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Equipment Required

- 8.5 Digit DMM (I.e. Transmille 8081, Agilent 3458A, Fluke 8508A)
 - High Precision Multiproduct calibrator (I.e. Transmille 3010A, Fluke 5520A)
 - Calibrated PRT probe + Indicator (I.e. Transmille 8081 with calibrated PRT probe)
 - Copper/Copper Thermocouple socket to 2 x 4mm plugs
- Copper/Copper Thermocouple plug to 2 x 4mm plugs

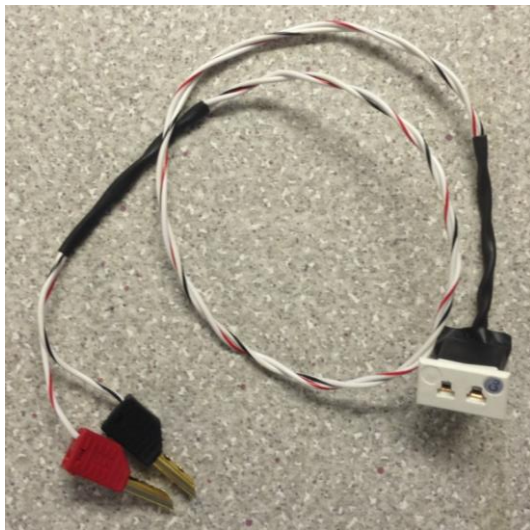


Figure 1 - Copper/Copper Thermocouple Socket to 2x4mm plugs



Figure 2 - Copper/Copper Thermocouple plug to 2x4mm plugs

Calibration Procedure

Cold Junction – Source Function.

1. Connect EA001A Adapter to the 3000A series calibrator
2. Enter thermocouple output mode
3. Compare the Cold Junction Measurement indicated on the screen of the 3000A against the reading from the indicated reading from the PRT probe.
4. In the case that adjustment of Cold Junction measurement is required, the potentiometer labeled 'VR4 / THERMO O/P CJC' can be adjusted. Continue to adjust the potentiometer until the indicated Cold Junction measurement matches the measurement from the probe.

Note: To improve the accuracy of the calibration of the Cold junction measurement, the Thermocouple plug can be inserted into a plastic bag, which can then be immersed in a liquid bath. This allows for a more stable temperature measurement.

