



Accredited Laboratory

A2LA has accredited

CAL-RITE CORPORATION

Naperville, IL

for technical competence in the field of

Calibration

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This laboratory also meets the requirements of ANSI/NCSL Z540-1-1994 and R205 – Specific Requirements: Calibration Laboratory Accreditation Program. 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 3rd day of January 2019.

A blue ink signature of the Senior Director of Accreditation Services.

Senior Director, Accreditation Services
For the Accreditation Council
Certificate Number 866.01
Valid to October 31, 2020

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



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017
& ANSI/NCSL Z540-1-1994

CAL-RITE CORPORATION
 1665 Quincy Avenue, Suite 103
 Naperville, IL 60540
 Paul Depmore Phone: 630 355 1522

CALIBRATION

Valid To: October 31, 2020

Certificate Number: 0866.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations^{1,7}:

I. Dimensional

Parameter/Equipment	Range	CMC ^{2,4,5,9} (±)	Comments
Displacement Length Indicators ³ (Drop, Test and LVDT)	Up to 4 in (> 4 to 12) in	7L + 29 μin 12L + 20 μin	Gage blocks, digital micrometer head
Extensometers/COD Gage/Deflectometers ³			ASTM E83 and ISO 9513;
Gage lengths 1 in and below	Up to 0.1 in (> 0.1 to 0.4) in (> 0.4 to 1) in	30 μin (34L + 28) μin (65L + 15) μin	Gage blocks, extensometer calibrator; uncertainties listed in displacement
Gage lengths > 1 to 2 in	Up to 0.2 in (> 0.2 to 2) in	63 μin (50L + 54) μin	
Gage lengths > 2 to 25 in	Up to 2 in (> 2 to 25) in	(56L + 33) μin (70L + 5) μin	
Gage Length	Up to 8 in	0.0016 in	Caliper
Microscopes ³ – Displacement	Up to 1 in Up to 25.4 mm	53 μin 1.4 μm	ASTM E1951 stage micrometers

Parameter/Equipment	Range	CMC ^{2,4,5} (±)	Comments
Alignment System Calibration	100 µe 500 µe 1000 µe 2000 µe 3000 µe	1.4 µe 1.5 µe 1.6 µe 1.9 µe 2.2 µe	Strain Indicator Calibrator

II. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2,4,5,6} (±)	Comments
DC Voltage ³ – Measure	(0 to 100) mV >100 mV to 1 V (>1 to 10) V (>10 to 100) V (>100 to 1000) V	12 µV/V + 0.35 µV 12 µV/V + 0.42 µV 12 µV/V + 2.4 µV 12 µV/V + 52 µV 12 µV/V + 350 µV	HP 3458A
DC Current ³ – Measure	(0 to 100 nA) >100 nA to 100 µA >100 µA to 1 mA (>1 to 10) mA (>10 to 100) mA >100 mA to 1 A (>1 to 3) A	83 µA/A + 0.39 nA 20 µA/A + 1.3 nA 29 µA/A + 8.0 nA 29 µA/A + 81 nA 46 µA/A + 0.86 µA 130 µA/A + 18 µA 0.14 % + 0.69 mA	HP 3458A HP 34401
Resistance ³ – Measure	(0 to 10) Ω (>10 to 100) Ω >100 Ω to 1 kΩ (>1 to 10) kΩ (>10 to 100) kΩ >100 kΩ to 1 MΩ (>1 to 10) MΩ (>10 to 100) MΩ >100 MΩ to 1 GΩ	23 µΩ/Ω + 130 µΩ 23 µΩ/Ω + 1.2 mΩ 17 µΩ/Ω + 1.4 mΩ 17 µΩ/Ω + 16 mΩ 17 µΩ/Ω + 170 mΩ 23 µΩ/Ω + 4.6 Ω 87 µΩ/Ω + 120 Ω 0.12 % + 1.2 kΩ 1.2 % + 14 kΩ	HP 3458A

