



PERRY JOHNSON LABORATORY ACCREDITATION, INC.

Certificate of Accreditation

Perry Johnson Laboratory Accreditation, Inc. has assessed the Laboratory of:

Precision Instrument Correction, Inc.
933 Mariner Street, Brea, CA 92821

(Hereinafter called the Organization) and hereby declares that Organization is accredited in accordance with the recognized International Standard:

**ISO/IEC 17025:2017
& Meets the Requirements of ANSI/NCSL Z540.3-2006**

This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (as outlined by the joint ISO-ILAC-IAF Communiqué dated April 2017):

Acoustic, Chemical, Dimensional, Electrical, Mechanical, Thermodynamic, Time & Frequency, Mass, Force & Weighing Devices Calibration
(As detailed in the supplement)

Accreditation claims for such testing and/or calibration services shall only be made from addresses referenced within this certificate. This Accreditation is granted subject to the system rules governing the Accreditation referred to above, and the Organization hereby covenants with the Accreditation body's duty to observe and comply with the said rules.

For PJLA:

Tracy Szerszen
President

Initial Accreditation Date:

January 16, 2003

Issue Date:

November 22, 2023

Expiration Date:

January 31, 2026

Accreditation No.:

59282

Certificate No.:

L23-844

Perry Johnson Laboratory
Accreditation, Inc. (PJLA)
755 W. Big Beaver, Suite 1325
Troy, Michigan 48084

The validity of this certificate is maintained through ongoing assessments based on a continuous accreditation cycle. The validity of this certificate should be confirmed through the PJLA website: www.pjilabs.com



Certificate of Accreditation: Supplement

Precision Instrument Correction, Inc.

933 Mariner Street, Brea CA 92821
 Contact Name: Gregg Phone: 714-671-6018

Accreditation is granted to the facility to perform the following calibrations:

Acoustic

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (\pm)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Sound Measuring Equipment ^{FO} (125 Hz to 4000 Hz)	114 dB	0.31 dB	IET Labd, Inc. 1986 Omnical Sound Level Calibrator NA 17-20SA-21
	104 dB	0.26 dB	
	94 dB	0.27 dB	
	84 dB	0.36 dB	
	74 dB	0.71 dB	

Chemical

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (\pm)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED	
Conductivity ^{FO} -Liquid Measuring Equipment ^{FO} -Metal Measuring Equipment ^F	84 μ s/cm	0.8 μ s/cm	Certified Conductivity Reference Solutions Traceable through NIST PIC-PHEC-001	
	1 413 μ s/cm	5.0 μ s/cm		
	12 880 μ s/cm	50.0 μ s/cm		
	-Metal Measuring Equipment ^F	9.33 %IACS	0.24 %IACS	Metal Conductivity Standards BAC5651 Rev D, ASTM E1004-17 & B193, MIL-STD-1537C
		14.92 %IACS	0.33 %IACS	
		25.80 %IACS	0.29 %IACS	
		32.56 %IACS	0.36 %IACS	
		44.92 %IACS	0.36 %IACS	
	59.42 %IACS	0.47 %IACS		
	100.97 %IACS	1.00 %IACS		
Metal Conductivity Standards ^F	up to 102 %IACS	0.008 8 % + 0.11 %IACS	Conductivity Meter	
pH Meters ^{FO}	4, 7, 10 pH	0.01 pH	Certified pH Reference Solutions Traceable through NIST PIC-PHEC-001	

Dimensional

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Angle Blocks ^F	Up to 90°	0.001 3 °	Square and Angle Blocks LVDT with Amplifier Flatness Table NA 17-20MD-78
Angle Gages ^F	Up to 120°	0.000 84 °	Video Measuring System PIC-KEYE-001



