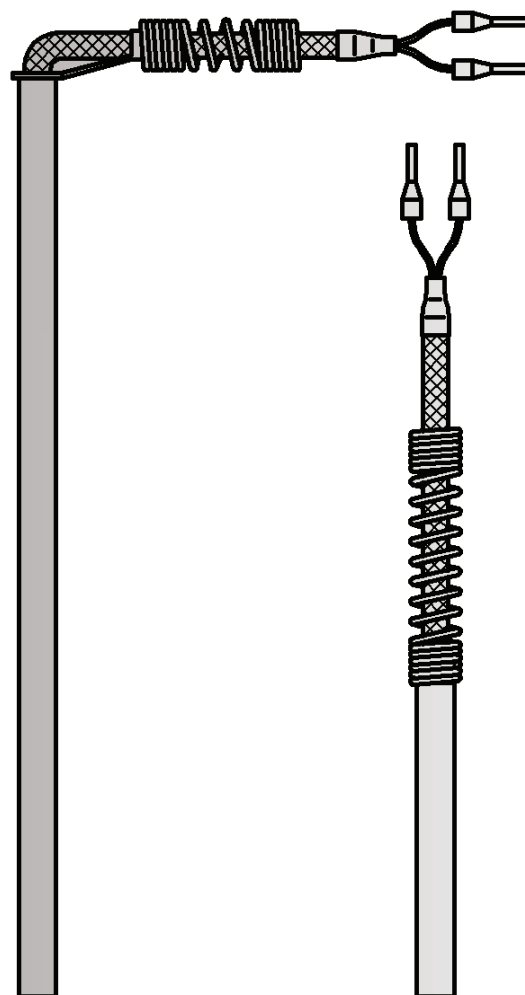




AP 108

Sensor suitable for temperature measurement in district heating substations. Applicable for temperature measurement of liquid and gaseous media in high pressure conditions. This Sensor consists of sensing element placed in the thin-walled acid-resistant sheath with connector and flexible lead wire.



### Specification

#### Temperature range / sensing element

-50÷400°C	<b>Pt100</b>	class B
-40÷400°C	<b>K, J</b>	class 2

#### Thermowell

- material: steel 1.4541
- diameter d [mm]: 3, 4, 5, 6, 8
- length L[mm]: 30÷1000

#### Lead wire

- stranded Cu wire or stranded thermocouple wire: 0,22mm<sup>2</sup>
- fiberglass insulation, metal overbraid
- length L<sub>p</sub> [m]: 1,5 (standard)
- Cu wire resistance~0,14 Ω/m = ~0,36°C

Other parameters acc. to requirements

### Options

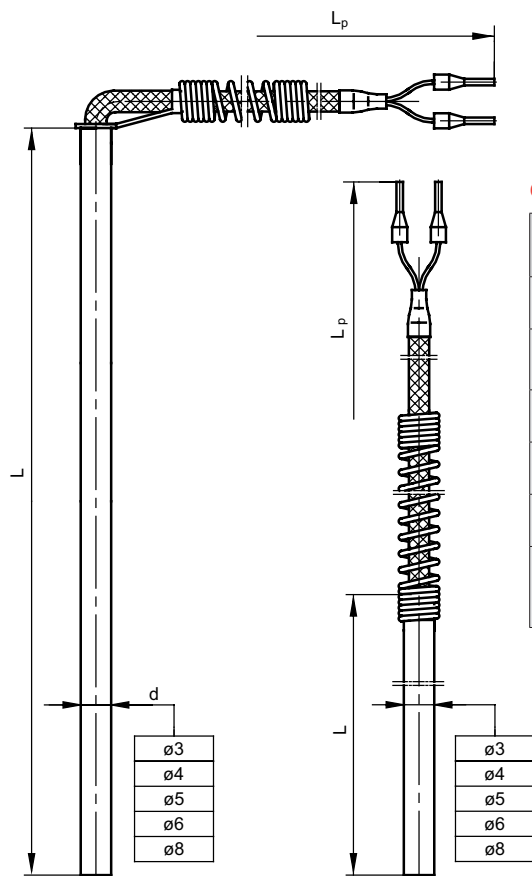
#### Temperature transmitter application

Temperature transmitter with standard 4÷20mA, 0÷10V output signals and with the HART or PROFIBUS communication protocols can be installed in the control cabinet.

#### Non-standard design

Immersion length, shape and material of the sheath and other parameters can be customized per client request.

**Calibrations performed by Limatherm Sensor Sp. z o.o. are confirmed with the Calibration Certificate of the Accredited Laboratory for Temperature Measurements.**



#### Compensation / thermocouple wire insulations

Insulation material	Operating temperature range [°C]	Properties
PCW (PCV)	-10÷105	Applied in mild environmental conditions. Waterproof and flexible.
Yc- polyvinyl chloride	-10÷105	Applied in mild environmental conditions. Waterproof and flexible.
FEP-teflon	-50÷200	Resistant to oils, acids and other aggressive liquids. Good flexibility.
Si-silicone	-50÷180	Waterproof, flexible. Applied in high humidity conditions.
Ws-fiberglass	-60÷400	Good resistance to high temperature Low resistance to liquid penetration.

