



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 – R205 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 & 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) μ in + 0.6R	Gage blocks w/ optical Parallels
Flatness	Up to 1 in	4.8 μ in	
Parallelism	Up to 0.0001 in	6.1 μ in	
Tri-Bore	Up to 5 in	(6.4 + 4.4L) μ in + 0.6R	Ring gage set
Calipers ³	Up to 36 in	(0.56 + 8.0L) μ 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 Linear Accuracy Angle	10× 20× 31.25× 50× 62.5× 100× (0.001 to 6) in (30/60/90/120/150)°	530 μ in 420 μ in 390 μ in 380 μ in 380 μ in 380 μ in 120 μ in + 0.6R 0.0048° + 0.6R	Magnification scale Glass scale
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) Major Diameter	Up to 8 in Up to 8 in	(72 + 1.6L) μ in (4.6 + 5.4L) μ in	ULM, thread wires, gage blocks 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	$3.9 \mu\text{m} + 0.0043 \mu\text{m/mm}$ $4.0 \mu\text{m} + 0.0043 \mu\text{m/mm}$ $3.9 \mu\text{m} + 0.0042 \mu\text{m/mm}$	CMM
Cylindrical Gages ³ – Pins, Plugs, Discs	Up to 3 in (3 to 8) in	$0.84 \mu\text{in/in} + 9.5 \mu\text{in}$ $1.4 \mu\text{in/in} + 6.8 \mu\text{in}$	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	$0.44 \mu\text{in/in} + 10 \mu\text{in}$ $1.4 \mu\text{in/in} + 6.8 \mu\text{in}$	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} ($\pm$)	Comments
AC Current ³ – Generate			
(9 to 220) μ A	(10 to 20) Hz (20 to 40) Hz (40 to 1000) Hz (1 to 5) kHz (5 to 10) kHz	0.33 mA/A + 19 nA 0.19 mA/A + 13 nA 0.12 mA/A + 9.8 nA 0.25 mA/A + 26 nA 0.98 mA/A + 0.14 μ A	Fluke 5730A
(29 to 329) μ A	(10 to 30) kHz	18 mA/A + 0.46 μ A	Fluke 552XA
(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	0.33 mA/A + 44 nA 0.19 mA/A + 41 nA 0.12 mA/A + 39 nA 0.21 mA/A + 0.13 μ A 1.1 mA/A + 0.75 μ A	Fluke 5730A
(0.33 to 3.3) mA	(10 to 30) kHz	12 mA/A + 0.69 μ A	Fluke 552XA
(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	0.33 mA/A + 0.45 μ A 0.18 mA/A + 0.41 μ A 0.12 mA/A + 0.4 μ A 0.21 mA/A + 0.84 μ A 1.0 mA/A + 5.6 μ A	Fluke 5730A
(3.3 to 33) mA	(10 to 30) kHz	4.6 mA/A + 4.7 μ A	Fluke 552XA
(22 to 220) mA	(10 to 20) Hz (20 to 40) Hz (40 to 1000) Hz (1 to 5) kHz (5 to 10) kHz	0.33 mA/A + 4.5 μ A 0.18 mA/A + 3.9 μ A 0.12 mA/A + 2.7 μ A 0.21 mA/A + 5.1 μ A 1 mA/A + 13 μ A	Fluke 5730A
(33 to 330) mA	(10 to 30) kHz	4.6 mA/A + 0.23 mA	Fluke 552XA
(0.22 to 2.2) A	(20 to 1000) Hz (1 to 5) kHz (5 to 10) kHz	0.28 mA/A + 40 μ A 0.43 mA/A + 96 μ A 7 mA/A + 200 μ A	Fluke 5730A
(2.2 to 11) A	(40 to 1000) Hz (1 to 5) kHz (5 to 10) kHz	0.41 mA/A + 0.24 mA 0.94 mA/A + 0.45 mA 3.7 mA/A + 0.89 mA	Fluke 5730A w/5725A
(11 to 20.5) A	(45 to 100) Hz (0.1 to 1) kHz (1 to 5) kHz	1.4 mA/A + 6 mA 1.7 mA/A + 5.8 mA 35 mA/A + 6 mA	Fluke 552XA
(>20.5 to 40) A	(45 to 440) Hz	6.2 mA/A + 0.1 A	Fluke 552XA w/ EA002 2/10/50 coil

Parameter/Range	Frequency	CMC ^{2, 4, 11} ($\pm$)	Comments
AC Current ³ – Measure			
(0 to 20.2) μ A	(1 to 2000) Hz (2 to 10) kHz (10 to 30) kHz	2.2 mA/A + 5.3 nA 2.2 mA/A + 5.5 nA 2.2 mA/A + 5.8 nA	Fluke 8588A
(10 to 202) μ A	(1 to 2000) Hz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz	0.3 mA/A + 8.8 nA 0.57 mA/A + 9.6 nA 0.72 mA/A + 28 nA 4.6 mA/A + 18 nA	
(0.1 to 2.02) mA	(1 to 2000) Hz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz	0.28 mA/A + 80 nA 0.57 mA/A + 76 nA 0.8 mA/A + 79 nA 4.6 mA/A + 0.12 μ A	
(0.1 to 20.2) mA	(1 to 2000) Hz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz	0.28 mA/A + 0.82 μ A 0.58 mA/A + 0.58 μ A 0.79 mA/A + 0.9 μ A 4.6 mA/A + 1.6 μ A	
(10 to 202) mA	(1 to 2000) Hz (2 to 10) kHz (10 to 30) kHz	0.3 mA/A + 5.8 μ A 0.58 mA/A + 5.8 μ A 0.81 mA/A + 6 μ A	
(0.1 to 2.02) A	(1 to 2000) Hz (2 to 10) kHz (10 to 30) kHz	0.3 mA/A + 0.11 mA 0.58 mA/A + 0.12 mA 0.79 mA/A + 0.18 mA	
(1 to 20.2) A	(1 to 2000) Hz (2 to 10) kHz	0.92 mA/A + 0.59 mA 0.92 mA/A + 0.6 mA	
Up to 30.2 A	(10 to 2000) Hz (2 to 10) kHz	0.91 mA/A + 15 mA 1.4 mA/A + 15 mA	
(0.02 to 0.1) mA	1 kHz 10 kHz 30 kHz	0.014 % 0.013 % 0.052 %	Fluke 5790X with Ohm Lab CSA current shunts
(0.1 to 1) mA	(10 to 20) Hz (20 to 40) Hz (40 to 10 000) Hz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.011 % 0.0071 % 0.0063 % 0.0081 % 0.0091 % 0.011 %	

