



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

NORTHSTAR CALIBRATION, INC.
1045 26th Place NW
Owatonna, MN 55060
John Moorhouse Phone: 507 444 9111

CALIBRATION

Valid To: August 31, 2026

Certificate Number: 0462.02

In recognition of the successful completion of the A2LA evaluation process (including an assessment of the organization's compliance with A2LA's Calibration Program Requirements), accreditation is granted to this laboratory to perform the following calibrations^{1, 8}:

I. Acoustical Quantities

Parameter/Equipment	Range	CMC ² (±)	Comments
Sound Level Meters ³	(94 & 114) dB	1.3 dB	Simpson 890-2 generator

II. Chemical Quantities

Parameter/Equipment	Range	CMC ^{2, 4, 9} (±)	Comments
pH Measuring Equipment	4.01 pH 7.00 pH 10.01 pH	0.019 pH + 0.60R 0.019 pH + 0.60R 0.020 pH + 0.60R	Standard solutions
Conductivity Measuring Equipment	100 µS 1000 µS 10 000 µS	1.8 µS + 0.6R 10 µS + 0.6R 270 µS + 0.6R	Standard solutions

III. Dimensional

Parameter/Equipment	Range	CMC ^{2, 4} ($\pm$)	Comments
Gage Blocks	Ceramic Up to 5 in (5 to 20) in Steel Up to 5 in (5 to 20) in	(1.6 + 0.81L) μ in (1.6 + 0.90L) μ in (1.6 + 0.83L) μ in (2.0 + 0.84L) μ in	Gage block comparator
Length Standards	Up to 24 in	(67 + 2.1L) μ in	Standard measuring machine
Cylindrical Plugs	Up to 1.2 in (1.2 to 4.0) in (4.0 to 20.0) in	(6.9 + 0.5L) μ in (8.9 + 0.11L) μ in (7.6 + 1.6L) μ in	Universal measuring machine (UMM)
Cylindrical Rings	(0.225 to 1.75) in (1.75 to 3.5) in (0.5 to 1.0) in (1.0 to 4.5) in (4.5 to 14.5) in	(2.1 + 11L) μ in (4.6 + 6.8L) μ in (5.7 + 0.16L) μ in (11 + 0.97L) μ in (7.0 + 2.3L) μ in	UMM
Threaded Plugs – Pitch Diameter Major Diameter	Up to 8.5 in Up to 8.5 in	120 μ in (1.6L + 25) μ in	Supermic
Threaded Rings – Pitch Diameter Minor Diameter	Up to 8 in (Vertical) (8 to 14) in (Horizontal) Up to 4 in (0.275 to 4) in (4 to 8) in Up to 0.150 in	(75 + 6L) μ in (71 + 5.6L) μ in (200 + 8.6L) μ in (160 + 11L) μ in (210 + 1.2L) μ in (13 + 44L) μ in	UMM UMM Setting plugs Tri-bore micrometer Precision height gage Cylindrical pin gages

Parameter/Equipment	Range	CMC ^{2, 4} (±)	Comments
Tapered Threaded Plugs – Pitch Diameter Notch Length	Up to 3 in Up to 2 in	130 µin (210 + 0.2L) µin	Supermic Precision height gage
Tapered Threaded Rings – Pitch Diameter Thickness of Ring	Up to 3 in Up to 2 in	140 µin 27 µin	Set plugs Supermic
Thread Wires	Up to 0.12 in	14 µin	UMM
Surface Plate ³ – Flatness Repeat Readings	(17 to 43) in (17 to 43) in (50 to 160) in Up to 160 in	52 µin 78 µin 86 µin 23 µin	Planekator Electronic level Repeat-o-meter
Calipers ³	Up to 120 in	(14L + 120) µin	Gage blocks & cylindrical ring
Micrometers ³	Up to 56 in	(2.1L + 75) µin	Gage blocks
Indicators ³	Up to 6 in	(10L + 60) µin	Gage blocks
Height Gages ³	Up to 24 in (24 to 40) in	(14L + 63) µin (4L + 310) µin	Gage blocks & amplifier
Optical Comparators ³ – Linear Angular Magnification	Up to 12 in (0 to 360)° (10 to 50) X	(150 + 4.6L) µin 0.035 ° 0.0023 in	Glass scales, mag checker & balls

