



National Voluntary Laboratory Accreditation Program



CALIBRATION LABORATORIES

NVLAP LAB CODE 200730-0

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) ^{Notes 1,2}

Measured Parameter or Device Calibrated	Range	Uncertainty ($k=2$) ^{Note 3}	Remarks
DIMENSIONAL			
NVLAP Code: 20/D01 ANGULAR Angles	0° to 90°	8 arc seconds	CMM
NVLAP Code: 20/D05 LENGTH & DIAMETER; STEP GAGES Micrometers – Outside, Inside, Depth Field calibrations available ^{Note 4}	0.01 in to 8 in 8 in to 24 in 24 in to 80 in 24 in to 80 in	Where L is the length in inches of device under test. 11 μin + 14 L μin 46 μin + 14 L μin 610 μin 130 μin	Comparison to Gage Blocks End Standards and CMM; Zero Setting CMM; 0 in to 1 in Micrometer Travel
Anvil Flatness Field calibrations available ^{Note 4}	0 in to 1 in	6.4 μin	Optical Flats
Calipers – Outside, Inside, Depth, Step Field calibrations available ^{Note 4}	0 in to 24 in 24 in to 80 in	46 μin + 14 L μin 640 μin	Comparison to Gage Blocks CMM

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Measured Parameter or Device Calibrated	Range	Uncertainty ($k=2$) <small>Note 3</small>	Remarks
Dial Indicators	0 in to 4 in	9 μ in + 3.9L μ in	Pratt & Whitney USM
Length Measurement – Single Axis	0 in to 10 in 10 in to 40 in 40 in to 80 in	9 μ in + 3.9L μ in 39 μ in + 1.4L μ in 250 μ in	Pratt & Whitney USM Gage Blocks with CMM CMM
Height Gages	0 in to 3 in 3 in to 24 in	37 μ in + 0.6L μ in 24 μ in + 4.2L μ in	Comparison to Gage Blocks
Linear Displacement Field calibrations available <small>Note 4</small>	0 ft to 12 ft	1.1 μ in + 0.6L μ in	Laser Interferometer
NVLAP Code: 20/D11 SPHERICAL DIAMETER; PLUG/RING GAGES Outer Diameters - Plugs	0 in to 10 in	9 μ in + 3.9L μ in	Pratt & Whitney USM
NVLAP Code: 20/D13 SURVEYING RODS and TAPES Steel Rules, Tape Measures, and PI Tapes	0 ft to 6 ft 6 ft to 100 ft 6 x 6 in	490 μ in + 3.5L μ in 130 μ in + 7.3L μ in 500 μ in	CMM with Vision Optical Comparator
NVLAP Code: 20/D14 THREADED PLUGS & RING GAGES Threaded Plugs – Outer Pitch Diameter	0 in to 6 in	83 μ in	Comparator with Thread Wires
Threaded Plugs – Major Diameter	0 in to 6 in	9 μ in + 3.9L μ in	Comparator
NVLAP Code: 20/D15 TWO DIMENSIONAL GAGES			

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Measured Parameter or Device Calibrated	Range	Uncertainty ($k=2$) ^{Note 3}	Remarks
Linear Dimension – Two Axis (X-Y)	20 in x 20 in	130 μ m + 7L μ m	Multi-Probing System
NVLAP Code: 20/D16 COORDINATE MEASURING MACHINES Volumetric	0 in ³ to 1 in ³ 1 in ³ to 216 in ³ 0.125 ft ³ to 18 ft ³ 18 ft ³ to 66 ft ³	53 μ m 120 μ m 310 μ m 0.0014 in	CMM

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) ^{Notes 1,2}

Measured Parameter or Device Calibrated	Remarks								
ELECTROMAGNETICS – DC/LOW FREQUENCY									
NVLAP Code: 20/E02 AC RESISTORS AC Current	Fluke A40 Shunts with 792A								
	Uncertainty ($k=2$) in μA/A ^{Note 3}								
	Frequency Range								
Range	10 Hz	20 Hz	40 Hz	400 Hz	1 kHz	5 kHz	10 kHz	20 kHz	50 kHz
100 μ A	61	66	56	60	59	72	81	100	120
200 μ A	62	43	38	36	36	63	73	98	120
1 mA	45	41	31	38	37	37	37	42	46
2 mA	46	31	31	28	28	28	28	31	39
10 mA	110	53	33	31	31	31	30	32	55
20 mA	130	54	33	31	31	31	32	34	63
100 mA	120	53	33	31	31	31	31	40	73
200 mA	120	57	33	31	31	31	31	36	73
1A	110	57	37	35	36	35	38	50	180
2A	110	60	37	35	36	41	38	52	120
10A	160	85	64	63	63	63	63	83	150
20A	220	140	110	110	110	120	140	140	250

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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) ^{Notes 1,2}

Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty (k=2) ^{Note 3}	Remarks
AC Current – Measuring Equipment and Measure Field calibrations available ^{Note 4}	0 μ A to 220 μ A	10 Hz to 20 Hz	0.03 % + 16 nA	Fluke 5720A
		20 Hz to 40 Hz	0.02 % + 10 nA	
		40 Hz to 1 kHz	0.015 % + 8 nA	
		1 kHz to 5 kHz	0.03 % + 12 nA	
		5 kHz to 10 kHz	0.11 % + 65 nA	
	0.22 mA to 2.2 mA	10 Hz to 20 Hz	0.03 % + 40 nA	
		20 Hz to 40 Hz	0.018 % + 35 nA	
		40 Hz to 1 kHz	0.014 % + 35 nA	
		1 kHz to 5 kHz	0.02 % + 110 nA	
		5 kHz to 10 kHz	0.11 % + 650 nA	
	2.2 mA to 22 mA	10 Hz to 20 Hz	0.039 % + 400 nA	
		20 Hz to 40 Hz	0.018 % + 350 nA	
		40 Hz to 1 kHz	0.014 % + 350 nA	
		1 kHz to 5 kHz	0.02 % + 550 nA	
5 kHz to 10 kHz		0.11 % + 5 μ A		
22 mA to 220 mA	10 Hz to 20 Hz	0.033 % + 4 μ A		
	20 Hz to 40 Hz	0.018% + 3.5 μ A		
	40 Hz to 1 kHz	0.014 % + 2.5 μ A		
	1 kHz to 5 kHz	0.021 % + 3.5 μ A		
	5 kHz to 10 kHz	0.11 % + 10 μ A		
0.22 A to 2.2 A	20 Hz to 1 kHz	0.027 % + 35 μ A		
	1 kHz to 5 kHz	0.046 % + 80 μ A		
	5 kHz to 10 kHz	0.7 % + 160 μ A		
2.2 A to 11 A	40 Hz to 1 kHz	0.05 % + 170 μ A	Fluke 5720A+5725A	
	1 kHz to 5 kHz	0.10 % + 380 μ A		
	5 kHz to 10 kHz	0.36 % + 750 μ A		
11 A to 20.5 A	45 Hz to 1 kHz	0.09 % + 2 mA	Fluke 5520A	
	1 kHz to 5 kHz	2.3 % + 5 mA		

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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) ^{Notes 1,2}

Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty (k=2) ^{Note 3}	Remarks
Clamp-on Ammeter Toroidal Type Field calibrations Available ^{Note 4}	20 A to 150 A	45 Hz to 65 Hz	0.34 % + 26 mA	Fluke 5520A
	20 A to 150 A	65 Hz to 440 Hz	0.95 % + 47 mA	
	150 A to 1000 A	45 Hz to 65 Hz	0.38 % + 0.12 A	
	150 A to 1000 A	65 Hz to 440 Hz	1.2 % + 0.22 A	
Clamp-on Ammeter Non-Toroidal Type Field calibrations Available ^{Note 4}	20 A to 150 A	45 Hz to 65 Hz	0.65 % + 0.25 A	Fluke 5520A
	20 A to 150 A	65 Hz to 440 Hz	1.2 % + 0.25 A	
	150 A to 1000 A	45 Hz to 65 Hz	0.68 % + 0.9 A	
	150 A to 1000 A	65 Hz to 440 Hz	1.4 % + 0.92 A	
AC Current – Measure Field calibrations available ^{Note 4}	0 µA to 100 µA	10 Hz to 20 Hz	0.46 % + 30 nA	Agilent 3458A opt 2
		20 Hz to 45 Hz	0.18 % + 30 nA	
		45 Hz to 100 Hz	0.072 % + 30 nA	
		100 Hz to 1 kHz	0.072 % + 30 nA	
	0.1 mA to 1 mA	10 Hz to 20 Hz	0.46 % + 200 nA	
		20 Hz to 45 Hz	0.17 % + 200 nA	
		45 Hz to 100 Hz	0.071 % + 200 nA	
		100 Hz to 1 kHz	0.037 % + 200 nA	
	1 mA to 10 mA	10 Hz to 20 Hz	0.46 % + 2 µA	
		20 Hz to 45 Hz	0.17 % + 2 µA	
		45 Hz to 100 Hz	0.071 % + 2 µA	
		100 Hz to 1 kHz	0.038 % + 2 µA	
	10 mA to 100 mA	10 Hz to 20 Hz	0.46 % + 20 µA	
		20 Hz to 45 Hz	0.17 % + 20 µA	
		45 Hz to 100 Hz	0.071 % + 20 µA	
		100 Hz to 1 kHz	0.037 % + 20 µA	
	0.1 A to 1 A	10 Hz to 20 Hz	0.46 % + 200 µA	
		20 Hz to 45 Hz	0.19 % + 200 µA	
		45 Hz to 100 Hz	0.097 % + 200 µA	
		100 Hz to 1 kHz	0.12 % + 200 µA	