Parameter/Range	Frequency	CMC ^{2, 4, 11} ($\pm$)	Comments
AC Current ³ – Measure (cont)			
(1 to 10) mA	(10 to 20) Hz	0.011 %	Fluke 5790X with Ohm Lab CSA current shunts
	(20 to 40) Hz	0.0067 %	
	(40 to 10 000) Hz	0.0068 %	
	(10 to 20) kHz	0.0086 %	
	(20 to 50) kHz	0.0092 %	
	(50 to 100) kHz	0.013 %	
(10 to 20) mA	(10 to 20) Hz	0.01 %	
	(20 to 40) Hz	0.0048 %	
	(40 to 10 000) Hz	0.0043 %	
	(10 to 20) kHz	0.0067 %	
	(20 to 50) kHz	0.011 %	
	(50 to 100) kHz	0.01 %	
(20 to 50) mA	(10 to 20) Hz	0.0087 %	
	(20 to 40) Hz	0.0052 %	
	(40 to 10 000) Hz	0.0046 %	
	(10 to 20) kHz	0.0058 %	
	(20 to 50) kHz	0.0069 %	
	(50 to 100) kHz	0.0093 %	
(50 to 100) mA	(10 to 20) Hz	0.0091 %	
	(20 to 40) Hz	0.0051 %	
	(40 to 10 000) Hz	0.0042 %	
	(10 to 20) kHz	0.0045 %	
	(20 to 50) kHz	0.0056 %	
	(50 to 100) kHz	0.0084 %	
(100 to 200) mA	(10 to 20) Hz	0.0087 %	
	(20 to 40) Hz	0.0051 %	
	(40 to 10 000) Hz	0.0044 %	
	(10 to 20) kHz	0.0044 %	
	(20 to 50) kHz	0.006 %	
	(50 to 100) kHz	0.0082 %	
(200 to 500) mA	(10 to 20) Hz	0.0089 %	
	(20 to 40) Hz	0.0053 %	
	(40 to 10 000) Hz	0.0046 %	
	(10 to 20) kHz	0.0046 %	
	(20 to 50) kHz	0.0048 %	
	(50 to 100) kHz	0.0079 %	

Parameter/Range	Frequency	CMC ^{2, 4, 11} ($\pm$)	Comments
AC Current ³ – Measure (cont)			
(0.5 to 1) A	(10 to 20) Hz	0.009 %	Fluke 5790X with Ohm Lab CSA current shunts
	(20 to 40) Hz	0.0056 %	
	(40 to 10 000) Hz	0.0048 %	
	(10 to 20) kHz	0.0064 %	
	(20 to 50) kHz	0.0065 %	
	(50 to 100) kHz	0.01 %	
(1 to 2) A	(10 to 20) Hz	0.009 %	
	(20 to 40) Hz	0.0054 %	
	(40 to 10 000) Hz	0.0049 %	
	(10 to 20) kHz	0.0051 %	
	(20 to 50) kHz	0.0052 %	
	(50 to 100) kHz	0.0081 %	
(2 to 5) A	(10 to 20) Hz	0.022 %	
	(20 to 40) Hz	0.013 %	
	(40 to 1000) Hz	0.013 %	
	(1 to 10) kHz	0.0084 %	
	(10 to 20) kHz	0.0096 %	
	(20 to 50) kHz	0.011 %	
	(50 to 100) kHz	0.012 %	
(5 to 10) A	(10 to 20) Hz	0.013 %	
	(20 to 40) Hz	0.012 %	
	(40 to 1000) Hz	0.011 %	
	(1 to 10) kHz	0.013 %	
	(10 to 20) kHz	0.013 %	
	(20 to 50) kHz	0.013 %	
	(50 to 100) kHz	0.016 %	
(10 to 20.5) A	(10 to 20) Hz	0.012 %	5790X with Y5020
	(20 to 40) Hz	0.0096 %	
	(40 to 1000) Hz	0.01 %	
	(1 to 10) kHz	0.014 %	
	(10 to 20) kHz	0.015 %	
	(20 to 50) kHz	0.017 %	
	(50 to 100) kHz	0.017 %	
	(40 to 1000) Hz	0.0084 %	
	(1 to 10) kHz	0.01 %	

