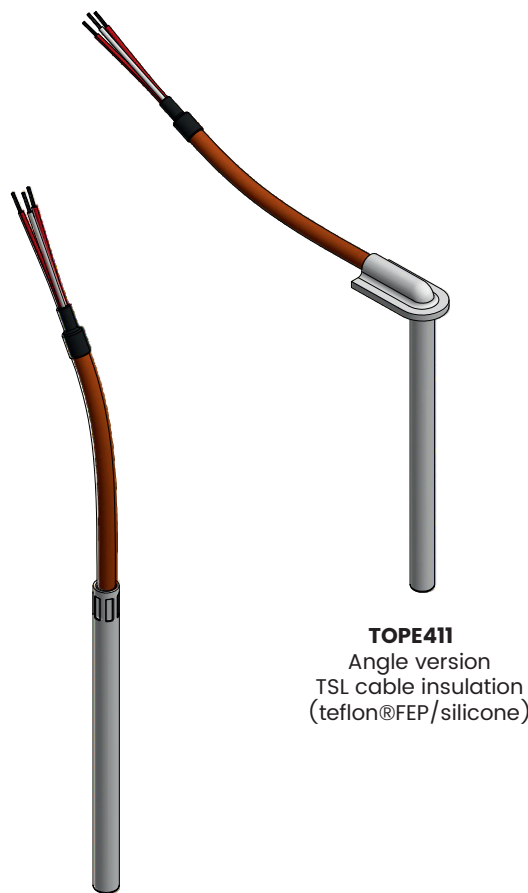
Resistance thermometers TOPE411 and TOPE412 are designed for push-in directly into the process or into the machine parts.

Complete probe consist of thermometric resistor, protection tube and connection cable. Inner space between the resistor and the wall of the protection tube is filled by thermo-conductive mass, which ensures very good heat transfer and high vibration resistance.

Insertion length, protection tube diameter, number of sensing elements, accuracy, cable length and material can be selected individually for the respective application.

## Temperature transmitter (Option)

It is possible to use a temperature transmitter with signal output 4÷20mA or 0÷10V in the control cabinet. Transmitters with communication protocol HART®, Profibus® are also available. More details in "Temperature transmitters" section.



