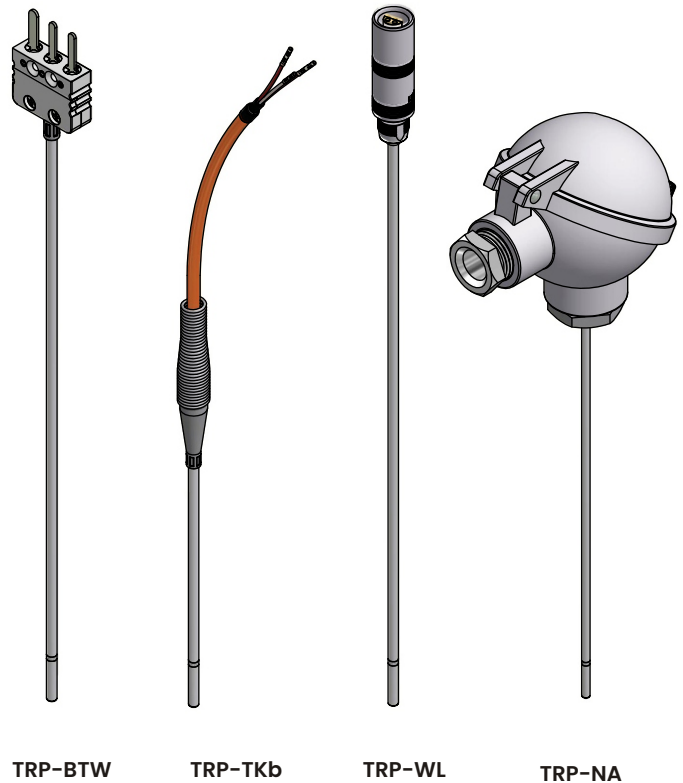## Application

- Measuring range: -50 .. +600°C
- General machinery and equipment design
- Measuring temperature of liquids, gases and solid bodies
- All branches of industry
- Measurement laboratories

Features

- Made of sheathed cable insulated inside with Magnesium Oxide (MgO)
- Small dimensions, outer diameter from Ø1.5 mm
- Short response time for temperature change
- The sensor is bendable
- Casing made of acid resistant steel AISI316 (1.4401), AISI321 (1.4541)
- Resistant to vibrations
- Optionally the head can be installed with a local temperature display (see models PR7501, DANWdie-LED)

Sheathed resistance thermometers are made of metal sheathed cable with internal wires (Cu or Ni) are insulated from each other and from the outer sheath with magnesium oxide (MgO) powder. This provides the sensor with high vibration resistance, flexibility as well as resistance to temperature and with good electrical insulation.

These sensors are designed for direct temperature measuring in places with difficult access, as well as in all places, where it is required to use flexible sensors of small diameters, high resistance to vibrations and shock, and with short response time to temperature changes.

Due to tight pressing of the insulating layer (MgO) and appropriate structure of the inner wires and the sheath, the sensors can be bent with a minimal radius of curvature of three times the outer diameter of the sheath.

Temperature transmitter (Option)

There is possibility of using standard temperature transmitter (4÷20mA, 0÷10V) or temperature transmitter with HART®, Profibus® PA, Foundation Fieldbus communication protocol, mounted inside electrical control cabinet.

TRP-BTW   **TRP-TKb**   **TRP-WL**   **TRP-NA**

ATEX, IECEx, EAC Ex versions

Intrinsically safe and Flameproof designs are available for applications in hazardous areas. These models are provided with certificate for „intrinsically safe" and „flameproof" 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)   data sheet XI-TRP.. (with connection head, cable or plug)

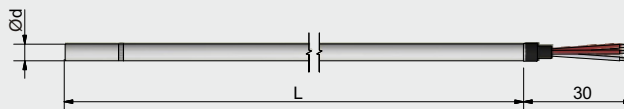Flameproof (Exd)   data sheet XD-TOPI.. (with connection head)

Other versions

This data sheet contains only small part of our program of supplying mineral insulated resistance thermometers. Upon the customer's request, other versions can also be delivered.