Parameter/Range	Frequency	CMC ^{2, 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	0.19 mV/V + 7.6 μ V 83 μ V/V + 7.6 μ V 79 μ V/V + 5.4 μ V 0.14 mV/V + 5.6 μ V 0.21 mV/V + 7.4 μ V 0.43 mV/V + 13 μ V 1.1 mV/V + 26 μ V 4.6 mV/V + 35 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	0.22 mV/V + 7.5 μ V 82 μ V/V + 7.6 μ V 71 μ V/V + 5.4 μ V 0.1 mV/V + 5.7 μ V 0.2 mV/V + 7.4 μ V 0.39 mV/V + 14 μ V 0.96 mV/V + 28 μ V 3.1 mV/V + 31 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	0.31 mV/V + 27 μ V 0.14 mV/V + 19 μ V 70 μ V/V + 8.6 μ V 99 μ V/V + 8.9 μ V 22 μ V/V + 20 μ V 0.4 mV/V + 24 μ V 0.99 mV/V + 33 μ V 3.0 mV/V + 61 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	0.32 mV/V + 52 μ V 0.13 mV/V + 25 μ V 49 μ V/V + 12 μ V 75 μ V/V + 16 μ V 0.11 mV/V + 37 μ V 0.31 mV/V + 96 μ V 0.96 mV/V + 0.24 mV 1.6 mV/V + 0.33 mV	
(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	0.32 mV/V + 0.42 mV 0.14 mV/V + 0.15 mV 53 μ V/V + 48 μ V 78 μ V/V + 0.11 mV 0.12 mV/V + 0.21 mV 0.36 mV/V + 0.65 mV 1.0 mV/V + 2.2 mV 2.0 mV/V + 3.1 mV	

Parameter/Range	Frequency	CMC ^{2, 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	0.32 mV/V + 4.2 mV 0.14 mV/V + 1.5 mV 57 μ V/V + 0.64 mV 88 μ V/V + 1.0 mV 0.16 mV/V + 2.6 mV 0.89 mV/V + 16 mV 4.4 mV/V + 47 mV 8.2 mV/V + 93 mV	Fluke 57X0A *220V range subject to 2.2E7 V-Hz Limitation
(220 to 250) V	(15 to 50) Hz (50 to 1000) Hz	0.35 mV/V + 17 mV 71 μ V/V + 2.3 mV	Fluke 5730A/5725A
(220 to 1100) V	(40 to 1000) Hz (1 to 20) kHz (20 to 30) kHz	0.19 mV/V + 4.7 mV 0.13 mV/V + 6.8 mV 0.39 mV/V + 13 mV	
(220 to 750) V	(30 to 50) kHz (50 to 100) kHz	0.39 mV/V + 13 mV 1.5 mV/V + 49 mV	
AC Voltage ³ – Measure			
(0.6 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 (0.5 to 1) MHz	0.12 mV/V + 1.6 μ V 0.1 mV/V + 1.6 μ V 0.1 mV/V + 1.6 μ V 0.15 mV/V + 2.2 μ V 0.11 mV/V + 3 μ V 0.27 mV/V + 4.8 μ V 0.81 mV/V + 9.9 μ V 3 mV/V + 10 μ V	Fluke 5790X
(1.9 to 7) 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 (0.5 to 1) MHz	90 μ V/V + 1.6 μ V 42 μ V/V + 1.7 μ V 39 μ V/V + 1.6 μ V 49 μ V/V + 2.4 μ V 62 μ V/V + 3.1 μ V 0.14 mV/V + 5.1 μ V 0.49 mV/V + 10 μ V 2.2 mV/V + 11 μ V	
(6 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 (0.5 to 1) MHz	98 μ V/V + 1.5 μ V 62 μ V/V + 1.5 μ V 52 μ V/V + 1.5 μ V 49 μ V/V + 2.6 μ V 82 μ V/V + 2.9 μ V 0.19 mV/V + 4.6 μ V 0.36 mV/V + 11 μ V 1.7 mV/V + 12 μ V	

Parameter/Range	Frequency	CMC ^{2, 4, 11} ($\pm$)	Comments
AC Voltage ³ – Measure (cont) (19 to 70) mV	(9.5 to 10) Hz	1.1 mV/V + 8 μ V	Fluke 5790X
	(10 to 20) Hz	0.11 mV/V + 1.4 μ V	
	(20 to 40) Hz	56 μ V/V + 1.5 μ V	
	(40 to 20 000) Hz	45 μ V/V + 1.6 μ V	
	(20 to 50) kHz	58 μ V/V + 2.1 μ V	
	(50 to 100) kHz	0.1 mV/V + 2.5 μ V	
	(100 to 300) kHz	0.21 mV/V + 4 μ V	
	(300 to 500) kHz	0.41 mV/V + 8.6 μ V	
	(0.5 to 1) MHz	1.2 mV/V + 8.9 μ V	
	(60 to 220) mV	1.1 mV/V + 15 μ V	
	(10 to 20) Hz	79 μ V/V + 1.6 μ V	
	(20 to 40) Hz	43 μ V/V + 1.5 μ V	
	(40 to 20 000) Hz	32 μ V/V + 1.6 μ V	
	(20 to 50) kHz	37 μ V/V + 2.1 μ V	
	(50 to 100) kHz	79 μ V/V + 2.5 μ V	
	(100 to 300) kHz	0.16 mV/V + 4.2 μ V	
	(300 to 500) kHz	0.36 mV/V + 8.8 μ V	
	(0.5 to 1) MHz	1.1 mV/V + 9.1 μ V	
	(190 to 700) mV	1.1 mV/V + 41 μ V	
	(10 to 20) Hz	77 μ V/V + 1.7 μ V	
	(20 to 40) Hz	41 μ V/V + 1.5 μ V	
	(40 to 20 000) Hz	30 μ V/V + 1.7 μ V	
	(20 to 50) kHz	30 μ V/V + 2.2 μ V	
	(50 to 100) kHz	66 μ V/V + 2.7 μ V	
	(100 to 300) kHz	0.15 mV/V + 4.5 μ V	
	(300 to 500) kHz	0.32 mV/V + 9.2 μ V	
	(0.5 to 1) MHz	1.1 mV/V + 9.3 μ V	
	(0.6 to 2.2) V	1.1 mV/V + 0.11 mV	
	(10 to 20) Hz	77 μ V/V + 0.46 μ V	
	(20 to 40) Hz	36 μ V/V + 1.9 μ V	
	(40 to 20 000) Hz	27 μ V/V + 0.85 μ V	
	(20 to 50) kHz	27 μ V/V + 1.4 μ V	
	(50 to 100) kHz	59 μ V/V + 3.1 μ V	
	(100 to 300) kHz	0.13 mV/V + 5.3 μ V	
	(300 to 500) kHz	0.27 mV/V + 1.3 μ V	
	(0.5 to 1) MHz	1 mV/V + 0.12 mV	
	(1.9 to 7) V	1.1 mV/V + 0.26 mV	
	(10 to 20) Hz	76 μ V/V + 0.52 μ V	
	(20 to 40) Hz	38 μ V/V + 0.68 μ V	
	(40 to 20 000) Hz	27 μ V/V + 0.42 μ V	
	(20 to 50) kHz	31 μ V/V + 0.53 μ V	
	(50 to 100) kHz	75 μ V/V + 0.1 μ V	
	(100 to 300) kHz	0.18 mV/V + 1.5 μ V	
	(300 to 500) kHz	0.44 mV/V + 1.2 μ V	
	(0.5 to 1) MHz	1.4 mV/V + 1 μ V	