**TOPE411**  
Angle version  
TSL cable insulation  
(teflon®FEP/silicone)

**TOPE412**  
Straight version  
TSL cable insulation  
(teflon®FEP/silicone)

## ATEX, IECEx, EAC Ex versions

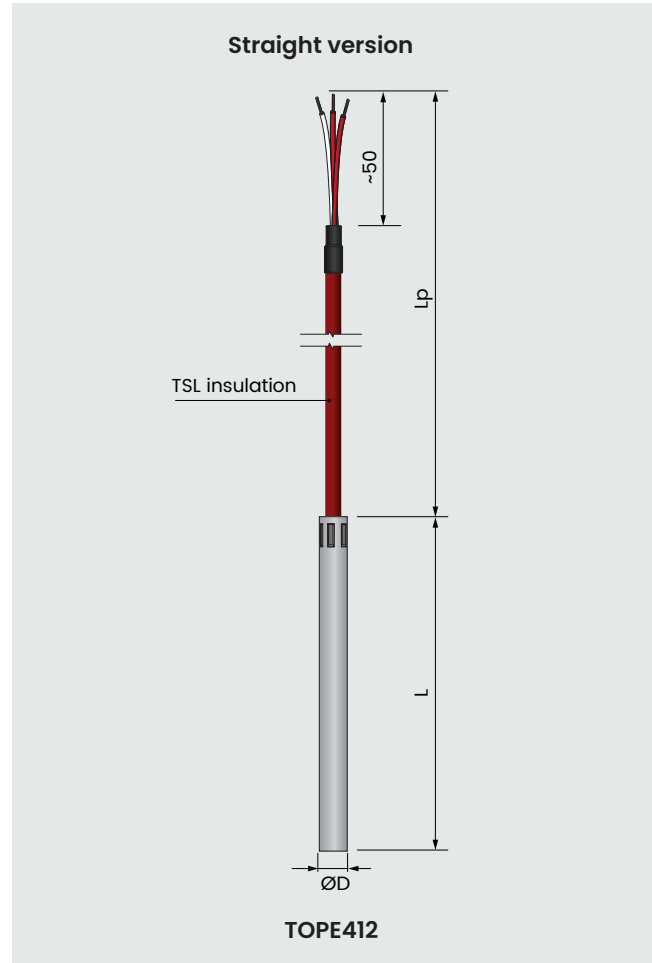
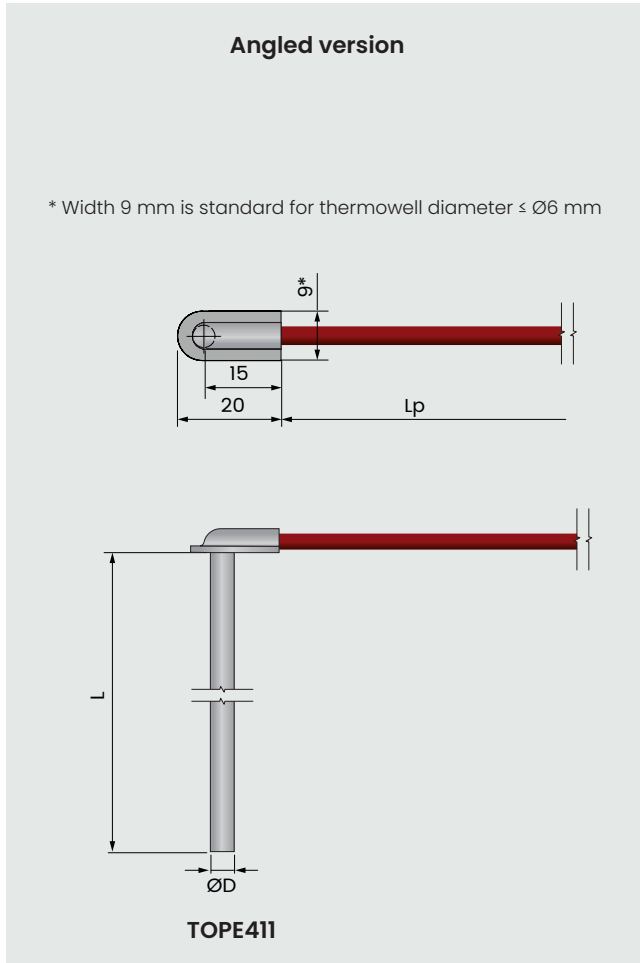
Intrinsically safe designs are available for applications in hazardous areas. These models are provided with certificate for „intrinsically safe“ type of protection according to Directive 2014/34/UE (ATEX), IECEx scheme and EAC Ex TR-CU 012/2011 (Eurasian Economic Union).

Intrinsically safe (Exi)	XI-TOPE411
	XI-TOPE412

# CABLE RESISTANCE THERMOMETER

TYPE TOPE411, TOPE412

## Construction



## Measuring ranges and thermowell diameters

Measuring range of the sensor depends on selected cable insulation material. Below table presents standard cable types and available thermowell diameters.

Measuring range	Thermowell diameter D [mm]	Code	Insulation material
-10 .. +105°C	Ø5, Ø6, Ø8	JJ	PVC
-50 .. +180°C	Ø5, Ø6, Ø8	SLSL, TSL, TPSL	silicone
-50 .. +260°C	Ø3, Ø4, Ø5, Ø6, Ø8	TT, TP, TCuT	teflon® PFA
-50 .. +400°C	Ø5, Ø6, Ø8	GLGLP	fiberglass

## Sensing element

Pt100, Pt500, Pt1000 (IEC 751,  $\alpha=0.00385$ )

Option:  
 Ni100, Ni500, Ni1000 (DIN43760,  $\alpha=0.00618$ )  
 Cu50, Cu100 (GOST 6651-94,  $\alpha=0.00426$ )

## Tolerances

Platinum Class A ( $\pm 0.15^\circ\text{C}$  in temp.  $0^\circ\text{C}$ )  
 Class B ( $\pm 0.30^\circ\text{C}$  in temp.  $0^\circ\text{C}$ )

PN-EN 60751 standard defines the formulas for calculating acceptable measure tolerance of platinum thermometers

Class of tolerance	Tolerance
A	$\pm 0.15 + (0.002 \times  t )$
B	$\pm 0.30 + (0.005 \times  t )$

**Electrical parameters**

Measuring current      nom. 0,1 mA to 1 mA  
Isolation resistance    >10 GΩ (test 500 VDC)

