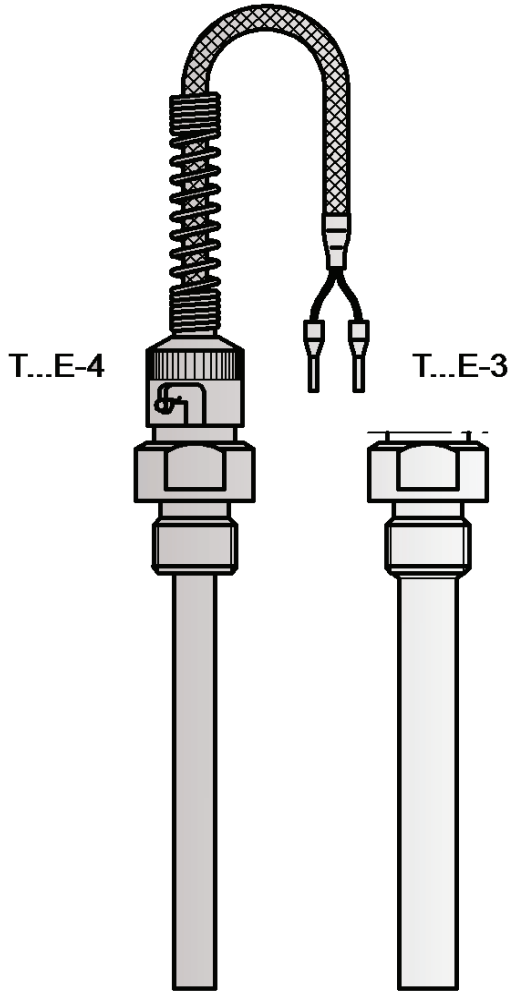
limatherm SENSOR

Temperature Sensors for Measurement of Machinery and Device Parts
TOPE-3, 4, TTJE-3, 4, TTKE-3, 4

AP 108

Temperature sensor suitable for measurement of movable or replaceable parts of machines and devices, e.g. bearings or injection moulds. Equipped with bayonet fitting that enables quick and easy installation in the measured element. Furthermore, the sensor has a spring that protects the flexible cable. The cap of a bayonet fitting can be easily moved across the spring enabling the adjustment of sensor immersion length.



Specification

Temperature range / sensing element

-50÷250ºC	**Pt100**	class B
-40÷400ºC	**K, J**	class 2

Sheath

– brass, atmospheric pressure (TOPE-4)
– additional thermowell 1.4541 up to 1MPa,
– length [mm]: 80 or 100 (TOPE-3)

Lead wire

– stranded Cu wire 2x0,35mm^2 with teflon insulation, metal overbraid
– thermocouple stranded wire 2x0,22mm^2 with double fiberglass insulation, metal overbraid
– length L_p [m]:1,5 (standard)
– Cu wire resistance 0,105Ω/m = ~0,2ºC

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, diameter and material of the sheath, and measuring insert 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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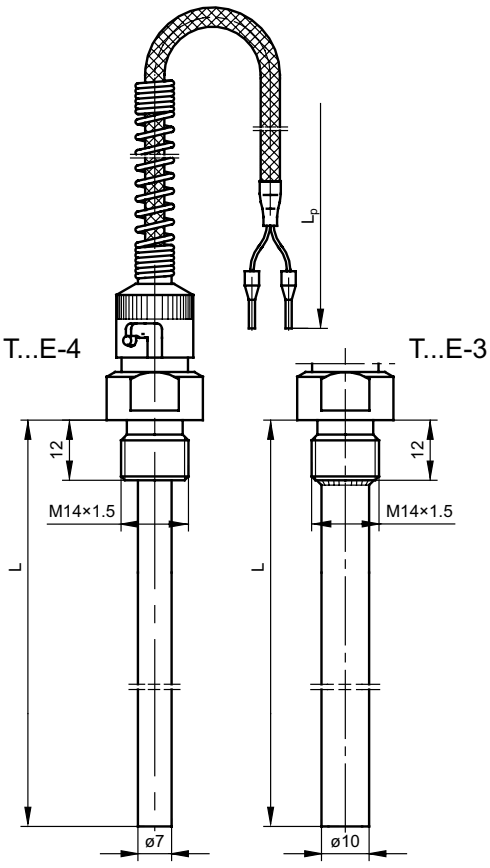