Parameter/Range	Frequency	CMC ^{2, 11} ($\pm$)	Comments
AC Voltage ³ – Measure (cont)			
(6 to 22) V	(9.5 to 10) Hz	1.2 mV/V + 53 μ V	Fluke 5790X
	(10 to 20) Hz	76 μ V/V + 3.6 μ V	
	(20 to 40) Hz	39 μ V/V + 1.1 μ V	
	(40 to 20 000) Hz	31 μ V/V + 0.51 μ V	
	(20 to 50) kHz	32 μ V/V + 1.4 μ V	
	(50 to 100) kHz	76 μ V/V + 0.18 μ V	
	(100 to 300) kHz	0.18 mV/V + 0.77 μ V	
	(300 to 500) kHz	0.44 mV/V + 1.1 μ V	
(19 to 70) V	(0.5 to 1) MHz	1.4 mV/V + 3.9 μ V	Fluke 5790X
	(9.5 to 10) Hz	1.2 mV/V + 0.14 mV	
	(10 to 20) Hz	77 μ V/V + 6.6 μ V	
	(20 to 40) Hz	40 μ V/V + 6.2 μ V	
	(40 to 20 000) Hz	30 μ V/V + 1.9 μ V	
	(20 to 50) kHz	33 μ V/V + 7.2 μ V	
	(50 to 100) kHz	82 μ V/V + 1.2 μ V	
	(100 to 300) kHz	0.18 mV/V + 10 μ V	
(60 to 220) V	(300 to 500) kHz	0.45 mV/V + 18 μ V	Fluke 5790X
	(0.5 to 1) MHz	1.4 mV/V + 5.9 μ V	
	(10 to 20) Hz	82 μ V/V + 51 μ V	
	(20 to 40) Hz	41 μ V/V + 21 μ V	
	(40 to 20 000) Hz	31 μ V/V + 10 μ V	
	(20 to 50) kHz	43 μ V/V + 8.5 μ V	
(190 to 700) V	(50 to 100) kHz	84 μ V/V + 30 μ V	Fluke 5790X
	(100 to 300) kHz	0.56 mV/V + 0.35 mV	
	(10 to 20) Hz	71 μ V/V + 0.75 mV	
	(20 to 40) Hz	41 μ V/V + 73 μ V	
(600 to 1000) V	(40 to 20 000) Hz	33 μ V/V + 24 μ V	Fluke 5790X
	(20 to 50) kHz	0.13 mV/V + 83 μ V	
	(50 to 100) kHz	0.58 mV/V + 0.39 mV	
	(20 to 40) Hz	41 μ V/V + 0.55 mV	
(0 to 10) mV	(40 to 20 000) Hz	33 μ V/V + 34 μ V	Fluke 8588A
	(20 to 50) kHz	0.12 mV/V + 32 μ V	
	(50 to 100) kHz	0.58 mV/V + 8 μ V	
	(1 to 2000) Hz	0.18 mV/V + 2.5 μ V	
	(2 to 30) kHz	0.28 mV/V + 2.5 μ V	
	(30 to 100) kHz	3.4 mV/V + 2.6 μ V	
	(100 to 300) kHz	11 mV/V + 8 μ V	
	(300 to 1000) kHz	22 mV/V + 24 μ V	