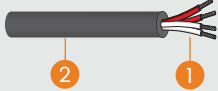
**Housing material**

Stainless steel 1H18N9T ( 1.4541 / AISI321 )

**Insulation types of connection cable**

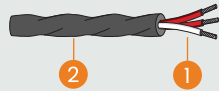
**JJ insulation**

① Conductor	PVC
② Sheath	PVC




**SLSL insulation**

① Conductor	Silicone
② Sheath	Silicone




**TSL insulation**

① Conductor	Teflon® FEP
② Sheath	Silicone



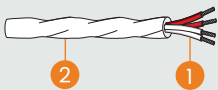
**TPSL insulation**

① Conductor	Teflon® FEP
② Screen	Copper braid
③ Sheath	Silicone



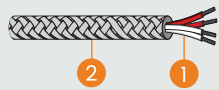
**TT insulation**

① Conductor	Teflon® PFA
② Sheath	Teflon® PFA



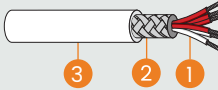
**TP insulation**

① Conductor	Teflon® PFA
② Sheath	Stainless steel braid



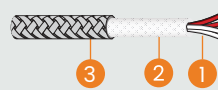
**TCuT insulation**

① Conductor	Teflon® PFA
② Screen	Copper braid
③ Sheath	Teflon® PFA



**GLGLP insulation**

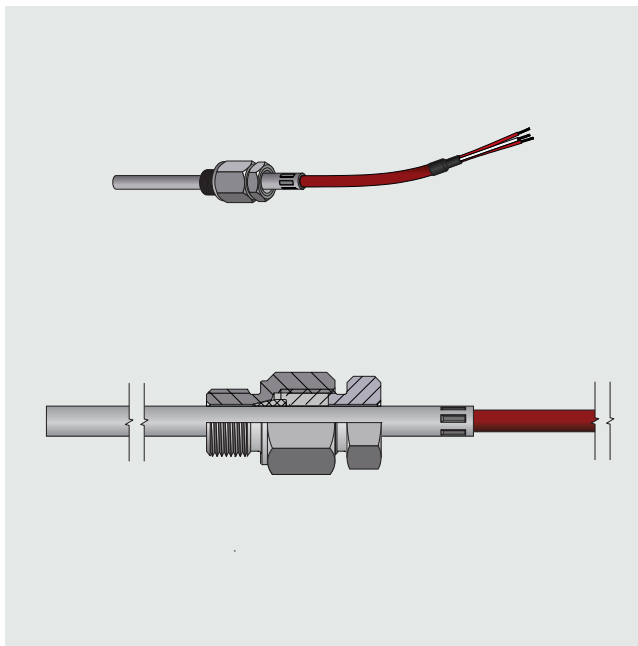
① Conductor	Fiberglass
② Screen	Fiberglass
③ Sheath	Stainless steel braid



**Accessories**

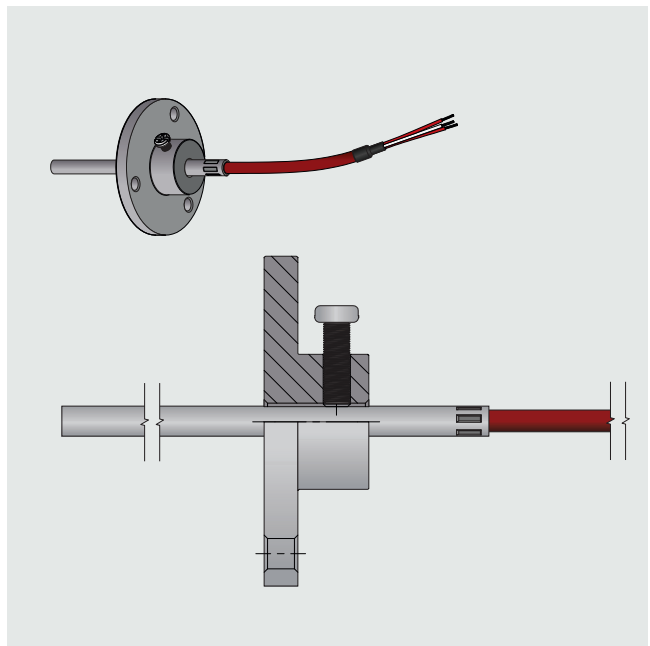
**Compression fitting UG**

Allows to adjust sensor insertion depth and provides a seal.