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Bore Gages/Intramics ^F	0.150 in to 1.000 in 3.810 mm to 25.400 mm	(3.9 + 3.2D) μ in (99.06 + 3.20D) nm	Lab Master, Gage Blocks, Cylindrical Rings NA 17-20MD-142
	1.000 1 in to 2.000 0 in 25.402 5 mm to 50.800 mm	(5 + 2.1D) μ in (127 + 2.1D) nm	
	2.000 1 in to 3.000 0 in 50.802 5 mm to 76.200 mm	(5.6 + 1.8D) μ in (142.24 + 1.80D) nm	
	3.000 1 in to 4.000 0 in 76.202 5 mm to 101.600 mm	(8 + 1D) μ in (203.20 + 1.00D) nm	
	4.000 1 in to 5.000 0 in 101.602 5 mm to 127.00 mm	(12 + 6D) μ in (304.80 + 6.00D) nm	
	5.000 1 in to 6.000 0 in 127.002 5 mm to 152.40 mm	(8 + 2D) μ in (203.20 + 2.00D) nm	
	6.000 1 in to 7.000 0 in 152.402 5 mm to 177.80 mm	(8 + 2D) μ in (203.20 + 2.00D) nm	
	Calipers ^{FO}	up to 6 in up to 150 mm	
6.000 5 in to 12 in 150.001 mm to 300 mm		(11 + 2.8L) μ in (279.40 + 2.80L) nm	
12.000 5 in to 18 in 300.001 mm to 450 mm		(36 + 6.2L) μ in (6.20L nm) + 0.91 μ m	
18.000 5 in to 24 in 450.001 mm to 600 mm		(18 + 2.7L) μ in (2.70L nm) + 0.46 μ m	
24.000 5 in to 36 in 600.001 mm to 900 mm		(20 + 2.8L) μ in (2.80L nm) + 0.51 μ m	
36.000 5 in to 48 in 900.001 mm to 1 200 mm		(41 + 4.2L) μ in (4.20L nm) + 1.04 μ m	
48.000 5 in to 60 in 1 200.001 mm to 1 500 mm		(52 + 4.2L) μ in (4.20L nm) + 1.32 μ m	
60.000 5 in to 72 in 1 500.001 mm to 1 830 mm		(230 + 6.7L) μ in (6.70L nm) + 5.84 μ m	
Chamfer and Countersink Gages ^F	up to 3 in up to 76.2 mm	(78 + 8.2D) μ in 1.98 μ m + (8.20D) nm	Chamfer Rings T.O. 33K6-4-2732-1
Coating Thickness ^F	up to 0.060 in thick	0.032 + 0.001 5L mils	Comparison to master films NA 17-20MD-163
Concentricity Gage ^F	up to 0.050 in	12 μ in 304.81 nm	LVDT with Amplifier Master Cylinder T.O. 33K6-4-889-1
Crimpers ^F	up to 12 in	(47 + 5.3L) μ in	Video Measuring System OPTP03-ZC-2009 (GIDEP)
	up to 304.8 mm	(1.19 + 0.005L) μ m	
	0.011 in to 0.060 in	(76 + 240L) μ in	Pin Gages
	0.061 in to 0.250 in	(170 + 110L) μ in	
	0.251 in to 0.500 in	(60 + 160L) μ in	