III. Mechanical

Parameter/Equipment	Range	CMC ^{2, 4, 5, 8} (±)	Comments
Scales and Balances ³	(1 to 200) mg 300 mg 500 mg 1 g 2 g 3 g 5 g 10 g 20 g 30 g 50 g 100 g 200 g 300 g 500 g 1 kg 2 kg 3 kg 5 kg 10 kg 20 kg (0.001 to 0.1) lb (> 0.1 to 2) lb (> 2 to 600) lb	0.023 mg 0.038 mg 0.038 mg 0.041 mg 0.039 mg 0.047 mg 0.047 mg 0.065 mg 0.080 mg 0.14 mg 0.14 mg 0.22 mg 0.38 mg 0.90 mg 0.90 mg 2.5 mg 9.5 mg 8.3 mg 14 mg 65 mg 70 mg 6.5e-7 lb 0.000021 lb 0.00080 %	Euramet cg-18
Mass – Measure	(1 to 200) mg 300 mg 500 mg 1 g 2 g 3 g 5 g 10 g 20 g 30 g 50 g 100 g 200 g 205 g 300 g 500 g	0.016 mg 0.026 mg 0.026 mg 0.027 mg 0.027 mg 0.029 mg 0.030 mg 0.037 mg 0.043 mg 0.068 mg 0.071 mg 0.12 mg 0.21 mg 0.22 mg 0.60 mg 0.58 mg	Mass comparator, mass standards



Parameter/Equipment	Range	CMC ^{2, 4, 5, 8} (±)	Comments
Mass – Measure (cont)	1 kg 2 kg 3 kg 5 kg 5.1 kg 10 kg 11.8 kg 20 kg 25 kg 30 kg 32.1 kg	1.8 mg 6.7 mg 6.0 mg 9.5 mg 9.5 mg 47 mg 47 mg 50 mg 55 mg 120 mg 120 mg	Mass comparator, mass standards
Force ³ – Measure			
Tension and Compression by Deadweight with Local Gravity and Air Bouyancy Corrections	(0.001 to 125) lbf	0.0020 %	ASTM E4 and ISO 7500-1
Comparison to Load Cell in Compression	(12.1 to 200) lbf (12.2 to 600) lbf (25 to 1000) lbf (50 to 2000) lbf (151 to 6751) lbf (250 to 11 250) lbf (617 to 20 000) lbf (1345 to 50 000) lbf (1232 to 67 000) lbf (6520 to 120 000) lbf (7560 to 200 000) lbf (24 960 to 400 000) lbf (26 553 to 600 000) lbf (51 600 to 1 000 000) lbf	0.020 % + 0.025 lbf 0.026 % + 0.027 lbf 0.025 % + 0.047 lbf 0.028 % + 0.042 lbf 0.028 % + 0.070 lbf 0.028 % + 0.18 lbf 0.081 % + 0.90 lbf 0.030 % + 2.5 lbf 0.083 % + 1.8 lbf 0.077 % + 10 lbf 0.080 % + 11 lbf 0.076 % + 38 lbf 0.081 % + 22 lbf 0.077 % + 79 lbf	ASTM E4 within the Class A working range, ISO 7500-1 within the Class 1 working range
Comparison to Load Cell in Tension	(19.9 to 200) lbf (27 to 679) lbf (27 to 1000) lbf (50 to 2000) lbf (151 to 6751) lbf (200 to 10 000) lbf (1080 to 40 000) lbf (1444 to 50 000) lbf (2477 to 68 000) lbf (7564 to 200 000) lbf	0.016 % + 0.041 lbf 0.023 % + 0.052 lbf 0.026 % + 0.054 lbf 0.029 % + 0.015 lbf 0.028 % + 0.10 lbf 0.026 % + 0.35 lbf 0.061 % + 1.7 lbf 0.030 % + 2.7 lbf 0.059 % + 4.0 lbf 0.080 % + 11 lbf	

Parameter/Equipment	Range	CMC ^{2, 4, 5, 8} (±)	Comments
<p>Force³ – Measuring Equipment (Tension and Compression)</p> <p>Calibration by Deadweight with Local Gravity and Air Buoyancy Corrections</p> <p>Force Multiplier Calibration Frame with Master Load Cells, Tension and Compression</p>	<p>(0.001 to 125) lbf</p> <p>(> 125 to 200) lbf</p> <p>(> 200 to 500) lbf</p> <p>(> 500 to 1200) lbf</p> <p>(> 1200 to 2000) lbf</p> <p>(> 2000 to 5000) lbf</p> <p>(> 5000 to 25 000) lbf</p> <p>(> 25 000 to 30 000) lbf</p> <p>(> 30 000 to 100 000) lbf</p>	<p>0.0020 %</p> <p>0.010 % + 0.0055 lbf</p> <p>0.012 % + 0.0018 lbf</p> <p>0.011 % + 0.015 lbf</p> <p>0.012 % + 0.0037 lbf</p> <p>0.012 % + 0.015 lbf</p> <p>0.012 % + 0.080 lbf</p> <p>0.0079 % + 2.8 lbf</p> <p>0.011 % + 1.9 lbf</p>	<p>Force calibrations include:</p> <p>ASTM E74: within Class AA working range</p> <p>ISO 376: within Class 00, 0.5 and 1 working ranges;</p> <p>ASTM E4: within Class A working range;</p> <p>ISO 7500-1: within Class 0.5 and 1 working ranges</p>
<p>Pressure – Hydraulic³</p> <p>Effective Area Determination of High Accuracy Piston-Cylinder Unit (PCU)</p> <p>Calibration of Pressure Devices</p>	<p>(100 to 4000) PSI</p> <p>(500 to 20 000) PSI</p> <p>(1000 to 40 000) PSI</p> <p>(100 to 400) PSI</p> <p>(400 to 4000) PSI</p> <p>(500 to 20 000) PSI</p> <p>(1000 to 40 000) PSI</p>	<p>0.0047 %</p> <p>0.0035 %</p> <p>0.0057 %</p> <p>0.0033 % + 0.0090 PSI</p> <p>0.0047 % + 0.0030 PSI</p> <p>0.0035 % + 0.0030 PSI</p> <p>0.0057 % + 0.0020 PSI</p>	<p>Cross float with Ruska deadweight tester</p> <p>Ruska deadweight tester</p>