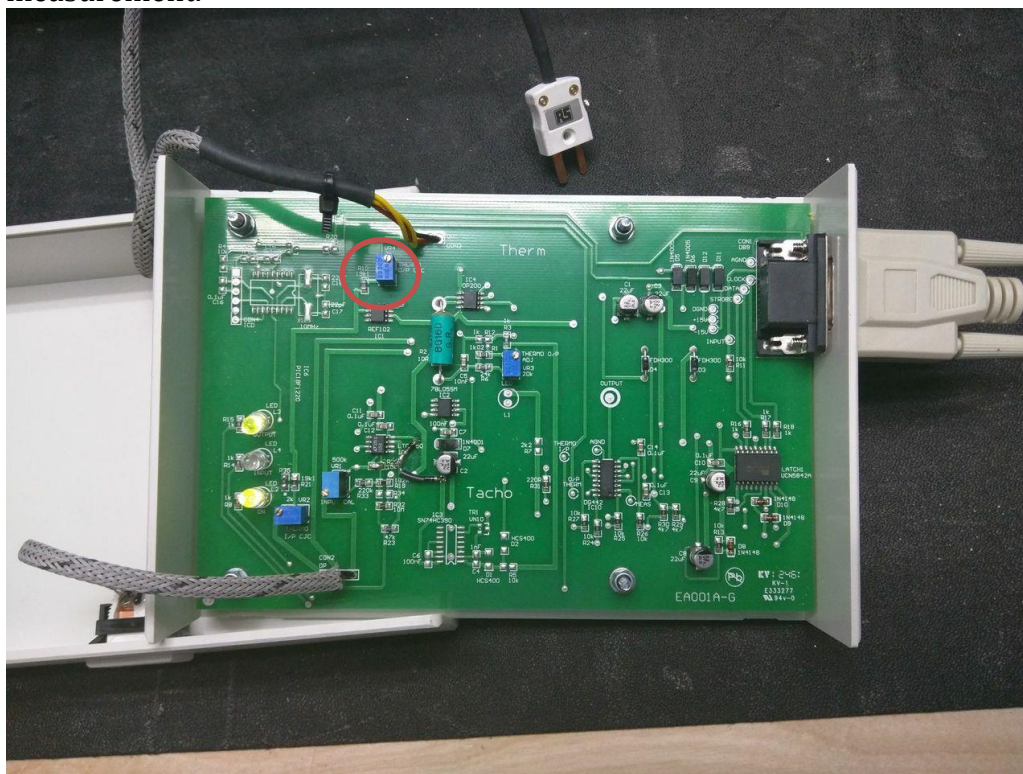


Figure 3 - Image showing location of VR4

Cold Junction – Measure Function

1. Connect the Thermocouple source output (Copper/Copper Thermocouple plug) to the thermocouple input
2. Set the thermocouple EA001A into source mode and take note of the Cold Junction Measurement
3. Switch the thermocouple mode to Measurement mode
4. Compare the indicated cold junction measurement from the thermocouple simulation mode against the cold junction measurement from the thermocouple measurement mode
5. In the case that adjustment of the Cold Junction measurement is required, the potentiometer labeled 'VR2 / THERMO I/P CJC' can be adjusted. Continue to adjust the potentiometer until the indicated Cold Junction measurement matches the measurement from the thermocouple simulation mode.