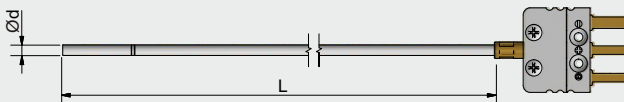Sensors with connection head

Sensors with connection cable

Mineral insulated sensors

Sensors with GDM connectors

Sensors with M12 connectors

Sensors with field transmitter

Stator RTDs

Ambient temperature sensors

Type **TRP**

WROCŁAW

| Designs
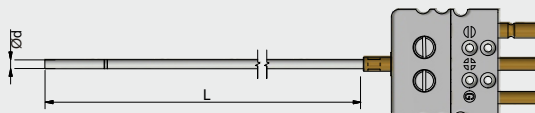
Type BT
with free unisolated wires
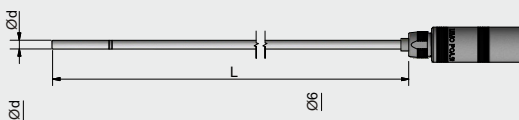length 30 mm

Type BTW
with miniature size plug

Type BTWs
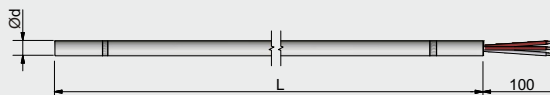with standard size plug

Type WL
with LEMO PCA
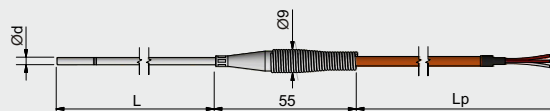connector

Type T
with pot seal and flying
leads

Type TS
with pot seal with the same diameter like
sheath and flying leads

For Ød=4.5, 4.76, 6.0, 6.4 mm

Type TKb
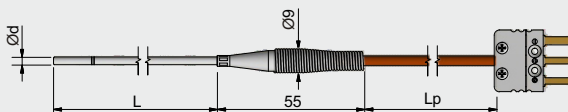with pot seal and compensating
cable

Type TKbW
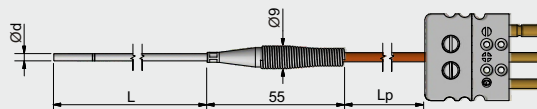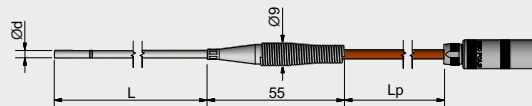Tkb + miniature size plug
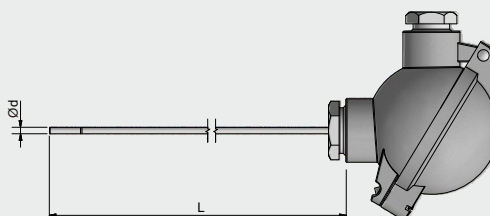
Type TKbWs
Tkb + miniature size plug

Type TKbWL
Tkb + LEMO PCA connector

Type NA
with aluminium connection
head NA type

Possible combinations of sheath diameters, multiplicity of the sensor and connecting lines

	Sheath diameter	1 x Pt100			2 x Pt100		
		2-wire	3-wire	4-wire	2-wire	3-wire	4-wire
BT	Ø 1.5	✔	✔	✔	✔		
	Ø 2.0	✔	✔	✔	✔		
	Ø 3.0	✔	✔	✔	✔	✔	
	Ø 4.5	✔	✔	✔	✔	✔	
	Ø 6.0	✔	✔	✔	✔	✔	✔
BTW BTWs	Ø 1.5	✔	✔		✔	✔	
	Ø 2.0	✔	✔		✔	✔	
	Ø 3.0	✔	✔		✔	✔	
	Ø 4.5	✔	✔		✔	✔	
	Ø 6.0	✔	✔		✔	✔	
WL	Ø 1.5	✔	✔	✔	✔		
	Ø 2.0	✔	✔	✔	✔		
	Ø 3.0	✔	✔	✔	✔	✔	
	Ø 4.5	✔	✔	✔	✔	✔	
	Ø 6.0	✔	✔	✔	✔	✔	✔
T TS	Ø 1.5	✔	✔	✔	✔		
	Ø 2.0	✔	✔	✔	✔		
	Ø 3.0	✔	✔	✔	✔	✔	
	Ø 4.5	✔	✔	✔	✔	✔	
	Ø 6.0	✔	✔	✔	✔	✔	✔
TKb	Ø 1.5	✔	✔	✔	✔		
	Ø 2.0	✔	✔	✔	✔		
	Ø 3.0	✔	✔	✔	✔	✔	
	Ø 4.5	✔	✔	✔	✔	✔	
	Ø 6.0	✔	✔	✔	✔	✔	✔
TKbW TKbWs	Ø 1.5	✔	✔		✔		
	Ø 2.0	✔	✔		✔		
	Ø 3.0	✔	✔		✔	✔	
	Ø 4.5	✔	✔		✔	✔	
	Ø 6.0	✔	✔		✔	✔	
NA DAN DANW lub inne	Ø 1.5	✔	✔		✔		
	Ø 2.0	✔	✔		✔		
	Ø 3.0	✔	✔	✔	✔	✔	
	Ø 4.5	✔	✔	✔	✔	✔	
	Ø 6.0	✔	✔	✔	✔	✔	✔

