



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005
&ANSI/NCSL Z540-1-1994

THERMOWORKS, INC.
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CALIBRATION

Valid To: May 31, 2020

Certificate Number: 4024.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations^{1,5}:

I. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
DC Voltage – Generate and Measure	(-10 to 75) mV ± (0 to 100) mV ± (>0.1 to 10.0) V ± (>10.0 to 100) V	35 µV/V + 2.4 µV 35 µV/V + 3.6 µV 35 µV/V + 6 µV 35 µV/V + 1.2 mV	Fluke 7526A Fluke 7526A Ectron 1140A Fluke 7526A
DC Current – Generate	± (0 to 100) mA	57 µA/a + 1.3 µA	Fluke 7526A
DC Resistance – Generate	(10 to 1111.11) Ω (>1.1 to 4.0) kΩ	60 µΩ/Ω 0.35 Ω	IET RTD-Z-.001 Fluke 7526A
DC Resistance – Measure	(0 to 1.2) Ω (0 to 12) Ω (0 to 120) Ω (0 to 400) Ω (0 to 10) kΩ (10 to 40) kΩ (40 to 100) kΩ (100 to 500) kΩ	Greater or 14 µΩ or 48 µΩ/Ω Greater or 28 µΩ or 12 µΩ/Ω Greater or 40 µΩ or 6 µΩ/Ω Greater or 95 µΩ or 5 µΩ/Ω Greater or 142 µΩ or 6 µΩ/Ω 10 µΩ/Ω 25 µΩ/Ω 95 µΩ/Ω	Fluke 1595A resistance bridge

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
DC Resistance – Transfer	(10 to 40) Ω (>40 to 200) Ω (<200 to 400) Ω	3 μΩ/Ω + 70 μΩ 3 μΩ/Ω + 0.5 mΩ 1 μΩ/Ω + 1.5 mΩ	Keithley 2002 long scale DMM
Electrical Calibration of Thermocouple Indicating Devices – Measure and Generate			
Type E	(-270 to < -245) °C (-245 to < -195) °C (-195 to < -155) °C (-155 to < -90) °C (-90 to < 15) °C (15 to < 890) °C (890 to 1000) °C	1.5 °C 0.24 °C 0.12 °C 0.10 °C 0.09 °C 0.07 °C 0.08 °C	Ectron 1140A
Type J	(-210 to < -180) °C (-180 to < -120) °C (-120 to < -50) °C (-50 to 1200) °C	0.15 °C 0.12 °C 0.10 °C 0.09 °C	
Type K	(-270 to < -255) °C (-255 to < -195) °C (-195 to < -115) °C (-115 to < -55) °C (-55 to < 1000) °C (1000 to 1372) °C	2.8 °C 0.85 °C 0.15 °C 0.11 °C 0.09 °C 0.10 °C	
Type N	(-270 to < -260) °C (-260 to < -200) °C (-200 to < -145) °C (-145 to < -70) °C (-70 to < 25) °C (25 to < 160) °C (160 to 1300) °C	5.8 °C 1.3 °C 0.28 °C 0.18 °C 0.14 °C 0.12 °C 0.11 °C	
Type R	(-50 to < -30) °C (-30 to < 45) °C (45 to < 160) °C (160 to < 380) °C (380 to < 775) °C (775 to 1768) °C	0.78 °C 0.66 °C 0.48 °C 0.36 °C 0.31 °C 0.22 °C	



Parameter/Equipment	Range	CMC ^{2,3,4} (±)	Comments
Electrical Calibration of Thermocouple Indicating Devices – Measure and Generate (cont)			
Type S	(-50 to < -30) °C (-30 to < 45) °C (45 to < 105) °C (105 to < 310) °C (310 to < 615) °C (615 to 1768) °C	0.74 °C 0.67 °C 0.48 °C 0.40 °C 0.35 °C 0.31 °C	Ectron 1140A
Type T	(-270 to < -255) °C (-255 to < -240) °C (-240 to < -210) °C (-210 to < -150) °C (-150 to < -40) °C (-40 to < 100) °C (100 to 400) °C	2.3 °C 0.59 °C 0.36 °C 0.22 °C 0.14 °C 0.10 °C 0.09 °C	
Electrical Calibration of Thermocouple Reference Junctions –			
Type E, J, K, N, T	0 °C (21 to 25) °C	0.60 °C 0.60 °C	Characterized thermocouple or thermocouple reference junction probe (RJP)
Type R, S	0 °C (21 to 25) °C	0.085 °C 0.085 °C	
Electrical Calibration of RTD Indicating Devices –			
Pt 100	(-200 to 500) °C (>500 to 800) °C	(0.006 % + 0.020) °C (0.007 % + 0.018) °C	IET RTD-Z-6-.001
Pt 200	(-200 to 800) °C (>500 to 800) °C	(0.006 % + 0.020) °C (0.007 % + 0.018) °C	IET RTD-Z-6-.001
Pt 500	(-200 to 325) °C (>325 to 800) °C	(0.006 % + 0.016) °C (0.011 % + 0.19) °C	IET RTD-Z-6-.001 Fluke 7526A
Pt 1000	(-200 to 800) °C	(0.0045 % + 0.10) °C	Fluke 7526A



