



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

NOVASTAR SOLUTIONS.COM LLC
 DBA NOVASTAR METROLOGY
 35200 Plymouth Road
 Livonia, MI 48150
 Guy Howe Phone: 734 453 8003

CALIBRATION

Valid To: March 31, 2027

Certificate Number: 1277.01

In recognition of the successful completion of the A2LA evaluation process (including an assessment of the organization's compliance with A2LA's - R025 Calibration Program Requirements), accreditation is granted to this laboratory at the location listed above as well as the satellite laboratory location listed below to perform the following calibrations^{1,9}:

I. Acoustical Quantities

Parameter/Range	Frequency	CMC ² (±)	Comments
Microphone Acoustic Level – Sensitivity: ¼, ½, & 1 in Frequency Response: ¼, ½, & 1 in	114 dB @ 250 Hz 20 Hz to 92.2 kHz	0.29 dB 0.30 dB + 0.000 84 dB/kHz	Modal shop acoustic calibration system
Sound Level Calibrators – (74 to 124) dB	(0.25 to 1) kHz	0.29 dB	Modal shop acoustic calibration system
Sound Level Meters – (94 and 114) dB	(0.125 to 2) kHz (0.02 to 20) kHz	0.65 dB 0.12 dB	Acoustic method Electrical method

II. Chemical

Parameter/Equipment	Range	CMC ^{2, 6, 10} (\pm)	Comments
pH ³ – Measuring Equipment	4.01 pH unit 7.01 pH unit 10.01 pH unit	0.019 pH unit 0.023 pH unit 0.025 pH unit	Accredited solutions
Conductance ³ – Measuring Equipment	1.015 mS/cm 1.408 mS/cm 12.85 mS/cm 111.3 mS/cm	0.0072 mS/cm + 0.6R 0.0096 mS/cm + 0.6R 0.080 mS/cm + 0.6R 0.63 mS/cm + 0.6R	Accredited solutions

III. Dimensional

Parameter/Equipment	Range	CMC ^{2, 6} (\pm)	Comments
Micrometers ³	Up to 36 in	$(0.31 + 8.0L) \mu\text{in} + 0.6R$	Gage blocks w/ optical Parallels
Flatness	Up to 1 in	4.8 μin	
Parallelism	Up to 0.0001 in	6.1 μin	
Tri-Bore	Up to 5 in	$(6.4 + 4.4L) \mu\text{in} + 0.6R$	Ring gage set
Calipers ³	Up to 36 in	$(0.56 + 8.0L) \mu\text{in} + 0.6R$	Gage blocks
Angle ³	90°	0.000 43°	Master square
	Up to 180°	0.000 048 °/°	Sine bar/gage blocks
Rulers & Tape Measures	Up to 1000 ft	0.001 in/ft	Ruler/Tapes calibrator

Parameter/Equipment	Range	CMC ^{2, 6} (\pm)	Comments
Optical Comparators ³ – Magnification	10× 20× 31.25× 50× 62.5× 100×	530 μ in 420 μ in 390 μ in 380 μ in 380 μ in 380 μ in	Magnification scale Glass scale
Linear Accuracy	(0.001 to 6) in	120 μ in + 0.6R	
Angle	(30/60/90/120/150)°	0.0048° + 0.6R	
Cylindrical Gages ³ – Pins, Plugs, Discs	Up to 4.0 in	(4.6 + 5.4L) μ in	ULM & gage blocks
Height Gages ^{3, 8}	Up to 48 in	(48 + 4.5L) μ in	Gage blocks
Indicators ³ – Dial & Digital	Up to 4 in	(54 + 0.74L) μ in + 0.6R	Gage blocks
Gage Blocks ³	(0.01 to 4) in (0.5 to 100) mm (>4 to 20) in	(3 + 1.4L) μ in (120 + 1.8L) nm (5 + 3.5L) μ in	Twin head comparison ULM
Length Standards	Up to 20 in	(5 + 3.5L) μ in	ULM
Linear Displacement ³	Up to 60 in Up to 254 M	(930 + 21L) μ in 0.47 mm	String pot calibration system Measurement Wheel System
Radius Gage	(0.005 to 5) in	0.0012 in	Optical comparator
Threaded Plug Gages – Pitch Diameter (5 to 80 TPI)	Up to 8 in	(72 + 1.6L) μ in	ULM, thread wires, gage blocks
Major Diameter	Up to 8 in	(4.6 + 5.4L) μ in	ULM & gage blocks

Parameter/Equipment	Range	CMC ^{2, 6} (\pm)	Comments
Thread rings – Pitch Diameter (5 to 80 TPI)	Up to 6.5 in	Set Plug Tolerance	Class W thread setting plugs
Gage Balls	Up to 4 in	$(4.6 + 5.4L) \mu\text{in}$	ULM
Ring Gages	Up to 8 in	$(4.6 + 5.4L) \mu\text{in}$	ULM, master rings & gage blocks
Foils & Thickness Gages	Up to 8 in	$(4.6 + 5.4L) \mu\text{in}$	ULM
Geometric Measurements – X Axis Y Axis Z Axis	Up to 900 mm Up to 1000 mm Up to 600 mm	$3.9 \mu\text{m} + 0.0043 \mu\text{m}/\text{mm}$ $4.0 \mu\text{m} + 0.0043 \mu\text{m}/\text{mm}$ $3.9 \mu\text{m} + 0.0042 \mu\text{m}/\text{mm}$	CMM
Cylindrical Gages ³ – Pins, Plugs, Discs	Up to 3 in 3 to 8 in	$0.84 \mu\text{in}/\text{in} + 9.5 \mu\text{in}$ $1.4 \mu\text{in}/\text{in} + 6.8 \mu\text{in}$	LabMaster, Gr.00 GB & XXX Master Rings
Gage Blocks	(0.01 to 4) in (>4 to 20) in	$(3.5 + 1.7L) \mu\text{in}$ $(0.063 + 2.6L) \mu\text{in}$	LabMaster w/Gr 00 Gage Blocks
Threaded Plug Gages ³ – Pitch Diameter (5 to 80) TPI Major Diameter	Up to 8 in Up to 8 in	$(33 + 0.7L) \mu\text{in}$ $(3.3 + 2.1L) \mu\text{in}$	LabMaster w/Gr 00 gage blocks & thread wires LabMaster w/Gr 00 gage blocks
Plain Ring Gages ³	Up to 3 in (3 to 8) in	$0.44 \mu\text{in}/\text{in} + 10 \mu\text{in}$ $1.4 \mu\text{in}/\text{in} + 6.8 \mu\text{in}$	LabMaster, Gr.00 GB & XXX master rings LabMaster & grade 00 GB & XXX master ring

