

# Platinum Temperature Sensor Pt 100

Platinum resistor is made of thin film technology on alumina ceramics. Meander is created in a thin layer of platinum and laser trimming at very precise resistance value. The sensor is covered with a dielectric passivation layer that protects the measuring structure against mechanical and chemical damage.

**Nominal Resistance  $R_0$ :** 100  $\Omega$  at 0 °C

**Tolerance:** DIN EN 60 751

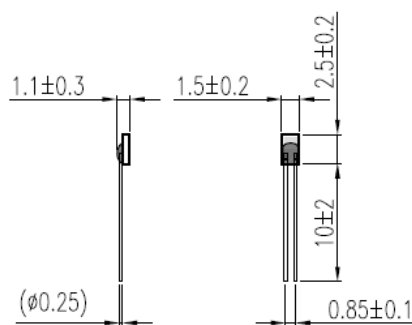
class F 0.1	$\pm (0.10 + 0.0017   t  )$ °C	-50 °C to +150 °C
class F 0.15	$\pm (0.15 + 0.0020   t  )$ °C	-90 °C to +300 °C
class F 0.3	$\pm (0.30 + 0.0050   t  )$ °C	-200 °C to +600 °C

**Specification:** DIN EN 60 751

**Temperature range:** -200 to 400 °C

**Temperature coefficient:** TCR = 3850 ppm/K

**Leads:** Ag wire  $\varnothing$  0.25 mm  
 Recommend connection technology:  
 Welding. Crimping



**Lead lengths:** 10  $\pm$  2 mm (Customer specification)

**Long-Term Stability:** The change of resistance after 1 000 hours at maximum operating temperature amounts to less than 0.1%.

**Self-heating:** 0.4 K/mW at 0 °C

**Response time:**

Water current ( $v = 0.4$ m/s)	$t_{0.5} = 0.08$ s
	$t_{0.9} = 0.25$ s
Air flow ( $v = 2$ m/s)	$t_{0.5} = 3.5$ s
	$t_{0.9} = 17.0$ s

**Measuring current:** 0.1 to 1 mA



**Tested:** rapid change in temperature -30 °C / 200 °C, constant humid heat 21 days 85 °C / 85 % RH, vibration (sin) 10 Hz – 500 Hz, 3 g, 1 okt/min. 75 h in axis X + 75 h in axis Y, tensile strength of outlets

## Temperature Dependence of Resistance

The function determines the relationship between the electrical resistance and the temperature.

$$\begin{aligned} R &= 100 (1 + At + Bt^2 + C (t - 100) t^3) && \text{in range } -200 \text{ }^\circ\text{C to } 0 \text{ }^\circ\text{C} \\ R &= 100 (1 + At + Bt^2) && \text{in range } 0 \text{ }^\circ\text{C to } 400 \text{ }^\circ\text{C} \end{aligned}$$

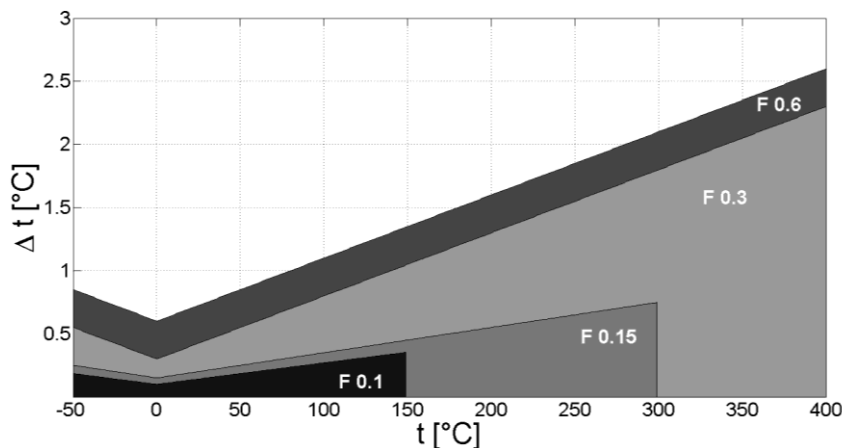
$$\begin{aligned} \text{where: } A &= 3.9083 \cdot 10^{-3} \text{ }^\circ\text{C}^{-1} \\ B &= -5.7750 \cdot 10^{-7} \text{ }^\circ\text{C}^{-2} \\ C &= -4.1830 \cdot 10^{-12} \text{ }^\circ\text{C}^{-4} \end{aligned}$$