**Mounting bracket KM**

Allows to adjust sensor insertion depth.



# CABLE RESISTANCE THERMOMETER

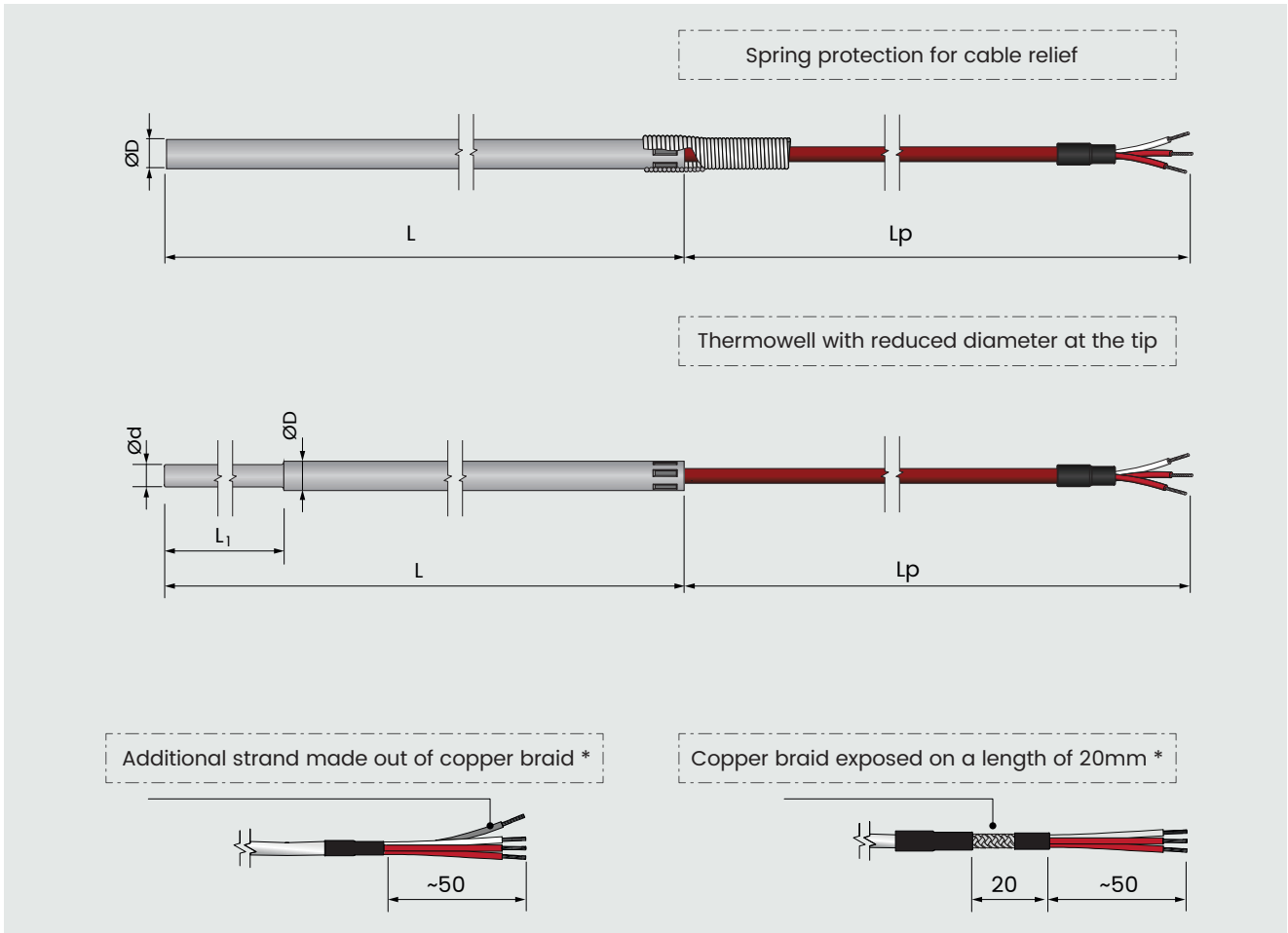
TYPE TOPE411, TOPE412



Data sheet TOPE411-412 | Edition 2023

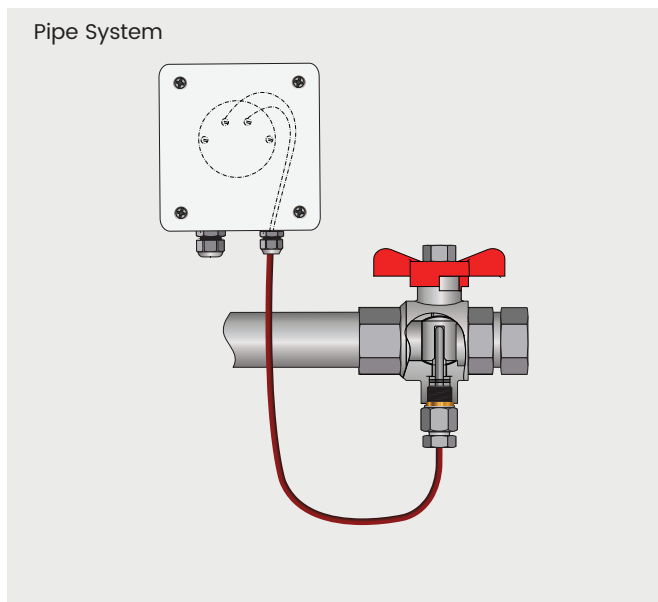
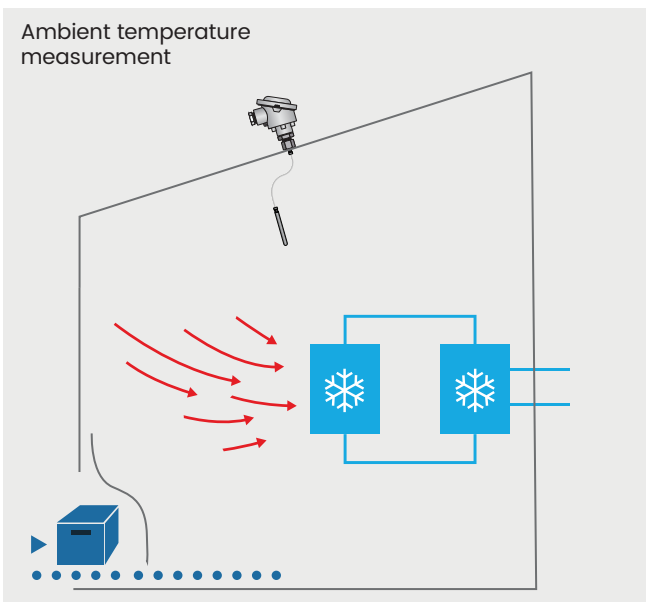
## Non-standard sensor versions

This data sheet contains only a small portion of our program of supplying cable resistance thermometers. Other versions can be supplied upon customer's request. Below presented examples of customized versions.



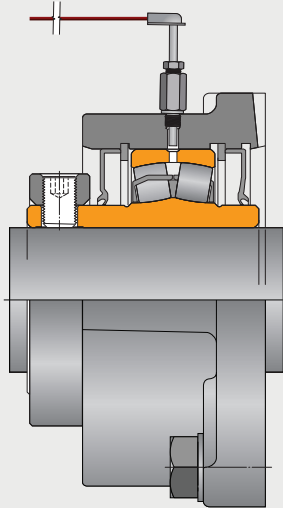
\* Available only for TCuT and TPSL cable insulation

