

Temperature sensing elements Pt 100, $\alpha = 3.91 \cdot 10^{-3} \text{ }^\circ\text{C}^{-1}$

Basic technical parameters

Sensing element	Thin-film platinum resistor
Maximum range of working temperature	-50 to 400 °C *
Resistance at 0 °C	100 Ω
Long-term resistance stability	0.05 % after 1000 h at 400 °C
Recommended / maximum direct measuring	0.3mA / 1mA

* The real range of working temperature of the sensor is given by the design and technology

Note: Pt 100 temperature sensors with this characteristic are usually part of equipment from Russia or countries of the former Soviet Union. Their properties are described in GOST 6651 - 2009.

The temperature dependence of the sensing element resistance is expressed as follows:

$$R = 100 (1 + At + Bt^2 + C (t-100) t^3) \quad \text{in a temperature range of } -200 \text{ to } 0 \text{ }^\circ\text{C}$$

$$R = 100 (1 + At + Bt^2) \quad \text{in a temperature range of } 0 \text{ to } 850 \text{ }^\circ\text{C}$$

where: $A = 3.969 \cdot 10^{-3} \text{ }^\circ\text{C}^{-1}$ $B = -5.841 \cdot 10^{-7} \text{ }^\circ\text{C}^{-2}$ $C = -4.330 \cdot 10^{-12} \text{ }^\circ\text{C}^{-4}$

Dependence of resistance on temperature in ohms [Ω]:

°C	0	-1	-2	-3	-4	-5	-6	-7	-8	-9
-50	80.00									
-40	84.03	83.62	83.22	82.82	82.42	82.02	81.61	81.21	80.81	80.40
-30	88.04	87.64	87.24	86.84	86.44	86.03	85.63	85.23	84.83	84.43
-20	92.04	91.64	91.24	90.84	90.44	90.04	89.64	89.24	88.84	88.44
-10	96.03	95.63	95.23	94.83	94.43	94.03	93.63	93.24	92.84	92.44
0	100.00	99.60	99.21	98.81	98.41	98.01	97.62	97.22	96.82	96.42

°C	0	1	2	3	4	5	6	7	8	9
0	100.00	100.40	100.79	101.19	101.59	101.98	102.38	102.78	103.17	103.57
10	103.96	104.36	104.75	105.15	105.55	105.94	106.34	106.73	107.13	107.52
20	107.91	108.31	108.70	109.10	109.49	109.89	110.28	110.67	111.07	111.46
30	111.85	112.25	112.64	113.03	113.43	113.82	114.21	114.61	115.00	115.39
40	115.78	116.17	116.57	116.96	117.35	117.74	118.13	118.53	118.92	119.31
50	119.70	120.09	120.48	120.87	121.26	121.65	122.04	122.43	122.82	123.21
60	123.60	123.99	124.38	124.77	125.16	125.55	125.94	126.33	126.72	127.11
70	127.50	127.89	128.27	128.66	129.05	129.44	129.83	130.21	130.60	130.99
80	131.38	131.77	132.15	132.54	132.93	133.31	133.70	134.09	134.47	134.86
90	135.25	135.63	136.02	136.41	136.79	137.18	137.56	137.95	138.34	138.72
100	139.11	139.49	139.88	140.26	140.65	141.03	141.42	141.80	142.18	142.57
110	142.95	143.34	143.72	144.10	144.49	144.87	145.25	145.64	146.02	146.40
120	146.79	147.17	147.55	147.94	148.32	148.70	149.08	149.46	149.85	150.23
130	150.61	150.99	151.37	151.75	152.14	152.52	152.90	153.28	153.66	154.04
140	154.42	154.80	155.18	155.56	155.94	156.32	156.70	157.08	157.46	157.84
150	158.22	158.60	158.98	159.36	159.74	160.12	160.49	160.87	161.25	161.63
160	162.01	162.39	162.76	163.14	163.52	163.90	164.28	164.65	165.03	165.41
170	165.78	166.16	166.54	166.92	167.29	167.67	168.05	168.42	168.80	169.17
180	169.55	169.93	170.30	170.68	171.05	171.43	171.80	172.18	172.55	172.93
190	173.30	173.68	174.05	174.43	174.80	175.17	175.55	175.92	176.30	176.67
200	177.04	177.42	177.79	178.16	178.54	178.91	179.28	179.66	180.03	180.40
210	180.77	181.15	181.52	181.89	182.26	182.63	183.01	183.38	183.75	184.12
220	184.49	184.86	185.23	185.60	185.97	186.35	186.72	187.09	187.46	187.83