t = temperature in accordance with ITS 90

## Tolerance fields

- Deviation of the accuracy class according to DIN EN 60 751

t [°C]	R [Ω]	class F 0.10		class F 0.15		class F 0.3	
		Δt [°C]	ΔR [Ω]	Δt [°C]	ΔR [Ω]	Δt [°C]	ΔR [Ω]
-200	18.52					1.300	0.562
-100	60.26			0.350	0.142	0.800	0.324
-50	80.31	0.185	0.073	0.250	0.099	0.550	0.218
0	100.00	0.100	0.039	0.150	0.059	0.300	0.117
50	119.40	0.185	0.071	0.250	0.096	0.550	0.212
100	138.51	0.270	0.102	0.350	0.133	0.800	0.303
200	175.86			0.550	0.202	1.300	0.478
300	212.05			0.750	0.267	1.800	0.641
400	247.09					2.300	0.792



## Resistor Table

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- Relative values of resistivity in steps of 1 °C ( $R_{xxx} = \text{Relative Value} \cdot R_0$ )

t [°C]	0	-1	-2	-3	-4	-5	-6	-7	-8	-9
-200	0.185	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-190	0.228	0.224	0.220	0.215	0.211	0.207	0.202	0.198	0.194	0.190
-180	0.271	0.267	0.262	0.258	0.254	0.250	0.245	0.241	0.237	0.233
-170	0.313	0.309	0.305	0.301	0.296	0.292	0.288	0.284	0.279	0.275
-160	0.355	0.351	0.347	0.343	0.339	0.334	0.330	0.326	0.322	0.318
-150	0.397	0.393	0.389	0.385	0.381	0.376	0.372	0.368	0.364	0.360
-140	0.439	0.435	0.430	0.426	0.422	0.418	0.414	0.410	0.406	0.401
-130	0.480	0.476	0.472	0.468	0.464	0.459	0.455	0.451	0.447	0.443
-120	0.521	0.517	0.513	0.509	0.505	0.501	0.496	0.492	0.488	0.484
-110	0.562	0.558	0.554	0.550	0.546	0.542	0.537	0.533	0.529	0.525
-100	0.603	0.599	0.594	0.590	0.586	0.582	0.578	0.574	0.570	0.566
-90	0.643	0.639	0.635	0.631	0.627	0.623	0.619	0.615	0.611	0.607
-80	0.683	0.679	0.675	0.671	0.667	0.663	0.659	0.655	0.651	0.647
-70	0.723	0.719	0.715	0.711	0.707	0.703	0.699	0.695	0.691	0.687
-60	0.763	0.759	0.755	0.751	0.747	0.743	0.739	0.735	0.731	0.727
-50	0.803	0.799	0.795	0.791	0.787	0.783	0.779	0.775	0.771	0.767
-40	0.843	0.839	0.835	0.831	0.827	0.823	0.819	0.815	0.811	0.807
-30	0.882	0.878	0.874	0.870	0.866	0.862	0.859	0.855	0.851	0.847
-20	0.922	0.918	0.914	0.910	0.906	0.902	0.898	0.894	0.890	0.886
-10	0.961	0.957	0.953	0.949	0.945	0.941	0.937	0.933	0.929	0.926
0	1.000	0.996	0.992	0.988	0.984	0.980	0.977	0.973	0.969	0.965