V. Electrical – DC/Low Frequency

Parameter/Range	Frequency	CMC ^{2, 11} (±)	Comments
AC Current ³ – Generate			
(0 to 220) µA	(10 to 20) Hz (20 to 40) Hz (40 to 1000) Hz (1 to 5) kHz (5 to 10) kHz	0.031 % + 16 nA 0.020 % + 10 nA 0.014 % + 8 nA 0.033 % + 12 nA 0.13 % + 65 nA	Fluke 5730A
(0.22 to 2.2) mA	(10 to 20) Hz (20 to 40) Hz (40 to 1000) Hz (1 to 5) kHz (5 to 10) kHz	0.031 % + 40 nA 0.020 % + 35 nA 0.013 % + 35 nA 0.027 % + 110 nA 0.13 % + 650 nA	
(2.2 to 22) mA	(10 to 20) Hz (20 to 40) Hz (40 to 1000) Hz (1 to 5) kHz (5 to 10) kHz	0.038 % + 400 nA 0.020 % + 350 nA 0.013 % + 350 nA 0.028 % + 550 nA 0.14 % + 5 µA	
(22 to 220) mA	(10 to 20) Hz (20 to 40) Hz (40 to 1000) Hz (1 to 5) kHz (5 to 10) kHz	0.031 % + 4 µA 0.021 % + 3.5 µA 0.014 % + 2.5 µA 0.033 % + 3.5 µA 0.14 % + 10 µA	
(0.22 to 2.2) A	(20 to 1000) Hz (1 to 5) kHz (5 to 10) kHz	0.031 % + 35 µA 0.059 % + 80 µA 0.86 % + 160 µA	
(2.2 to 11) A	(40 to 1000) Hz (1 to 5) kHz (5 to 10) kHz	0.053 % + 170 µA 0.11 % + 380 µA 0.42 % + 750 µA	Fluke 5730A/5725A
(11 to 20.5) A	(45 to 100) Hz (0.1 to 1) kHz (1 to 5) kHz	0.12 % + 5 mA 0.15 % + 5 mA 3.1 % + 5 mA	Fluke 552XA

Parameter/Range	Frequency	CMC ^{2, 4, 11} (\pm)	Comments
AC Current ³ – Generate (cont.)			
(>20.5 to 40) A	(45 to 440) Hz	0.46 % + 0.008 A	Fluke 552XA w/ EA002 2/10/50 Coil
(>40 to 200) A	(45 to 440) Hz	0.53 % + 0.01 A	
(>200 to 1025) A	(45 to 440) Hz	0.35 % + 0.04 A	
AC Current ³ – Measure			
(0 to 100) μ A	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 1 kHz	5 mA/A + 30 nA 2.1 mA/A + 30 nA 1.1 mA/A + 30 nA 1.1 mA/A + 30 nA	HP 3458A, option II
(0.1 to 1) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz	4.6 mA/A + 0.20 μ A 1.7 mA/A + 0.20 μ A 0.70 mA/A + 0.20 μ A 0.36 mA/A + 0.20 μ A 0.70 mA/A + 0.20 μ A	
(1 to 10) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.100 to 5) kHz (5 to 20) kHz	4.9 mA/A + 2 μ A 2 mA/A + 2 μ A 0.94 mA/A + 2 μ A 0.60 mA/A + 2 μ A 0.93 mA/A + 2 μ A	
(10 to 100) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.100 to 5) kHz (5 to 20) kHz	4.9 mA/A + 20 μ A 2 mA/A + 20 μ A 0.94 mA/A + 20 μ A 0.60 mA/A + 20 μ A 0.69 mA/A + 20 μ A	
100 mA to 1 A	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz	0.5 % + 0.2 mA 0.24 % + 0.2 mA 0.15 % + 0.2 mA 0.18 % + 0.2 mA	
(1 to 10) A	(45 to 1000) Hz (1 to 3) kHz (3 to 5) kHz	0.055 % 0.058 % 0.08 %	

Parameter/Range	Frequency	CMC ^{2, 4, 11} (\pm)	Comments
AC Voltage ³ – Generate			
(0 to 2.2) mV	(10 to 20) Hz (20 to 40) Hz (40 to 20 000) Hz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (500 to 1000) kHz	0.63 mV/V + 4 μ V 0.86 mV/V + 4 μ V 0.50 mV/V + 4 μ V 0.59 mV/V + 4 μ V 0.82 mV/V + 5 μ V 1.8 mV/V + 10 μ V 3.4 mV/V + 20 μ V 5 mV/V + 20 μ V	Fluke 5730A
(2.2 to 22) mV	(10 to 20) Hz (20 to 40) Hz (40 to 20 000) Hz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (500 to 1000) kHz	0.26 mV/V + 4.0 μ V 0.14 mV/V + 4.0 μ V 0.12 mV/V + 4.0 μ V 0.22 mV/V + 4.0 μ V 0.46 mV/V + 5.0 μ V 1 mV/V + 10 μ V 1.4 mV/V + 20 μ V 2.9 mV/V + 20 μ V	
(22 to 220) mV	(10 to 20) Hz (20 to 40) Hz (40 to 20 000) Hz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (500 to 1000) kHz	0.23 mV/V + 12 μ V 64 μ V/V + 7.0 μ V 55 μ V/V + 7.0 μ V 0.12 mV/V + 7.0 μ V 0.31 mV/V + 17 μ V 0.59 mV/V + 20 μ V 1.2 mV/V + 25 μ V 2.5 mV/V + 45 μ V	
(0.22 to 2.2) V	(10 to 20) Hz (20 to 40) Hz (40 to 20 000) Hz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (500 to 1000) kHz	0.22 mV/V + 40 μ V 36 μ V/V + 15 μ V 36 μ V/V + 8.0 μ V 59 μ V/V + 10 μ V 78 μ V/V + 30 μ V 0.30 mV/V + 80 μ V 0.87 mV/V + 200 μ V 1.5 mV/V + 300 μ V	
(2.2 to 22) V	(10 to 20) Hz (20 to 40) Hz (40 to 20 000) Hz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (500 to 1000) kHz	0.22 mV/V + 400 μ V 37 μ V/V + 150 μ V 37 μ V/V + 50 μ V 59 μ V/V + 100 μ V 73 μ V/V + 200 μ V 0.23 mV/V + 600 μ V 0.86 mV/V + 2.0 mV 1.5 mV/V + 3.2 mV	

