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

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CALIBRATION

Valid To: June 30, 2013 Certificate Number: 2208.03

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations[1]:

I. Dimensional

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
Calipers – Outside Measurement Only	(0 to 6) in	(290 + 5*L*) µin	Gage blocks
Indicators	(0 to 1) in	140 µin	Gage blocks
Micrometers – Outside Measurement Only	(0 to 3) in	(21 + 39*L*) µin	Gage blocks
Extensometers[3]	(0 to 1) in	250 µin	TO Cal 60, micrometer fixtures, ASTM E83
Creep Harness[3]	(0 to 1) in	140 µin	Mitutoyo micrometer, ASTM E83

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Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
Height Gages, Lab	(1 to 10) in	(280 + 20*L*) µin	Gage blocks
Microscopes – Optical Length of Reticule	25× to 1000× Magnification	75 µin	Stage micrometer

II. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC[2] (±)	Comments
DC Voltage– Generate & Measure[3, 5]	(0 to 100) mV 100 mV to 1 V (1 to 10) V (10 to 100) V	2.5 µV 13 µV 120 µV 1.4 mV	HP 3458A plus voltage source
DC Current – Generate & Measure[3, 5]	(0 to 10) mA (10 to 100) mA 100 mA to 1A	0.36 µA 4.9 µA 140 µA	HP 3458A plus current source
Electrical Simulation of Thermocouples[3] – Measure			
Type B	600 °F to 1000 °F 1000 °F to 2000 °F 2000 °F to 3000 °F	0.98 °F 0.62 °F 0.48 °F	HP 3458A plus cold junction compensation
Type C	0 °F to 850 °F 850 °F to 2100 °F 2100 °F to 3350 °F	0.43 °F 0.47 °F 0.50 °F	
Type E	0 °F to 1832 °F	0.40 °F	
Type J	0 °F to 2192 °F	0.24 °F	
Type K	0 °F to 2400 °F	0.24 °F	
Type R	0 °F to 600 °F 600 °F to 1800 °F 1800 °F to 3214 °F	0.62 °F 0.44 °F 0.44 °F	

Parameter/Equipment	Range	CMC[2] (±)	Comments
Electrical Simulation of Thermocouples[3] – Measure (cont)			
Type S	0 °F to 600 °F 600 °F to 1800 °F 1800 °F to 3214 °F	0.61°F 0.46 °F 0.52 °F	HP 3458A plus cold junction compensation
Type T	0 °F to 752 °F	0.32 °F	
Electrical Simulation of Thermocouples[3] – Generate			
Type B	600 °F to 1000 °F 1000 °F to 2000 °F 2000 °F to 3000 °F	1.1°F 0.75 °F 0.63 °F	HP 3458A plus cold junction compensation and voltage source
Type C	0 °F to 850 °F 850 °F to 2100 °F 2100 °F to 3350 °F	0.48 °F 0.51 °F 0.53 °F	
Type E	0 °F to 1832 °F	0.18 °F	
Type J	0 °F to 2192 °F	0.24 °F	
Type K	0 °F to 2400 °F	0.28 °F	
Type R	0 °F to 600 °F 600 °F to 1800 °F 1800 °F to 3214 °F	0.67°F 0.50 °F 0.50 °F	
Type S	0 °F to 600 °F 600 °F to 1800 °F 1800 °F to 3214 °F	0.61°F 0.46 °F 0.52 °F	
Type T	0 °F to 752 °F	0.20 °F	
Electrical Simulation of Thermocouple Process Indicators[3] –			
Type B	600 °F to 3000 °F	2.0 °F	Druck TRX II calibrator
Type C	0 °F to 3350 °F	2.8 °F	
Type J	0 °F to 2192 °F	0.6 °F	
Type K	0 °F to 2400 °F	0.6 °F	
Type R	0 °F to 3214 °F	1.4 °F	
Type S	0 °F to 3214 °F	1.4 °F	

III. Mechanical

Parameter/Equipment	Range	CMC[2] (±)	Comments
Pressure Gages and Transducers –			
Gauge, Pneumatic	(1.5 to 50) psi (50 to 500) psi	0.023 % of reading 0.034 % of reading	CEC 6-201
Gauge, Pneumatic[3]	(0 to 200) psi (200 to 500) psi (500 to 1000) psi	0.18 psi 0.39 psi 0.95 psi	Eaton UPC-5000
Vacuum Measuring Instruments –			
Stable Ion Gage	$(1 \times 10^{-5}$ to $1 \times 10^{-3})$ torr	8.2 % of reading	MKS spinning rotor gage
Stable Ion Gage	(1 to 20) microns	6.5 % of reading	SRG & BOC/MKS monometer
Cold Cathode Gage[3]	$(1 \times 10^{-5}$ to $1 \times 10^{-3})$ torr	10 % of reading	Grandville Phillips stable ion gage
Thermocouple & Convection Gages[3]	(1 to 20) microns	6.5 % of reading	Grandville Phillips stable ion gage
Scales & Balances	(0 to 20) mg	0.01 mg	Class 1 weights
	(0 to 200) mg (0 to 1000) mg (0 to 5) g (0 to 110) g (0 to 200) g (0 to 610) g (0 to 1600) g (0 to 4000) g (0 to 6000) g (0 to 15 000) g	0.025 mg 0.13 mg 1.8 mg 0.41 mg 0.61 mg 2.6 mg 16 mg 160 mg 150 mg 580 mg	Class 3 weights