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Depth Measuring Instruments, Gages and Micrometers ^{FO}	up to 6 in up to 150.0 mm	(22 + 1.3L) μ in (1.30L nm) + 0.56 μ m	Gage Blocks, Surface Plate PIC-DPTH-001
	6.000 1 in to 12 in 150.001 mm to 300 mm	(27 + 1.5L) μ in (1.50L nm) + 0.69 μ m	
	12.000 1 in to 18 in 300.001 mm to 450 mm	(18 + 5.2L) μ in (5.20L nm) + 0.46 μ m	
	18.000 1 in to 24 in 450.001 mm to 600 mm	(20 + 5L) μ in (5.00L nm) + 0.51 μ m	
Flatness ^{FO} - Anvils, Spindles, Gage Stands, and Gage Blocks	up to 3 in diameter up to 76.2 mm diameter	2.8 μ in 0.071 μ m	Comparison to master optical flat under monochromatic light source GIDEP
Gage Block - Length ^F	0.01 in to 0.21 in	4.7 μ in	Gage Blocks, Gage Block Comparator T.O. 33K6-4-1-1
	0.031 25 in to 4 in	(2.5 + 1.7L) μ in	
	2 in	5.7 μ in	
	3 in	7.2 μ in	
	4 in	8.9 μ in	Lab Master 175
Gage Block – Parallelism ^F	5 in to 20 in 125 mm to 500 mm	(8.8 + 1.2L) μ in (1.218L nm) + 0.224 μ m	Lab Master 175
	up to 4 in up to 100 mm	2.7 μ in 0.069 μ m	Gage Block Comparator
Gage Block – Parallelism ^F	5 in to 20 in 125 mm to 500 mm	1.6 μ in 0.04 μ m	Lab Master 175
	up to 12 in up to 304.8 mm	(47 + 5.3L) μ in (1.19 + 0.005L) μ m	Video Measuring System PIC-KEYE-001
Height Gages ^{FO} -Dial, Digital, and Vernier	up to 12 in. up to 300 mm	(26 + 1.7L) μ in (1.70L nm) + 0.66 μ m	Gage Blocks Surface Plate NA 17-20MD-17, NA 17-20MD-62
	12.000 1 in to 18 in 300.001 mm to 450 mm	(20 + 5.3L) μ in (5.30L nm) + 0.51 μ m	
	18.000 1 in to 24 in 450.001 mm to 600 mm	(20 + 5L) μ in (5.00L nm) + 0.51 μ m	
	24.000 1 in to 36 in 600.001 mm to 900 mm	(30 + 2.5L) μ in (2.50L nm) + 0.76 μ m	
	36.000 1 in to 48 in 900.001 mm to 1 200 mm	(70 + 5L) μ in (5.00L nm) + 1.78 μ m	
	48.000 1 in to 60 in 1 200.001 mm to 1 500 mm	(90 + 5L) μ in (5.00L nm) + 2.29 μ m	
	High Accuracy Height Gages ^F - Mahr DigiMar - Mitutoyo Linear Height - Tesa Micro-Hite - Tesa-Hite - Fowler Trimos	up to 12 in up to 300 mm	
	12.000 1 in to 18 in 300.001 mm to 450 mm	(8 + 2L) μ in (2.00L nm) + 0.20 μ m	
	18.000 1 in to 24 in 450.000 1 mm to 609.6 mm	(14 + 1.8L) μ in (1.80L nm) + 0.36 μ m	