Parameter/Range	Frequency	CMC ^{2, 11} ($\pm$)	Comments
AC Voltage ³ – Measure (cont)			
(10 to 100) mV	(1 to 2000) Hz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz (300 to 1000) kHz (1 to 2) MHz (2 to 4) MHz (4 to 8) MHz (8 to 10) MHz	54 μ V/V + 3.1 μ V 0.11 mV/V + 2.1 μ V 0.22 mV/V + 2.2 μ V 0.52 mV/V + 14 μ V 2.1 mV/V + 67 μ V 11 mV/V + 0.23 mV 17 mV/V + 0.62 mV 46 mV/V + 1.2 mV 89 mV/V + 1.7 mV 170 mV/V + 1.9 mV	Fluke 8588A
(0.1 to 1) V	(1 to 2000) Hz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz (300 to 1000) kHz (1 to 2) MHz (2 to 4) MHz (4 to 8) MHz (8 to 10) MHz	70 μ V/V + 7.7 μ V 0.11 mV/V + 14 μ V 0.23 mV/V + 18 μ V 0.53 mV/V + 0.12 mV 2.1 mV/V + 0.67 mV 11 mV/V + 2.2 mV 17 mV/V + 6.3 mV 46 mV/V + 12 mV 89 mV/V + 17 mV 170 mV/V + 19 mV	
(1 to 10) V	(1 to 2000) Hz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz (300 to 1000) kHz (1 to 2) MHz (2 to 4) MHz (4 to 8) MHz (8 to 10) MHz	71 μ V/V + 58 μ V 0.11 mV/V + 0.13 mV 0.23 mV/V + 0.17 mV 0.54 mV/V + 1.1 mV 2.1 mV/V + 6.1 mV 11 mV/V + 15 mV 17 mV/V + 59 mV 46 mV/V + 120 mV 92 mV/V + 120 mV 170 mV/V + 120 mV	
(10 to 100) V	(1 to 2000) Hz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz	56 μ V/V + 2.7 mV 84 μ V/V + 1.7 mV 0.16 mV/V + 13 mV 0.51 mV/V + 16 mV 4 mV/V + 69 mV	Fluke 8588A
(100 to 1000) V	(300 to 1000) kHz (1 to 2000) Hz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz	10 mV/V + 0.82 V 94 μ V/V + 34 mV 87 μ V/V + 36 mV 0.2 mV/V + 77 mV 0.54 mV/V + 0.16 V	*8588A input impedance on auto

Parameter/Range	Frequency	CMC ^{2, 11} ($\pm$)	Comments
AC Voltage ³ – Measure (cont)			
(1 to 10) kV	(30 to 200) Hz	1.4 V/kV + 0.12 V	Vitrek 4700 high voltage meter
(10 to 30) kV	(30 to 200) Hz	1.8 V/kV + 0.54 V	Vitrek 4700 high voltage meter with HVP-35 probe
AC-DC Transfer			
(60 to 220) mV	(10 to 20) Hz (20 to 40) Hz (40 to 20 000) Hz (20 to 50) kHz	0.24 mV/V + 1.8 μ V 98 μ V/V + 11 nV 41 μ V/V + 51 nV 81 μ V/V + 15 nV	Fluke 5790X
(200 to 700) mV	(10 to 20) Hz (20 to 40) Hz (40 to 20 000) Hz (20 to 50) kHz	0.24 mV/V + 0.16 μ V 87 μ V/V + 0.44 μ V 32 μ V/V + 0.54 μ V 55 μ V/V + 0.32 μ V	
(0.6 to 2.2) V	(10 to 20) Hz (20 to 40) Hz (40 to 20 000) Hz (20 to 50) kHz	0.23 mV/V + 0.43 μ V 75 μ V/V + 0.55 μ V 21 μ V/V + 1.3 μ V 50 μ V/V + 0.83 μ V	
(2 to 7) V	(10 to 20) Hz (20 to 40) Hz (40 to 20 000) Hz (20 to 50) kHz	0.23 mV/V + 2 μ V 0.23 mV/V + 2 μ V 21 μ V/V + 4.8 μ V 50 μ V/V + 1 μ V	
(6 to 22) V	(10 to 20) Hz (20 to 40) Hz (40 to 20 000) Hz (20 to 50) kHz	0.23 mV/V + 3 μ V 75 μ V/V + 3.1 μ V 25 μ V/V + 4.6 μ V 51 μ V/V + 2.2 μ V	
(20 to 70) V	(10 to 20) Hz (20 to 40) Hz (40 to 20 000) Hz (20 to 50) kHz	0.23 mV/V + 52 μ V 75 μ V/V + 28 μ V 30 μ V/V + 7.6 μ V 64 μ V/V + 6.5 μ V	
(60 to 220) V	(10 to 20) Hz (20 to 40) Hz (40 to 20 000) Hz (20 to 50) kHz	0.23 mV/V + 0.31 mV 75 μ V/V + 0.2 mV 28 μ V/V + 60 μ V 74 μ V/V + 33 μ V	

Parameter/Range	Frequency	CMC ^{2, 4, 11} ($\pm$)	Comments
AC-DC Transfer (cont)			
(200 to 700) V	(10 to 20) Hz (20 to 40) Hz (40 to 2 000 020 000) Hz	0.23 mV/V + 2.9 mV 0.1 mV/V + 5.7 mV 44 μ V/V + 0.14 mV	Fluke 5790X
(600 to 1000) V	(10 to 20) Hz (20 to 40) Hz (40 to 2 000 020 000) Hz	0.23 mV/V + 12 μ V 0.11 mV/V + 25 μ V 41 μ V/V + 0.56 mV	
AC Voltage – Flatness			
5 mV to 5.5 V	50 kHz to 2 MHz (2 to 10) MHz (10 to 20) MHz 20 MHz to 1.1 GHz	0.42 % 0.40 % 0.44 % 0.44 %	R&S NRX, NRP6A, Fluke 5790X