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Measured Parameter or Device Calibrated	Range	Uncertainty ($k=2$) ^{Note 3}	Remarks		
NVLAP Code: 20/E05 DC RESISTANCE DC Resistance – Measuring Equipment and Measure	0 Ω (floor)	0.63 n Ω	Standard Resistors with Current Source and DMM		
	100 $\mu\Omega$ to < 1 m Ω	6.3 $\mu\Omega/\Omega$			
	1 m Ω to < 10 m Ω	3.0 $\mu\Omega/\Omega$			
	10 m Ω to < 100 m Ω	2.3 $\mu\Omega/\Omega$			
	0.1 Ω to < 1 Ω	2.3 $\mu\Omega/\Omega$			
	DC Resistance – Measure	1 Ω to < 10 Ω	0.18 $\mu\Omega/\Omega$	Standard Resistors with MI 6242B Bridge	
		10 Ω to < 100 Ω	0.29 $\mu\Omega/\Omega$		
		100 Ω to < 1 k Ω	0.28 $\mu\Omega/\Omega$		
		1 k Ω to < 10 k Ω	0.44 $\mu\Omega/\Omega$		
		10 k Ω to < 100 k Ω	0.19 $\mu\Omega/\Omega$		
		Resistance Ratio	100 k Ω to < 1 M Ω	1.7 $\mu\Omega/\Omega$	Standard Resistor
			1 M Ω to < 10 M Ω	5.7 $\mu\Omega/\Omega$	
			10 M Ω to < 100 M Ω	11 $\mu\Omega/\Omega$	
			100 M Ω to < 1 G Ω	29 $\mu\Omega/\Omega$	
1 G Ω to < 20 G Ω			130 $\mu\Omega/\Omega$		
DC Resistance – Measure	100 M Ω Source	24 $\mu\Omega/\Omega$	Standard Resistor		
	1 G Ω Source	38 $\mu\Omega/\Omega$			
DC Resistance – Measuring Equipment and Measure Field calibrations available ^{Note 4}	1 Ω to 1 k Ω	0.2 $\mu\Omega/\Omega$	MI 6242B Bridge		
	10 m Ω to 10 Ω	18 $\mu\Omega/\Omega$ + 50 $\mu\Omega$	HP3458A with Decade Resistor		
	10 Ω to 100 Ω	15 $\mu\Omega/\Omega$ + 500 $\mu\Omega$			
	100 Ω to 1 k Ω	12 $\mu\Omega/\Omega$ + 500 $\mu\Omega$			
	1 k Ω to 10 k Ω	12 $\mu\Omega/\Omega$ + 5 m Ω			
	10 k Ω to 100 k Ω	12 $\mu\Omega/\Omega$ + 50 m Ω			
	100 k Ω to 1 M Ω	19 $\mu\Omega/\Omega$ + 2 Ω			
	1 M Ω to 10 M Ω	62 $\mu\Omega/\Omega$ + 100 Ω			
	10 M Ω to 100 M Ω	590 $\mu\Omega/\Omega$ + 1 k Ω			

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Measured Parameter or Device Calibrated	Range	Uncertainty (k=2) <small>Note 3</small>	Remarks
DC Resistance – Measuring Equipment Field calibrations available <small>Note 4</small>	100 MΩ to 1 GΩ	0.58 % + 10 kΩ	Biddle Mega Dek
	10 GΩ to 1 TΩ	4.2 %	
DC Current – Measuring Equipment and Measure	0 A (floor)	0.40 nA	Standard Shunts with Current Source
	100 μA to < 1 mA	4.5 μA/A	
	1 mA to < 10 mA	2.0 μA/A	
	10 mA to < 100 mA	1.9 μA/A	
	100 mA to < 1 A	2.2 μA/A	
	1 A to < 10 A	3.3 μA/A	
	10 A to < 20 A	6.9 μA/A	
	20 A	61 μA/A	
DC Current – Measuring Equipment and Measure Field calibrations available <small>Note 4</small>	> 20 A to 100 A	78 μA/A	HP3458A with Current Source
	0 μA to 100 μA	26 μA/A + 0.8 nA	
	100 μA to 1 mA	26 μA/A + 5 nA	
	1 mA to 10 mA	26 μA/A + 50 nA	
	10 mA to 100 mA	43 μA/A + 500 nA	
	100 mA to 1 A	130 μA/A + 10 μA	
Clamp-on Ammeter Non-Toroidal Type Field calibrations Available <small>Note 4</small>	1 A to 20 A	230 μA/A + 750 μA	Fluke 5520A with Current Source
	20 A to 150 A	0.5 % + 0.14 A	
NVLAP Code: 20/E06 DC VOLTAGE DC Voltage – Fixed Points Measuring Equipment and Measure	150 A to 1000 A	0.52 % + 0.5 A	5520A/Coil
	0 V (floor)	59 nV	
			Ratio Metric with Zener Reference

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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) ^{Notes 1,2}

Measured Parameter or Device Calibrated	Range	Uncertainty ($k=2$) ^{Note 3}	Remarks
DC Voltage – Measuring Equipment and Measure Field calibrations Available ^{Note 4}	1 mV	120 μ V/V	High Voltage Divider Comparison HP3458A opt 2 with 5720A
	10 mV	22 μ V/V	
	100 mV	0.80 μ V/V	
	1 V	0.29 μ V/V	
	10 V	0.20 μ V/V	
	19 V	0.48 μ V/V	
	100 V	0.28 μ V/V	
	1000 V	0.54 μ V/V	
	20 mV to < 50 mV	13 μ V/V + 0.059 μ V	
	50 mV to < 100 mV	7.3 μ V/V + 0.059 μ V	
	100 mV to \leq 1 kV	0.61 μ V/V + 0.059 μ V	
	> 1 kV to 120 kV	170 μ V/V	
	0 V to 100 mV	7.1 μ V/V + 0.5 μ V	
	100 mV to 10 V	5 μ V/V + 0.5 μ V	
10 V to 100 V	7.6 μ V/V + 30 μ V		
100 V to 500 V	11 μ V/V + 100 μ V		
500 V to 800 V	16 μ V/V + 100 μ V		
800 V to 1000 V	21 μ V/V + 100 μ V		

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) ^{Notes 1,2}

Measured Parameter or Device Calibrated	Remarks													
NVLAP Code: 20/E09 LOW FREQUENCY AC VOLTAGE	Fluke 792A													
AC Voltage – Measure														
	Uncertainty ($k=2$) in μV/V ^{Note 3}													
	Frequency Range													
Range	10 Hz	20 Hz	40 Hz	100 Hz	1 kHz	10 kHz	20 kHz	50 kHz	100 kHz	300 kHz	500 kHz	800 kHz	1 MHz	
2 mV	630	880	920	910	370	830	830	420	1000	1200	2000	2400	2400	
6 mV	320	300	330	200	260	250	270	330	530	760	920	600	660	