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Indicators ^{FO} - Digital, Dial, Bore gages With Removable Indicator	up to 4 in up to 101.6 mm	(3.4 + 2.2L) μ in (86.36 + 2.20L) nm	Gage Blocks, PIC-DIND-001
Indicators Test ^{FO}	up to 0.05 in up to 1.25 mm	(14 + 23L) μ in (355.60 + 23.00L) nm	Calibration Teste Gage Blocks, PIC-DIND-001
Inside Measurements ^F - Cylindrical Ring Gages - Protrusion Gages - Washer Rings	0.040 in to 0.125 in 1.015 mm to 3.175 mm	4.2 μ in 0.107 μ m	LMU-175, Gage Blocks,
	0.125 in to 0.250 in 3.175 mm to 6.350 mm	4.4 μ in 0.112 μ m	
	0.250 in to 1.000 in 6.350 to mm 25.400 mm	7.1 μ in 0.180 μ m	
	1.000 1 in to 2.000 0 in 25.402 5 mm to 50.800 0 mm	9.2 μ in 0.234 μ m	
	2.000 1 in to 3.000 0 in 50.802 5 mm to 76.200 0 mm	11 μ in 0.279 μ m	
	3.000 1 in to 4.000 0 in 76.202 5 mm to 101.600 0 mm	12 μ in 0.305 μ m	
	4.000 1 in to 5.000 0 in 101.602 5 mm to 127.000 0 mm	18 μ in 0.457 μ m	
	5.000 1 in to 6.000 0 in 127.002 5 mm to 152.400 0 mm	20 μ in 0.508 μ m	
	6.000 1 in to 7.000 0 in 152.402 5 mm to 177.800 0 mm	22 μ in 0.559 μ m	
	7.000 1 in to 8.000 0 in 177.802 5 mm to 203.200 0 mm	25 μ in 0.635 μ m	
	8.000 1 in to 9.000 0 in 203.202 5 mm to 228.600 0 mm	29 μ in 0.737 μ m	
	9.000 1 in to 10.000 0 in 228.602 5 to mm 254.000 0 mm	29 μ in 0.737 μ m	
	10.000 1 in to 11.000 0 in 254.002 5 mm to 279.400 0 mm	29 μ in 0.737 μ m	
	11.000 1 in to 12.000 0 in 279.402 5 mm to 304.800 0 mm	34 μ in 0.864 μ m	
Inside / Outside Measurement ^F -Non-Contact	up to 12 in up to 304.8 mm	(47 + 5.3L) μ in (1.19 + 0.005L) μ m	Video Measuring System, PIC-KEYE-001



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Inspection Fixtures ^F -Angle Plate, Bench Center, -Cylindrical Square, Parallels, -Steel Square, V-Block -1-2-3 & 2-4-6 Block Parallelism	up to 72 in up to 1 825 mm	(37 + 0.11L) μ in (0.94 + 0.003L) μ m	Surface Plate, LVDT with Amplifier, GIDEP
Perpendicularity / Squareness	up to 24 in up to 455 mm	(50 + 6.7L) μ in (1.27 + 0.170L) μ m	Surface Plate, Granite Square, LVDT with Amplifier, GIDEP
V-Groove Parallelism	up to 12 in up to 305 mm	(37 + 8L) μ in (0.94 + 0.20L) μ m	Surface Plate, Master Cylinders, LVDT, GIDEP
Laser Micrometer ^{FO}	0.05 in to 1.00 in 1.27 mm to 25.4 mm	(3.1 + 2.3L) μ in (0.08 + 0.002L) μ m	Master Cylinders, T.O. 33K6-4-981-1
Length / Height – Fixed ^F - Caliper Checkers - Check Masters - Depth Mic Masters - Height Masters - Mic Masters - Micrometer Standards - Riser Blocks - Standard Reference Bars	1 in 25 mm 2 in 50 mm 3 in 75 mm 4 in 100 mm 5 in 125 mm 6 in 150 mm 7 in 175 mm 8 in 200 mm 9 in 225 mm 10 in 250 mm 11 in 275 mm 12 in 300 mm 16 in 400 mm 20 in 500 mm	9.2 μ in 0.23 μ m 9.2 μ in 0.23 μ m 9.2 μ in 0.23 μ m 9.2 μ in 0.23 μ m 12 μ in 0.30 μ m 12 μ in 0.30 μ m 13 μ in 0.33 μ m 13 μ in 0.33 μ m 14 μ in 0.36 μ m 13 μ in 0.33 μ m 15 μ in 0.38 μ m 14 μ in 0.36 μ m 15 μ in 0.38 μ m 17 μ in 0.43 μ m	Surface Plate, Gage Blocks and LVDT with Amplifier, GIDEP