AC Voltage Measure – Level Sine Wave / Flatness								
	Uncertainty in mV							
Frequency	2.2mV	7 mV	22 mV	70 mV	220 mV	700 mV	2.2 V	7 V
(10 to 30) Hz	0.015	0.0095	0.027	0.086	0.27	0.85	2.6	8.5
(30 to 120) Hz	0.0042	0.0062	0.015	0.046	0.12	0.33	1	5.6
(120 to 1200) Hz	0.0042	0.0062	0.015	0.046	0.12	0.33	1	5.6
(1.2 to 120) kHz	0.0042	0.0062	0.015	0.046	0.12	0.33	1	5.6
(120 to 500) kHz	0.005	0.0083	0.021	0.046	0.12	0.33	1	5.6
(0.5 to 1.2) MHz	0.005	0.0083	0.021	0.047	0.15	0.47	1.5	4.6
(1.2 to 2) MHz	0.005	0.0083	0.023	0.047	0.15	0.47	1.5	4.6
(2 to 10) MHz	0.0079	0.011	0.03	0.088	0.3	0.89	2.8	8.7
(10 to 20) MHz	0.0098	0.016	0.052	0.15	0.43	1.4	4.2	13
(20 to 30) MHz	0.021	0.033	0.1	0.17	0.94	3	9.4	30
Using Fluke 5790X Relative to 1 kHz								

Parameter/Range	Frequency	CMC ^{2, 4, 11} (±)	Comments
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

Parameter/Equipment	Range	CMC ^{2, 4, 11} (±)	Comments
Capacitance – Measure	(0 to 2.02) nF (2 to 20.2) nF (20 to 202) nF (0.2 to 2.02) µF (2 to 20.2) µF (20 to 202) µF (0.2 to 2.02) mF (2 to 20.2) mF (20 to 202) mF	1.4 pF/nF + 1.2 pF 4 pF/nF + 18 pF 0.37 pF/nF + 78 pF 0.77 nF/µF + 71 pF 0.47 nF/µF + 1.2 nF 0.68 nF/µF + 22 nF 0.64 µF/mF + 0.3 µF 0.84 µF/mF + 1.2 µF 0.82µF/mF + 12 µF	Fluke 8588A
10 pF to 1.1 µF	10 Hz to 100 kHz	0.018 %	Gen Rad 1615A capacitance bridge CMC is valid at 1 kHz
5 kHz	(190 to 350) Pf	1.5 mF/F + 21 fF	Rohde & Schwarz HM8118
1 kHz	(0.35 to 300) nF	1.2 mF/F + 8.5 fF	
50 & 100 Hz	(0.3 to 300) µF	1.2 mF/F + 1.5 nF	
Capacitance – Measure, Charge Time Method	(200 to 329) µF (0.3 to 1.1) mF	0.02 % 0.015 %	HP 3458 – 002, Keithley 2400

Parameter/Equipment	Range	CMC ^{2, 4, 11} ($\pm$)	Comments
DC Current ³ – Generate	(0 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	28 μ A/A + 1.9 nA 27 μ A/A + 6.6 nA 26 μ A/A + 69 nA 32 μ A/A + 0.4 μ A 52 μ A/A + 11 μ A	Fluke 5730A
	(2.2 to 11) A	0.13 mA/A + 0.19 mA	Fluke 5730A/5725A
	(1 to 20.5) A	1.2 mA/A + 29 μ A	Fluke 552XA
	(20 to 40) A (40 to 200) A (200 to 1025) A	0.45 % + 0.008 A 0.51 % + 0.01 A 0.31 % + 0.04 A	Fluke 552XA with EA002 2/10/50 coil
DC Current – Generate & Measure	(0.2 to 2) μ A (2 to 20) μ A (20 to 200) μ A (0.2 to 2) mA (2 to 10) mA (10 to 20) mA (20 to 100) mA (100 to 500) mA	0.021 % 0.0012 % 0.0008 % 0.00074 % 0.00075 % 0.0007 % 0.0008 % 0.00092 %	8588A/standard resistors
DC Current ³ – Measure	(0 to 20.2) μ A (20 to 202) μ A (202 to 2.02) mA (2 to 20.2) mA (20 to 202) mA (0.2 to 2.02) A (2 to 20.2) A (20 to 30.2) A	29 μ A/A + 0.48 nA 9.6 μ A/A + 0.5 nA 7.5 μ A/A + 4.7 nA 10 μ A/A + 53 nA 40 μ A/A + 1.2 μ A 0.12 mA/A + 12 mA 0.22 mA/A + 0.47 mA 0.57 mA/A + 5.1 mA	Fluke 8588A
	(10 to 100) μ A (0.1 to 1) mA (1 to 10) mA (10 to 100) mA (0.1 to 1) A	19 μ A/A + 0.91 nA 39 μ A/A + 3.7 nA 18 μ A/A + 65 nA 36 μ A/A + 0.57 μ A 0.12 mA/A + 11 μ A	HP 3458A, option II
	(1 to 10) A (10 to 20) A	0.0065 % 0.0043 %	Fluke 8588A w/ Fluke Y5020 shunt
	(20 to 300) A (300 to 1200) A	0.12 % 0.3 %	L&N shunt 2000A shunt