Parameter/Range	Frequency	CMC ^{2, 4, 11} (\pm)	Comments
AC Voltage ³ – Generate (cont)			
(22 to 220) V*	(10 to 20) Hz (20 to 40) Hz (40 to 20 000) Hz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	0.23 mV/V + 4.0 mV 59 μ V/V + 1.5 mV 50 μ V/V + 0.6 mV 73 μ V/V + 1.0 mV 0.14 mV/V + 2.5 mV 0.86 mV/V + 16 mV 4.2 mV/V + 40 mV 7.8 mV/V + 80 mV	Fluke 57X0A *220V range subject to 2.2E7 V-Hz Limitation
(220 to 1100) V	(40 to 1000) Hz (1 to 20) kHz (20 to 30) kHz	68. μ V/V + 3.1 mV 0.12 mV/V + 4.7 mV 0.43 mV/V + 8.5 mV	Fluke 5730A/5725A
(220 to 750) V	(30 to 50) kHz (50 to 100) kHz	0.47 mV/V + 8.5 mV 1.7 mV/V + 35 mV	
AC Voltage ³ – Measure			
(0 to 10) mV	(40 to 1000) Hz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz	0.023 % + 1.1 μ V 0.035 % + 1.1 μ V 0.12 % + 1.1 μ V 0.58 % + 1.1 μ V 4.6 % + 2 μ V	HP 3458A, option II
(10 to 100) mV	(40 to 1000) Hz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 1000) kHz (1 to 2) MHz	0.0087 % + 2 μ V 0.017 % + 2 μ V 0.035 % + 2 μ V 0.093 % + 2 μ V 0.35 % + 10 μ V 1.2 % + 10 μ V 1.7 % + 10 μ V	
100 mV to 1 V	(40 to 1000) Hz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 1000) kHz (1 to 2) MHz	0.0081 % + 20 μ V 0.016 % + 20 μ V 0.035 % + 20 μ V 0.092 % + 20 μ V 0.35 % + 0.1 mV 1.2 % + 0.1 mV 1.7 % + 0.1 mV	
(1 to 10) V	(40 to 1000) Hz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 1000) kHz	0.0081 % + 0.2 mV 0.016 % + 0.2 mV 0.035 % + 0.2 mV 0.092 % + 0.2 mV 0.35 % + 1 mV 1.2 % + 1 mV	

Parameter/Range	Frequency	CMC ^{2, 4, 11} (±)	Comments
AC Voltage ³ – Measure (cont)			
(10 to 100) V	(40 to 1000) Hz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.023 % + 2 mV 0.023 % + 2 mV 0.040 % + 2 mV 0.14 % + 2 mV	HP 3458A, option II
(100 to 1000) V	(40 to 1000) Hz	0.51 % + 20 mV	
(1 to 10) kV	(30 to 200) Hz	0.14 % IV + 0.1 V	Vitretek 4700 high voltage meter
(10 to 30) kV	(30 to 200) Hz	0.22 % IV	Vitretek 4700 high voltage meter with HVP-35 probe
Capacitance ³ – Generate			
(0.19 to 0.4) nF	10 Hz to 10 kHz	0.58 % + 0.01 nF	Fluke 552XA
(0.4 to 1.1) nF	10 Hz to 10 kHz	0.52 % + 0.01 nF	
(1.1 to 3.3) nF	10 Hz to 3 kHz	0.52 % + 0.01 nF	
(3.3 to 11) nF	10 Hz to 1 kHz	0.28 % + 0.01 nF	
(11 to 33) nF	10 Hz to 1 kHz	0.26 % + 0.1 nF	
(33 to 110) nF	10 Hz to 1 kHz	0.26 % + 0.1 nF	
(110 to 330) nF	10 Hz to 1 kHz	0.26 % + 0.3 nF	
(0.33 to 1.1) μF	(10 to 600) Hz	0.26 % + 1 nF	
(1.1 to 3.3) μF	(10 to 300) Hz	0.26 % + 3 nF	
(3.3 to 11) μF	(10 to 150) Hz	0.26 % + 10 nF	
(11 to 33) μF	(10 to 120) Hz	0.41 % + 30 nF	
(33 to 110) μF	(10 to 80) Hz	0.46 % + 0.1 μF	
(110 to 330) μF	(10 to 50) Hz	0.47 % + 0.3 μF	
(0.33 to 1.1) mF	(0 to 20) Hz	0.46 % + 1 μF	
(1.1 to 3.3) mF	(0 to 6) Hz	0.47 % + 3 μF	
(3.3 to 11) mF	(0 to 2) Hz	0.47 % + 10 μF	
(11 to 33) mF	(0 to 0.6) Hz	0.76 % + 30 μF	
(33 to 110) mF	(0 to 0.2) Hz	1.1 % + 0.10 mF	
Fixed Points, 1 kHz	100 pF 1 nF to 1 μF	0.058 % 0.016 %	Standard capacitors
Capacitance – Measure			
10 pF to 1.1 μF	10 Hz to 100 kHz	0.018 %	Gen Rad 1615A capacitance bridge CMC is valid at 1 kHz