Parameter/Equipment	Range	CMC ^{2, 4} ($\pm$)	Comments
Optical Flats – Flatness	Up to 3 in	2.8 μ in	Reference flat & monochromatic light source
Tape Measures, Pi Tapes, Steel Rules ³	0.5 in to 18 ft (18 to 72) ft	(6900 + 5L) μ in 0.013 in	Length fixture
String Potentiometers	Up to 150 in	0.020 % FS	Length fixture/laser
Brinell Scopes ³ Microscopes ³ & Glass Line Reticles ³	Up to 6 mm Up to 6 in	120 μ m 190 μ in	Ceramic scale Glass scale
Surface Finish Patch	Up to 250 μ in	9.1 μ in	Surface analyzer
Surface Finish Analyzer ³	Up to 250 μ in	7.2 μ in	Surface finish patch
CMM ³ – Repeatability Linearity: Step Gage Laser Volumetric Bi-Directional	Up to 48 in Up to 48 in Up to 240 in -- --	62 μ in 150 μ in (5.5 + 0.47L) μ in (90 + 13L) μ in 55 μ in	Master ball Step gage/laser Ball bar Gage block
Protractors	(0 to 180) °	7 arcmin	Angle blocks, surface plate
Squares	(1 to 24) in	82 μ in	Square, height gage, amplifier
Levels	(1 to 24) in	2 arcmin	Sine plate, gage blocks, surface plate

IV. Dimensional Testing/Calibration¹

Parameter/Equipment	Range	CMC ^{2, 4, 7, 9} ($\pm$)	Comments
1-Dimensional Measurement ⁷	Up to 45 in Up to 24 in Up to 20 in Up to 6 in Up to 6 in Up to 1.25 in Up to 2 in Up to 6 in	(72 + 0.94L) μ in (20 + 3.4L) μ in (3.9 + 3.4L) μ in (150 + 5.6L) μ in (930 + 160L) μ in (240 + 190L) μ in 750 μ in (120 + 20L) μ in	Precision HG & amp Supermic UMM Optical comparator Caliper Cylindrical pins Indicator Micrometer
	(1 to 28) in (1 to 34) in (1 to 42) in	(80 + 2.5L) μ in (89 + 2.6L) μ in (73 + 6.0L) μ in	CMM 1-D 2-D 3-D
1-Dimensional Measurement ^{3, 7}	Up to 4 in Up to 240 in	(7.1 + 2.2L) μ in (5.5 + 0.47L) μ in	THV Laser
Angular Measurement ⁷ (Includes Angle Blocks)	(0 to 180)° (0 to 90)°	(0.033 + 0.000 16R)° 2' 50"	Optical comparator Sine plate, gage blocks
Radius Measurement	Up to 2 in	(860 + 390L) μ in	Optical comparator

V. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2, 5, 6} ($\pm$)	Comments
DC Voltage – Generate ³	(0 to 330) mV (0.33 to 3.3) V (3.3 to 33) V (33 to 330) V (330 to 1000) V	0.000 36 % + 2.3 μ V 0.000 067 % + 7.8 μ V 0.000 37 % + 33 μ V 0.000 38 % + 160 μ V 0.000 31 % + 1.1 mV	Calibrator

