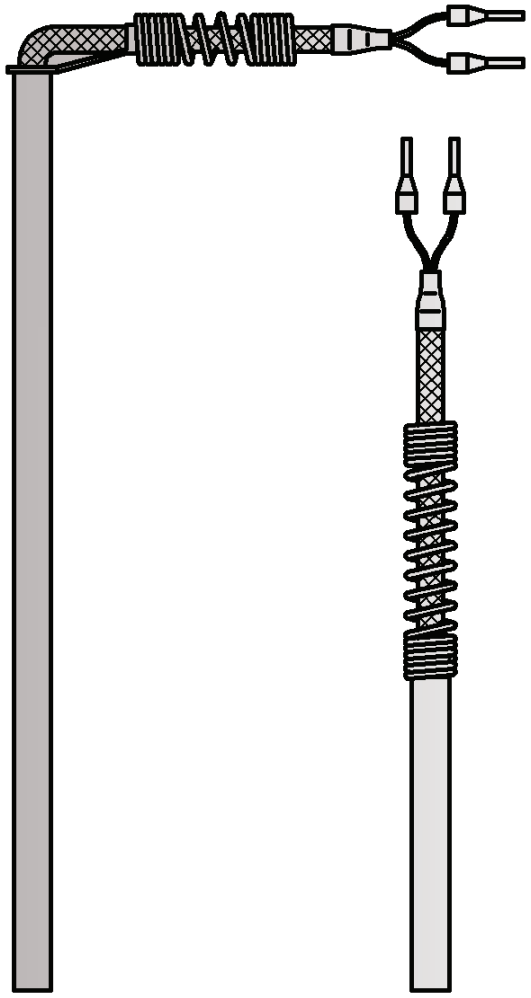
limatherm SENSOR

Temperature Sensors for Measurement of Machinery and Device Parts
TOPE-361, 362, TTJE-361, 362, TKE-361, 362

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	**Pt100**	class B
-40÷400°C	**K, J**	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^2
– fiberglass insulation, metal overbraid
– length L_p [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.

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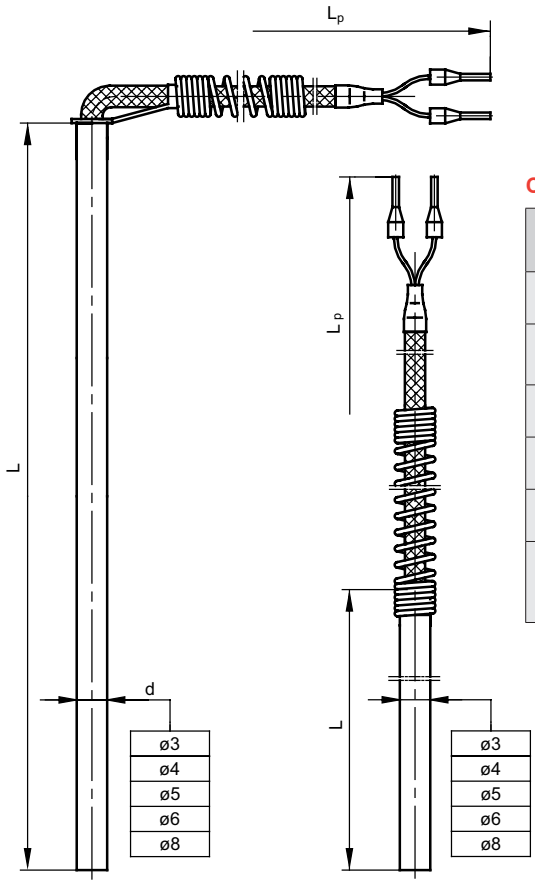


Compensation / thermocouple wire insulations

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.

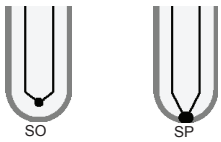
Notes: Additionally, copper or steel braids/shields are used on wires to prevent electrical noises, Increasing, at the same time, wire insulation resistance to mechanical damages. In case of longer wire lengths grounding may be needed to minimize the noise in measurement circuit

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 = ±(0,10 + 0,0017 |t|)
A	-30÷300	T = ±(0,15 + 0,002 |t|)
B	-50÷500	T = ±(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]
J Fe-CuNi	from -40 to +375 from +375 to +750	±1,5 ±0,004 |t|	from -40 to +333 from +333 to +750	±2,5 ±0,0075 |t|
K NiCr-NiAl	from -40 to +375 from +375 to +1000	±1,5 ±0,004 |t|	from -40 to +333 from +333 to +1200	±2,5 ±0,0075 |t|

|t|- absolute value of temperature

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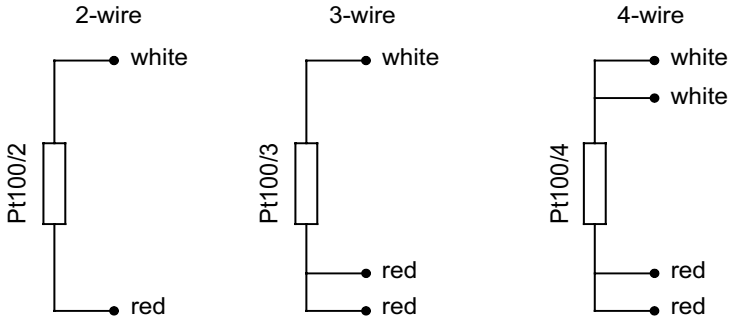
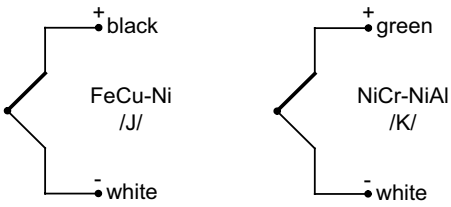
Connection schemes

Pt100 (thermometric resistor)



TC (thermocouple)



Cable types and colours acc. to the norm

EU	D	GB	F	USA
Thermocouple J type				
black / black / white	blue / red / blue	black / yellow / blue	black / yellow / black	black / white / red
Thermocouple K type				
green / green / white	green / red / green	red / brown / blue	violet / yellow / violet	yellow / yellow / red

Product code

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

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

1		2		3		4		5		6		7		8		9
T		**E-36**		–		–		–		–		–		–		

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_p=4 m