✔ - available

Type **TRP**

TRP type terminals
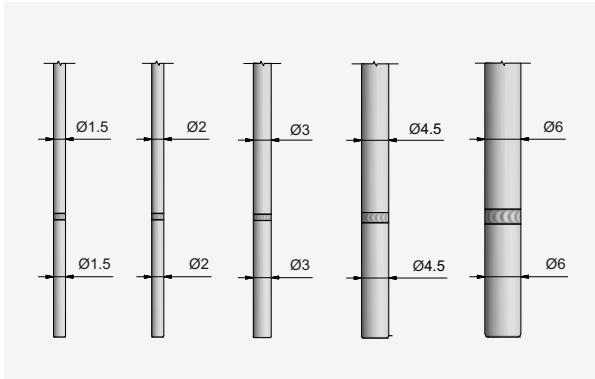
Threaded compression fittings

Allows simple adaptation to the required insertion length at the installation point.

Material: stainless steel
Sealing ring material: stainless steel or PTFE

Sealing rings of stainless steel can be adjusted once, after unscrewing, sliding along the sheath is no longer possible. Max. temperature at process connection 500 °C

Sealing rings of PTFE can be adjusted several times, after unscrewing, repeated sliding along the sheath is still possible. Max. temperature at process connection 150 °C

Tolerances

PN-EN 60751 Standard defines the formulas for calculating acceptable measure tolerance. More information in the general resistance thermometer sheet.

Class	Tolerance in °C
A	± 0.15 + (0.002 x | t |)
B	± 0.30 + (0.005 x | t |)

Response time

Sheath dia. [mm]	in water 0.4 m/s		in air 3 m/s	
	t_{50}	t_{90}	t_{50}	t_{90}
Ø 6	4	10	40	105
Ø 3	1.5	4.5	15	50

Example of assembly

More detailed information are available in the "Compression fittings UG" data sheet.

Thermometric characteristics of Pt100 resistors, acc. to PN-EN 60751/IEC 751

Temperature		°C	0	100	200	300	400	500	600
Nominal value		Ω	100.00	138.51	175.86	212.05	247.09	280.98	313.71
Tolerance	Class A	°C	±0.15	±0.35	±0.55	±0.75	±0.95	±1.15	±1.35
	Class B	°C	±0.30	±0.80	±1.30	±1.80	±2.30	±2.80	±3.30
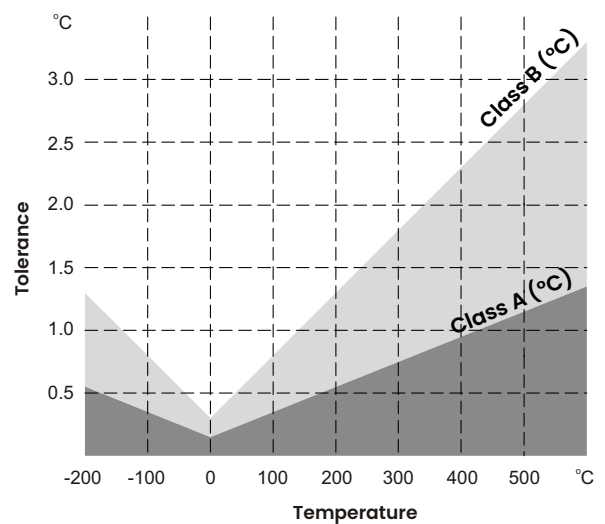
Wiring diagrams, LEMO® socket connectors [Size: 0S, 1S, 2S, 3S]

1 x Pt100			2 x Pt100	
2-wire	3-wire	4-wire	2-wire	3-wire
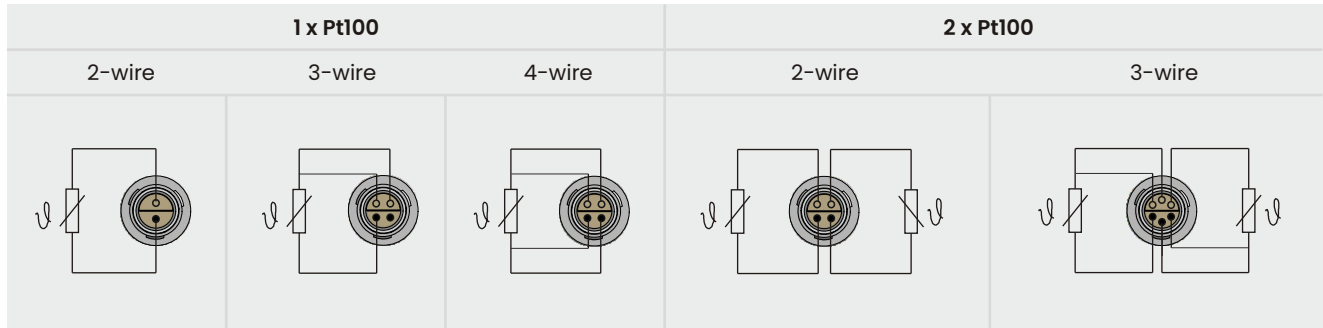
3-pin connection diagram