II. Thermodynamics

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Temperature – Measure	(-200 to < -80) °C (-80 to < 0) °C 0 °C (>0 to 100) °C (>100 to 200) °C (>200 to 300) °C (>300 to 420) °C	0.0050 °C 0.0060 °C 0.0050 °C 0.0060 °C 0.0075 °C 0.010 °C 0.012 °C	Fluke 1595A with SPRT/TPW cell
	(-200 to < -80) °C (-80 to < 0) °C 0 °C (>0 to 100) °C (>100 to 200) °C (>200 to 300) °C (>300 to 400) °C (>400 to 500) °C (>500 to 600) °C (>600 to 660) °C	0.009 °C 0.008 °C 0.007 °C 0.009 °C 0.011 °C 0.014 °C 0.016 °C 0.018 °C 0.020 °C 0.023 °C	Fluke 1595A with PRT
Temperature – Measuring Equipment	(-80 to <0) °C 0 °C (>0 to 100) °C (>100 to 200) °C (>200 to 300) °C (>300 to 420) °C	0.0060 °C 0.0050 °C 0.0060 °C 0.0080 °C 0.010 °C 0.012 °C	Fluke 1595A with SPRT/TPWcell/bath
	(-80 to <0) °C 0 °C (>0 to 100) °C (>100 to 200) °C (>200 to 300) °C (>300 to 400) °C (>400 to 500) °C (>500 to 600) °C (>600 to 660) °C	0.008 °C 0.007 °C 0.009 °C 0.012 °C 0.014 °C 0.016 °C 0.018 °C 0.022 °C 0.025 °C	Fluke 1595A with PRT/baths/dry-block calibrators



Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Non-Contact (IR) Thermometry – Measuring Equipment	(-15 to 0) °C 35 °C 100 °C 200 °C 350 °C 500 °C (>500 to 700) °C	0.60 °C 0.55 °C 0.70 °C 1.0 °C 1.6 °C 2.1 °C 2.5 °C	Fluke 4180, Fluke 4181, Isotech R700
Relative Humidity – Measuring Equipment	(10 to 50) % RH (>50 to 75) % RH (>75 to 90) % RH (15 to 20) °C (>20 to 25) °C (>25 to 35) °C	0.55 % RH 0.60 % RH 0.65 % RH 0.060 °C 0.055 °C 0.060 °C	Thunder Scientific 2500 humidity generator

¹ This laboratory offers commercial calibration service.

² Calibration and Measurement Capability Uncertainty (CMC) is the smallest uncertainty of measurement that a laboratory can achieve within its scope of accreditation when performing more or less routine calibrations of nearly ideal measurement standards or nearly ideal measuring equipment. CMC's represent expanded uncertainties expressed at approximately the 95 % level of confidence, usually using a coverage factor of $k = 2$. The actual measurement uncertainty of a specific calibration performed by the laboratory may be greater than the CMC due to the behavior of the customer's device and to influences from the circumstances of the specific calibration.

³ The use of % means percent of reading with the exception of humidity which is a % point.

⁴ The type of instrument or material being calibrated is defined by the parameter. This indicates the laboratory is capable of calibrating instruments that measure or generate the values in the ranges indicated for the listed measurement parameter.

⁵ This scope meets A2LA's P112 Flexible Scope Policy.



Accredited Laboratory

A2LA has accredited

THERMOWORKS, INC.

Salt Lake City, UT

for technical competence in the field of

Calibration

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General requirements for the competence of testing and calibration laboratories*. This laboratory also meets the requirements of ANSI/NCSLI Z540-1-1994 and any additional program requirements in the field of calibration. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).



Presented this 16th day of November 2018.

A handwritten signature in black ink, written over a horizontal line.

President and CEO
For the Accreditation Council
Certificate Number 4024.01
Valid to May 31, 2020

For the calibrations to which this accreditation applies, please refer to the laboratory's Calibration Scope of Accreditation.