Parameter/Equipment	Range	CMC ^{2, 4, 11} (\pm)	Comments
Oscilloscopes ³ –			
Amplitude, DC Signal 50 Ω Load 1 M Ω Load	(-6.6 to 6.6) V (-130 to 130) V	0.29 % IV + 40 μ V 0.058 % IV + 40 μ V	Fluke 552XA/SC1100
Amplitude, Square Wave 50 Ω Load	\pm 1 mV to \pm 6.6 V _{p-p} 10 Hz to 10 kHz	0.29 % IV + 40 μ V	
1 M Ω Load	\pm 1 mV to \pm 130 V _{p-p} 10 Hz to 1 kHz	0.12 % IV + 40 μ V	
Time Marker into 50 Ω Load-Source	5 s to 50 ms 50 ms to 2 ns	29 parts in 10 ⁶ + 1000 parts in 10 ⁶ /s 2.9 parts in 10 ⁶	
Leveled Sine Wave Relative to 50 kHz [5 mV to 5.5 V] p-p [5 mV to 3.5 V] p-p [5 mV to 3.0 V] p-p [5 mV to 3.0 V] p-p	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (550 to 1100) MHz (1.1 to 3.2) GHz (3.2 to 6.0) GHz	2.0 % + 100 μ V 2.5 % + 100 μ V 4.7 % + 100 μ V 4.3 % 3.4 % 3.5 %	Fluke 9500B w/ active head(s)
Edge/Rise Time	10 Hz to 2 MHz (125 to 175) ps 10 Hz to 1 MHz (59 to 81) ps	20 ps 15 ps	
DC Current ³ – Generate	0.1 nA to 220 μ A (0.22 to 2.2) mA (2.2 to 22) mA (22 to 220) mA (0.22 to 2.2) A (2.2 to 11) A (1.1 to 3) A (3 to 11) A (11 to 20) A (20 to 40) A (40 to 200) A (200 to 1025) A	41 μ A/A + 6.0 nA 31 μ A/A + 7.0 nA 31 μ A/A + 40 nA 44 μ A/A + 0.7 μ A 96 μ A/A + 12 μ A 250 μ A/A + 480 μ A 0.039 % + 40 μ A 0.052 % + 0.33 mA 0.1 % + 0.75 mA 0.45 % + 0.008 A 0.51 % + 0.01 A 0.31 % + 0.04 A	Fluke 5730A Fluke 5730A/5725A Fluke 552XA Fluke 552XA with EA002 2/10/50 Coil

Parameter/Equipment	Range	CMC ^{2, 4, 11} (\pm)	Comments
DC Current ³ – Measure	(10 to 100) μ A (0.1 to 1) mA (1 to 10) mA (10 to 100) mA (0.1 to 1) A	43 μ A/A + 0.8 nA 34 μ A/A + 5 nA 35 μ A/A + 50 nA 52 μ A/A + 0.5 μ A 0.15 mA/A + 10 μ A	HP 3458A, option II
	(1 to 10) A (10 to 20) A (20 to 300) A (300 to 1200) A	0.13 mA/A + 0.6 mA 0.14 mA/A + 3.3 mA 0.15 mA/A 2.7 mA/A	HP 3458A w/ Fluke Y5020 shunt
DC Voltage ³ – Measure	(0 to 100) mV (0.1 to 1) V (1.0 to 10) V (10 to 100) V (100 to 1000) V	5.2 μ V/V + 0.3 μ V 4.1 μ V/V + 0.3 μ V 4.0 μ V/V + 0.5 μ V 6.2 μ V/V + 30 μ V 63 μ V/V + 0.1 mV*	HP 3458A, option II *Add 12 mV/V · (V _{in} /1000) ² for input >100 V
	(1 to 10) kV	0.036 % IV + 0.03 V	Vitretek 4700 high voltage meter
	(10 to 30) kV	0.13 % IV	Vitretek 4700 high voltage meter with HVP-35 probe
DC Voltage ³ – Generate	(0 to 220) mV (0 to 2.2) V (2.2 to 11) V (11 to 22) V (22 to 220) V (220 to 1100) V	12 μ V/V + 0.39 μ V 5.5 μ V/V + 0.62 μ V 3.5 μ V/V + 2.3 μ V 4.1 μ V/V + 3.9 μ V 5.2 μ V/V + 39 μ V 7.0 μ V/V + 0.39 mV	Fluke 5730A

Parameter/Range	Frequency	CMC ^{2, 4, 11} (\pm)	Comments
Inductance – Measure 100 μ H to 5 H	100 Hz to 100 kHz	0.12 %	Hewlett Packard 4263B LCR Meter. CMC valid at 1 kHz
Inductance – Generate Fixed Values			
100 μ H	100 Hz to 10 kHz	0.29 μ H	Gen Rad 1482B
1 mH	100 Hz to 10 kHz	1.2 μ H	Gen Rad 1482E
10 mH	100 Hz to 10 kHz	12 μ H	Gen Rad 1482H
100 mH	100 Hz to 10 kHz	0.12 mH	Gen Rad 1482L
1 H	100 Hz to 1 kHz	1.2 mH	Gen Rad 1482P
5 H	100 Hz to 1 kHz	6.2 mH	Gen Rad 1482R

