

## Type J thermocouple sensors

### Basic technical parameters

Sensing element	Type J thermocouple
Maximum range of working temperature	-40 to +750 °C *
Reference voltage at 0 °C	0.00 µV

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

### Principle:

A change of the temperature of the measured environment results in a defined change of the measuring thermocouple voltage. The change of voltage is defined by the following equation according to EN 60584-1:

$$U = \sum_{i=1}^n a_i (t_{90})^i \quad \mu\text{V} \quad \text{in a temperature range of } -210 \text{ to } +760 \text{ } ^\circ\text{C}$$

where

$$\begin{aligned}
 a_1 &= 5.038\ 118\ 7815 \times 10^1 & a_5 &= -1.705\ 295\ 8337 \times 10^{-10} \\
 a_2 &= 3.047\ 583\ 6930 \times 10^{-2} & a_6 &= 2.094\ 809\ 0697 \times 10^{-13} \\
 a_3 &= -8.568\ 106\ 5720 \times 10^{-5} & a_7 &= -1.253\ 839\ 5336 \times 10^{-16} \\
 a_4 &= 1.322\ 819\ 5295 \times 10^{-7} & a_8 &= 1.563\ 172\ 5697 \times 10^{-20}
 \end{aligned}$$

$$U = \sum_{i=1}^n a_i (t_{90})^i \quad \mu\text{V} \quad \text{in a temperature range of } +760 \text{ to } 1200 \text{ } ^\circ\text{C}$$

where

$$\begin{aligned}
 a_0 &= 2.964\ 562\ 5681 \times 10^5 & a_3 &= -3.184\ 768\ 6701 \times 10^{-3} \\
 a_1 &= -1.497\ 612\ 7786 \times 10^3 & a_4 &= 1.572\ 081\ 9004 \times 10^{-6} \\
 a_2 &= 3.178\ 710\ 3924 & a_5 &= -3.069\ 136\ 9056 \times 10^{-10}
 \end{aligned}$$

### Dependence of voltage in mV on temperature:

°C	0	-10	-20	-30	-40	-50	-60	-70	-80	-90
-200	-7.890	-8.095								
-100	-4.633	-5.037	-5.426	-5.801	-6.159	-6.500	-6.821	-7.123	-7.403	-7.659
0	0.000	-0.501	-0.995	-1.482	-1.961	-2.431	-2.893	-3.344	-3.786	-4.215

°C	0	10	20	30	40	50	60	70	80	90
0	0.000	0.507	1.019	1.537	2.059	2.585	3.116	3.650	4.187	4.726
100	5.269	5.814	6.360	6.909	7.459	8.010	8.562	9.115	9.669	10.224
200	10.779	11.334	11.889	12.445	13.000	13.555	14.110	14.665	15.219	15.773
300	16.327	16.881	17.434	17.986	18.538	19.090	19.642	20.194	20.745	21.297
400	21.848	22.400	22.952	23.504	24.057	24.610	25.164	25.720	26.276	26.834
500	27.393	27.953	28.516	29.080	29.647	30.216	30.788	31.362	31.939	32.519
600	33.102	33.689	34.279	34.873	35.470	36.071	36.675	37.284	37.896	38.512
700	39.132	39.755	40.382	41.012	41.645	42.281	42.919	43.559	44.203	44.848
800	45.494	46.141	46.786	47.431	48.074	48.715	49.353	49.989	50.622	51.251
900	51.877	52.500	53.119	53.735	54.347	54.956	55.561	56.164	56.763	57.360
1000	57.953	58.545	59.134	59.721	60.307	60.890	61.473	62.054	62.634	63.214
1100	63.792	64.370	64.948	65.525	66.102	66.679	67.255	67.831	68.406	68.980
1200	69.553									

The temperature dependence of voltage on temperature with 1 degree Celsius increments is shown in EN 60584-1.

### Tolerance classes of accuracy:

Tolerance classes for J thermocouples are defined by EN 60584-2.

Thermocouple designation	Tolerance class	Permissible deviations (°C)
J	1	$\pm 1.5\text{ }^{\circ}\text{C}$ for temperatures of -40 to +375 °C $\pm 0.004 *  t $ for temperatures of +375 to +750 °C
	2	$\pm 2.5\text{ }^{\circ}\text{C}$ for temperatures of -40 to +333°C $\pm 0.0075 *  t $ for temperatures of +333 to +750 °C

### Sensit temperature sensors based on J thermocouples

Currently only cable (standard and custom) temperature sensors are produced with these sensing elements.

**Note:** An overview of cable (standard and custom) temperature sensors can be found at [www.sensit.cz](http://www.sensit.cz) or in the Sensit catalogue.