



1. Accuracy limits

1.1 Thermometer resistors Pt100 and thermometers with nominal resistance 100 Ω

EN-60751 specifies the resistance value ranges in the function of temperature and classes for accuracy limits: 1/3B, A and B class. Accuracy limit specify max. accuracy in °C or in Ω comparing with standard values. Class „1/3B” should not be used in platinum resistors Pt100 with resistance 100Ω, when operating temperatures is higher than 250°C, and class „A”, when operating temperatures is higher than 450°C. Thermometers with 2-wire configuration should not be used with class „A” and higher.

Accuracy limits for resistors Pt100						
Temperature °C	Class A		Class B		Class 1/3 B	
	°C	Ω	°C	Ω	°C	Ω
-200	±0.55	±0.24	±1.3	±0.56	-	-
-100	±0.35	±0.14	±0.8	±0.32	-	-
0	±0.15	±0.06	±0.3	±0.12	±0.1	±0.04
100	±0.35	±0.13	±0.8	±0.30	±0.26	±0.1
200	±0.55	±0.20	±1.3	±0.48	±0.4	±0.16
300	±0.75	±0.27	±1.8	±0.64	±0.6	±0.21
400	±0.95	±0.33	±2.3	±0.79	-	-
500	±1.15	±0.38	±2.8	±0.93	-	-
600	±1.35	±0.43	±3.3	±1.06	-	-
700	-	-	±3.8	±1.17	-	-
800	-	-	±4.3	±1.28	-	-
900	-	-	±4.6	±1.34	-	-

1.2 Thermocouples

EN-60584-2 specifies three classes and values of thermoelectric force in the function of temperature.

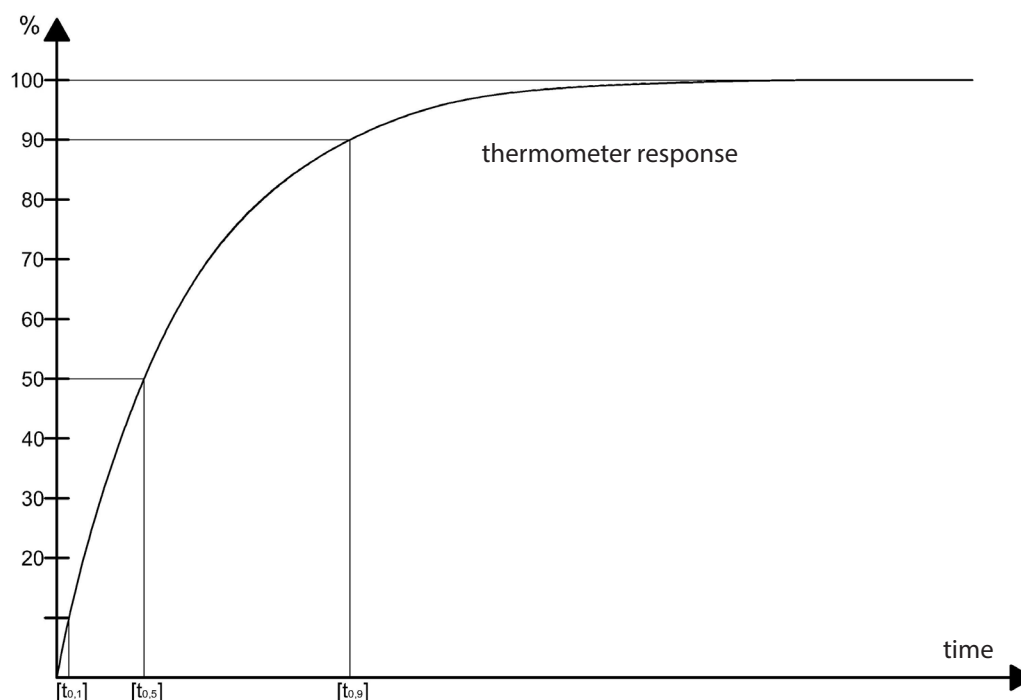
Accuracy limits acc. to norm EN-60584-2						
Type	Class 1		Class 2		Class 3	
	Temp. range [°C]	Temp. range [°C]	Temp. range [°C]	Temp. range [°C]	Temp. range [°C]	Temp. range [°C]
Type T	-40 to +125	±0.5	-40 do +133	±1.0	-67 do +40	±1.0
	+125 to +350	±0.004 x t	+133 do +350	±0.0075 x t	-200 do -67	±0.015 x t
Type E	-40 to +375	±1.5	-40 do +333	±2.5	-167 do +40	±2.5
	+375 to +800	±0.004 x t	+333 do +900	±0.0075 x t	-200 do -167	±0.015 x t
Type J	-40 to +375	±1.5	-40 do +333	±2.5	-	-
	+375 to +750	±0.004 x t	+333 do +750	±0.0075 x t	-	-
Type K	-40 to +375	±1.5	-40 do +333	±2.5	-167 do +40	±2.5
	+375 to +1000	±0.004 x t	+333 do +1200	±0.0075 x t	-200 do -167	±0.015 x t
Type R+S	0 to +1100	±1.0	0 do +600	±1.5	-	-
	+1100 to +1600	±[1+0.003 (t -1100)]	+600 do +1600	±0.0025 x t	-	-
Type B 400	-	-	-	-	+600 do +800	±4.0
	-	-	+600 do +1700	±0.0025 x t	+800 do +1700	±0.005 x t