Parameter/Equipment	Range	CMC ^{2,4,5} (±)	Comments
Verification of Test Frames ³ –			
Specimen Alignment (50 to 10 000) lbf	(100 to 3000) µe	0.86 % + 11 µe	ASTM E1012 alignment calibration system
Crosshead Displacement	(0 to 2) in (2 to 25) in	250 µin 0.23 %	ASTM E2309 digital indicator cable extension transducer
Crosshead Speed	(0 to 20) in/min	0.33 %	ASTM E2658 cable extension transducer with stop watch
Strain Rate	(0.0005 to 0.007) in/in/min	0.00012 in/in/min	Calibrated extensometer within ASTM Class B1 range and stopwatch as mentioned in ASTM E8 and ASTM A370
Hardness Testers ³ – Rockwell	HRA: (20 to 65) HRA (70 to 78) HRA (80 to 84) HRA HRBW: (40 to 59) HRBW (60 to 79) HRBW (80 to 100) HRBW HRC: (20 to 30) HRC (35 to 55) HRC (60 to 65) HRC HREW: (70 to 79) HREW (84 to 90) HREW (93 to 100) HREW HRFW: (60 to 75) HRFW (80 to 90) HRFW (94 to 100) HRFW HRGW: (30 to 50) HRGW (55 to 75) HRGW (80 to 94) HRGW HRHW: (80 to 94) HRHW (94 to 100)HRHW	0.50 HRA 0.39 HRA 0.34 HRA 0.72 HRBW 0.72 HRBW 0.61 HRBW 0.45 HRC 0.44 HRC 0.43 HRC 0.63 HREW 0.65 HREW 0.57 HREW 0.55 HRFW 0.55 HRFW 0.61 HRFW 0.59 HRGW 0.48 HRGW 0.49 HRGW 0.61 HRHW 0.48 HRHW	Indirect verification per ASTM E18

Parameter/Equipment	Range	CMC ^{2,4,5} (±)	Comments
Hardness Testers ³ – Rockwell (cont)	HRKW: (40 to 60) HRKW (65 to 80) HRKW (85 to 100) HRKW	0.54 HRKW 0.51 HRKW 0.46 HRKW	Indirect verification per ASTM E18
	HRMW: Low High	0.62 HRMW 0.59 HRMW	
	HRLW: Low High	0.58 HRLW 0.48 HRLW	
	HRRW: (100 to 120) HRRW	0.61 HRRW	
	HR15TW: (74 to 80) HR15TW (81 to 86) HR15TW (87 to 93) HR15TW	0.63 HR15TW 0.65 HR15TW 0.48 HR15TW	
	HR30TW: (43 to 56) HR30TW (57 to 69) HR30TW (70 to 83) HR30TW	0.58 HR30TW 0.55 HR30TW 0.55 HR30TW	
	HR45TW: (13 to 32) HR45TW (33 to 52) HR45TW (53 to 73) HR45TW	0.58 HR45TW 0.61 HR45TW 0.62 HR45TW	
	HR15N: (70 to 77) HR15N (78 to 88) HR15N (90 to 92) HR15N	0.49 HR15N 0.62 HR15N 0.45 HR15N	
	HR30N: (42 to 50) HR30N (55 to 73) HR30N (77 to 82) HR30N	0.70 HR30N 0.62 HR30N 0.54 HR30N	
	HR45N: (20 to 31) HR45N (37 to 61) HR45N (66 to 72) HR45N	0.49 HR45N 0.57 HR45N 0.52 HR45N	
	HR15WW: Low High	0.58 HR15WW 0.53 HR15WW	