Parameter/Equipment	Range	CMC ^{2, 4, 11} (±)	Comments
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	15 μΩ/Ω + 0.05 mΩ 13 μΩ/Ω + 0.50 mΩ 10 μΩ/Ω + 5.0 mΩ 10 μΩ/Ω + 50 mΩ 10 μΩ/Ω + 50 mΩ 16 μΩ/Ω + 2.0 Ω 52 μΩ/Ω + 100 Ω 0.051 % + 1.0 kΩ 0.5 % + 10 kΩ	HP 3458A, option II
Resistance ³ – Generate	(1 & 10) mΩ (0.1, 1, 10, 100) Ω (1, 10, 100, 1000) kΩ 0 Ω (0 to 10.9999) Ω (11 to 32.9999) Ω (33 to 109.9999) Ω (110 to 329.9999) Ω (0.33 to 1.099 999) kΩ (1.1 to 3.299 999) kΩ (3.3 to 10.999 99) kΩ (11 to 32.999 99) kΩ (33 to 109.9999) kΩ (110 to 329.9999) kΩ (0.33 to 1.099 999) MΩ (1.1 to 3.299 999) MΩ (3.3 to 10.999 99) MΩ (11 to 32.999 99) MΩ (33 to 109.9999) MΩ (110 to 329.9999) MΩ (330 to 1100) MΩ	4.7 μΩ/Ω 4.7 μΩ/Ω 4.7 μΩ/Ω 4.8 μΩ 110 μΩ/Ω + .78 mΩ 58 μΩ/Ω + 1.2 mΩ 34 μΩ/Ω + 1.1 mΩ 27 μΩ/Ω + 1.6 mΩ 26 μΩ/Ω + 1.6 mΩ 27 μΩ/Ω + 16 mΩ 26 μΩ/Ω + 16 mΩ 27 μΩ/Ω + 0.16 Ω 26 μΩ/Ω + 0.16 Ω 30 μΩ/Ω + 1.6 Ω 28 μΩ/Ω + 1.6 Ω 52 μΩ/Ω + 23 Ω 0.11 mΩ/Ω + 39 Ω 0.25 mΩ/Ω + 1.9 kΩ 0.46 mΩ/Ω + 2.3 kΩ 2.4 mΩ/Ω + 78 kΩ 12 mΩ/Ω + 0.39 MΩ	L&N reference resistors ESI SR1010 reference resistors Copper shorting block Fluke 5522A
Fixed Values	1 Ω 1.9 Ω 10 Ω 19 Ω 100 Ω 190 Ω 1 kΩ 1.9 kΩ 10 kΩ 19 kΩ 100 kΩ 190 kΩ 1 MΩ 1.9 MΩ 10 MΩ 19 MΩ 100 MΩ	88 μΩ 160 μΩ 180 μΩ 450 μΩ 0.97 mΩ 1.8 mΩ 6.5 mΩ 13 mΩ 65 mΩ 130 mΩ 0.81 Ω 1.9 Ω 14 Ω 46 Ω 390 Ω 940 Ω 10 kΩ	Fluke 5730A

Parameter/Equipment	Range	CMC ^{2, 11} (±)	Comments
Resistance ³ – Generate (cont)	(0.0001 to 1) TΩ	0.23 % IV. + 0.0011 % IV/GΩ	IET Labs HRRS decade resistor
Electrical Simulation – Thermocouple Indication & Measure devices ³			
Type C	(0 to 250) °C (250 to 1000) °C (1000 to 1500) °C (1500 to 1800) °C (1800 to 2000) °C (2000 to 2250) °C (2250 to 2315) °C	0.24 °C 0.19 °C 0.21 °C 0.25 °C 0.27 °C 0.34 °C 0.38 °C	Ectron 1140A
Type E	(-270 to -245) °C (-245 to -195) °C (-195 to -155) °C (-155 to -90) °C (-90 to 1000) °C	1.4 °C 0.21 °C 0.12 °C 0.10 °C 0.09 °C	
Type J	(-210 to -180) °C (-180 to -120) °C (-120 to -50) °C (-50 to 1200) °C	0.14 °C 0.12 °C 0.10 °C 0.09 °C	
Type K	(-255 to -195) °C (-195 to -115) °C (-115 to -55) °C (-55 to 1000) °C (1000 to 1372) °C	0.81 °C 0.15 °C 0.11 °C 0.09 °C 0.10 °C	
Type N	(-200 to -140) °C (-140 to -70) °C (-70 to 25) °C (25 to 160) °C (160 to 1300) °C	0.28 °C 0.18 °C 0.14 °C 0.12 °C 0.11 °C	
Type R	(-30 to 45) °C (45 to 160) °C (160 to 380) °C (380 to 775) °C (775 to 1768) °C	0.66 °C 0.49 °C 0.38 °C 0.34 °C 0.30 °C	
Type S	(-30 to 45) °C (45 to 105) °C (105 to 310) °C (310 to 615) °C (615 to 1768) °C	0.67 °C 0.49 °C 0.41 °C 0.37 °C 0.34 °C	

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Simulation – Thermocouple Indication & Measure Devices ³ (cont)			
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	2.1 °C 0.57 °C 0.35 °C 0.22 °C 0.14 °C 0.10 °C 0.09 °C	
Type U	(-200 to 0) °C (0 to 600) °C	0.65 °C 0.31 °C	Fluke 552XA
Electrical Simulation – RTD Indicating Devices ³ –			
Pt 385, 100 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C (630 to 800) °C	0.058 °C 0.058 °C 0.085 °C 0.1 °C 0.12 °C 0.12 °C 0.27 °C	Fluke 552XA
Pt 3926, 100 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C	0.058 °C 0.058 °C 0.081 °C 0.1 °C 0.12 °C 0.14 °C	
Pt 3916, 100 Ω	(-200 to -190) °C (-190 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.29 °C 0.046 °C 0.058 °C 0.069 °C 0.081 °C 0.092 °C 0.1 °C 0.12 °C 0.27 °C	
Pt 385, 200 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.046 °C 0.046 °C 0.046 °C 0.058 °C 0.14 °C 0.15 °C 0.16 °C 0.18 °C	

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Simulation RTD Indicating Devices ³ – (cont)			
Pt 385, 500 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.047 °C 0.058 °C 0.058 °C 0.069 °C 0.093 °C 0.093 °C 0.1 °C 0.13 °C	Fluke 552XA
Pt 385, 1000 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.035 °C 0.035 °C 0.046 °C 0.058 °C 0.069 °C 0.081 °C 0.081 °C 0.27 °C	
PtNi 385, 120 Ω	(-80 to 0) °C (0 to 100) °C (100 to 260) °C	0.092 °C 0.092 °C 0.16 °C	
Cu 427, 10 Ω	(-100 to 260) °C	0.35 °C	
LF Energy	10 J 50 J 100 J 360 J	0.17 J 0.32 J 0.53 J 2.4 J	Fluke impulse 7000 “Gold Standard”
Phase – Generate ³ , (0 to 180)°	(10 to 65) Hz (65 to 500) Hz (0.5 to 1) kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.081° 0.20° 0.39° 1.9° 3.9° 7.8°	Fluke 5522A
Phase – Measure ³	-180° to +360°, Up to 225 MHz	0.025°	HP 53131A