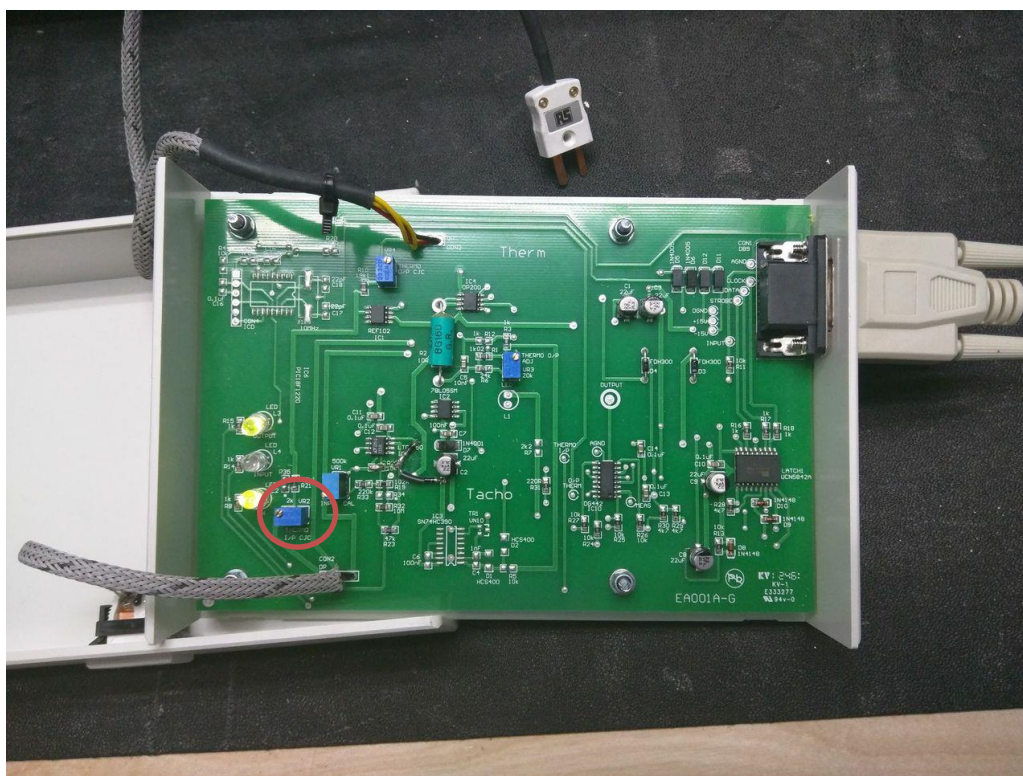


Figure 4 - Image showing location of VR2

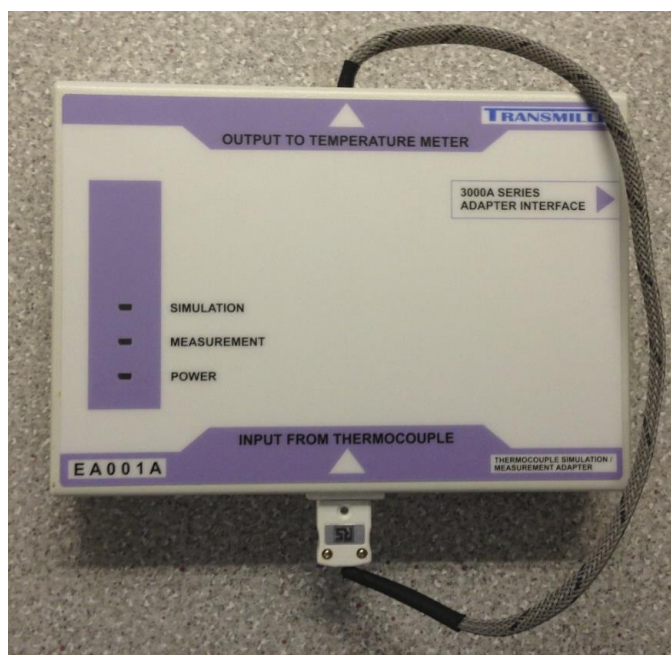


Figure 5 - Image showing connection described in Step 1

Thermocouple simulation output Function

1. Connect the thermocouple output plug into the Copper/Copper Thermocouple socket
2. Connect the 2 x 4mm plugs to the Voltage terminals of the DMM.
3. With the EA001A thermocouple disconnected from the calibrator, perform a Null. This removes any voltage offsets in the leads and connections. As the thermocouple outputs are accurate in terms of μV it is essential to correctly null the system for measurements.
4. Connect the EA001A to the calibrator
5. Set the cold junction compensation to Manual, with a setting of 0°C
6. Set the required thermocouple type and value and press output on
7. Proceed through the test points in the Calibration worksheet in the Appendix
8. If the thermocouple is found to require adjustment, set the calibrator to a setting of 5V DC
9. The setting of 5V will equate to an output of 50mV DC from the EA001A
10. Adjust potentiometer 'VR3 / THERMO O/P ADJ' for a setting of 50mV output as measured by the DMM
11. Proceed to re-verify the EA001A output