Standard size connectors	Miniature size connectors
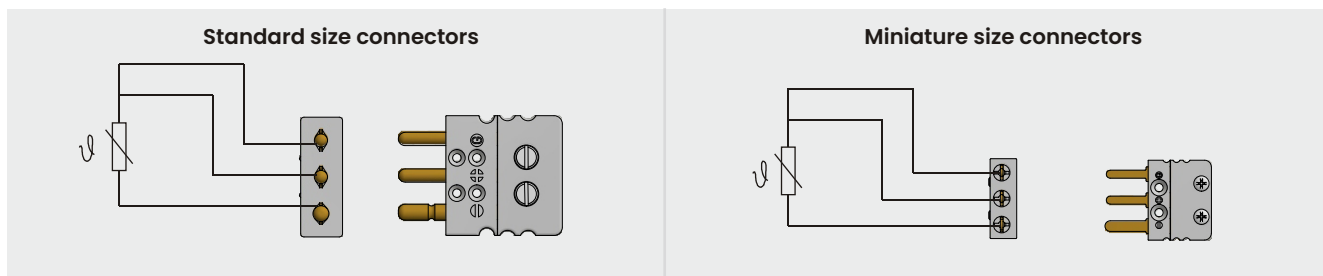
Connection cable colour coding

1 x Pt100, 2-wire **1 x Pt100, 3-wire** **1 x Pt100, 4-wire** **2 x Pt100, 2-wire** **2 x Pt100, 3-wire**
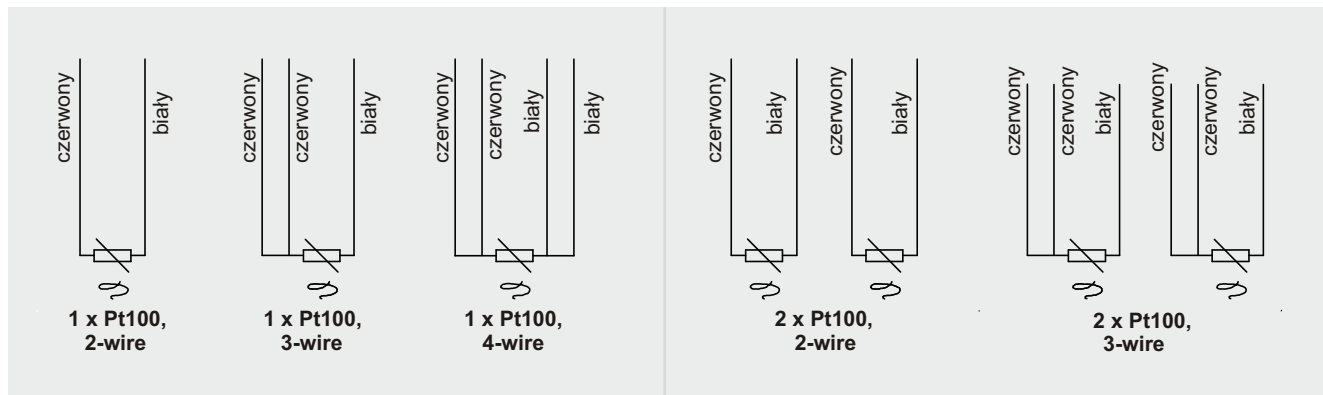
| Connecting cables