230	188.20	188.57	188.94	189.31	189.68	190.05	190.4	190.78	191.15	191.52
240	191.89	192.26	192.63	193.00	193.37	193.73	194.10	194.47	194.84	195.21
250	195.57	195.94	196.31	196.68	197.04	197.41	197.78	198.15	198.51	198.88
260	199.25	199.61	199.98	200.34	200.71	201.08	201.44	201.81	202.17	202.54
270	202.90	203.27	203.64	204.00	204.37	204.73	205.09	205.46	205.82	206.19
280	206.55	206.92	207.28	207.64	208.01	208.37	208.74	209.10	209.46	209.83
290	210.19	210.55	210.91	211.28	211.64	212.00	212.36	212.73	213.09	213.45
300	213.81	214.17	214.54	214.90	215.26	215.62	215.98	216.34	216.70	217.07
310	217.43	217.79	218.15	218.51	218.87	219.23	219.59	219.95	220.31	220.67
320	221.03	221.39	221.75	222.10	222.46	222.82	223.18	223.54	223.90	224.26
330	224.62	224.97	225.33	225.69	226.05	226.41	226.76	227.12	227.48	227.84
340	228.19	228.55	228.91	229.26	229.62	229.98	230.33	230.69	231.05	231.40
350	231.76	232.12	232.47	232.83	233.18	233.54	233.89	234.25	234.60	234.96
360	235.31	235.67	236.02	236.38	236.73	237.09	237.44	237.80	238.15	238.50
370	238.86	239.21	239.56	239.92	240.27	240.62	240.98	241.33	241.68	242.04
380	242.39	242.74	243.09	243.44	243.80	244.15	244.50	244.85	245.20	245.56
390	245.91	246.26	246.61	246.96	247.31	247.66	248.01	248.36	248.71	249.06
400	249.41									

Sensing element accuracy classes













Because EN 60 571 does not apply to Pt 100/3911, it is possible to conclude that even these sensing elements can be classified into two basic accuracy classes expressed as follows:

	for $-50^{\circ}\text{C} \leq t \leq 400^{\circ}\text{C}$
Class A	$\Delta T = \pm (0.15 + 0.002 * t)$ in $^{\circ}\text{C}$
Class B	$\Delta T = \pm (0.30 + 0.005 * t)$ in $^{\circ}\text{C}$

* | t | is the absolute value of temperature.

Temperature [$^{\circ}\text{C}$]	Resistance [Ω]	Class A		Class B	
		ΔT [$^{\circ}\text{C}$]	ΔR [Ω]	ΔT [$^{\circ}\text{C}$]	ΔR [Ω]
-50	80.00	± 0.25	± 0.10	± 0.55	± 0.22
0	100.00	± 0.15	± 0.06	± 0.30	± 0.12
100	139.11	± 0.35	± 0.13	± 0.80	± 0.30
200	177.04	± 0.55	± 0.20	± 1.30	± 0.47
400	249.44	± 0.95	± 0.33	± 2.30	± 0.79

Application of sensing elements:

 Heating industry	 Heating systems	 Air-conditioning	 Alt. energy	 Rail vehicles	 Rubber industry	 Healthcare	 Gastronomy	 Engineering	 Custom manufacturing
 Chemical industry	 Science and research								