Parameter/Equipment	Range	CMC ^{2, 5, 6} ($\pm$)	Comments
DC Voltage – Measure ³	(0 to 1) V (1 to 10) V (10 to 1000) V	47 μ V/V + 12 μ V 46 μ V/V + 51 μ V 67 μ V/V + 510 μ V	Precision bench meter
	(1 to 10) kV	0.015 % + 1.4 mV	Precision bench meter with voltage divider
DC Current – Generate ³	(0 to 330) μ A (.33 to 3.3) mA (3.3 to 33) mA (33 to 330) mA (.33 to 1.1) A (1.1 to 3) A (3 to 11) A (11 to 20) A	0.0054 % + 110 nA 0.016 % + 2.3 μ A 0.016 % + 2.3 μ A 0.002 % + 2.3 μ A 0.47 % + 2.3 μ A 0.27 % + 700 μ A 0.047 % + 2.3 mA 0.0044 % + 490 μ A	Calibrator
	(11 to 500) A (500 to 1000) A	0.71 % + 0.022 A 0.51 % + 890 μ A	Calibrator, 50 turn coil
DC Current – Measure ³	(0 to 10) mA (10 to 100) mA (0.1 to 3) A (3 to 20) A	0.038 % + 6.8 μ A 0.084 % + 2.2 μ A 0.14 % + 34 μ A 0.01 % + 0.044 A	Precision bench meter
	(10 to 1000) A	0.064 % + 0.06 A	Current shunt & DMM
DC Welders ³	DC Volt DC Amps	5.6 % + 0.55 mV 3.7 % mV	DMM, clamp meter, load bank
DC Power – Generate	109 μ W to 1 mW (1 to 11) mW (11 to 108) mW 108 mW to 11 W 11 W to 5 kW (5 to 12) kW (12 to 20) kW	0.51% + 2.9 μ W 0.02% + 7.8 μ W 0.031% + 49 μ W 0.013% + 1.7 μ W 2.0 mW 7.0 mW 4.2 mW	Calibrator

Parameter/Equipment	Range	CMC ^{2, 5, 6} ($\pm$)	Comments
Resistance – Generate ³	(0 to 330) Ω (0.33 to 1.1) k Ω (1.1 to 11) k Ω (11 to 330) k Ω (0.33 to 3.3) M Ω (3.3 to 33) M Ω (33 to 330) M Ω	0.011 % + 19 m Ω 0.014 % + 21 m Ω 0.039 % + 940 m Ω 0.014 % + 11 Ω 0.018 % + 82 Ω 0.21 % + 570 Ω 0.62 % + 9.6 k Ω	Calibrator
Fixed Points	0.001 Ω 0.01 Ω 0.1 Ω 1.0 Ω 10.0 Ω 100.0 Ω 1.0 k Ω 10.0 k Ω 100.0 k Ω 1 T Ω 10 T Ω	3.1 n Ω 1.2 $\mu\Omega$ 17 $\mu\Omega$ 20 $\mu\Omega$ 120 $\mu\Omega$ 1.2 m Ω 12 m Ω 120 m Ω 1.2 Ω 58 G Ω 1.2 T Ω	Standard resistors
Variable Resistance	(0.001 to 100) G Ω	0.38 %	High voltage decade
Resistance – Measure ³	(0 to 100) Ω (0.1 to 10) k Ω 10 k to 1 M Ω (1 to 100) M Ω	0.12 % + 4.9 m Ω 0.011 % + 140 m Ω 0.011 % + 16 Ω 0.93 % + 610 Ω	Precision bench meter
AC Voltage – Measure ³			
(0 to 1) V	(3 to 10) Hz (10 to 50) Hz (50 to 300) Hz	0.41 % + 55 μ V 0.14 % + 57 μ V 0.74 % + 52 μ V	Precision bench meter
(1 to 750) V	(3 to 10) Hz (10 to 50) Hz (50 to 300) Hz	0.44 % + 31 mV 0.17 % + 42 mV 0.52 % + 130 mV	
(1 to 10) kV	60 Hz	0.5 %	Voltage divider bench meter

Parameter/Equipment	Frequency	CMC ^{2, 6} (±)	Comments
AC Voltage – Generate ³			
(1 to 33) mV	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.0081 % + 1.2 µV 0.0085 % + 1.1 µV 0.0085 % + 910 nV 0.0092 % + 530 nV 0.0076 % + 1.3 µV 0.000 51 % + 38 µV	Calibrator
(33 to 330) mV	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.0065 % + 330 nV 0.0013 % + 1.3 µV 0.0021 % + 660 nV 0.002 % + 210 nV 0.0031 % + 570 nV 0.025 % + 30 µV	
(0.33 to 3.3) V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.0064 % + 7.8 µV 0.0075 % + 200 nV 0.0032 % + 9.5 µV 0.0048 % + 6.3 µV 0.0078 % + 6.7 µV 0.052 % + 22 µV	
(3.3 to 33) V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.0074 % + 21 µV 0.0073 % + 21 µV 0.0032 % + 26 µV 0.0056 % + 8.6 µV 0.012 % + 98 µV	
(33 to 330) V	45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.0039 % + 42 µV 0.0081 % + 130 µV 0.0048 % + 340 µV 0.011 % + 1.6 mV 0.024 % + 4.3 mV	
(330 to 1020) V	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.0072 % + 120 µV 0.0068 % + 3.5 mV 0.0068 % + 5.8 mV	