VI. Electrical – RF/Microwave

Parameter/Range	Frequency	CMC ^{2, 4, 11} (±)	Comments
RF Absolute Power ^{3, 5} – Measure			
1 mW Reference	50 MHz	0.79 %	HP 8478B sensor w/ HP 432A power meter & type N connector
(-30 to 10) dBm	100 kHz to 4.2 GHz (4.2 to 18) GHz	1.6 % 1.8 %	Power meter w/ 8482A power sensor 8481A power sensor
(10 to 20) dBm	100 kHz to 4.2 GHz (4.2 to 18) GHz	3.3 % 3.8 %	8482A power sensor 8481A power sensor
(-30 to 20) dBm	10 MHz to 18 GHz	3.8 %	Agilent 5532B, N1913A
RF Absolute Power ^{3, 5} – Generate			
Sine Wave into 50 Ω			
(-48 to 24) dBm	0.001 Hz to 100 kHz	0.035 dB	Fluke 96040B RF reference source
(-48 to 24) dBm	100 kHz to 128 MHz	0.066 dB	
(-48 to 20) dBm	(128 to 300) MHz	0.088 dB	
(-48 to 20) dBm	(0.3 to 1.4) GHz	0.24 dB	
(-48 to 14) dBm	(1.4 to 3) GHz	0.36 dB	
(-17 to 14) dBm	(3 to 4) GHz	0.37 dB	
(-74 to -17) dBm	(3 to 4) GHz	0.61 dB	
(-74 to -48) dBm	(0.1 to 10) MHz	0.24 dB	
(-84 to -48) dBm	(10 to 128) MHz	0.12 dB	
(-74 to -48) dBm	(128 to 300) MHz	0.12 dB	
(-74 to -48) dBm	(0.3 to 1.4) GHz	0.47 dB	
(-74 to -48) dBm	(1.4 to 3) GHz	0.59 dB	
(-94 to -74) dBm	(0.1 to 10) MHz	0.59 dB	
(-94 to -74) dBm	(1.4 to 3) GHz	1.2 dB	
(-84 to -74) dBm	(128 to 300) MHz	0.35 dB	
(-84 to -74) dBm	(0.3 to 1.4) GHz	0.60 dB	
(-84 to -74) dBm	(3 to 4) GHz	1.2 dB	
(-94 to -84) dBm	(10 to 128) MHz	0.36 dB	
(-94 to -84) dBm	(128 to 300) MHz	0.58 dB	
(-94 to -84) dBm	(0.3 to 1.4) GHz	1.2 dB	
(-130 to -94) dBm	(10 to 128) MHz	0.84 dB	
(-130 to -94) dBm	(128 to 300) MHz	1.8 dB	
(-130 to -94) dBm	(0.3 to 3) GHz	1.8 dB	

Parameter/Range	Frequency	CMC ^{2, 4, 11} (\pm)	Comments
RF Tuned Power – Measure ³ (-129 to 16) dB	(0.0001 to 18) GHz	0.073 dB + 0.007 dB/dB	N5531S System MMR
Amplitude Modulation – Generate ³ AM Flatness Carrier Frequency: (11 to 13.5) MHz Depth: (0 to 99) %	Rate Frequency: 50 Hz to 50 kHz 20 Hz to 100 kHz	0.16 % 0.32 %	HP 11715A AM/FM test source
Amplitude Modulation – Measure ³ (5 to 99%) Depth (5 to 20%) Depth (20 to 99%) Depth (5 to 20%) Depth (20 to 99%) Depth	100 kHz to 10 MHz 10 MHz to 3 GHz 3 to 26.5 GHz	0.89 % of Depth 3.0 % of Depth 0.59 % of Depth 5.3 % of Depth 1.8 % of Depth	Agilent E4440A
Frequency Modulation – Measure ³ Modulation rate: 20 Hz to 10 kHz Deviation: 200 Hz to 40 kHz Modulation rate: 20 Hz to 10 kHz Deviation: 200 Hz to 40 kHz	250 kHz to 10 MHz 10 MHz to 6.6 GHz	1.8 % 1.8 %	Agilent E4440A
Distortion – Measure ³	20 Hz to 20 kHz >20 kHz to 100 kHz >100 kHz to 18 GHz	1.2 dB 2.3 dB 0.23 dB + 0.12 dB/GHz	HP 8903B audio analyzer HP E4440A spectrum analyzer

Parameter/Range	Frequency	CMC ^{2, 4, 11} (\pm)	Comments
Frequency Modulation – Generate ³ FM Flatness Carrier Frequency: (11 to 13.5) MHz (88 to 108) MHz (352 to 432) MHz	Rate Frequency: DC to 100 kHz (100 to 200) kHz DC to 100 kHz (100 to 200) kHz DC to 100 kHz (100 to 200) kHz	0.33 % 0.43 % 0.34 % 0.43 % 0.34 % 0.43 %	HP 11715A AM/FM test source
Phase Modulation – Measure ³ (0.3 to 0.7) rad (0.7 to 100) rad	100 kHz to 6.6 GHz	3.6 % 1.2 %	Agilent E4440A
RF Volts – Measure ³ Fixed Points 3 V	10 Hz to 10 MHz (10 to 30) MHz (30 to 50) MHz (50 to 70) MHz (70 to 80) MHz (80 to 100) MHz	0.091 % 0.11 % 0.19 % 0.30 % 0.32 % 0.38 %	HP 11049A thermal voltage converter
LISN – Insertion Loss (-10 to 0) dB Impedance – Magnitude (Up to 150) $\Omega \pm 20$ % Impedance – Phase (Up to 180) $^{\circ} \pm 12^{\circ}$ Decoupling Isolation (-70 to 0) dB	100 kHz to 400 MHz 100 kHz to 500 kHz 500 kHz to 400 MHz 100 kHz to 400 MHz 100 kHz to 400 MHz	0.12 dB 0.4 Ω 1.2 Ω 2.5 $^{\circ}$ 1.0 dB	Keysight E5061B/ Hewlett Packard 85032B CISPR 16-1-2, CISPR 25, ISO 7637, ANSI C63.4