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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) ^{Notes 1,2}

Measured Parameter or Device Calibrated	Remarks												
NVLAP Code: 20/E09 LOW FREQUENCY AC VOLTAGE AC Voltage – Measure	Fluke 792A												
	Uncertainty (k=2) in $\mu\text{V/V}$ ^{Note 3}												
	Frequency Range												
Range	10 Hz	20 Hz	40 Hz	100 Hz	1 kHz	10 kHz	20 kHz	50 kHz	100 kHz	300 kHz	500 kHz	800 kHz	1 MHz
10 mV	140	190	110	230	180	190	160	210	290	230	640	390	490
20 mV	82	73	63	110	73	84	62	140	200	300	460	340	390
60 mV	100	66	52	45	37	47	52	70	130	270	350	410	420
100 mV	38	35	22	32	30	34	31	41	76	150	200	270	210
200 mV	42	24	38	23	19	25	18	45	87	130	110	250	200
600 mV	30	39	17	11	12	11	12	22	31	96	90	86	110
1 V	86	35	18	9.2	9.4	11	7.7	18	10	70	95	95	75
2 V	25	20	18	8.0	6.9	6.5	7.1	15	11	96	95	76	76
6 V	33	21	18	8.9	6.8	8.2	7.0	21	12	92	93	78	78
10 V	20	32	18	9.8	8.3	8.3	9.3	10	11	70	99	100	120
20 V	37	21	19	8.9	8.5	8.9	9.7	11	15	85	91	78	82
60 V	37	23	19	11	11	12	11	33	16	73			
100 V	86	35	19	15	14	15	11	31	16				
200 V	44	24	19	18	12	12	13	17	21				
600 V	96	47	27	23	16	16	17	46	51				
1000 V	54	21	22	22	19	18	20	49	52				

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) ^{Notes 1,2}

Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty (k=2) ^{Note 3}	Remarks
AC High Voltage	1 kV to 80 kV	60 Hz	820 $\mu\text{V/V}$	HV Divider Comparison
AC Voltage – Measure Field calibrations	0 mV to 10 mV	1 Hz to 40 Hz 40 Hz to 1 kHz	0.039 % + 3 μV 0.028 % + 1 μV	Agilent 3458A opt 2

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Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty (k=2) ^{Note 3}	Remarks	
available ^{Note 4}	10 mV to 100 mV	1 kHz to 20 kHz	0.038 % + 1 μV		
		20 kHz to 50 kHz	0.15 % + 1 μV		
		50 kHz to 100 kHz	0.59 % + 1 μV		
		100 kHz to 300 kHz	4.6 % + 2 μV		
	100 mV to 1 V	10 mV to 100 mV	1 Hz to 40 Hz		0.013 % + 4 μV
			40 Hz to 1 kHz		0.0094 % + 2 μV
			1 kHz to 20 kHz		0.017 % + 2 μV
			20 kHz to 50 kHz		0.037 % + 2 μV
			50 kHz to 100 kHz		0.093 % + 2 μV
			100 kHz to 300 kHz		0.36 % + 10 μV
			300 kHz to 1 MHz		1.2 % + 10 μV
			1 V to 10 V		100 mV to 1 V
	40 Hz to 1 kHz	0.0094 % + 20 μV			
	1 kHz to 20 kHz	0.017 % + 20 μV			
	20 kHz to 50 kHz	0.036 % + 20 μV			
	50 kHz to 100 kHz	0.093 % + 20 μV			
	100 kHz to 300 kHz	0.35 % + 100 μV			
	300 kHz to 1 MHz	1.2 % + 100 μV			
	10 V to 100 V	1 V to 10 V			
			40 Hz to 1 kHz		0.0095 % + 0.2 mV
1 kHz to 20 kHz			0.017 % + 0.2 mV		
20 kHz to 50 kHz			0.036 % + 0.2 mV		
50 kHz to 100 kHz			0.093 % + 0.2 mV		
100 kHz to 300 kHz			0.35 % + 1 mV		
300 kHz to 1 MHz			1.2 % + 1 mV		
10 V to 100 V			10 V to 100 V	1 Hz to 40 Hz	0.024 % + 4 mV
	40 Hz to 1 kHz	0.024 % + 2 mV			
	1 kHz to 20 kHz	0.024 % + 2 mV			
	20 kHz to 50 kHz	0.041 % + 2 mV			
	50 kHz to 100 kHz	0.14 % + 2 mV			
	100 kHz to 300 kHz	0.46 % + 10 mV			
	300 kHz to 1 MHz	1.7 % + 10 mV			