Parameter/Range	Frequency	CMC ^{2, 6} (±)	Comments
AC Current – Measure ³			
(0 to 1) A	(3 to 5) Hz (5 to 10) Hz 10 Hz to 5 kHz	0.12 % + 770 µA 0.33 % + 770 µA 0.091 % + 770 µA	Multimeter
(1 to 3) A	(3 to 5) Hz (5 to 10) Hz 10 Hz to 5 kHz	0.12 % + 4.8 mA 0.34 % + 4.4 mA 0.097 % + 4.8 mA	
(10 to 500) A	50 Hz to 1 kHz	0.2 % + 96 mA	Multimeter, current clamp
(3 to 1000) A	50 Hz to 1 kHz	0.24 % + 32 mA	Multimeter, shunt
AC Current – Generate ³			
(29 to 330) µA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.12 % + 400 nA 0.000 49 % + 2.7 nA 0.000 25 % + 1.9 nA 0.0005 % + 1.6 nA 0.0012 % + 1.6 nA 0.0053 % + 1.6 nA	Calibrator
(0.33 to 3.3) mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.012 % + 590 nA 0.015 % + 660 nA 0.0086 % + 680 nA 0.013 % + 540 nA 0.013 % + 540 nA 0.015 % + 660 nA	
(3.3 to 33) mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.0013 % + 590 nA 0.0018 % + 550 nA 0.0012 % + 600 nA 0.0012 % + 600 nA 0.0015 % + 1.6 µA 0.0022 % + 560 nA	
(33 to 330) mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.000 085 % + 2.6 µA 0.000 45 % + 2 µA 0.0011 % + 1.3 µA 0.000 92 % + 1.9 µA 0.0014 % + 2.1 µA 0.0065 % + 110 nA	

Parameter/Range	Frequency	CMC ^{2, 6} (±)	Comments
AC Current – Generate ³ (cont)			
(0.33 to 1.1) A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.057 % + 520 µA 0.049 % + 420 µA 0.058 % + 520 µA 0.058 % + 520 µA	Calibrator
(1.1 to 3) A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.02 % + 370 µA 0.02 % + 370 µA 0.02 % + 370 µA 0.024 % + 320 µA	
(3 to 11) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.0057 % + 600 µA 0.006 % + 600 µA 0.0048 % + 590 µA	
(11 to 20) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.009 % + 150 µA 0.0071 % + 310 µA 0.0069 % + 180 µA	
AC Current Clamps ³			
Toroidal-Type:			Calibrator/50 turn coil
(10 to 500) A	(45 to 65) Hz	0.71 % + 22 mA	
(500 to 1000) A	(45 to 65) Hz	0.51 % + 220 µA	
Non-Toroidal-Type:			
(10 to 500) A	(45 to 65) Hz	0.71 % + 22 mA	
(500 to 1000) A	(45 to 65) Hz	0.51 % + 270 µA	
AC Power – Generate (45 to 65) Hz PF=1	109 µW to 1 mW (1 to 11) mW (11 to 108) mW 108 mW to 11 W 11 W to 5 kW (5 to 12) kW (12 to 20) kW	1.9% + 27µW 2.5% 300 µW 0.12% + 120 µW 13 mW 0.00085% 72 mW	Calibrator