Parameter/Equipment	Range	CMC ^{2, 4, 5} (±)	Comments
Hardness Testers ³ – Rockwell (cont)	HR30WW: Low High HR15YW: Low High HR15TS: (74 to 80) HR15TS (81 to 86) HR15TS (87 to 93) HR15TS HR30TS: (43 to 56) HR30TS (57 to 69) HR30TS (70 to 83) HR30TS HR30BS: (40 to 59) HR30BS (60 to 79) HR30BS (80 to 100) HR30BS	0.80 HR30WW 0.65 HR30WW 0.53 HR15YW 0.55 HR15YW 0.70 HR15TS 0.70 HR15TS 0.46 HR15TS 0.57 HR30TS 0.55 HR30TS 0.47 HR30TS 0.75 HR30BS 0.71 HR30BS 0.64 HR30BS	Indirect verification per ASTM E18 Indirect verification per ASTM E18 rev-05e1
Hardness Testers – Brinell HBW 10/3000/15 HBW 10/3000/30 HBW 10/1500/15 HBW 10/1000/10 HBW 5/750/30 HBW 10/500/5 HBW 2.5/187.5/30 HBW 2.5/62.5/10 Direct Verification of the Test Force Verification of the Brinell Scope ⁵	(95 to 650) HBW (96 to 650) HBW (48 to 327) HBW (32 to 218) HBW (96 to 650) HBW (16 to 109) HBW (96 to 650) HBW (32 to 218) HBW (62.5, 187.5, 500, 750, 1000, 1500, 3000) kgf (0 to 10) mm Type A and Type B	7.3 HBW 4.1 HBW 1.7 HBW 1.8 HBW 11 HBW 4.3 HBW 9.9 HBW 6.4 HBW 0.25 % 2.5 µm	Indirect verification method per ISO 6506-2, ASTM E10 Load cells within ASTM E4 Class A working range Stage micrometer

Parameter/Equipment	Range	CMC ^{2,4,5} (±)	Comments
<p>Microindentation Hardness Testers (Knoop and Vickers)³ –</p> <p>For Loads Less than 1000 g</p> <p>For Loads Greater than 1000 g</p> <p>X-Y Stage</p>	<p>(100 to 250) HK (250 to 650) HK > 650 HK</p> <p>(100 to 240) HV (240 to 600) HV > 600 HV</p> <p>Low HV Mid HV High HV</p> <p>(0 to 1) inch (0 to 25.4) mm</p>	<p>1.0 % HK 1.1 % HK 1.1 % HK</p> <p>1.1 % HV 0.9 % HV 0.8 % HV</p> <p>1.2 % HV 1.2 % HV 1.2 % HV</p> <p>53 µin 1.4 µm</p>	<p>Indirect verification method per ASTM E384</p> <p>Stage micrometer</p>
<p>Indirect Verification of Charpy Impact Testers³</p> <p>Specimen Evaluation</p> <p>Specimen Temperature Bath Verification</p>	<p>Low Energy Mid Energy High Energy</p> <p>-40 °C</p>	<p>1.2 J 2.8 J 5.0 J</p> <p>0.25 °C</p>	<p>ISO 148-2</p> <p>Precision thermometer; ASTM E23</p>
<p>Direct Verification of Charpy Impact Testers³</p> <p>Anvil to Anvil Measure</p> <p>Center Strike Measure</p> <p>Charpy Base Level</p> <p>Charpy Bolt Torque</p>	<p>40 mm</p> <p>20 mm</p> <p>0°</p> <p>(30 to 150) lbf·ft</p>	<p>0.042 mm</p> <p>0.17 mm</p> <p>0.14°</p> <p>5.1 %</p>	<p>ASTM E23 and ISO 148-2; Caliper and telescope gage</p> <p>Caliper</p> <p>Precision level</p> <p>Torque wrench</p>

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- ¹ This laboratory offers commercial calibration service and field 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. CMCs 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 CMC, percentages are percent of reading unless otherwise indicated.
- ⁵ Uncertainties may differ depending on the performance of artifact being measured at the time of calibration and the resolution of the device under test.
- ⁶ The stated measured values are determined using the indicated instrument (see Comments). This capability is suitable for the calibration of the devices intended to measure or generate the measured value in the ranges indicated. CMC's are expressed as either a specific value that covers the full range or as a percent or fraction of the reading plus a fixed floor specification.
- ⁷ This scope meets A2LA's *P112 Flexible Scope Policy*.
- ⁸ 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.
- ⁹ In the statement of CMC, L is the numerical value of the nominal length of the device measured in inches.