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AC Voltage – Measuring Equipment Field calibrations available ^{Note 4}	100 V to 700 V	1 Hz to 40 Hz	0.047 % + 40 mV	Fluke 5720A
		40 Hz to 1 kHz	0.047 % + 20 mV	
		1 kHz to 20 kHz	0.071 % + 20 mV	
		20 kHz to 50 kHz	0.14 % + 20 mV	
		50 kHz to 100 kHz	0.35 % + 20 mV	
	0 mV to 2.2 mV	10 Hz to 20 Hz	0.16 % + 4 μV	
		20 Hz to 40 Hz	0.1 % + 4 μV	
		40 Hz to 20 kHz	0.077% + 4 μV	
		20 kHz to 50 kHz	0.12 % + 4.5 μV	
		50 kHz to 100 kHz	0.17 % + 5 μV	
		100 kHz to 300 kHz	0.33 % + 10 μV	
		300 kHz to 500 kHz	0.47 % + 20 μV	
	2.2 mV to 22 mV	500 kHz to 1 MHz	0.58 % + 20 μV	
		10 Hz to 20 Hz	0.044 % + 4 μV	
		20 Hz to 40 Hz	0.031 % + 4 μV	
		40 Hz to 20 kHz	0.015 % + 4 μV	
20 kHz to 50 kHz		0.031 % + 4 μV		
50 kHz to 100 kHz		0.059 % + 5 μV		
100 kHz to 300 kHz		0.12 % + 12 μV		
22 mV to 220 mV	300 kHz to 500 kHz	0.16 % + 20 μV		
	500 kHz to 1 MHz	0.3 % + 20 μV		
	10 Hz to 20 Hz	0.028 % + 12 μV		
	20 Hz to 40 Hz	0.011 % + 7 μV		
	40 Hz to 20 kHz	0.0083 % + 7 μV		
220 mV to 2.2 V	20 kHz to 50 kHz	0.021 % + 7 μV		
	50 kHz to 100 kHz	0.047 % + 17 μV		
	100 kHz to 300 kHz	0.092 % + 20 μV		
	300 kHz to 500 kHz	0.14 % + 25 μV		
	500 kHz to 1 MHz	0.28 % + 45 μV		
220 mV to 2.2 V	10 Hz to 20 Hz	0.028 % + 40 μV		

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Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty (k=2) ^{Note 3}	Remarks
	2.2 V to 22 V	20 Hz to 40 Hz	0.01 % + 15 μV	
		40 Hz to 20 kHz	0.0048 % + 8 μV	
		20 kHz to 50 kHz	0.0081 % + 10 μV	
		50 kHz to 100 kHz	0.012 % + 30 μV	
		100 kHz to 300 kHz	0.043 % + 80 μV	
		300 kHz to 500 kHz	0.1 % + 200 μV	
		500 kHz to 1 MHz	0.18 % + 300 μV	
		22 V to 220 V	10 Hz to 20 Hz	
	20 Hz to 40 Hz		0.01 % + 0.15 mV	
	40 Hz to 20 kHz		0.0049 % + 50 μV	
	20 kHz to 50 kHz		0.0083 % + 0.1 mV	
	50 kHz to 100 kHz		0.011 % + 0.2 mV	
	100 kHz to 300 kHz		0.03 % + 0.6 mV	
	300 kHz to 500 kHz		0.10 % + 2 mV	
	500 kHz to 1 MHz		0.17 % + 3.2 mV	
	220 V to 1100 V	10 Hz to 20 Hz	0.028 % + 4 mV	
		20 Hz to 40 Hz	0.01 % + 1.5 mV	
		40 Hz to 20 kHz	0.0056 % + 0.6 mV	
		20 kHz to 50 kHz	0.0093 % + 1 mV	
		50 kHz to 100 kHz	0.016 % + 2.5 mV	
		100 kHz to 300 kHz	0.085 % + 16 mV	
	220 V to 750 V	300 kHz to 500 kHz	0.44 % + 40 mV	
		500 kHz to 1 MHz	0.8 % + 40 mV	
		220 V to 1100 V	40 Hz to 1 kHz	
1 kHz to 30 kHz			0.017 % + 6 mV	
	220 V to 750 V	30 kHz to 50 kHz	0.061 % + 11 mV	
		50 kHz to 100 kHz	0.23 % + 45 mV	

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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) ^{Notes 1,2}

Measured Parameter or Device Calibrated	Range	Uncertainty ($k=2$) ^{Note 3}	Remarks
NVLAP Code: 20/E10 LOW FREQUENCY CAPACITANCE			
Capacitance – Source: 1 kHz	0.01 pF 0.1 pF 1 pF 10 pF 100 pF 500 pF 1 nF 10 nF 200 nF	0.02 % + 30 aF 0.02 % + 30 aF 0.02 % 0.02 % 0.02 % 0.02 % 0.002 % 0.02 % 0.02 %	Fixed Capacitors with GR1615-A Bridge
Capacitance – Measure: 50 Hz to 1 MHz	1 aF to 1.1 μ F 1.1 μ F to 10 mF 0.33 mF 0.8 mF 1 mF 1.2 mF 3 mF 3.3 mF 8 mF 10 mF 12 mF 30 mF 80 mF 100 mF	0.012 % + 30 aF 0.06 % + 30 aF 0.048 % 0.027 % 0.024 % 0.023 % 0.018 % 0.017 % 0.016 % 0.016 % 0.016 % 0.015 % 0.014 % 0.014 %	GR1615-A Bridge Quadtech 7600LCR Bridge Time/Charge Method with HP3458A

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) ^{Notes 1,2}

Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty ($k=2$) ^{Note 3}	Remarks
Capacitance – Measuring Equipment Field calibrations	0.19 nF to 1.0999 nF 1.1 nF to 3.2999 nF	10 Hz to 10 kHz 10 Hz to 3 kHz	0.39 % + 7.8 pF 0.39 % + 7.8 pF	Fluke 5520A

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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) ^{Notes 1,2}

Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty (k=2) ^{Note 3}	Remarks
available ^{Note 4}	3.3 nF to 10.9999 nF	10 Hz to 1 kHz	0.21 %+ 7.8 pF	
	11 nF to 109.999 nF	10 Hz to 1 kHz	0.21 %+ 78 pF	
	110 nF to 329.999 nF	10 Hz to 1 kHz	0.21 %+ 0.23 nF	
	0.33 μF to 1.09999 μF	10 Hz to 600 Hz	0.20 %+ 0.78 nF	
	1.1 μF to 3.2999 μF	10 Hz to 300 Hz	0.20 %+ 2.3 nF	
	3.3 μF to 10.9999 μF	10 Hz to 150 Hz	0.20 %+ 7.8 nF	
	11 μF to 32.9999 μF	10 Hz to 120 Hz	0.31 %+ 23 nF	
	33 μF to 109.9999 μF	10 Hz to 80 Hz	0.35 %+ 78 nF	
	110 μF to 329.999 μF	DC to 50 Hz	0.35 %+ 0.23 μF	
	0.33 mF to 1.09999 mF	DC to 20 Hz	0.35 %+ 0.78 μF	
	1.1 mF to 3.2999 mF	DC to 6 Hz	0.35 %+ 2.3 μF	
	3.3 mF to 10.9999 mF	DC to 2 Hz	0.35 %+ 7.8 μF	
	11 mF to 32.9999 mF	DC to 0.6 Hz	0.58 %+ 23 μF	
	33 mF to 109.9999 mF	DC to 0.2 Hz	0.85 %+ 78 μF	

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) ^{Notes 1,2}

Measured Parameter or Device Calibrated	Range	Uncertainty (k=2) ^{Note 3}	Remarks
NVLAP Code: 20/E11 LOW FREQUENCY INDUCTANCE			
Inductance – Source Field calibrations available ^{Note 4}	100 mH	0.07 %	Fixed Inductors with Quadtech 7600
Inductance – Measure: 1 kHz Field calibrations available ^{Note 4}	10 μH to 100 H	0.07 %	Quadtech 7600

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) ^{Notes 1,2}

Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty (k=2) ^{Note 3}	Remarks
NVLAP Code: 20/E15 PHASE METERS				
AC Phase – Measure	0° to 360°	1 Hz to 1 kHz	7.2 arcseconds	Clark-Hess 5002

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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) ^{Notes 1,2}

Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty (k=2) ^{Note 3}	Remarks
AC Phase – Generate: 50 mV to < 100 V	0° to 360°	> 1 kHz to 50 kHz > 50 kHz to 200 kHz	15 arcseconds 36 arcseconds	Bridge Set
		1 Hz to 1 kHz > 1 kHz to 6.25 kHz > 6.25 kHz to 50 kHz > 50 kHz to 200 kHz	47 arcseconds 61 arcseconds 76 arcseconds 180 arcseconds	Clark-Hess 5500-2 Phase Standard
100 V to 120 V	0° to 360°	1 Hz to 1 kHz > 1 kHz to 6.25 kHz > 6.25 kHz to 50 kHz > 50 kHz to 200 kHz	61 arcseconds 94 arcseconds 133 arcseconds 340 arcseconds	Clark-Hess 5500-2 Phase Standard

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) ^{Notes 1,2}

Measured Parameter or Device Calibrated	Range	Uncertainty (k=2) ^{Note 3}	Remarks
TIME AND FREQUENCY			
NVLAP Code: 20/F01 FREQUENCY DISSEMINATION Frequency – Source and Measure Uncertainty values of derivatives of 10 MHz will differ due to resolution, noise and gating errors.	10 MHz	5.8×10^{-10} Hz	Rubidium Frequency Standard
NVLAP Code: 20/F04 PULSE WAVEFORM Rise time (Generate) Rise time (Measure)	≥ 14 ps 28 ps to 300 ps 300 ps to 5 ns 5 ns to 100 ns 100 ns	2 ps 14 % 4.7 % 1.4 % 0.73 %	Pulser Sampling System

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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) Notes 1,2

Measured Parameter or Device Calibrated	Range	Uncertainty ($k=2$) <small>Note 3</small>	Remarks
MECHANICAL			
NVLAP Code: 20/M08 MASS Mass Field calibrations available <small>Note 4</small>	8 kg	9.4 mg	Echelon III
	7 kg	8.9 mg	
	6 kg	8.5 mg	
	5 kg	7.9 mg	
	4 kg	7.5 mg	
	2 kg	4.0 mg	
	1 kg	2.6 mg	
	500 g	1.0 mg	
	200 g	0.75 mg	
	100 g	0.38 mg	
	50 g	0.17 mg	
	20 g	0.30 mg	
	10 g	0.18 mg	
	5 g	0.20 mg	
	2 g	0.18 mg	
	1 g	0.15 mg	
	500 mg	0.15 mg	
	200 mg	0.14 mg	
	100 mg	0.14 mg	
	50 mg	0.14 mg	
	20 mg	0.14 mg	
10 mg	0.16 mg		
5 mg	0.14 mg		
2 mg	0.14 mg		
1 mg	0.14 mg		
NVLAP Code: 20/M15 TORQUE Torque Measure Field calibrations available <small>Note 4</small>	10 lbf-in to 600 lbf-ft	1.0 %	CDI Torque system

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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) ^{Notes 1,2}

Measured Parameter or Device Calibrated	Range	Uncertainty ($k=2$) ^{Note 3}	Remarks
ELECTROMAGNETICS – RF/MICROWAVE			
NVLAP Code: 20/R07 HIGH FREQUENCY RESISTORS Impedance: 10 Hz to 1 MHz Field calibrations Available ^{Note 4}	1 Ω	0.059 %	Quadtech 7600 LCR Meter
	10 Ω	0.059 %	
	100 Ω	0.059 %	
	1 k Ω	0.059 %	
	10 k Ω	0.062 %	
	100 k Ω	0.19 %	