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Length/Height -Ranged ^F - Caliper Checkers - Check Master - Depth Mic Master - Height Master - Mic Master - Micrometer Standards - Rise Blocks - Standard Reference Bars	up to 6 in	(11 + 0.8L) μ in	Surface Plate, Gage Blocks and LVDT with Amplifier, GIDEP		
	up to 155 mm	(0.80L nm) + 0.28 μ m			
	6.000 1 in to 12 in.	(11 + 0.5L) μ in			
	150.001 mm to 300 mm	(0.50L nm) + 0.28 μ m			
	12.000 1 in to 18 in	(9.6 + 1.8L) μ in			
	300.001 mm to 450 mm	(1.80L nm) + 0.24 μ m			
	18.000 1 in to 24 in	(23 + 0.33L) μ in			
	450.001 mm to 600 mm	(0.33L nm) + 0.58 μ m			
	24.000 1 in to 36 in	(26 + 0.42L) μ in			
Levels ^F up to 18 in up to 455 mm	600.001 mm to 900 mm	(0.42L nm) + 0.66 μ m	Gage Blocks & Surface Plate PIC-LEVL-001		
	36.000 1 in to 48 in	(16 + 1.2L) μ in			
	900.001 mm to 1 200 mm	(1.20L nm) + 0.41 μ m			
	48.000 1 in to 60 in	(45 + 1.7L) μ in			
	1 200.001 mm to 1 500 mm	(1.70L nm) + 1.14 μ m			
	up to 18 in	(5.8 + 3.9L) μ in			
	up to 455 mm	(147.32 + 3.90L) nm			
	Micrometers Inside ^{FO} up to 6 in up to 150 mm	6.000 1 to 12 in		(29 + 1.3L) μ in	Gage Blocks, T.O. 33K6-4-661-1
		150.001 to 300 mm		(1.30L nm) + 0.74 μ m	
12.000 1 in to 32 in		(11 + 2.8L) μ in			
300.001 mm to 800 mm		(2.80L nm) + 0.28 μ m			
32.001 in to 60 in		(25 + 3.9L) μ in			
Micrometers Outside ^{FO} up to 6 in up to 150 mm	800.001 mm to 1 525 mm	(3.90L nm) + 0.64 μ m	Gage Blocks, NA 17-20MD-06		
	6.000 1 in to 12 in	(6.1 + 1.5L) μ in			
	150.001 mm to 300 mm	(154.94 + 1.50L) nm			
	12.000 1 in to 18 in	(9.5 + 3.2L) μ in			
	300.001 mm to 450 mm	(241.30 + 3.20L) nm			
	18.000 1 in to 24 in	(7.4 + 2.7L) μ in			
	450.001 mm to 600 mm	(187.96 + 2.70L) nm			
	24.000 1 in to 30 in	(32 + 3.8L) μ in			
	600.001 mm to 750 mm	(3.80L nm) + 0.81 μ m			
	30.000 1 in to 36 in	(25 + 1.2L) μ in			
	750.001 mm to 900 mm	(1.20L nm) + 0.64 μ m			
	36.000 1 in to 42 in	(58 + 2.8L) μ in			
	900.001 mm to 1 050 mm	(2.80L nm) + 1.47 μ m			
	42.000 1 in to 48 in	(69 + 2.7L) μ in			
1 050.001 mm to 1 200 mm	(2.70L nm) + 1.75 μ m				
48.000 1 in to 54 in	(81 + 2.8L) μ in				
1 200.001 mm to 1 375 mm	(2.80L nm) + 2.06 μ m				
54.000 1 in to 60 in	(100 + 3L) μ in				
1 375.001 mm to 1 525 mm	(3.00L nm) + 2.54 μ m				
		(120 + 3.2L) μ in			
		(3.20L nm) + 3.05 μ m			