Code	No. of cables / cross section	Outer diameter	Maximal temperature	Insulation design		Application
JJ	4 x 0.22 mm²	Ø 4.4	105°C	cond.: sheath:	PVC PVC	damp interiors, weak acids, resistant to oils, fixed packing
SLSL	3 x 0.22 mm²	Ø 3.4	180°C	cond.: sheath:	Silicone Silicone	damp interiors, weak acids, resistant to oils, movable packing
TSL	2 x 0.22 mm² 3 x 0.22 mm² 4 x 0.22 mm²	Ø 4.2 Ø3.8 Ø 3.8	180°C	cond.: sheath:	FEP Silicone	damp interiors, weak acids, resistant to oils, movable packing
TPSL	4 x 0.22 mm²	Ø 4.0	180°C	cond.: screen: sheath:	FEP Cu braid Silicone	damp interiors, weak acids, resistant to oils, movable packing, resistant to electromagnetic interference, computer connectable
TT	2 x 0.22 mm² 3 x 0.22 mm² 4 x 0.22 mm²	Ø 2.5 Ø 2.6 Ø 2.6	260°C	cond.: sheath:	PFA PFA	damp interiors, acid resistant oils, movable packing
TCuT	4 x 0.22 mm² 6 x 0.22 mm²	Ø 3.9 Ø4.1	260°C	cond.: screen: sheath:	PFA Cu braid PFA	damp interiors, acid resistant oils, movable packing, resistance to electromagnetic interference, computer connectable
TP	4 x 0.22 mm²	Ø 3.6	260°C	cond.: braid:	PFA stainless steel	damp interiors, acid resistant, oil resistant, resistant to mechanical damage, movable packing
GLGLP	4 x 0.22 mm²	Ø 3.8	400°C	cond.: sheath: braid:	fibreglass fibreglass stainless steel	dry interiors, resistant to high temperatures and mechanical damage