VII. Mechanical

Parameter/Equipment	Range	CMC ^{2, 4, 10} (±)	Comments
Torque Wrench ³	(4.0 to 40) ozf·in *	1.3 % of IV from (10 to 100) % FS	JETCO TED-40
	(2.5 to 25) lbf·in *	0.32 % of IV from (10 to 100) % FS	Larson STWCS
	(5 to 50) lbf·in *	0.30 % of IV from (10 to 100) % FS	CDI Transducer System
	(40 to 400) lbf·in *	0.29 % of IV from (10 to 100) % FS	
	(100 to 1000) lbf·in *	0.29 % of IV from (10 to 100) % FS	
	(300 to 3000) lbf·in *	0.38 % of IV from (10 to 100) % FS	
	(100 to 1000) ozf·in *	0.49 % of IV (10 to 100) % of range	
	(100 to 1000) lbf·ft	0.14 % of IV (10 to 100) % of range	Futek torque system
			Note: Ranges indicated by * are related to footnote 3
Acceleration/Vibration – Measuring Equipment			
Voltage Sensitivity, Frequency Response (0.02 to 5000) mV/g	(5 to 99) Hz 100 Hz (101 to 920) Hz (921 to 5000) Hz (5 to 10) kHz	2.1 % IV 1.4 % IV 1.2 % IV 1.8 % IV 3.0 % IV	Modal shop 9155
Charge Sensitivity, Frequency Response (0.04 to 100) pC/g	(5 to 99) Hz 100 Hz (101 to 920) Hz (921 to 5000) Hz (5 to 10) kHz	2.1 % IV 1.4 % IV 1.2 % IV 1.8 % IV 3.0 % IV	
Piezoresistive Sensitivity, Frequency Response (0.000 08 to 100) mV/V/g	(5 to 99) Hz 100 Hz (101 to 920) Hz (921 to 5000) Hz (5 to 10) kHz	2.1 % IV 1.4 % IV 1.2 % IV 1.8 % IV 3.0 % IV	
Digital Sensitivity, Frequency Response (1 to 500 000) Counts/g	(5 to 99) Hz 100 Hz (101 to 920) Hz (921 to 5000) Hz (5 to 10) kHz	2.1 % IV 1.4 % IV 1.2 % IV 1.8 % IV 3.0 % IV	

Parameter/Equipment	Range	CMC ^{2, 4, 6, 10} (±)	Comments
Durometers – Indenter Extension & Shape Diameter Radius Angle Extension Indenter Display Spring Calibration Force	Types A, B, C, D, E, O, OO, & DO Indenter Diameter Tip radius Indenter Angle Indenter extension length Up to 100 Duro Units All scales	11 µm 11 µm 0.085° 11 µm 0.09 Duro + 0.6R 0.0013 N	ASTM D2240 Optical comparator Gage blocks & surface plate Dual pan balance & weights
Torque ³ – Measuring Equipment Torque Transducers	Up to 42 lbf·ft (42 to 300) lbf·ft (1.7 to 600) lbf·ft	0.015 % IV 0.013 % IV 0.015 % IV	Torque arm/dead weight
Pressure Gauges ³ – Measuring Equipment Pneumatic Hydraulic	(-5 to 5) psig (-14.5 to 50) psig (-14.5 to 300) psig (-14.5 to 1000) psig (10 to 50) psig (51 to 10 000) psig (-1 to 1) inH ₂ O (-10 to 10) inH ₂ O	0.0065 % IV + 0.0005 psig 0.0055 % IV + 0.0033 psig 0.0085 % IV + 0.015 psig 0.011 % IV + 0.051 psig 0.0088 psig 0.019 % 0.0016 inH ₂ O 0.012 inH ₂ O	Pace 6000 Deadweight tester Additel ADT 155-05-DP1 Additel ADT 155-05-DP10
Absolute Pressure ³ – Measuring Equipment & Measure	(9 to 20) psia (0.5 to 80) psia (0.5 to 330) psia (0.5 to 1030) psia	0.0058 % IV + 0.0013 psia 0.0058 % IV + 0.004 psia 0.0063 % IV + 0.017 psia 0.0064 % IV + 0.052 psia	Pace 6000
Scales & Balances ³ – Analytical Balances ³	Up to 629 lb (1 to 500) mg (0.5 to 10) g (10 to 100) g (100 to 1000) g (1 to 10) kg	0.01 % + 0.6R 0.012 mg + 0.000 088 mg/g 0.0094 mg + 0.0051 mg/g 0.034 mg + 0.0027 mg/g 0.02 mg + 0.0029 mg/g 0.014 mg + 0.0029 mg/g	ASTM class 6 weights ASTM class 1 weights

Parameter/Equipment	Range	CMC ^{2, 4, 6, 10} (±)	Comments
Mass Measure–	(1 to 5) g	0.09 mg	XE-50
	(5 to 10) g	0.10 mg	XE-50
Fixed Points	(10 to 20) g	0.13 mg	XE-50
	(20 to 50) g	0.16 mg	XE-50
	(50 to 200) g	6.9 mg	PE 1600
	(200 to 500) g	7 mg	PE 1600
	(500 to 1000) g	7.4 mg	PE 1600
	(1 to 2) kg	0.02 g	TCL-6002
	(2 to 5) kg	0.03 g	TCL-6002
	(5 to 10) kg	0.16 g	Setra12000L
	(10 to 20) kg	0.16 g	GP-30K
	1 g	0.09 mg	Mass Comparator, Class 1 weight, Substitution method
	2 g	0.09 mg	
	5 g	0.09 mg	
	10 g	0.10 mg	
	20 g	0.13 mg	
	50 g	0.16 mg	
	100 g	6.9 mg	
200 g	6.9 mg		
500 g	7 mg		
1 kg	7.4 mg		
2 kg	0.02 g		
5 kg	0.03 g		
10 kg	0.16 g		
20 kg	0.16 g		
50 lb	0.000 37 lb (170 mg)		
Force ^{3, 7} – Measuring Equipment	Up to 500 lbf	0.01 % IV + 0.6R	
	(100 to 1000) lbf	0.061 % FS	Load cells ASTM E74
	(200 to 2000) lbf	0.050 % FS	
	(500 to 5000) lbf	0.049 % FS	
	(1000 to 10 000) lbf	0.049 % FS	
	(2500 to 25 000) lbf	0.056 % FS	
	(5000 to 50 000) lbf	0.049 % FS	
	(10 000 to 100 000) lbf	0.064 % FS	
(50 000 to 500 000) lbf	0.059 % FS	Compression only	
Gas Flow – Measure	(10 to 100) sccm	0.30 %	Molbox2 System
	(100 to 1000) sccm	0.27 %	
	(3 to 100) slm	0.0021 slm/slm + 0.084 slm	