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
Indirect Verification of Rockwell and Rockwell Superficial Hardness Testers[3]	HRBW: Low Middle High HRC: Low Middle High HR15N: High* HR30N: Low Middle High	 0.56 HRBW 0.40 HRBW 0.33 HRBW 0.26 HRC 0.22 HRC 0.19 HRC 0.19 HR15N 0.41 HR30N 0.39 HR30N 0.23 HR30N	Wilson Rockwell test blocks, ASTM E18 * This laboratory is not accredited to verify the low and middle ranges of the HR15N scale. Therefore, any accredited indirect verification of a testing machine on this scale by this laboratory will be a partial verification.
Indirect Verification of Brinell Hardness Testers At Test Conditions[3] 10/1500/15	 Repeatability (>50 to <250) HBW Error	 0.05*d* 4.3 %	Brinell test blocks, ASTM E10 *d* is the mean of the n mean test diameters in mm Uncertainty is stated as a percentage of the standardized test block hardness value
Force Verification of Testing Machines, Compression & Tension[3]	(208 to 6000) lbf (1000 to 25 000) lbf	(0.86 + 0.00016*F*) lbf (5.7 + 0.00013*F*) lbf	Ultra precision load cells
Mass – Nominal Values	(0.1 to 1.0) lb 5 lb 20 lb	0.000019 lb 0.00018 lb 0.0018 lb	Nominal value assume nominal density of 8000 kg/m^3

IV. Thermodynamics

Parameter/Equipment	Range	CMC[2] (±)	Comments
Temperature – Measuring Equipment	(32 to 70) °F (70 to 160) °F (160 to 310) °F (310 to 510) °F	0.06 °F 0.09 °F 0.13 °F 0.19 °F	Hart MN 1502A
Thermocouple Calibration	600 ºF to 3000 °F, Types B, K, R, S	0.16 % of reading	ASTM E220, comparison testing using NIST traceable type B & S standards and HP 3478A
Relative Humidity/ Temperature – Measurement[3]	(5 to 90) % RH 50 ºF to 100 °F	2.0 % RH 0.55 °F	Vaisala HMI-46
Dew Point Measurement, Panametric	-85 ºF to 68 °F	0.98 °F	General Eastern 1311DR, M4

V. Time & Frequency

Parameter/Equipment	Range	CMC[2] (±)	Comments
Timer[3]	15 s to 1 hr (1 to 24) hr	0.8 s 1.4 s	Reference stopwatch
Stopwatch[3]	15 s to 24 hr	0.5 s	WWV

[1] This laboratory offers commercial and field calibration service.

[2] Calibration and Measurement Capability (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. Calibration and Measurement Capabilities 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] Field calibration service is available for this calibration and this laboratory meets A2LA *R104 – General Requirements: Accreditation of Field Testing and Field Calibration Laboratories* for these calibrations. Please note the actual measurement uncertainties achievable on a customer's site can normally be expected to be larger than the CMC found on the A2LA Scope. Allowance must be made for aspects such as the environment at the place of calibration and for other possible adverse effects such as those caused by transportation of the calibration equipment. The usual allowance for the actual uncertainty introduced by the item being calibrated, (e.g. resolution) must also be considered and this, on its own, could result in the actual measurement uncertainty achievable on a customer's site being larger than the CMC.

[4] In the statement of Calibration and Measurement Capability, F is the numerical value of the nominal force measured in units of pound-force. L is the numerical value of the nominal length of the device measured in inches.

[5] The measurands stated are measured with the HP 3458A. This capability is suitable for the calibration of the devices intended to generate the measurand in the ranges indicated. Calibration and Measurement Capability is expressed as either a specific value that covers the full range or as a combination of the fraction of the reading/output plus a range specification.

The American Association for Laboratory Accreditation

World Class Accreditation

Accredited Laboratory

A2LA has accredited

HOWMET RESEARCH CENTER

Whitehall, MI

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/NCSL 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 8 January 2009*).

Presented this 12th day of April 2011.

President & CEO
For the Accreditation Council
Certificate Number 2208.03
Valid to June 30, 2013
Revised: March 29, 2013

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