

Thermocouple Accuracy With instruNet 100

Application Note #7, 8/13/2002

Summary

instruNet supports a direct connection to thermocouples with the following measurement accuracies. The table excludes thermocouple device errors; yet includes cold junction compensation errors, voltage measurement errors, and linearization errors.

Thermocouple	Range		Accuracy	
J	-210C	to -100C	+- .8C	
	-100C	to 1200C	+- .5C	
K	-200C	to -50C	+- .8C	
	-50C	to 1360C	+- .6C	
T	-200C	to -100C	+- .8C	
	-100C	to 400C	+- .5C	
E	-200C	to -60C	+- .7C	
	-60C	to 1000C	+- .5C	
R	-50C	to 70C	+-3.5C	
	70C	to 1768C	+-2.0C	
S	-50C	to 150C	+-2.8C	
	150C	to 1768C	+-1.8C	
B	250C	to 600C	+-3.8C	
	600C	to 1300C	+-2.0C	
N	-200C	to -110C	+-1.3C	
	-110C	to 1260C	+- .8C	

CONDITIONS: 18-28C, excludes thermocouple errors, 0.001 sec of integration, instruNet 100 #iNet-100 Rev 3, assumes temperature has not changed since instruNet 100 self-calibration.

Analysis

Thermocouple errors are the sum of the following components:

- 1) Errors within the thermocouple itself, which are often due to impurities in the thermocouple materials. For more information, please consult your thermocouple supplier.
- 2) Cold Junction Compensation measurement and linearization error: +/- .25C.
- 3) Thermocouple linearization errors: J: +/- .05C; K: +/- .08; T: +/- .05C; E: +/- .04C; R: +/- .03C; S: +/- .03C; B: +/- .04C; N: +/- .05C.
- 4) Thermocouple voltage measurement errors (based on +/- 15uV measurement accuracy with +/-80mV range, and +/- 10uV accuracy with +/-10mV range) are listed below, in the last 2 columns, in units of +/- degrees C:

TC	Min Temp C	Max Temp C	Min Temp mV	Max Temp mV	Min Temp uV/C	Max Temp uV/C	Min Temp Accuracy	Max Temp Accuracy
J	-210	-100	-8	-4	19	41	.5	.25
	-100	150	-8	8	41	55	.25	.2
	150	1200	+8	69	55	57	.25	.25

K	-200	-50	-6	-2	15	35	.7	.3
	-50	200	-2	8	35	40	.3	.25
	200	1360	+8	54	40	33	.37	.45
T	-200	-100	-6	-3	15	28	.7	.35
	-100	175	-3	8	28	50	.3	.2
	175	400	8	20	50	61	.3	.25
E	-200	-60	-8	3	25	50	.4	.2
	-60	125	3	8	50	70	.2	.15
	125	1000	8	76	70	75	.2	.2
R	-50	70	-1	1	3	6	3.0	1.6
	70	800	1	8	6	12	1.6	.8
	800	1768	8	21	12	12	.8	.8
S	-50	150	-1	1	4	8	2.5	1.2
	150	860	1	8	8	11	1.2	.9
	860	1768	8	19	11	10	1.3	1.5
B	250	600	1	2	3	6	3.3	1.6
	600	1300	2	8	6	10	1.6	1.0
	1300	1820	8	14	10	12	1.5	1.2
N	-200	-110	-4	-2	10	20	1.0	.7
	-110	260	-2	8	20	34	.5	.3
	260	1300	8	47	34	36	.5	.5