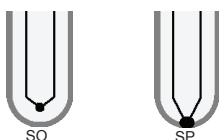
**Notes:** Additionally, copper or steel braids/shields are used on wires to prevent electrical noises, Increasing, at the same time, wire insulation resistance to mechanical damages. In case of longer wire lengths grounding may be needed to minimize the noise in measurement circuit

#### Response time to temperature change dla Pt

Thermowell diameter [mm]	Response time [s]
ø6	$t_{0,5} = 12$
	$t_{0,9} = 55$
ø8	$t_{0,5} = 20$
	$t_{0,9} = 85$

test carried out in mixed water 0,4 m/s acc. to PN-EN 60751

#### Thermocouple hot junction types



#### Tolerance for classes of sensors with resistors Pt acc. to PN-EN 60751

Sensor classes	Range of application [°C]	Formula for calculating acceptable deviations [°C]
AA	0÷150	$T = \pm(0,10 + 0,0017  t )$
A	-30÷300	$T = \pm(0,15 + 0,002  t )$
B	-50÷500	$T = \pm(0,3 + 0,005  t )$

|t| - absolute value of temperature

#### Measurement circuit

1 x Pt100			2 x Pt100			1 x TC	2 x TC
2-wire	3-wire	4-wire	2-wire	3-wire	4-wire	2-wire	2-wire
✓	✓	✓	x	x	x	✓	x

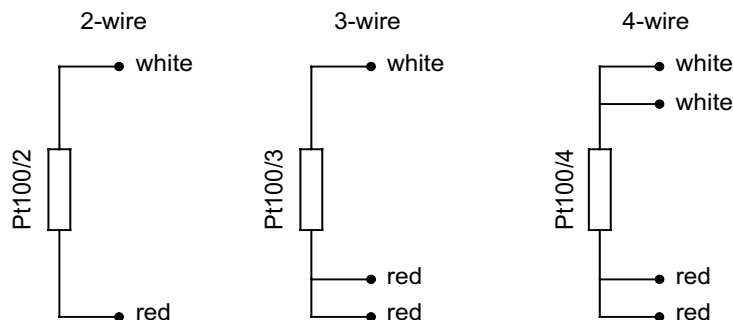
#### Tolerance for thermocouple classes acc. to PN-EN 60584

Thermocouple type	Class 1		Class 2	
	Range of application [°C]	Tolerance [°C]	Range of application [°C]	Tolerance [°C]
<b>J</b> Fe-CuNi	from -40 to +375 from +375 to +750	$\pm 1,5$ $\pm 0,004  t $	from -40 to +333 from +333 to +750	$\pm 2,5$ $\pm 0,0075  t $
<b>K</b> NiCr-NiAl	from -40 to +375 from +375 to +1000	$\pm 1,5$ $\pm 0,004  t $	from -40 to +333 from +333 to +1200	$\pm 2,5$ $\pm 0,0075  t $

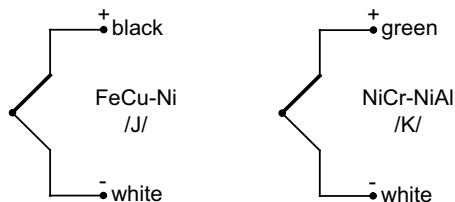
|t| - absolute value of temperature

Connection schemes

Pt100 (thermometric resistor)



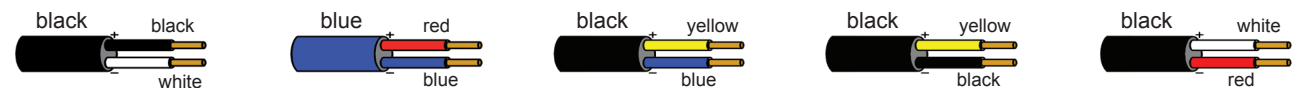
TC (thermocouple)



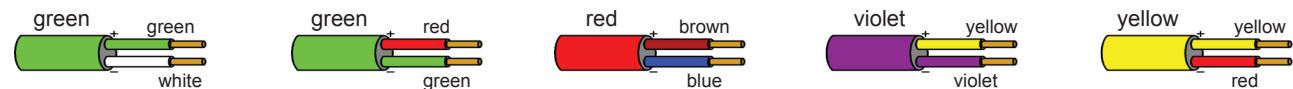
Cable types and colours acc. to the norm

EU D GB F USA

Thermocouple J type



Thermocouple K type



Product code

Sensing element	
OP	resistor Pt
TJ	thermocouple Fe-CuNi /J/
TK	thermocouple NiCr-NiAl /K/
Constructional version	
1	straight
2	anular
Sheath length	
50	50mm
500	500mm
	other parameters acc. to requirements

		<b>Sheath diameter</b>	
		3	ø3mm
		4	ø4mm
		5	ø5mm
		6	ø6mm
		8	ø8mm
4	<input type="text"/>		other parameters acc. to requirements
		<b>Lead wire insulation</b>	
		Si	silicone
		Ws	fiberglass
5	<input type="text"/>	F	teflon
		<b>Resistor type or hot junction type for thermocouple</b>	
		Pt100	Pt100
6	<input type="text"/>		other parameters acc. to requirements
		<b>Accuracy</b>	
		A or B	for measuring resistor
7	<input type="text"/>	1 or 2	for thermocouple
		<b>Measurement circuit (for resistor)</b>	
		2	2 - wire
		3	3 - wire
8	<input type="text"/>	4	4 - wire
		<b>Lead wire length</b>	
		1,5	1,5m
9	<input type="text"/>		other parameters acc. to requirements

	1		2		3		4		5		6		7		8		9
T	<input type="text"/>	E-36	<input type="text"/>	-	<input type="text"/>	-	<input type="text"/>	-	<input type="text"/>	-	<input type="text"/>	-	<input type="text"/>	-	<input type="text"/>	-	<input type="text"/>

Ordering example: **TOPE-361-100-6-Si-Pt100-B-2-4 m** sensor with Pt100, class B, 2-wire connection, sheath diameter 6 mm, sensor length L=100 mm, silicone insulated lead wire length L<sub>p</sub>=4 m