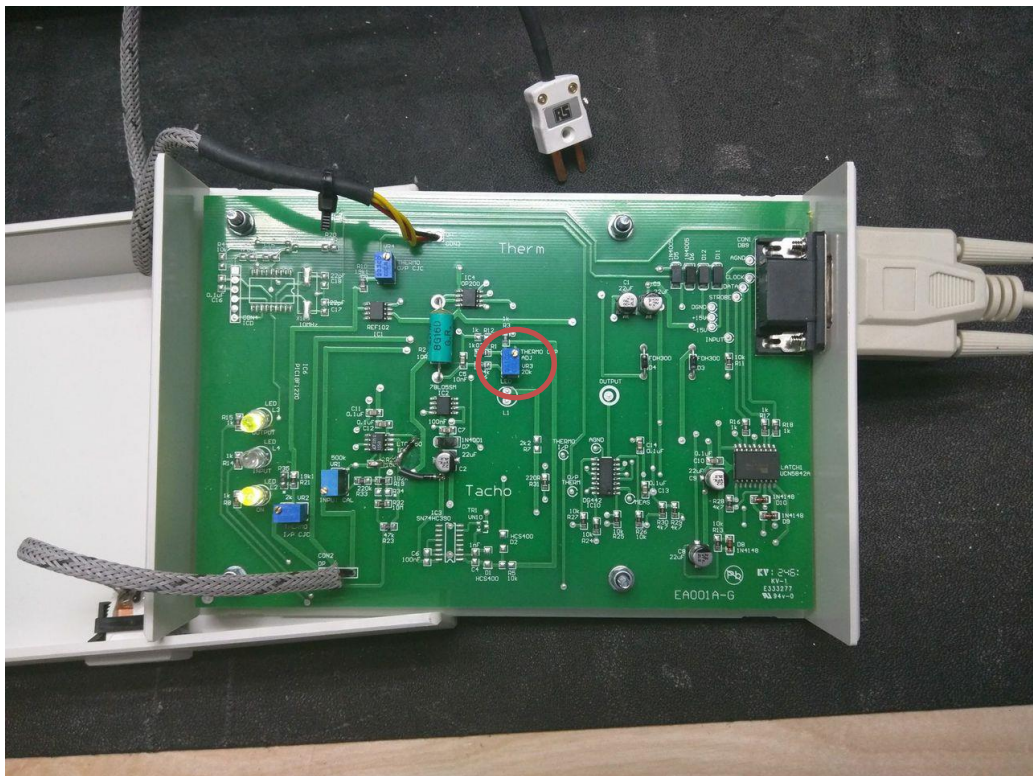


Figure 6 - Figure showing location of VR3

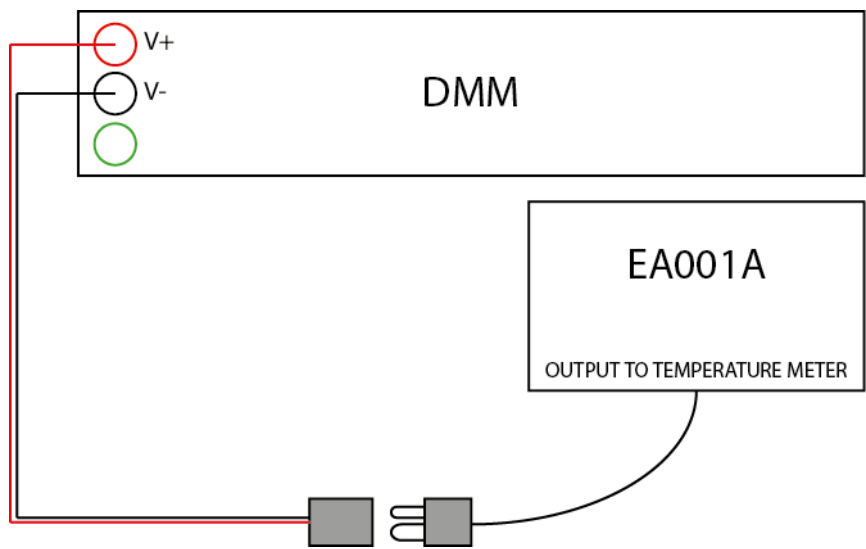


Figure 7 - Diagram showing connection of Thermocouple Output to DMM

Thermocouple measurement input Function

1. Connect the Copper/Copper thermocouple plug to the EA001A
2. Connect the 2 x 4mm plugs to the voltage source (Multiproduct Calibrator)
3. Connect the EA001A adapter to the 3000A calibrator
4. Set the calibrator to Thermocouple Measurement mode
5. Set the cold junction compensation to Manual, with a setting of 0°C
6. Set the required thermocouple type on the 3000A
7. Proceed through the test points in the Calibration worksheet in the Appendix
8. If the thermocouple measurement is found to require adjustment, set the source calibrator to input 50mV DC into the EA001
9. Press the Mode Key on the 3000A, and select 'Torque/Pressure'
10. Select any of the available adapters labeled 'Custom'. This will put the calibrator into voltage measurement without any scaling factor, i.e. the voltage measured on the adapter interface will be displayed on the screen.
11. The Measurement circuitry of the thermocouple is a x100 multiplier, so 50mV DC input will equal a 5V measurement on the 3000A calibrator
12. Adjust potentiometer 'VR1 / INPUT CAL' until the reading on the 3000A indicates 5V
13. Proceed to re-verify the measurement portion of the EA001A