Parameter/Range	Frequency	CMC ^{2, 6} (±)	Comments
Synchro/Resolver Simulators (0 to 360)°	(0 to 10) kHz	0.0018°	Angle position indicator
Capacitance – Generate ³	(190 to 400) pF (0.4 to 1.1) nF (1.1 to 3.3) nF (3.3 to 11) nF (11 to 33) nF (33 to 110) nF (110 to 330) nF (0.33 to 1.1) µF (1.1 to 3.3) µF (3.3 to 11) µF (11 to 33) µF (33 to 110) µF (110 to 330) µF (0.33 to 1.1) mF (1.1 to 3.3) mF (3.3 to 11) mF (11 to 33) mF (33 to 110) mF	0.097 % + 940 fF 0.035 % + 550 fF 0.032 % + 560 fF 0.018 % + 5.4 pF 0.0095 % + 290 fF 0.0017 % + 1.9 pF 0.0045 % + 4.9 pF 0.0013 % + 15 nF 0.0067 % + 74 nF 0.027 % + 720 pF 0.086 % + 7.1 nF 0.13 % + 3.8 nF 0.012 % + 13 nF 0.021 % + 47 nF 0.04 % + 94 nF 0.28 % + 8.1 µF 0.59 % + 48 µF 0.075 % + 87 µF	Calibrator

Parameter/Equipment	Range	CMC ^{2, 5, 6} (±)	Comments
Capacitance – Generate ³ cont. Fixed Points	1 nF 2 nF 3 nF 4 nF 5 nF 6 nF 7 nF 8 nF 9 nF 10 nF 20 nF 30 nF 40 nF 50 nF 60 nF 70 nF 80 nF 90 nF 100 nF 200 nF 300 nF 400 nF 500 nF 1 µF	0.09 % 0.53 % 0.37 % 0.0024 % 0.37 % 0.51 % 0.37 % 0.69 % 0.69 % 0.61 % 5.1 % 5.1 % 6.1 % 6.9 % 11 % 3.7 % 7.6 % 1.1 % 9.6 % 0.0024 % 0.0024 % 0.0024 % 0.0024 % 24 µF/F + 0.6R	Capacitor set
Inductance – Generate Fixed Points	200 µH 2 mH 10 mH 20 mH 1 H	150 nH 1.6 µH 1.6 µH 1.3 µH 3.2 mH	Standard inductors

Parameter/Equipment	Range	CMC ^{2, 5, 6} ($\pm$)	Comments
Oscilloscopes ³ –			
Level Sine Wave: 50 kHz Reference	1 mV to 5.5 V(p-p)	2.0 % + 300 μ V	Calibrator
Level Sine Flatness: 5 mV to 5.5 V	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz	3.6 % + 300 μ V 4.1 % + 300 μ V 6.1 % + 330 μ V	Relative to 50 kHz reference
Vertical Gain DC: Into 50 Ω Into 1 M Ω	Up to 6.6 V Up to 130 V	0.24 % + 400 μ V 0.051 % + 400 μ V	
Square Wave: Into 50 Ω Into 1 M Ω	1 mV to 6.6 V(p-p) 1 mV to 130 V(p-p)	0.24 % + 400 μ V 0.10 % + 400 μ V	
Time Marker Output: Into 50 Ω	5 s to 50 ms 20 ms to 2 ns In 5-2-1 sequence	0.0001 % + 25 ns 0.000 014 % + 2.5 ns	Relative to 50 kHz reference
Pulse Rise Time: 5 mV to 2.5 V(p-p)	$\leq$ 350 ps	+0/-120 ps	

Parameter/Equipment	Range	CMC ^{2, 5, 6} (±)	Comments
Electrical Calibration of Thermocouple Indicating Devices ³ –			
Type B	(600 to 1820) °C	0.51 °C	Calibrator
Type C	(0 to 1800) °C (1800 to 2316) °C	0.58 °C 0.97 °C	
Type E	(-150 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1000) °C	0.53 °C 0.71 °C 1.37 °C 0.57 °C	
Type J	(-210 to -100) °C (-100 to 1200) °C	0.34 °C 0.26 °C	
Type K	(-200 to -100) °C (-100 to 1000) °C (1000 to 1372) °C	0.39 °C 0.30 °C 0.38 °C	
Type N	(-200 to -100) °C (-100 to 1300) °C	0.46 °C 0.31 °C	
Type R (S)	(0 to 1767) °C	0.66 °C	
Type T	(-250 to -150) °C (-150 to 400) °C	0.66 °C 0.31 °C	