## Installation examples



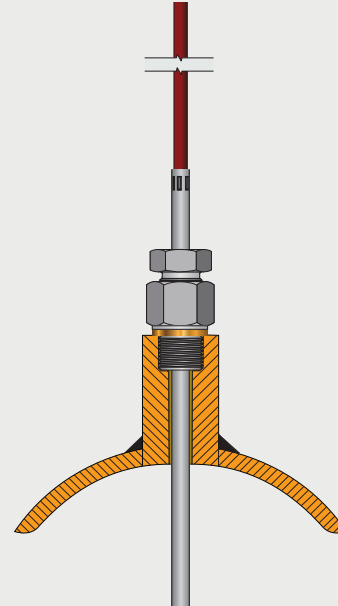
**Installation examples**

Bearing temperature measurement



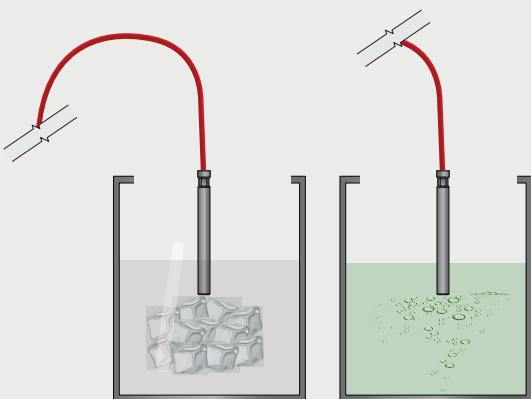
Model  
**TOPE411**

Pipeline installation



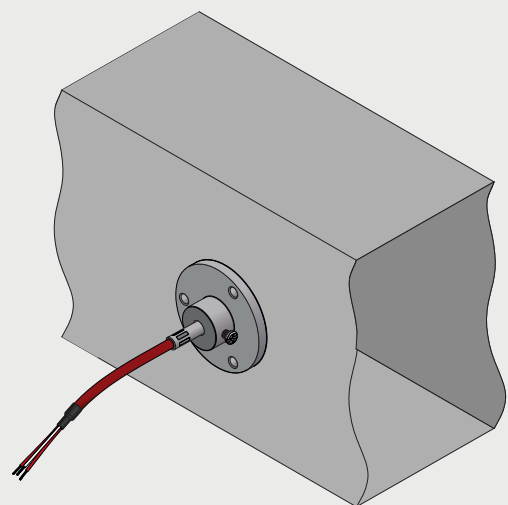
Model  
**TOPE412**

Chemical industry temperature measurement



Model  
**TOPE412**

Ventilation channel temperature measurement



Model  
**TOPE412**

# CABLE RESISTANCE THERMOMETER

TYPE TOPE411, TOPE412

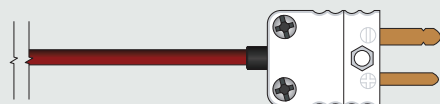
## Connectors (Optional)

Sensors with connection cable can be equipped with connector.

Available options:

### Connector S-010-Cu-W

Miniature plug, 2-pin.



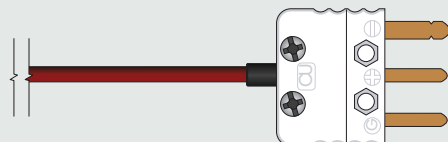
### Connector S-010-Cu-G

Miniature socket, 2-pin.



### Connector S-013-Cu-W

Miniature plug, 3-pin.



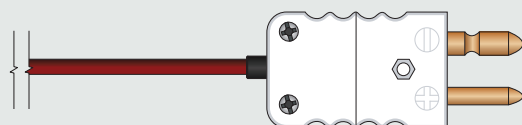
### Connector S-013-Cu-G

Miniature socket, 3-pin.



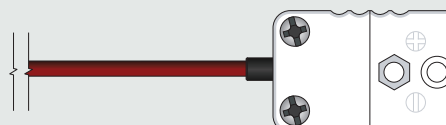
### Connector S-020-Cu-W

Standard plug, 2-pin.



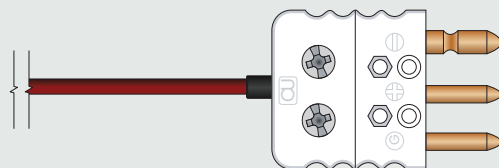
### Connector S-020-Cu-G

Standard socket, 2-pin.



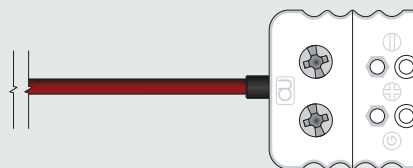
### Connector S-023-Cu-W

Standard plug, 3-pin.



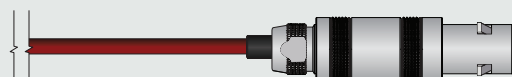
### Connector S-023-Cu-G

Standard socket, 3-pin.



### Connector LEMO® FFA

Plug size from 0S to 3S. 2-, 3-, 4-, 6-pin.



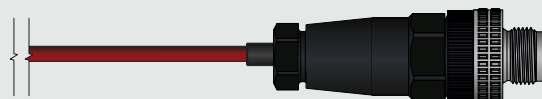
### Connector LEMO® PCA

Plug size from 0S to 3S. 2-, 3-, 4-, 6-pin.