| Wiring diagram

1 x Pt100, 2-wire

1 x Pt100, 3-wire

1 x Pt100, 4-wire

2 x Pt100, 2-wire
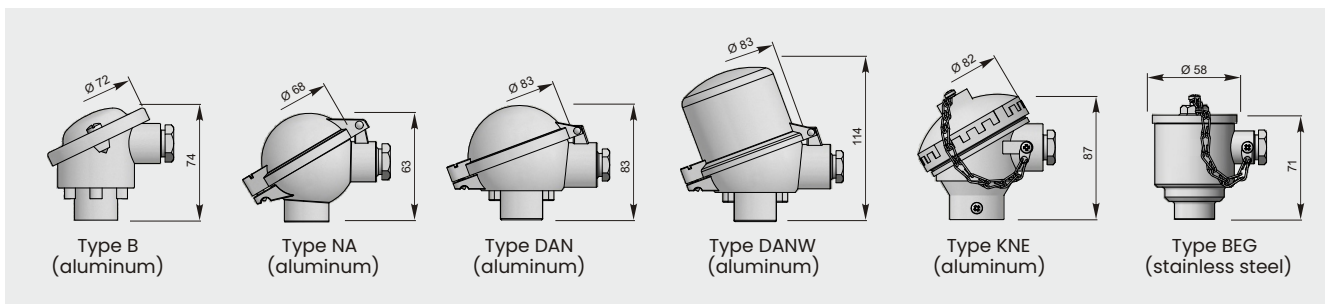
2 x Pt100, 3-wire

2 x Pt100, 4-wire
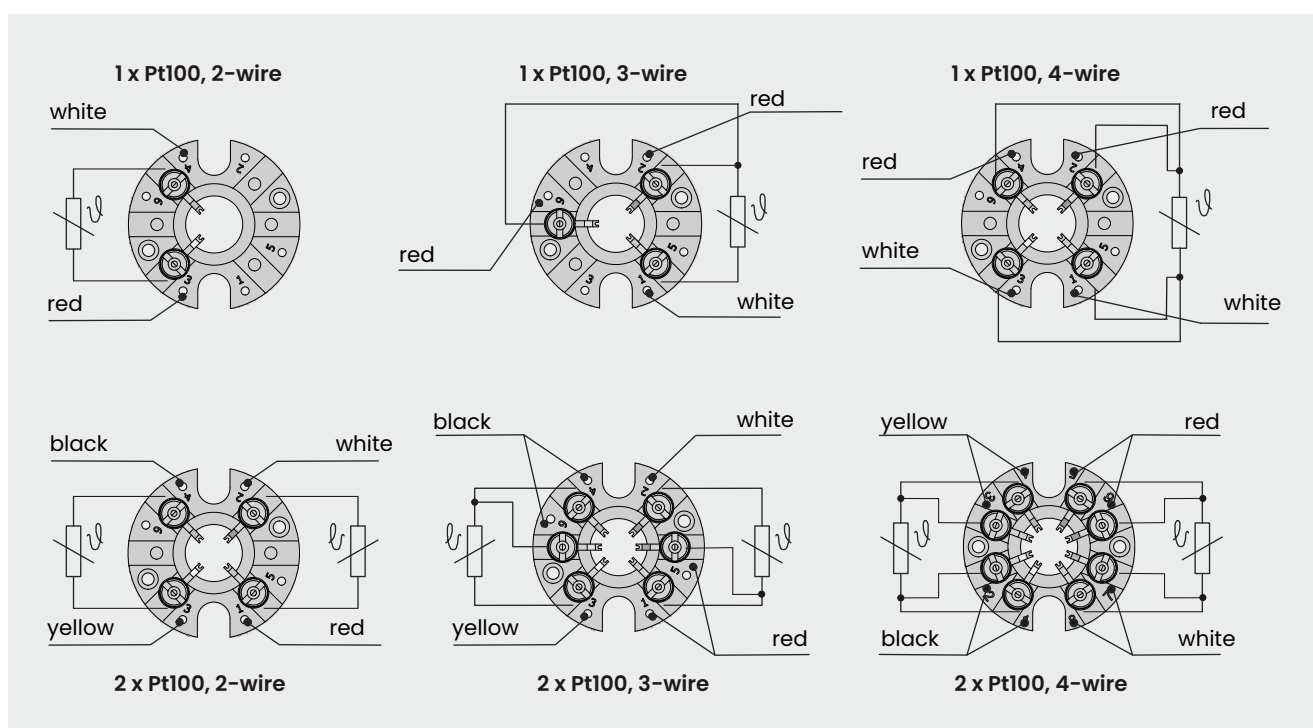
Steel armour

Sheathed sensors can be fitted with stainless steel armour which provides an additional protection against mechanical duty.
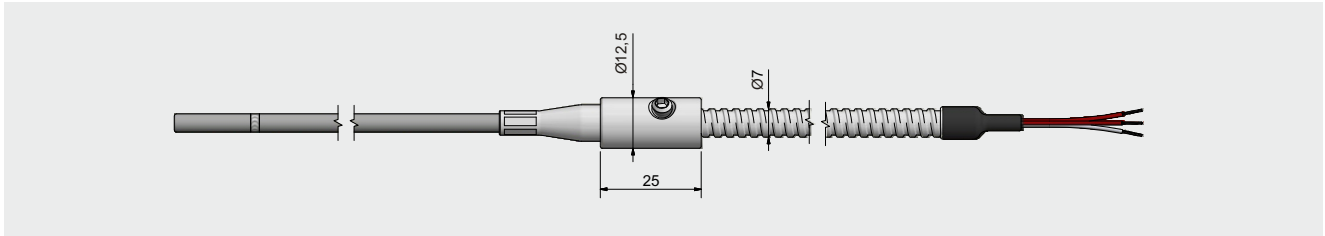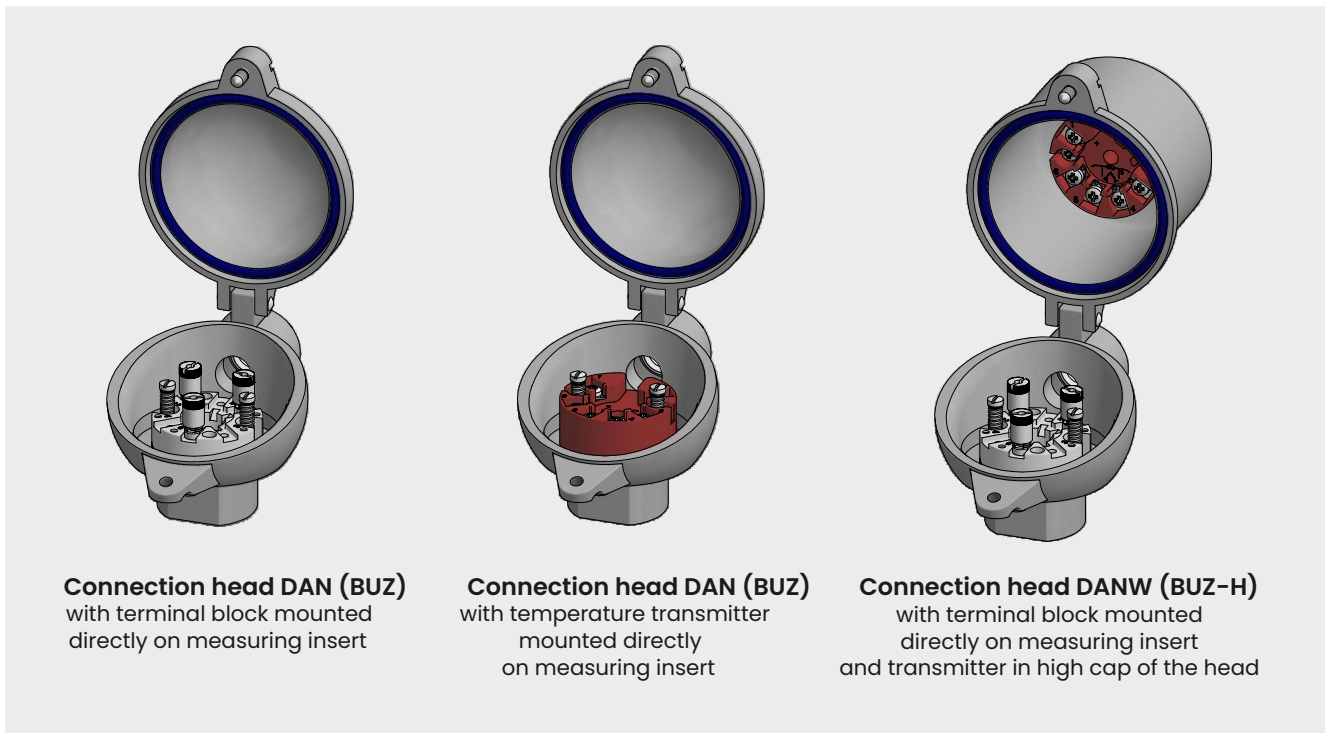