VI. Electrical - RF/Microwave

Parameter/Equipment	Range	CMC ^{2, 5, 9} (±)	Comments
RF Power – Measure (0.001 to 100) mW (-30 to 20) dBm	100 kHz to 6 GHz	0.89% + 0.63 dBm	N8482A Power Sensor & Meter

VII. Fluid Quantities

Parameter/Equipment	Range	CMC ^{2, 5, 9} (±)	Comments
Air Velocity Measuring Equipment	(0.45 to 30) m/s	2.7% + 0.1 m/s	Wind Tunnel w/ Hotwire Reference

VIII. Mechanical

Parameter/Equipment	Range	CMC ^{2, 5, 9} (±)	Comments
Accelerometers – Shear & Charge	(5 to 10) Hz 10 Hz to 1 kHz (1 to 5) kHz (5 to 15) kHz (15 to 20) kHz	1.1 % 0.73 % 0.89 % 1.6 % 2.2 %	Precision air bearing shaker/reference accelerometer – back-to-back comparison method.
Force ³ – Compression & Tension, Measuring Equipment	Up to 250 lbf Up to 1000 lbf (1000 to 10 000) lbf Compression Tension Transducer Output in mV Compression Tension (10 000 to 100 000) lbf Compression Tension Transducer Output in mV Compression Tension	0.20 % 0.28 % 0.018 % 0.019 % 0.018 % 0.019 % 0.019 % 0.024 % 0.017 % 0.019 %	Precision weights Load cells

Parameter/Equipment	Range	CMC ^{2, 5, 9} ($\pm$)	Comments
Durometers ³			
Indenter Extension & Shape:			
Diameter	Up to 0.6 in	260 μ in	ASTM D2240 ASTM F1957
Radius	Up to 0.5 in	510 μ in	
Angle	Up to 40°	0.032°	
Extension	Up to 0.110 in	130 μ in	
Indenter Force	Up to 100 Duros	0.45 Duros	
Pressure/Vacuum Gauges & Transducers ^{3,4}	(0 to 80 inH ₂ O) (0.01 to 16) psia (0 to 10) psig (-15 to 300) psig (300 to 3000) psig (1000 to 10 000) psig	0.012% + 0.025 inH ₂ O 0.056% + 0.0092 psia 0.098% + 0.025 psig 0.0029 % + 0.018 psig 0.0027 % + 0.019 psig 0.002 % + 5.9 psig	Fluke 6270A pressure system Transducer
Torque Testers ³	(0.125 to 100) lbf·in (8 to 250) lbf·ft (251 to 1500) lbf·ft	(0.059 + 0.000 72 <i>A</i>) lbf·in (0.062 + 0.0060 <i>A</i>) lbf·ft (0.89 + 0.0064 <i>A</i>) lbf·ft	Weights & radius arms; <i>A</i> is applied torque
Torque Tools ³	(0.01 to 250) lbf·ft (250 to 1000) lbf·ft (1000 to 2000) lbf·ft	1.0 % 0.8 % 0.78 %	Torque tester
Mass (Weights) ³	(1 to 500) g (1 to 10) lb (> 10 to 75) lb	1.2 mg 120 mg 550 mg	520 g balance, weight sets Verification with Class 1 & 4 weights, precision scale Precision scale, weight set

Parameter/Equipment	Range	CMC ² (±)	Comments
Scales & Balances ³	(0.002 to 6.8) lb (6.8 to 50) lb (50 to 1000) lb (1001 to 5000) lb (5001 to 10 000) lb	(0.000 040) lb (0.0022 + 0.0027 <i>W</i>) lb 0.30 lb 1.6 lb 2.1 lb	Verification with Class 1, 4 & F weights; <i>W</i> is the weight reading
Indirect Verification of Brinell Hardness Testers ³ – 10/500/15 10/3000/15	 Up to 225 HBW (226 to 650) HBW	 1.7 HBW 1.9 HBW	 Indirect verification method per ASTM E10 of Brinell hardness testers
Indirect Verification of Micro-Indentation Hardness Testers (Knoop & Vickers) ³ – Knoop Vickers	 (100 to 250) HK (251 to 650) HK > 650 HK (100 to 240) HV (241 to 600) HV > 600 HV	 11 HK 33 HK 64 HK 26 HV 75 HV 160 HV	 Indirect verification method per ASTM E92