2. Dynamic parameters

2.1 Time of response [t]

Time of response [t], this is the time, which thermometer needs, after temperature step change, to show specified percentage of a change. Time of response [t_{0.5}], this is the time, after which the thermometer show 50% of value of the temperature step change. On customer request there can be specified time of response for 10% [t_{0.1}] or for 90% [t_{0.9}]. Time of response can be specified for circulated air or water.

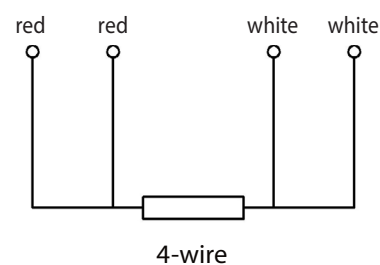
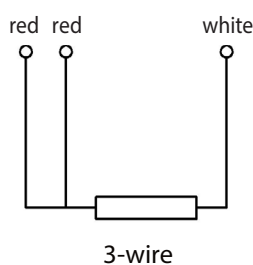
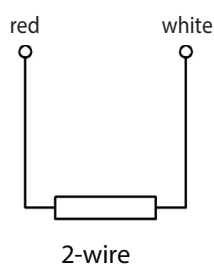


3. Wire configuration

Norm EN- 60751+A2 specify the following wire configuration:

Thermometers with only 2-wire configuration, which are used with 2 outer connecting cables only, should not be applied to class A (pkt3.3.1 EN-60751+A2).