Connection Heads

These sensors can be equipped with one of the following connection heads.
For more information about available connection heads see section "Accessories".

Type B (aluminum) Type NA (aluminum) Type DAN (aluminum) Type DANW (aluminum) Type KNE (aluminum) Type BEG (stainless steel)

Temperature Transmitter

Transmitter is mounted inside the connection head of the sensor: directly on measuring inset or in the high cap of head. The second method is advantageous as it allows changing standard measuring inset quickly without a need to disassemble the transmitter; it means reduction of time and costs of maintenance of the sensor and protecting wires against any damage possible. Mounting of two transmitters inside the connection head available upon request

Connection head DAN (BUZ)
with terminal block mounted directly on measuring insert

Connection head DAN (BUZ)
with temperature transmitter mounted directly on measuring insert

Connection head DANW (BUZ-H)
with terminal block mounted directly on measuring insert and transmitter in high cap of the head

Type **TRP**

Connection head DANWdie with local LED display

The display is mounted in connection head cover with glasswindow which allows preview of measuring temperature. 4 digits with a height of 9.5 milimeter ensure clear reading of values.

Programming of measure range can be performed via three buttons placed on the back of display panel.

Mounted temperature transmitter 4..20mA on measuring insert is necessary for proper use. It also works with temperature transmitters with HART® protocol.

Features

Accuracy:	0,1% of range +/- 1 digit
Sensor type:	Pt50 – Pt1000, Ni50 – Ni1000
Output types:	4–20 mA
Response time:	from 1 to 10 sec
Min. amps for LED activation:	3,5mA
Display:	LED /30x14 mm
No of process value digits:	4
Backlight color:	None
Buttons:	None
Electromagnetic standards:	made in accordance to EN 61000 EN 55022 with positive result

Field mounted temperature transmitter PR7501

PR7501 field mounted HART® temperature transmitter with display and optical buttons allows to easy programming, review and diagnostics from the front of the sensor. Sensor display can be rotated in 90 degree increments for easy vertical or horizontal viewing.

Features

Accuracy:	Better than 0.05% of selected range
Sensor type:	Pt50 – Pt1000, Ni50 – Ni1000
Outrput types:	4–20 mA
Response time:	from 1 to 60 sec (programmable)
Min. amps for LED activation:	3,5mA
Display:	Dot matrix / 60 mm
No of process value digits:	5
Backlight color:	Selectable red or white
Buttons:	Three optical buttons: up arrow, down arrow and OK.
Electromagnetic standards:	made in accordance to EN 61326–1
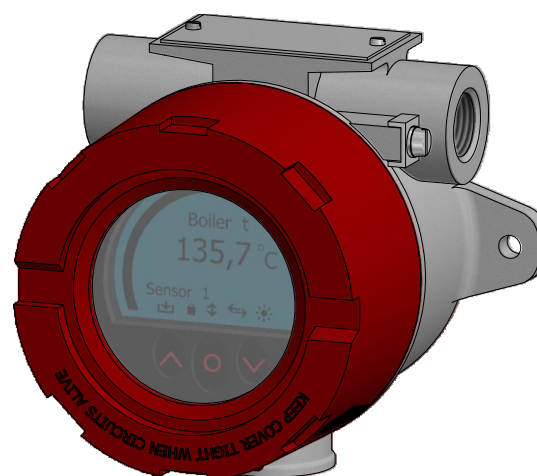
Ordering code

1		2	3	4	5	6	7	8	9	10	11	12
☐	TRP-	☐ -	☐ -	☐☐ -	☐ -	☐ -	☐ -	☐ -	☐ -	☐ -	☐	

Temperature transmitter

1			
			without transmitter
	AP		with temperature transmitter
	APW		with 4..20 mA temperature transmitter and local LED display*
	2AP		with two temperature transmitters