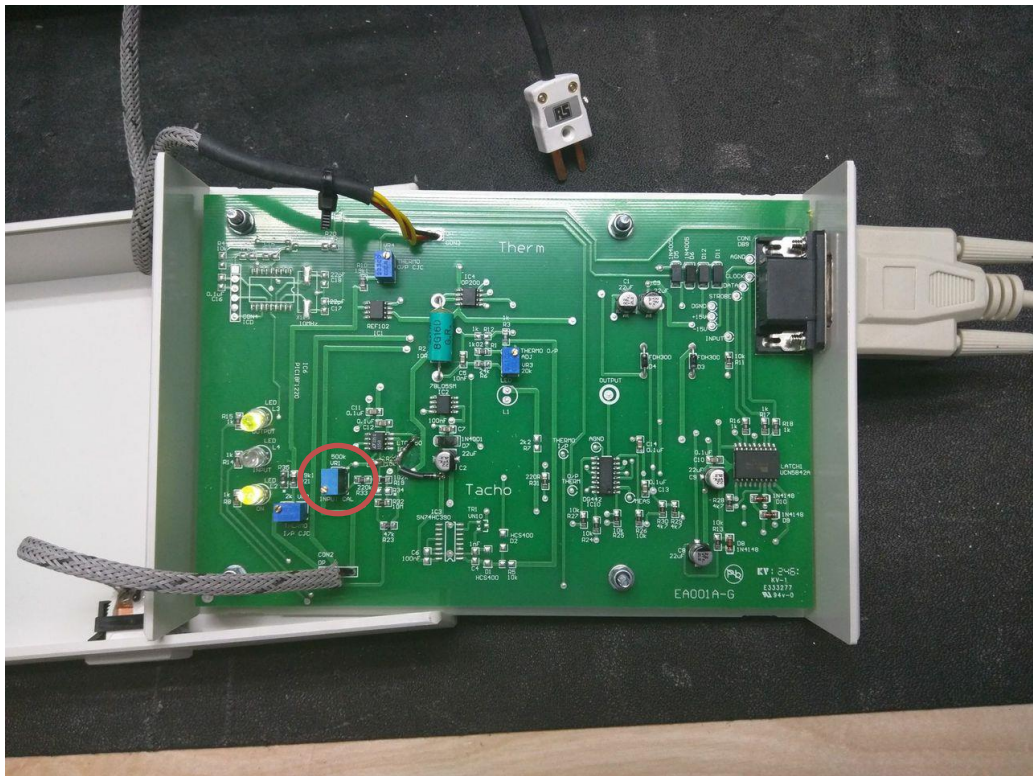


Figure 8 - Image showing location of VR1

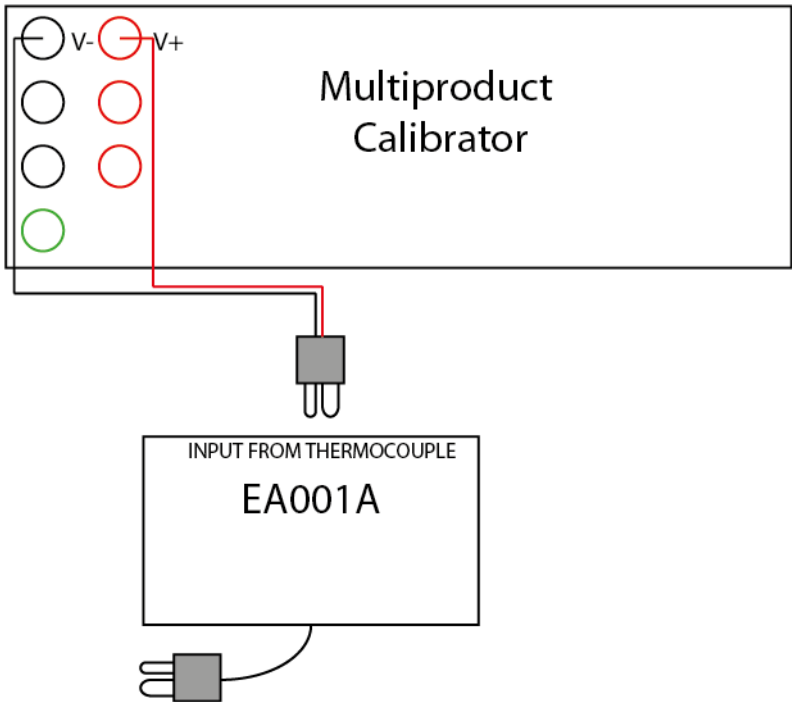


Figure 9 - Diagram showing connection of EA001A Thermocouple input to Multiproduct Calibrator

Appendix 1: EA001A Extended Specifications

Extended specifications are correct at the time of printing, for the most up to date specifications please download from www.transmille.com

EA001A Extended Specifications

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General Specifications	
Adaptor connection	Connects to male 'D' type adapter interface connector on 3000A Series front panel
Indicators	Incorporates 'Active', 'Measure' & 'Source' LED's mounted in the adaptor case
Adaptor Dimensions	12.5cm x 6.5cm x 2.5cm
Connections	1 x 9 way male 'D' type connector 1 x Neutral (copper) industry standard thermocouple plug with integral temperature sensor 1 x Neutral (copper) industry standard thermocouple socket with integral temperature sensor
Connection to Calibrator	Via supplied 9 Way male to female serial lead (straight through connection)
Sensor Type	Thermistor Sensor incorporated into thermocouple plug to eliminate any lead effects
Output impedance	10 Ohms