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) ^{Notes 1,2}

Measured Parameter or Device Calibrated	Remarks							
NVLAP Code: 20/R11 RF – DC VOLTAGE/ CURRENT CONVERTERS AC Voltage Flatness Relative to 1 kHz Field calibrations Available ^{Note 4}								
	Uncertainty ($k=2$) in % ^{Note 3}							
	Range							
Frequency Range	7 V	2.2 V	700 mV	220 mV	70 mV	22 mV	7 mV	2.2 mV
10 Hz	0.006	0.01	0.01	0.015	0.017	0.019	0.02	0.022
20 Hz	0.007	0.011	0.011	0.015	0.017	0.019	0.02	0.022
50 Hz	0.005	0.006	0.006	0.007	0.008	0.008	0.009	0.009
105 Hz	0.007	0.007	0.007	0.008	0.009	0.009	0.010	0.010
200 Hz	0.005	0.006	0.006	0.007	0.008	0.008	0.009	0.009
2 kHz	0.005	0.006	0.006	0.007	0.008	0.008	0.009	0.009
10 kHz	0.006	0.006	0.006	0.007	0.008	0.008	0.009	0.009
20 kHz	0.005	0.006	0.006	0.007	0.008	0.008	0.009	0.009
50 kHz	0.006	0.006	0.006	0.007	0.008	0.008	0.009	0.009

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Measured Parameter or Device Calibrated	Remarks							
NVLAP Code: 20/R11 RF – DC VOLTAGE/ CURRENT CONVERTERS AC Voltage Flatness Relative to 1 kHz Field calibrations Available ^{Note 4}								
	Uncertainty ($k=2$) in % ^{Note 3}							
	Range							
Frequency Range	7 V	2.2 V	700 mV	220 mV	70 mV	22 mV	7 mV	2.2 mV
100 kHz	0.005	0.006	0.006	0.007	0.008	0.008	0.009	0.009
200 kHz	0.006	0.006	0.006	0.007	0.008	0.008	0.009	0.009
500 kHz	0.005	0.006	0.006	0.007	0.008	0.008	0.009	0.009
700 kHz	0.011	0.012	0.012	0.013	0.014	0.014	0.015	0.016
1 MHz	0.011	0.012	0.013	0.014	0.014	0.015	0.015	0.016
1.2 MHz	0.012	0.013	0.014	0.014	0.014	0.015	0.016	0.016
2 MHz	0.014	0.015	0.016	0.016	0.016	0.017	0.018	0.018
3 MHz	0.017	0.019	0.02	0.021	0.022	0.023	0.023	0.025
4 MHz	0.019	0.02	0.022	0.022	0.023	0.024	0.024	0.025
6 MHz	0.023	0.025	0.027	0.028	0.028	0.03	0.031	0.032
8 MHz	0.028	0.029	0.031	0.032	0.032	0.034	0.034	0.036
9 MHz	0.027	0.029	0.03	0.031	0.032	0.033	0.034	0.035
10 MHz	0.026	0.029	0.031	0.030	0.031	0.032	0.033	0.035
12 MHz	0.036	0.039	0.041	0.042	0.043	0.045	0.046	0.048
15 MHz	0.037	0.04	0.042	0.042	0.043	0.046	0.047	0.049
17 MHz	0.042	0.045	0.047	0.047	0.048	0.050	0.050	0.052
20 MHz	0.045	0.048	0.051	0.052	0.054	0.057	0.059	0.061
23 MHz	0.068	0.070	0.073	0.074	0.076	0.079	0.081	0.084
26 MHz	0.083	0.084	0.087	0.09	0.093	0.096	0.098	0.10
28 MHz	0.094	0.096	0.10	0.10	0.11	0.11	0.12	0.12
30 MHz	0.11	0.11	0.11	0.11	0.12	0.12	0.12	0.13

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Measured Parameter or Device Calibrated	Range	Uncertainty ($k=2$) ^{Note 3}	Remarks
NVLAP Code: 20/R13 RF/MICROWAVE ATTENUATORS Attenuation: 2.5 MHz to 26.5 GHz	0 dB to -10 dB	0.02 dB + M	Agilent 8902 with 11793A sensor
	-10 dB to -20 dB	0.021 dB + M	
	-20 dB to -30 dB	0.025 dB + M	
	-30 dB to -40 dB	0.029 dB + M	
	-40 dB to -50 dB	0.034 dB + M	
	-50 dB to -60 dB	0.039 dB + M	
	-60 dB to -70 dB	0.043 dB + M	
	-70 dB to -80 dB	0.052 dB + M	
	-80 dB to -90 dB	0.056 dB + M	
	-90 dB to -100 dB	0.06 dB + M	
	-100 dB to -110 dB	0.12 dB + M	
	-110 dB to -120 dB	0.18 dB + M	

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) ^{Notes 1,2}

Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty ($k=2$) ^{Note 3}	Remarks
NVLAP Code: 20/R17 RF/MICROWAVE POWER METERS RF Power Field calibrations Available ^{Note 4} Total Harmonic Distortion: 50 Ω and 600 Ω AM Total Harmonic Distortion	+30 dBm to -20 dBm	100 kHz to 2.6GHz 2.6 GHz to 26.5 GHz	Where M is mismatch uncertainty at time of test. 0.11 dBm + M 0.16 dBm + M	Measuring Receiver Power Meter with sensor
	-20 dBm to -40 dBm	9 kHz to 6 GHz	0.18 dBm + M	
	0 dB	20 Hz to 100 kHz	3.1 dB	8903B
	0 dB	20 Hz to 100 kHz	3.1 dB	8903B/8902A

