

Please place your responses in the green boxes.

Name of laboratory
Date survey was filled out
Name of technical contact filling out survey
Phone number of technical contact
Fax number of technical contact
E-mail of technical contact

Sandia National Laboratories
9/19/2019
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1. Basic Methods

Do you perform calibrations by a comparison method?

Yes (y/n)

If yes, please fill in the following information

1a. Type of reference thermometer (e.g., type S TC)

SPRT & Type S TC

1b. Type of furnace or bath, and temperature range of each

	temperature range	thermocouple immersion in furnace/bath (cm)
Fluke 9173	50°C-700°C	20.3 cm
Fluke 9118A	300°C-1200°C	36.5 cm

1c. Is an isothermal block used?

Yes (y/n)

1d. Are the test thermocouples thermally anchored to the reference thermometer?

No (y/n)

Do you perform calibrations at fixed points?

No (y/n)

Reference Junctions

1f. Type of reference junction bath (ice/water in Dewar, electronic compensation,

Ice/water in Dewar

1g. Thermocouple immersion into bath (cm)

7.5 in. or 19.1 cm.

2. Uncertainty Budget

Below are possible uncertainty components. Please fill in the relevant values for your calibration service, either at the temperatures listed or at temperatures relevant to your service. Enter component uncertainties in units of equivalent temperature, at a confidence level of $k=1$.

2a. Uncertainty components: comparison methods, in units of °C

Reference thermometer calibration
Reference thermometer drift
Reference thermometer repeatability
Reference thermometer readout
Test thermocouple repeatability
Test thermocouple readout
Test thermocouple inhomogeneity
Test thermocouple stability
Reference junction temperature uncertainty
Bath or furnace temperature stability
Bath or furnace temperature non-uniformity
Extraneous emf of wiring, scanners, etc.

t=100 °C	200 °C	300 °C	400 °C	500 °C	600 °C	700 °C
0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.125
0.001	0.001	0.001	0.001	0.001	0.001	0.124
0.005	0.002	0.002	0.002	0.003	0.002	0.008
0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.02
0.007	0.007	0.007	0.023	0.008	0.008	0.033
0.077	0.077	0.077	0.077	0.077	0.077	0.077
0.029	0.052	0.081	0.104	0.133	0.162	0.185
0.002	0.002	0.002	0.007	0.002	0.002	0.008
0.002	0.002	0.002	0.002	0.002	0.002	0.002
0.006	0.006	0.006	0.006	0.017	0.017	0.058
0.065	0.065	0.065	0.065	0.101	0.101	0.116
0.006	0.006	0.006	0.006	0.006	0.006	0.006

2b. Additional components not in above list, if any (description of extra component)

2c. Total expanded uncertainty ($k=2$), comparison methods, in units of °C

0.21	0.23	0.26	0.29	0.37	0.41	0.60
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3. Thermal history

3a. Please describe, approximately, the duration and temperature for each exposure of the test thermocouple to temperatures above 100 °C

(An alternative description in words is acceptable.)

temperature of exposure / °C	duration / minutes
100	20 min.
200	20 min.
300	20 min.
400	20 min.
500	30 min.
600	30 min.
700	60 min.

4. Immersion history

4a. Please describe, in words, whether the test thermocouple is kept at a single, fixed immersion through the test, or whether the immersion of the thermocouple varies throughout the test.

The test thermocouple was immersed 8" for the test ranges 100°C to 600°C. It was immersed 14.5" at 700°C.

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Thermocouple emf at the time of first heating

Cut number

C

D

temperature / °C

	emf/mV	U(k=2)/mV
100	5.269395943	0.011
200	10.80885675	0.013
300	16.37046432	0.014
400	21.8891463	0.016
500	27.44343887	0.021
600	33.14454203	0.024
700	39.12395399	0.037

	emf/mV	U(k=2)/mV
	5.264754725	0.011
	10.79137026	0.013
	16.35491921	0.014
	21.89270889	0.016
	27.44845131	0.021
	33.14558268	0.024
	39.10081303	0.037