Parameter/Equipment	Range	CMC ^{2, 4, 11} ($\pm$)	Comments
DC Voltage ³ – Measure	(0 to 200) mV (0.1 to 2) V (1.0 to 20) V (10 to 200) V (100 to 1000) V	2.3 μ V/V + 0.41 μ V 0.93 μ V/V + 0.56 μ V 1.3 μ V/V + 2.2 μ V 22 nV/V + 27 μ V 0.62 nV/V + 25 μ V	Fluke 8588A/732C/752A transfer method
	0 V	0.12 μ V	Copper short
	(0 to 200) mV (0.1 to 2) V (1.0 to 20) V (10 to 200) V (100 to 1000) V	4.1 μ V/V + 0.29 μ V 3.3 μ V/V + 0.36 μ V 3.2 μ V/V + 0.99 μ V 4.8 μ V/V + 46 μ V 4.9 μ V/V + 0.67 mV	Fluke 8588A
	(0 to 120) mV (0.1 to 1.2) V (1 to 12) V (10 to 120) V (100 to 1050) V	6.9 μ V/V + 0.72 μ V 5.4 μ V/V + 0.73 μ V 4.8 μ V/V + 90 nV 8.2 μ V/V + 11 μ V 6.8 μ V/V + 0.38 mV	HP 3458A, option II
	(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	(0.1 to 10) V	2.3 μ V/V + 0.2 μ V	Fluke 732C & 752A
	(0 to 111) mV (0.1 to 1.1) V (1 to 11.1) V (11.1 to 100) V	9.8 μ V/V + 2.9 μ V 8.4 μ V/V + 5.6 μ V 9.9 μ V/V + 28 μ V 13 μ V/V + 0.27 mV	Krohn Hite 523 DC source
	(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	4.2 μ V/V + 0.62 μ V 3.2 μ V/V + 1.6 μ V 0.68 μ V/V + 25 μ V 3.1 μ V/V + 35 μ V 3.6 μ V/V + 68 μ V 4.2 μ V/V + 0.43 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

Parameter/Range	Frequency	CMC ^{2, 11} ($\pm$)	Comments
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, 11} ($\pm$)	Comments
Resistance ³ – Measure	(0.1 to 2.02) Ω	23 $\mu\Omega/\Omega$ + 5.2 $\mu\Omega$	Fluke 8588A transfer method
	(1 to 20.2) Ω	0.98 $\mu\Omega/\Omega$ + 27 $\mu\Omega$	
	(10 to 202) Ω	0.27 $\mu\Omega/\Omega$ + 0.18 m Ω	
	(0.1 to 2.02) k Ω	0.7 $\mu\Omega/\Omega$ + 1.2 m Ω	
	(1 to 20.2) k Ω	0.3 $\mu\Omega/\Omega$ + 16 m Ω	
	(10 to 202) k Ω	1.0 $\mu\Omega/\Omega$ + 0.29 Ω	
	(0.1 to 2.02) M Ω	2.5 $\mu\Omega/\Omega$ + 1.6 Ω	
	(1 to 20.2) M Ω	3.5 $\mu\Omega/\Omega$ + 19 Ω	
	(10 to 202) M Ω	2.7 $\mu\Omega/\Omega$ + 2.3 k Ω	
	(1 to 20.2) G Ω	1.0 m Ω/Ω + 17 M Ω	
	(0.1 to 2.02) Ω	12 $\mu\Omega/\Omega$ + 4.1 $\mu\Omega$	Fluke 8588A
	(1 to 20.2) Ω	7.5 $\mu\Omega/\Omega$ + 37 $\mu\Omega$	
	(10 to 202) Ω	7.5 $\mu\Omega/\Omega$ + 0.18 m Ω	
	(0.1 to 2.02) k Ω	7.7 $\mu\Omega/\Omega$ + 1.5 m Ω	
	(1 to 20.2) k Ω	7.7 $\mu\Omega/\Omega$ + 18 m Ω	
	(10 to 202) k Ω	5.7 $\mu\Omega/\Omega$ + 0.72 Ω	
	(0.1 to 2.02) M Ω	7.5 $\mu\Omega/\Omega$ + 4.4 Ω	
	(10 to 20.2) M Ω	7.6 $\mu\Omega/\Omega$ + 75 Ω	
	(10 to 202) M Ω	5.6 $\mu\Omega/\Omega$ + 3.6 k Ω	
	(1 to 20.2) G Ω	0.86 m Ω/Ω + 98 k Ω	
	(0 to 12) Ω	15 $\mu\Omega/\Omega$ + 0.05 m Ω	HP 3458A, option 02
	(10 to 120) Ω	13 $\mu\Omega/\Omega$ + 0.50 m Ω	
	100 Ω to 1.2 k Ω	10 $\mu\Omega/\Omega$ + 5.0 m Ω	
	(1 to 12) k Ω	10 $\mu\Omega/\Omega$ + 50 m Ω	
	(10 to 120) k Ω	10 $\mu\Omega/\Omega$ + 50 m Ω	
	100 k Ω to 1.2 M Ω	16 $\mu\Omega/\Omega$ + 2.0 Ω	
	(1 to 12) M Ω	52 $\mu\Omega/\Omega$ + 100 Ω	
	(10 to 120) M Ω	0.051 % + 1.0 k Ω	
	100 M Ω to 1.2 G Ω	0.5 % + 10 k Ω	