Parameter/Equipment	Range	CMC ^{2, 4, 10} (±)	Comments
Rockwell Hardness ³ – Indirect Verification of Superficial Hardness Testers	<p>HRA: Low Medium High</p> <p>HRBW: Low Medium High</p> <p>HRC: Low Medium High</p> <p>HRRW</p> <p>HR15N: Low Medium High</p> <p>HR30N: Low Medium High</p> <p>HR15TW: Low Medium High</p> <p>HR30TW: Low Medium High</p>	<p>0.54 HRA 0.43 HRA 0.32 HRA</p> <p>0.83 HRBW 1.0 HRBW 0.79 HRBW</p> <p>0.86 HRC 1.0 HRC 0.44 HRC</p> <p>1.6 HRRW</p> <p>0.99 HR15N 0.80 HR15N 0.97 HR15N</p> <p>0.49 HR30N 0.78 HR30N 0.38 HR30N</p> <p>0.52 HR15TW 0.59 HR15TW 0.48 HR15TW</p> <p>0.97 HR30TW 0.77 HR30TW 0.57 HR30TW</p>	ASTM E18
Universal Testing Machine, Compression Testing Machines, Tension Testing Machines ³	<p>(0.5 to 500) lbf (100 to 1000) lbf (200 to 2000) lbf (500 to 5000) lbf (1000 to 10 000) lbf</p> <p>(2500 to 25 000) lbf (5000 to 50 000) lbf (10 000 to 100 000) lbf (50 000 to 500 000) lbf</p>	<p>0.011 % IV 0.061 % FS 0.050 % FS 0.058 % FS 0.049 % FS</p> <p>0.056 % FS 0.056 % FS 0.056 % FS 0.056 % FS</p>	<p>ASTM E4, load cells & dead weights tension & compression</p> <p>Compression only</p>

VIII. Thermodynamics

Parameter/Equipment	Range	CMC ^{2, 10} (±)	Comments
Temperature ³ – Measuring Equipment	(-95 to 150) °C (50 to 660) °C	0.014 °C + 42 μ °C/°C 0.031 °C + 72 μ °C/°C	Fluke 1502 w/ 5628 PRT in Bath/Drywell
Infrared Temperature ³ – Measuring Equipment	(-15 to 120) °C (50 to 500) °C	0.29 °C + 0.0013 °C/°C 0.38 °C + 0.0017 °C/°C	Fluke 4180 Thermoworks IR-500
Temperature ³ – Measure	(-95 to 660) °C (200 to 1200) °C	0.031 °C + 72 μ °C/°C 0.4 °C + 5.2 m °C/°C	Fluke 1502 w/ 5628 PRT Type N thermocouple
Thermocouples – Types B, C, E, J, K N, R, S, T, U	(-50 to 660) °C	0.23 °C + 0.12 m °C/°C	Fluke 552XA/ Fluke 1502A/5628
RTDs –	(-95 to 0) °C (0 to 420) °C (420 to 660) °C	0.017 °C 0.035 °C 0.046 °C	HP3458A/Hart 1502A/ 5628
Relative Humidity – Measuring Equipment	(10 to 95) % RH	0.7 % RH	Thunder Scientific 2500
Relative Humidity ³ – Measure	(10 to 90) % RH (90 to 95) % RH	1.4 % RH 2.1 % RH	Vaisala MI70/HMP77B

IX. Time & Frequency

Parameter/Equipment	Range	CMC ^{2, 10} (±)	Comments
Frequency – Measuring Equipment	10 MHz	5.7 x 10 ⁻¹² Hz/Hz	NOVAS WR 2410 GPS receiver
Frequency – Measure ³	0.01 Hz to 18 GHz	1.6 x 10 ⁻⁹ Hz/Hz	NOVAS WR 2410 GPS receiver w/ Frequency Counter

Parameter/Equipment	Range	CMC ^{2, 10} (\pm)	Comments
Rise Time – Measure ³	(0.35 to 1000) ns	0.40 ns	Oscilloscope
Stopwatches ³	(0 to 19.99) s/day	0.039 s/day	NIST RP 960-12, Timometer

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. Please note the actual measurement uncertainties achievable on a customer's site can normally be expected to be larger than the Calibration and Measurement Capability Uncertainty (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 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, the value is defined as the percentage of reading unless otherwise indicated; IV represents *Indicated Value* and FS represents *Full Scale*.

⁵ The CMCs do not include mismatches.

⁶ In the statement of CMC, L represents the length of the unit under test in inches or millimeters, where appropriate; R represents the resolution of the unit under test.

⁷ Greater than 100 kbf, field service available only.

⁸ Repeatability of the Unit Under Test has not been utilized in the calculation of the CMC value for this measurement parameter.

⁹ This scope meets A2LA's *P112 Flexible Scope Policy*.

¹⁰ 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.

¹¹ 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.



Accredited Laboratory

A2LA has accredited

NOVASTAR SOLUTIONS.COM LLC dba NOVASTAR METROLOGY

Livonia, MI

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 2nd day of April 2025.

A blue ink signature of Mr. Trace McInturff, written over a horizontal line.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 1277.01
Valid to March 31, 2027
Revised May 20, 2026

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