Parameter/Equipment	Range	CMC ² (±)	Comments
Indirect Verification of Rockwell & Rockwell Superficial Hardness Testers ³ –	HRA: Low Medium High HRBW: Low Medium High HRC: Low Medium High HR15N: Low Medium High HR30N: Low Medium High HR45N: Low Medium High HR15TW: Low Medium High	1.4 HRA 1.4 HRA 1.5 HRA 1.9 HRBW 1.5 HRBW 1.0 HRBW 1.3 HRC 1.4 HRC 1.0 HRC 1.3 HR15N 1.2 HR15N 1.4 HR15N 1.9 HR30N 2.0 HR30N 1.8 HR30N 1.4 HR45N 1.4 HR45N 1.4 HT45N 1.5 HR15TW 1.5 HR15TW 1.7 HR15TW	ASTM E18
Indirect Verification of Rockwell & Rockwell Superficial Hardness Testers ³ – (cont)	HR30TW: Low Medium High HR45TW: Low Medium High	1.9 HR30TW 2.0 HR30TW 1.8 HR30TW 2.0 HR45TW 1.7 HR45TW 1.7 HR45TW	ASTM E18
Tachometers	Up to 99 999 RPM	0.0028 % + 0.078 RPM	Calibrator

IX. Thermodynamics

Parameter/Equipment	Range	CMC ^{2,9} (±)	Comments
Infrared Thermometers ³	(85 to 750) °F	(0.65 + 0.0016T) °F	Black body calibrator, <i>T</i> is the temperature reading $\lambda = (8 \text{ to } 14) \mu\text{m}$, where $\varepsilon = 0.95$
Temperature – Generate	(-15 to 110) °C (5 to 230) °F (50 to 350) °C (122 to 662) °F	0.91°C 1.64°F 0.89 °C 1.60 °F	Dual Block Drywell
Humidity – Measure	(10 to 95) % RH	0.29 + 0.011 % RH	Humidity generator & thermo-hygrometer
Temperature – Measure	(-40 to 100) °C (-40 to 212) °F (100 to 350) °C (212 to 662) °F	0.035 °C 0.063 °F 0.048 °C 0.086 °F	PRT

X. Time & Frequency

Parameter/Equipment	Range	CMC ^{2,9} (±)	Comments
Frequency – Generate	Up to 12 kHz 12 kHz to 2 MHz 50 kHz to 600 MHz	28 µHz/Hz + 1.3 mHz 26 µHz/Hz + 16 mHz 2.7 µHz/Hz	Calibrator
Frequency – Measure ³	Up to 160 MHz 40 MHz to 1.3 GHz	3.2 µHz/Hz 5.9 µHz/Hz	Counter
Timers & Stopwatches ³	Up to 24 hrs	5.9 µs/s	Counter

- ¹ This laboratory offers commercial dimensional testing/calibration service 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. 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. 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, L is the numerical value of the nominal length of the device measured in inches; D is the numerical value of the diagonal length of the device measured in inches; R is the resolution of the device under test; P is the numerical value of the pressure; RH is the numerical value of the relative humidity.
- ⁵ In the statement of CMC, % denotes percent of reading unless otherwise noted.
- 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. CMCs 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 laboratory meets R205 – *Specific Requirements: Calibration Laboratory Accreditation Program* for the types of dimensional calibrations listed above. Accredited test reports issued containing appropriate statements of measurement results, measurement uncertainty, and traceability are considered equivalent to a "calibration" certificate.
- ⁸ This scope meets A2LA's *P112 Flexible Scope Policy*.
- ⁹ 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.



Accredited Laboratory

A2LA has accredited

NORTHSTAR CALIBRATION, INC.

Owatonna, MN

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 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 5th day of August 2024.

A blue ink signature of Mr. Trace McInturff.

Mr. Trace McInturff Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 462.02
Valid to August 31, 2026
Revised April 9, 2025

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