t [°C]	0	1	2	3	4	5	6	7	8	9
0	1.000	1.004	1.008	1.012	1.016	1.020	1.023	1.027	1.031	1.035
10	1.039	1.043	1.047	1.051	1.055	1.058	1.062	1.066	1.070	1.074
20	1.078	1.082	1.086	1.090	1.093	1.097	1.101	1.105	1.109	1.113
30	1.117	1.121	1.124	1.128	1.132	1.136	1.140	1.144	1.148	1.152
40	1.155	1.159	1.163	1.167	1.171	1.175	1.179	1.182	1.186	1.190
50	1.194	1.198	1.202	1.206	1.209	1.213	1.217	1.221	1.225	1.229
60	1.232	1.236	1.240	1.244	1.248	1.252	1.255	1.259	1.263	1.267
70	1.271	1.275	1.278	1.282	1.286	1.290	1.294	1.298	1.301	1.305
80	1.309	1.313	1.317	1.320	1.324	1.328	1.332	1.336	1.339	1.343
90	1.347	1.351	1.355	1.358	1.362	1.366	1.370	1.374	1.377	1.381
100	1.385	1.389	1.393	1.396	1.400	1.404	1.408	1.412	1.415	1.419
110	1.423	1.427	1.430	1.434	1.438	1.442	1.446	1.449	1.453	1.457
120	1.461	1.464	1.468	1.472	1.476	1.480	1.483	1.487	1.491	1.495
130	1.498	1.502	1.506	1.510	1.513	1.517	1.521	1.525	1.528	1.532
140	1.536	1.540	1.543	1.547	1.551	1.555	1.558	1.562	1.566	1.570

150	1.573	1.577	1.581	1.584	1.588	1.592	1.596	1.599	1.603	1.607
160	1.611	1.614	1.618	1.622	1.625	1.629	1.633	1.637	1.640	1.644
170	1.648	1.651	1.655	1.659	1.663	1.666	1.670	1.674	1.677	1.681
180	1.685	1.688	1.692	1.696	1.700	1.703	1.707	1.711	1.714	1.718
190	1.722	1.725	1.729	1.733	1.736	1.740	1.744	1.748	1.751	1.755
200	1.759	1.762	1.766	1.770	1.773	1.777	1.781	1.784	1.788	1.792
210	1.795	1.799	1.803	1.806	1.810	1.814	1.817	1.821	1.825	1.828
220	1.832	1.836	1.839	1.843	1.846	1.850	1.854	1.857	1.861	1.865
230	1.868	1.872	1.876	1.879	1.883	1.887	1.890	1.894	1.897	1.901
240	1.905	1.908	1.912	1.916	1.919	1.923	1.926	1.930	1.934	1.937
250	1.941	1.945	1.948	1.952	1.955	1.959	1.963	1.966	1.970	1.974
260	1.977	1.981	1.984	1.988	1.992	1.995	1.999	2.002	2.006	2.010
270	2.013	2.017	2.020	2.024	2.028	2.031	2.035	2.038	2.042	2.045
280	2.049	2.053	2.056	2.060	2.063	2.067	2.071	2.074	2.078	2.081
290	2.085	2.088	2.092	2.096	2.099	2.103	2.106	2.110	2.113	2.117
300	2.121	2.124	2.128	2.131	2.135	2.138	2.142	2.145	2.149	2.153
310	2.156	2.160	2.163	2.167	2.170	2.174	2.177	2.181	2.184	2.188
320	2.192	2.195	2.199	2.202	2.206	2.209	2.213	2.216	2.220	2.223
330	2.227	2.230	2.234	2.237	2.241	2.244	2.248	2.252	2.255	2.259
340	2.262	2.266	2.269	2.273	2.276	2.280	2.283	2.287	2.290	2.294
350	2.297	2.301	2.304	2.308	2.311	2.315	2.318	2.322	2.325	2.329
360	2.332	2.336	2.339	2.343	2.346	2.350	2.353	2.357	2.360	2.364
370	2.367	2.370	2.374	2.377	2.381	2.384	2.388	2.391	2.395	2.398
380	2.402	2.405	2.409	2.412	2.416	2.419	2.423	2.426	2.429	2.433
390	2.436	2.440	2.443	2.447	2.450	2.454	2.457	2.461	2.464	2.467
400	2.471									

**Typical Properties:**

small size  
 long-term stability  
 short thermal response time  
 negligible self-heating  
 easy interchangeability

**Possible Applications:**

heating  
 air conditioning, ventilation  
 household devices  
 automotive industry  
 food processing  
 meteorology  
 measuring  
 testing and inspection equipment