3.1 Configuration symbols

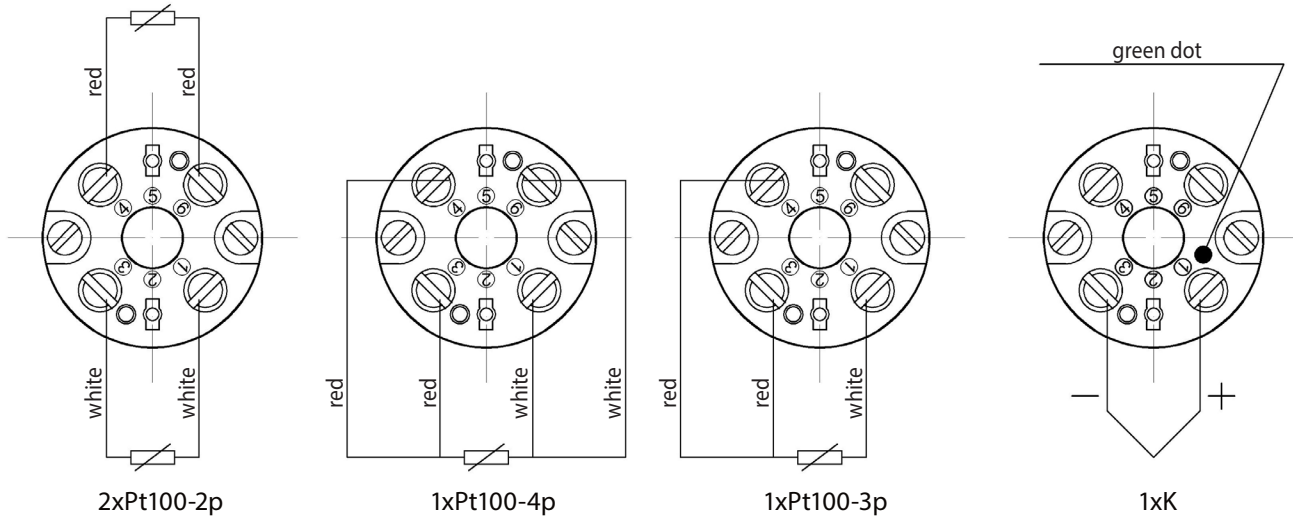


Cable resistance Cu: $R = (L \times 0.0175) / s$

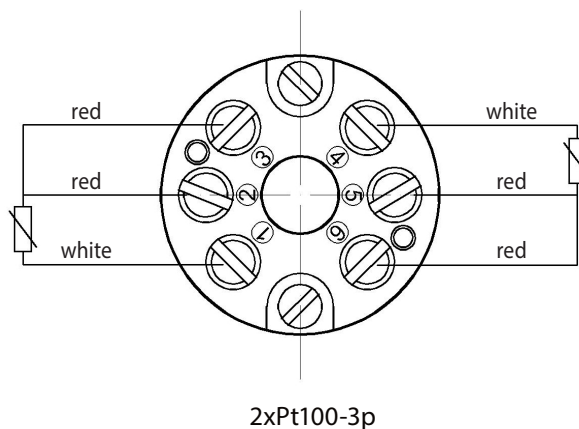
where: L = cable length [m] ; s = cable diam. [mm²] ; 0.0175 = Cu material resistance

3.2 Resistance thermometers connection

Connecting diagram of terminal block with 4 connections



Connecting diagram of terminal block with 6 connections



4. Products quality control

Each manufactured product is quality controlled in our laboratory in compliance with norm requirements. The quality control of manufactured by us platinum resistors was also made by Certified Laboratory D-K 15186-01-00 ZMK GmbH Sachsen-Anhalt.

4.1 Resistance thermometer quality control

This procedure is made for the following sensors: Pt-100/1.3850, Ni-100/1.617, Cu-100/1.426 and also for of unusual resistance in 0°C sensors (Pt-50, Pt-500, Ni-200, Cu-50, itp.) and resistance thermometers equipped with these sensors. There is also possibility of checking the parameters of equipment used for measuring resistance and voltage of sensors.

4.2 Thermocouple quality control

Procedure is done for the following thermocouples PtRh10-Pt (S), NiCr-NiAl (K), Fe-NiCu (J), Cu-CuNi (T) itp., and sensors equipped in above thermocouples.

4.3 Measuring accuracy

- Temperature from 0°C: ± 0.03 °C (by confidence level 95%)
- Temperature from 0°C to 100 °C : ± 0.10 °C (by confidence level 95)
- Temperature from 100°C to 500 °C : ± 0.30 °C (by confidence level 95%)
- Temperature from 500°C to 1200 °C : ± 1.3 °C (by confidence level)

4.4 Control and measuring instruments used in the laboratory

- Control platinum resistant thermometer type PW-EZ100 Heraeus Sensor GmbH (Cert.No. D-K 15186-01-00).
- Platinum resistant laboratory sensors of LSM brand (Cert. No. D-K 15186-01-00).
- Control platinum thermometers II class PtRh10-Pt (Certification of Regional Measuring Department in Cracow).
- Standard resistors of 10 Ω ,100 Ω ,1000 Ω ,10000 Ω , 1000M Ω kl. 0,01 of ZIP brand
- Resistance decades class. 0,01 (Certification of Regional Measuring Department in Cracow).
- Measurer of insulation in the range of 1M Ω to 10G Ω voltage 0÷1000V.
- Digital multimeter type 6001 (Certification of Regional Measuring Department in Cracow)
- Digital multimeter type FLUKE 8508A (Certification of Regional Measuring Department in Cracow)
- Thermometer bridge 5840E.
- PC for measurements MC8047.
- Pipe furnace type TPK 500 up to 1200 °C.
- Pipe furnace ROF 7/75 up to 1300 °C, with measuring blocks made form aluminum, nickel steel and ceramic.
- Oil thermostat LAUDA US-12 up to 120 °C.
- Liquid thermostat up to 300 °C.
- Ebullioscope for boiling water point measurements.
- Deware instrument for melting water point measurements.

In our laboratory we issue certificates of quality control of resistors and sensors in given measuring range.