Parameter/Equipment	Range	CMC ^{2, 11} ($\pm$)	Comments
Resistance ³ – Generate	(1 & 10) m Ω	4.7 $\mu\Omega/\Omega$	L&N reference resistors
	(0.1, 1, 10, 100) Ω	4.7 $\mu\Omega/\Omega$	ESI SR1010 reference resistors
	(1, 10, 100, 1000) k Ω	4.7 $\mu\Omega/\Omega$	
	0 Ω	4.8 $\mu\Omega$	Copper shorting block
	0 Ω	40 $\mu\Omega$	Fluke 5730A
	1 Ω	56 $\mu\Omega$	
	1.9 Ω	80 $\mu\Omega$	
	10 Ω	0.11 m Ω	
	19 Ω	0.16 m Ω	
	100 Ω	0.44 m Ω	
	190 Ω	0.81 m Ω	
	1 k Ω	4.0 m Ω	
	1.9 k Ω	7.3 m Ω	
	10 k Ω	40 m Ω	
	19 k Ω	72 m Ω	
	100 k Ω	0.43 Ω	
	190 k Ω	0.81 Ω	
	1 M Ω	6.5 Ω	
	1.9 M Ω	12 Ω	
	10 M Ω	190 Ω	
	19 M Ω	0.63 k Ω	
	100 M Ω	8.5 k Ω	
Fixed Values	0 Ω	97 $\mu\Omega$	Fluke 5450A
	1 Ω	55 $\mu\Omega$	
	1.9 Ω	83 $\mu\Omega$	
	10 Ω	0.13 m Ω	
	19 Ω	0.17 m Ω	
	100 Ω	0.46 m Ω	
	190 Ω	0.75 m Ω	
	1 k Ω	5.3 m Ω	
	1.9 k Ω	8 m Ω	
	10 k Ω	41 m Ω	
	19 k Ω	73 m Ω	
	100 k Ω	0.52 Ω	
	190 k Ω	0.85 Ω	
	1 M Ω	7.8 Ω	
	1.9 M Ω	14 Ω	
	10 M Ω	0.21 k Ω	
	19 M Ω	0.48 k Ω	
	100 M Ω	7.7 k Ω	
	1 Ω	6.1 $\mu\Omega$	Fluke 742 resistors
	10 Ω	58 $\mu\Omega$	
	100 Ω	0.47 m Ω	
	1 k Ω	4.8 m Ω	
	10 k Ω	31 m Ω	
	100 k Ω	0.5 Ω	
	1 M Ω	7.4 Ω	
	10 M Ω	85 Ω	

Parameter/Equipment	Range	CMC ^{2, 4, 11} ($\pm$)	Comments
Resistance ³ – Generate (cont)	1 G Ω (0.0001 to 1) T Ω	0.15 M Ω 0.23 % IV + 0.0011 % IV/G Ω	85X8A-7000k – 1G Ω 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	Ectron 1140A
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	0.08 ° 0.2 ° 0.4 ° 1.9 ° 3.9 ° 7.8 °	Fluke 5522A
Phase – Measure ³	(0 to +360) ° (5 to 2000) Hz (2 to 5) kHz (5 to 10) kHz (10 to 50) kHz	0.034° 0.087° 0.092° 0.32°	Clarke Hess 6000A

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 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 ° ± 12 ° 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° 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* (2.5 to 25) lbf·in* (5 to 50) lbf·in* (40 to 400) lbf·in* (100 to 1000) lbf·in* (300 to 3000) lbf·in* (100 to 1000) ozf·in* (100 to 1000) lbf·ft	1.3 % of IV from (10 to 100) % FS 0.32 % of IV from (10 to 100) % FS 0.30 % of IV from (10 to 100) % FS 0.29 % of IV from (10 to 100) % FS 0.29 % of IV from (10 to 100) % FS 0.38 % of IV from (10 to 100) % FS 0.49 % of IV (10 to 100) % of range 0.14 % of IV (10 to 100) % of range	JETCO TED-40 Larson STWCS CDI transducer system 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 class6 weights ASTM class 1 weights

Parameter/Equipment	Range	CMC ^{2, 4, 6, 10} (±)	Comments
Mass – Measure	(1 to 5) g (5 to 10) g (10 to 20) g (20 to 50) g (50 to 200) g (200 to 500) g (500 to 1000) g (1 to 2) kg (2 to 5) kg (5 to 10) kg (10 to 20) kg	0.09 mg 0.10 mg 0.13 mg 0.16 mg 6.9 mg 7 mg 7.4 mg 0.02 g 0.03 g 0.16 g 0.16 g	XE-50 XE-50 XE-50 XE-50 PE 1600 PE 1600 PE 1600 TCL-6002 TCL-6002 Setra12000L GP-30K
Fixed Points	1 g 2 g 5 g 10 g 20 g 50 g 100 g 200 g 500 g 1 kg 2 kg 5 kg 10 kg 20 kg 50 lb	0.09 mg 0.09 mg 0.09 mg 0.10 mg 0.13 mg 0.16 mg 6.9 mg 6.9 mg 7 mg 7.4 mg 0.02 g 0.03 g 0.16 g 0.16 g 0.000 37 lb (170 mg)	Mass comparator, Class 1 weight, substitution method
Force ^{3, 7} – Measuring Equipment	Up to 500 lbf (100 to 1000) lbf (200 to 2000) lbf (500 to 5000) lbf (1000 to 10 000) lbf (2500 to 25 000) lbf (5000 to 50 000) lbf (10 000 to 100 000) lbf (50 000 to 500 000) lbf	0.01 % IV + 0.6R 0.061 % FS 0.050 % FS 0.049 % FS 0.049 % FS 0.056 % FS 0.049 % FS 0.064 % FS 0.059 % FS	ASTM class 6 weights Load cells ASTM E74 Compression only
Volumetric Gas Flow – Measure/Measuring Equipment	(10 to 100) sccm (100 to 1000) sccm (3 to 100) slm	0.19 % 0.19 % 0.0018 slm/slm + 0.013 slm	Molbox2 system

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

VIII. Thermodynamics

Parameter/Equipment	Range	CMC ^{2, 10} ($\pm$)	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} ($\pm$)	Comments
Frequency – Measuring Equipment	10 MHz 1 Hz to 80 MHz	5.7 x 10 ⁻¹² Hz/Hz 2.3 μ Hz/Hz + 1 μ Hz	NOVAS WR 2410 GPS receiver Keysight 33250A
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	(0.1 to 1000) ns	0.22 ps	Oscilloscope with sampling head
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 klb, 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 *PI12 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.