THERMOCOUPLES: GENERAL INFORMATION

Temperature measurement with thermocouples is based on measurement of electrical voltage. The output voltage (emf) of thermocouples, *E,* varies with the temperature in a predetermined fashion. The relationship between temperature t (°C) and emf E (mV) can be expressed by mathematical functions as follows:

Type K

From -270°C to 0°C:

$$E = \sum_{i=1}^{10} a_i t^i$$

Where:

a_1 = 3.9450128025 x 10^{-2}
a_2 = 2.3622373598 x 10^{-5}
a_3 = -3.2858906784 x 10^{-7}
a_4 = -4.9904828777 x 10^{-9}
a_5 = -6.7509059173 x 10^{-11}
a_6 = -5.7410327428 x 10^{-13}
a_7 = -3.1088872894 x 10^{-15}
a_8 = -1.0451609365 x 10^{-17}
a_9 = -1.9889266878 x 10^{-20}
a_{10} = -1.6322697486 x 10^{-23}

From 0°C to 1372°C:

$$E = b_0 + \sum_{i=1}^{9} b_i t^i + c_0 \exp[c_1(t-126.9686)^2]$$

Where:

b_0 = -1.7600413686 x 10^{-2}
b_1 = 3.8921204975 x 10^{-2}
b_2 = 1.8558770032 x 10^{-5}
b_3 = -9.9457592874 x 10^{-8}
b_4 = 3.1840945719 x 10^{-10}
b_5 = -5.6072844889 x 10^{-13}
b_6 = 5.6075059059 x 10^{-16}
b_7 = -3.2020720003 x 10^{-19}
b_8 = 9.7151147152 x 10^{-23}
b_9 = -1.2104721275 x 10^{-26}
c_0 = 1.185976 x 10^{-1}
c_1 = -1.183432 x 10^{-4}

Type J

From -210°C to 760°C:

$$E = \sum_{i=1}^{8} a_i t^i$$

Where:

a_1 = 5.0381187815 x 10^{-2}
a_2 = 3.0475836930 x 10^{-5}
a_3 = -8.5681065720 x 10^{-8}
a_4 = 1.3228195295 x 10^{-10}
a_5 = -1.7052958337 x 10^{-13}
a_6 = 2.0948090697 x 10^{-16}
a_7 = -1.2538395336 x 10^{-19}
a_8 = 1.5631725697 x 10^{-23}

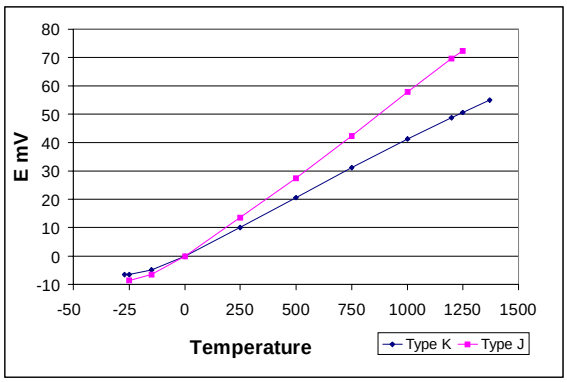
From 760°C to 1200°C:

$$E = \sum_{i=0}^{5} a_i t^i$$

Where:

a_0 = 2.9645625681 x 10^{2}
a_1 = -1.4976127786
a_2 = 3.1787103924 x 10^{-3}
a_3 = -3.1847686701 x 10^{-6}
a_4 = 1.5720819004 x 10^{-9}
a_5 = -3.0691369056 x 10^{-13}

Temperature °C	E mV	
	Type K	Type J
-270	-6.46	
-250	-6.40	
-150	-4.91	-6.50
0	0.00	0.00
250	10.15	13.56
500	20.64	27.39
750	31.21	42.28
1000	41.28	57.95
1200	48.84	69.55
1250	50.64	72.39
1372	54.89	



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