Compensation / thermocouple wire insulations

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 for TOPE-3

Thermowell diameter [mm]	Response time [s]
ø10	$t_{0,5}$= 35
	$t_{0,9}$= 100

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

Thermocouple hot junction types

SO

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

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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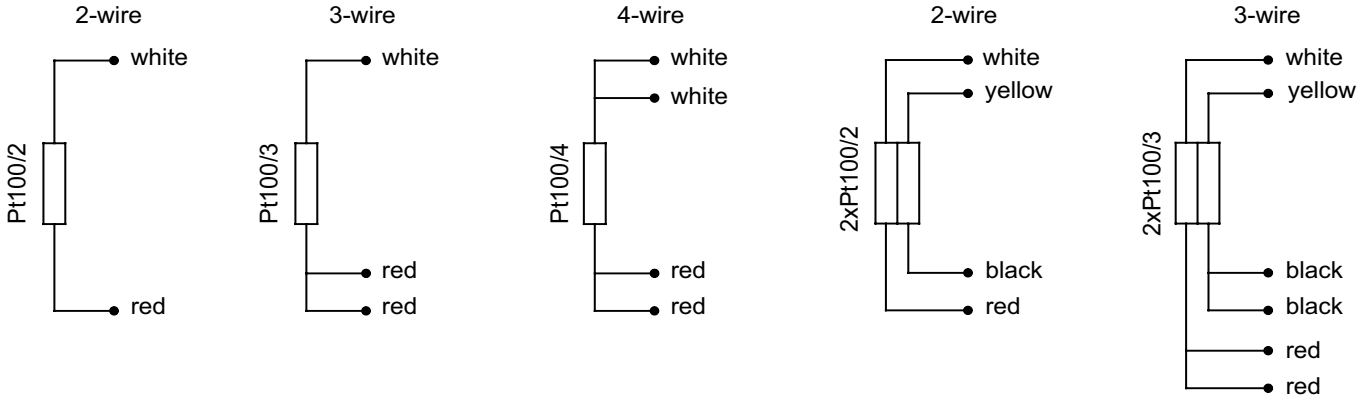
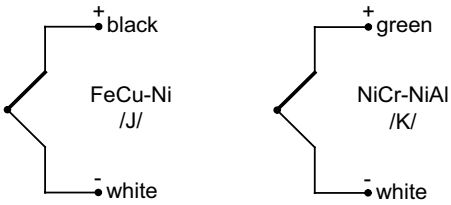
Connection schemes

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

		Sensor version	
0		**no designation**	single
		2	double
		Sensing element	
		OP	resistor Pt
		TJ	thermocouple Fe-CuNi /J/
1		**TK**	thermocouple NiCr-NiAl /K/
		Constructional version	
		3	with additional thermowell ø10mm
2		**4**	with connector

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		Sheath length	
		80	80mm
		100	100mm
3			other parameters acc. to requirements
		Accuracy	
		A or B	for measuring resistor
4		**1 or 2**	for thermocouple
		Measurement circuit (for resistor)	
		2	2 - wire
		3	3 - wire
5		**4**	4 - wire
		Lead wire insulation type for Pt100	
		Fek	teflon with copper shield
6		**Ws**	fiberglass with steel overbraid
		Resistor type	
		Pt100	Pt100
7			other parameters acc. to requirements
		Dimension of process connection thread	
		M14x1,5	metric thread M14x1,5
8			other parameters acc. to requirements
		Lead wire length	
		1,5	1,5m
9			other parameters acc. to requirements

0	1			2	3	4	5	6	7	8	9
	T		E	–	–	–	–	–	–	–	–

Ordering example:

TTJE-4–100–2–Ws–M14x1,5–2 m single sensor with thermocouple Fe-CuNi /J/, class 2, sheath diameter 7 mm, length L=100 mm, fiberglass insulated lead wire length L_p=2 m, with threaded connector M14x1,5