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Microscope ^{FO} -Linearity (X and Y)	up to 4 in up to 101.6 mm	(3.4 + 2.2L) μ in (86.36 + 2.20L) nm	Gage Blocks
-Angular	Up to 90 °	0.001 3 °	Angle Blocks GIDEP
Mu-Checker/Gage Amplifier and Probe ^{FO}	up to 0.05 in up to 1.25 mm	4.8 μ in 114.36 nm	Gage Blocks, T.O. 33K6-4-1021-1
Optical Comparator ^{FO} -X and Y Stage Movement	0.5 to 12 in 12.7 mm to 304.8 mm	(38 + 11L) μ in (965.20 + 11.00L) nm	Gage Blocks GIDEP
-Angularity -Squareness of X axis to Y axis - Magnification	Up to 360° (12 in of X axis travel maximum, Y axis travel maximum less than 12 in) 10X 20X 31.25X 50X 62.5X 100X	0.001 3 ° 0.025 %	True Square GIDEP Gage Blocks, Glass Scale GIDEP
Optical Flats ^F	up to 3 in diameter up to 76.2 mm diameter	2.8 μ in 0.071 μ m	Comparison to master optical flat NA 17-20ML-31
Optical Parallels ^F -Flatness	up to 3 in diameter up to 76.2 mm diameter	2.8 μ in 0.071 μ m	Comparison to master optical flat
-Parallelism	up to 3 in diameter up to 76.2 mm diameter	0.75 μ in 0.19 μ m	NA 17-20ML-31 Gage Block Comparator
Outside Measurements ^F - Cylindrical Plug Gages - Deltronic Pin Gages - Discs - Master Cylinders - Spheres (Diameter)	up to 1.000 0 in up to 25.400 0 mm 1.000 1 to 2.000 0 in 25.402 5 to 50.800 0 mm 2.000 1 to 3.000 0 in 50.802 5 to 76.200 0 mm 3.000 1 to 4.000 0 in 76.202 5 to 101.600 0 mm 4.000 1 to 5.000 0 in 101.602 5 to 127.000 0 mm 5.000 1 to 6.000 0 in 127.002 5 to 152.400 0 mm 6.000 1 to 7.000 0 in 152.402 5 to 177.800 0 mm 7.000 1 to 8.000 0 in 177.802 5 to 203.200 0 mm 8.000 1 to 9.000 0 in 203.202 5 to 228.600 0 mm 9.000 1 to 10.000 0 in 228.602 5 to 254.000 0 mm	8 μ in 0.203 μ m 9.4 μ in 0.239 μ m 11 μ in 0.279 μ m 12 μ in 0.305 μ m 18 μ in 0.457 μ m 20 μ in 0.508 μ m 22 μ in 0.559 μ m 25 μ in 0.635 μ m 27 μ in 0.686 μ m 29 μ in 0.737 μ m	LMU-175, Gage Blocks GIDEP