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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) ^{Notes 1,2}

Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty (k=2) ^{Note 3}	Remarks
Harmonic Distortion	0 dB	100 kHz to 2.9 GHz	1.7 dB	Spectrum Analyzer
		2.9 GHz to 6.5 GHz	1.9 dB	
		6.5 GHz to 13.2 GHz	2.6 dB	
		13.2 GHz to 22 GHz	3.7 dB	

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) ^{Notes 1,2}

Measured Parameter or Device Calibrated	Range	Uncertainty (k=2) ^{Note 3}	Remarks
THERMODYNAMIC			
NVLAP Code: 20/T05 PRESSURE			
Absolute Pressure Source – Pneumatic	0.2 psia to 100 psia 100 psia to 1000 psia	0.0011 % + 0.07 mpsi 0.0015 %	Ruska 2465
Gage Pressure Source – Gage	-60 inH ₂ O to +60 inH ₂ O 2 psi to 100 psi 100 psi to 1000 psi	0.0028 % + 22 μinH ₂ O 0.0011 % 0.0015 %	DHI FPG 7601 Ruska 2465
Gage Pressure Source – Hydraulic	75 psi to 3000 psi 725 psi to 30 000 psi 30 000 psi to 72 500 psi	0.0016 % 0.005 % 0.010 %	DHI PG7000
Determination of Piston Area	0.2 psia to 100 psia	0.0013 %	Ruska 2465
	100 psia to 1000 psia	0.0016 %	
	40 psia to 10 000 psia	0.0037 %	DHI 5300
Gage Pressure Source Field calibrations Available ^{Note 4}	0.5 psi to 500 psi	0.0065 %	Pressurements T2300
Hydraulic Field calibrations Available ^{Note 4}	500 psi to 15 000 psi	0.03 %	Ametek T-150

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Measured Parameter or Device Calibrated	Range	Uncertainty ($k=2$) ^{Note 3}	Remarks
NVLAP Code: 20/T07 RESISTANCE THERMOMETRY Resistance Thermometry Measure Field calibrations Available ^{Note 4}	0 °C to 50 °C 50 °C to 300 °C 300 °C to 600 °C -195 °C to 660 °C	0.007 °C 0.12 °C 0.23 °C 0.026 °C	Liquid Bath with RTD Dry Block Calibrator PRT and Hart 1575
NVLAP Code: 20/T08 THERMOCOUPLES & PYROMETER INDICATORS Isothermal Block Verification Field calibrations Available ^{Note 4}	Ambient (~ 23 °C)	0.04 °C	Thermocouple Half Junction
END			

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Notes

Note 1: A Calibration and Measurement Capability (CMC) is a description of the best result of a calibration or measurement (result with the smallest uncertainty of measurement) that is available to the laboratory's customers under normal conditions, when performing more or less routine calibrations of nearly ideal measurement standards or instruments. The CMC is described in the laboratory's scope of accreditation by: the measurement parameter/device being calibrated, the measurement range, the uncertainty associated with that range (see note 3), and remarks on additional parameters, if applicable.

Note 2: Calibration and Measurement Capabilities are traceable to the national measurement standards of the U.S. or to the national measurement standards of other countries and are thus traceable to the internationally accepted representation of the appropriate SI (Système International) unit.

Note 3: The uncertainty associated with a measurement in a CMC is an expanded uncertainty using a coverage factor, $k = 2$, with a level of confidence of approximately 95 %. Units for the measurand and its uncertainty are to match. Exceptions to this occur when marketplace practice employs mixed units, such as when the artifact to be measured is labeled in non-SI units and the uncertainty is given in SI units (Example: 5 lb weight with uncertainty given in mg).

Note 3a: The uncertainty of a specific calibration by the laboratory may be greater than the uncertainty in the CMC due to the condition and behavior of the customer's device and specific circumstances of the calibration. The uncertainties quoted do not include possible effects on the calibrated device of transportation, long term stability, or intended use.

Note 3b: As the CMC represents the best measurement results achievable under normal conditions, the accredited calibration laboratory shall not report smaller uncertainty of measurement than that given in a CMC for calibrations or measurements covered by that CMC.

Note 3c: As described in Note 1, CMCs cover calibrations and measurements that are available to the laboratory's customers under *normal conditions*. However, the laboratory may have the capability to offer special tests, employing special conditions, which yield calibration or measurement results with lower uncertainties. Such special tests are not covered by the CMCs and are outside the laboratory's scope of accreditation. In this case, NVLAP requirements for the labeling, on calibration reports, of results outside the laboratory's scope of accreditation apply. These requirements are set out in Annex A.1.h. of NIST Handbook 150, Procedures and General Requirements.

Note 4: Uncertainties associated with field service calibration may be greater as they incorporate on-site environmental contributions, transportation effects, or other factors that affect the measurements. (This note applies only if marked in the body of the scope.)

Note 5: Values listed with percent (%) are percent of reading or generated value unless otherwise noted.

Note 6: NVLAP accreditation is the formal recognition of specific calibration capabilities. Neither NVLAP nor NIST guarantee the accuracy of individual calibrations made by accredited laboratories.

Note 7: See [NIST Handbook 150](#) for further explanation of these notes.

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