* available only with DANWdie and PR7501 type connection head

Sensor type

2			
	1xPt100	1 x Pt100
	2xPt100	2 x Pt100
	xxx	other, please specify

Design

3		
	BT	without pot seal
	BTW	without pot seal, with miniature size plug
	BTWs	without pot seal, with standard size plug
	WL	without pot seal, with LEMO® socket PCA 1.S
	WLKb	with pot seal, connection cable with LEMO® socket PCA
	T	with pot seal, teflon insulated flying leeds
	TS	with pot seal with the same diameter like sheath and flying leads
	TKb	with pot seal and connection cable
	TKbp	with pot seal, connection cable and stainless steel armour
	TKbW	with pot seal, connection cable and miniature size plug
	TKbWs	with pot seal, connection cable and standard size plug
	NA	with NA type aluminium connection head (other head types acc. to the table on page 7)
	DANWdie	with connection head equipped with local LED display
	PR7501	with field mounted PR7501 temperature transmitter 4..20mA with HART® and local LED

Sheath material

4		
	Y	stainless steel 1.4404 (AISI316)
	V	stainless steel 1.4541 (AISI321)

Sheath diameter d

5		
	15	Ø 1.5 mm (sensor tip Ø1.6 x 20 mm)
	20	Ø 2.0 mm
	30	Ø 3.0 mm
	45	Ø 4.5 mm
	60	Ø 6.0 mm
	xxx	other, please specify

Class of tolerance

6		
	A	Class A according to PN-EN 60751
	B	Class B according to PN-EN 60751
	xxx	other, please specify

Connection line

7		
	2	2-wire (only class B)
	3	3-wire
	4	4-wire

Length L

8		
	500	500 mm
	xxx	other, please specify

Cable length Lp

9		
	1000	1000 mm
	xxx	other, please specify

Cable insulation

10		
	JJ	PVC / PVC (do +105°C)
	SLSL	Silicone / Silicone(do +180°C)
	TSL	Teflon® FEP / Silicone (do +180°C)
	TPSL	Teflon® FEP / Cu braid / Silicone (do +180°C)
	TT	Teflon® PFA / Teflon® PFA (do +260°C)
	TCuT	Teflon® PFA / Cu braid / Teflon® PFA (do +260°C)
	GLGLP	Fibreglass / Fibreglass / Steel braid

Measuring range for the temperature transmitter

11		
	0..100	Measuring range for signal 4..20mA: 0..100°C
	xxx	other, please specify

| Ordering code (continue)

```
   1            2     3      4  5      6       7       8       9      10      11    12
        TRP-   □  -  □  -  □□  -  □  -  □  -  □  -  □  -  □  -  □  -  □
```

Type of temperature transmitter

12			
		PR5333A	Output signal 4..20 mA
		PR5335A	Output signal 4..20 mA, with HART® communication protocol
		PR5350A	Output signal: Profibus® PA / Foundation Fieldbus communication protocol
		PR5437A2	Dual input, Signal output 4..20 mA + HART® ver.5/7 protocol
		PR5437A2S	Dual input, Signal output 4..20 mA + HART® ver.5/7 protocol, SIL2/3
		xxx	other, please specify

| Example

TRP-1xPt100-TKbWs-I-Y30-A-3-1000-3000-SLSL

Mineral insulated RTD 1xPt100, with pot seal, connection cable and standard size plug, sheath material AISI316, sheath diameter Ø3.0 mm, class A acc. to PN-EN 60751, 3-wire connection line, length L=1000mm, cable length Lp=3000 mm, cable insulation silicone/silicone.

TRP-1xPt100-DAN-I-V60-B-2-5000

Mineral insulated RTD 1xPt100, with aluminum connection head DAN type, sheath material AISI321, sheath diameter Ø6.0 mm, class B acc. to PN-EN 60751, 2-wire connection line, length L=5000mm.

APTRP-1xPt100-DANW-I-Y60-A-4-2000-0÷1300°C-PR5334A3B

Mineral insulated RTD 1xPt100, with aluminum connection head DANW type with installed temperature transmitter 4..20mA, sheath material AISI316, sheath diameter Ø6.0 mm, class A acc. to PN-EN 60751, 4-wire connection line, length L=2000mm

APWTRP-1xPt100-DANWdie-I-V60-A-3-500-(0..+100)°C-PR5334A3B

Mineral insulated RTD 1xPt100, with aluminum connection head DANWdie type with installed temperature transmitter 4..20mA and local LED display, sheath material AISI321, sheath diameter Ø6.0 mm, class A acc. to PN-EN 60751, 3-wire connection line, length L=500mm.