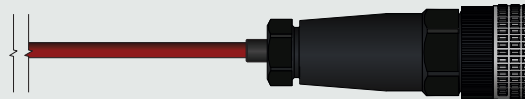
### Hirschmann M12 series

4-pin.



### Hirschmann M12 series

Standard socket, 4-pin.



**Ordering code**

**TOPE4**    1    2    3    4    5    6    7    8    9  
 -  -  -  -  -  -  -  -

Order	Parameter	Code	<input checked="" type="checkbox"/>	Description	
1	Model type	11	<input type="checkbox"/>	Angle version	
		12	<input type="checkbox"/>	Straight version	
2	Type of sensing element	1xPt100	<input type="checkbox"/>	Single Pt100	IEC 751, $\alpha = 0.00385$
		2xPt100	<input type="checkbox"/>	Double Pt100	IEC 751, $\alpha = 0.00385$
		1xNi100	<input type="checkbox"/>	Single Ni100	DIN43760, $\alpha = 0.00618$
		2xNi100	<input type="checkbox"/>	Double Ni100	DIN43760, $\alpha = 0.00618$
		xxx	<input type="checkbox"/>	Other, please specify	
3	Thermowell diameter ØD	5	<input type="checkbox"/>	Ø5 mm	
		6	<input type="checkbox"/>	Ø6 mm	
		8	<input type="checkbox"/>	Ø8 mm	
		xxx	<input type="checkbox"/>	Other, please specify	
4	Thermowell length L	50	<input type="checkbox"/>	50mm	
		100	<input type="checkbox"/>	100mm	
		150	<input type="checkbox"/>	150mm	
		xxx	<input type="checkbox"/>	Other, please specify	
5	Connecting cable length Lp	1000	<input type="checkbox"/>	1000mm	
		2500	<input type="checkbox"/>	2500mm	
		xxx	<input type="checkbox"/>	Other, please specify	
6	Tolerance class	A	<input type="checkbox"/>	Class A acc. to PN-EN 60751 / IEC 751 (available only for Pt sensing elements)	
		B	<input type="checkbox"/>	Class B acc. to PN-EN 60751 / IEC 751 / DIN43760 / GOST 6651-94	
7	Measuring circuit	2	<input type="checkbox"/>	2-wire (not available for class A)	
		3	<input type="checkbox"/>	3-wire	
		4	<input type="checkbox"/>	4-wire	
8	Connecting cable type	JJ	<input type="checkbox"/>	PVC / PVC	-10 .. +105°C
		SLSL	<input type="checkbox"/>	Silicone / Silicone	-50 .. +180°C
		TSL	<input type="checkbox"/>	Teflon® FEP / Silicone	-50 .. +180°C
		TPSL	<input type="checkbox"/>	Teflon® FEP / Cu braid / Silicone	-50 .. +180°C
		TT	<input type="checkbox"/>	Teflon® PFA / Teflon® PFA	-50 .. +260°C
		TP	<input type="checkbox"/>	Teflon® PFA / Stainless steel	-50 .. +260°C
		TCuT	<input type="checkbox"/>	Teflon® PFA / Cu braid / Teflon® PFA	-50 .. +260°C
GLGLP	<input type="checkbox"/>	Fiberglass / Fiber glass / Stainless steel	-50 .. +400°C		
9	Connector (optional)		<input type="checkbox"/>	without connector, free end conductors of connection cable	
		S-013-Cu-W	<input type="checkbox"/>	Miniature plug, 3-pin	
		FFA.IS	<input type="checkbox"/>	Connector LEMO® FFA size IS	
		xxx	<input type="checkbox"/>	Other, please specify	

**Example**
**TOPE411-1xPt100-8-150-2000-A-3-TSL**

Angle version type, RTD sensor 1xPt100, thermowell diameter Ø8 mm, thermowell length L=150 mm, connection cable length Lp=2000 mm, A tolerance class, 3-wire measuring circuit, single conductors in teflon insulation, sheath in silicone insulation.

**TOPE412-1xPt100-6-100-2500-B-2-TT-FFA.IS**

Straight version type, RTD sensor 1xPt100, thermowell diameter Ø6 mm, thermowell length L=100 mm, connection cable length Lp=2500 mm, B tolerance class, 2-wire measuring circuit, single conductors in teflon insulation, sheath in teflon insulation, connection cable equipped with LEMO® FFA plug size IS.