Thermocouple Type	Range Source / Measure	90 Day ¹ Rel. (°C)	180 Day ¹ Rel. (°C)	1 Year ¹ Rel. (°C)	2 Year ¹ Rel. (°C)
J	-210°C to -100°C	0.18	0.21	0.23	0.32
	-100°C to -30°C	0.09	0.10	0.11	0.15
	-30°C to 150°C	0.07	0.08	0.09	0.13
	150°C to 760°C	0.11	0.13	0.14	0.20
	760°C to 1200°C	0.15	0.17	0.19	0.27
K	-200°C to -100°C	0.22	0.24	0.27	0.38
	-100°C to -25°C	0.12	0.14	0.15	0.21
	-25°C to 120°C	0.09	0.10	0.11	0.15
	-120°C to -1000°C	0.16	0.18	0.20	0.28
	1000°C to 1370°C	0.21	0.23	0.26	0.36
T	-250°C to -150°C	0.48	0.54	0.60	0.84
	-150°C to 0°C	0.08	0.09	0.10	0.14
	0°C to 120°C	0.07	0.08	0.09	0.13
	-120°C to 400°C	0.09	0.10	0.11	0.15
R	-0°C to 250°C	0.64	0.72	0.80	1.12
	250°C to 1000°C	0.35	0.40	0.44	0.62
	1000°C to 1760°C	0.41	0.46	0.51	0.71
S	0°C to 250°C	0.64	0.72	0.80	1.12
	250°C to 1000°C	0.35	0.40	0.44	0.62
	1000°C to 1760°C	0.41	0.46	0.51	0.71
B	600°C to 800°C	0.58	0.66	0.73	1.02
	800°C to 1000°C	0.52	0.59	0.65	0.91
	1000°C to 1550°C	0.43	0.49	0.54	0.76
	1550°C to 1820°C	0.44	0.50	0.55	0.77

Note 1 : Does not include cold junction compensation errors

Cold Junction Compensation Error = $\pm 0.2^{\circ}\text{C}$

All thermocouple measurement specifications assume correct compensation cable is being used

Specifications apply between 17°C and 27°C.

Outside this range an allowance of 0.18 x 1 Year Spec. per °C should be added.

All specifications apply for 3000A Firmware Version 12.2.3 onwards

EA001A Extended Specifications

Due to continuous development specifications may be subject to change.

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EA001A Extended Specifications

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Thermocouple Type	Range Source / Measure	90 Day ¹ Rel. (°C)	180 Day ¹ Rel. (°C)	1 Year ¹ Rel. (°C)	2 Year ¹ Rel. (°C)
N	-200°C to -100°C	0.34	0.38	0.42	0.59
	-100°C to -25°C	0.16	0.18	0.20	0.28
	-25°C to 120°C	0.13	0.14	0.16	0.22
	120°C to 410°C	0.12	0.14	0.15	0.21
	410°C to 1300°C	0.19	0.22	0.24	0.34
E	-250°C to -100°C	0.40	0.45	0.50	0.70
	-100°C to -25°C	0.08	0.09	0.10	0.14
	-25°C to 350°C	0.07	0.08	0.09	0.13
	350°C to 650°C	0.10	0.11	0.12	0.17
	650°C to 1000°C	0.12	0.14	0.15	0.21
L	-200°C to -100°C	0.27	0.31	0.34	0.48
	-100°C to 800°C	0.26	0.30	0.33	0.46
	800°C to 900°C	0.27	0.31	0.34	0.48
U	-200°C to 0°C	0.34	0.38	0.42	0.59
	0°C to 600°C	0.24	0.27	0.30	0.42
C	0°C to 150°C	0.25	0.28	0.31	0.43
	150°C to 650°C	0.22	0.24	0.27	0.38
	650°C to 1000°C	0.26	0.29	0.32	0.45
	1000°C to 1800°C	0.38	0.42	0.47	0.66
	1800°C to 2316°C	0.54	0.61	0.68	0.95

Note 1 : Does not include cold junction compensation errors

Cold Junction Compensation Error = $\pm 0.2^{\circ}\text{C}$

All thermocouple measurement specifications assume correct compensation cable is being used

Specifications apply between 17°C and 27°C.

Outside this range an allowance of 0.18 x 1 Year Spec. per °C should be added.

All specifications apply for 3000A Firmware Version 12.2.3 onwards