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Protractors ^{FO} - Bevel, Electronic, and Vernier	Up to 90°	0.001 3 °	Master Angle Blocks, GIDEP
Radius Length ^F	up to 6 in up to 152.4 mm	(47 + 5.3L) μ in (1.19 + 0.005L) μ m	Video Measuring System P119, PIC Q1 10-16
Rulers, Tape ^F	up to 12 in up to 304.8 mm 12 in to 144 in 304.8 mm to 365 7.6 mm	(47 + 5.3L) μ in (1.19 + 0.005L) μ m (180 + 19L) μ in (19.00L nm) + 4.57 μ m	Video Measuring System Gage Blocks PIC-RULE-003
Sine Bars/Plates ^F	up to 5 in up to 127 mm	(23 + 20L) μ in	Squares, Angle Blocks LVDT with Amplifier , Gage Blocks TO 33K6-4-120-1
Surface Plates ^{FO} - Flatness	up to 12 in up to 300 mm 12 in to 120 in 300 mm to 305 0 mm	23 μ in 0.58 μ m 22 μ in 0.6 μ m	LVDT with Amplifier TO 33K6-4-2696-1 Auto Collimator NA17-20MD-17
- Repeatability	0.002 in 0.05 mm	24 μ in 0.61 μ m	Repeat O Meter NA17-20MD-17
Surface Roughness Instrument Profilometer ^F	116.6 μ in Ra 2.96 μ m Ra 40 μ in Ra 1.02 μ m Ra 20 μ in Ra 0.508 μ m Ra 14.9 μ in Ra 0.378 μ m Ra	1 μ in 0.03 μ m 1 μ in 0.03 μ m 1 μ in 0.03 μ m 1 μ in 0.03 μ m	Roughness Specimen ASME B46.1-2009
Surface Roughness Patch / Specimens ^F	2 μ in Ra to 500 μ in Ra 0.050 8 μ m Ra to 127 μ m Ra	1 μ in 0.03 μ m	Profilometer with Specimens ASME B46.1- 2009
Tapered Thread Plug ^F - Major Diameter - Pitch Diameter	up to 6 in up to 150 mm up to 6 in up to 150 mm	(100.9 + 3.4D) μ in (3.43D nm) + 2.56 μ m (110.0 + 3.4D) μ in (3.43D nm) + 2.79 μ m	Lab Master 175, Thread Wires, SAE AS7105B, ASME B1.20.5-1991, ASME B1.20.1-1983, PIC-TAPR-001
Tapered Thread Ring ^F - Taper Thickness / Step Height	up to 6 in up to 150 mm up to 6 in up to 150 mm	(110.0 + 3.4D) μ in (3.34D nm) + 2.79 μ m (4.7 + 3.4L) μ in (3.43L nm) + 0.12 μ m	Gage Blocks, Master Taper Plugs, Lab Master 175, NA17-20MD-149, SAE AS7105B, ASME B1.20.5-1991,



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MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (\pm)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Thread Plug ^F - Major Diameter	up to 10 in up to 254 mm	(4.7 + 3.2D) μ m (3.16D nm) + 0.12 μ m	Lab Master 175, Gage Blocks, Thread Wires ANSI/ASME B1.16 B1.2, H28 Hdbk, GIDEP
- Pitch Diameter (127 to 4 TPI) (0.35 to 2.50 mm Pitch)	up to 10 in up to 254 mm	(41.0 + 3.2D) μ m (3.16D nm) + 1.04 μ m	
Thread Rings ^F - Pitch Diameter	up to 4.500 0 in up to 115.000 mm	(41.0 + 3.2D) μ m (3.16D nm) + 1.04 μ m	Setting Plug Gages
Thread & Gear Wires ^F	up to 1.000 0 in Diameter up to 25.400 mm Diameter	9.8 μ m 0.249 μ m	Lab Master 175, Gage Blocks, Master Cylinders, T.O. 33K6-4-119-1
Video Measuring System Keyence ^{FO}	up to 12 in	(15 + 10D) μ m	Master Cylinders

Electrical

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Equipment to Measure AC Current at the listed frequencies ^{FO}			Fluke 5700A with 5725A GIDEP Manufacturer procedures
10 Hz to 20 Hz	Up to 219.999 μ A	0.012 % + 45 nA	
20 Hz to 40 Hz	Up to 219.999 μ A	0.012 % + 31 nA	
40 Hz to 1 kHz	Up to 219.999 μ A	0.019 % + 19 nA	
1 kHz to 5 kHz	Up to 219.999 μ A	0.012 % + 21 nA	
5 kHz to 10 kHz	Up to 219.999 μ A	0.044 % + 130 nA	
Equipment to Measure AC Current at the listed frequencies ^{FO}			
10 Hz to 20 Hz	220 μ A to 2.199 99 mA	0.082 % + 66 nA	
20 Hz to 40 Hz	220 μ A to 2.199 99 mA	0.042 % + 26 nA	
40 Hz to 1 kHz	220 μ A to 2.199 99 mA	0.018 % + 38 nA	
1 kHz to 5 kHz	220 μ A to 2.199 99 mA	0.07 % + 0.5 μ A	
5 kHz to 10 kHz	220 μ A to 2.199 99 mA	0.05 % + 1.3 μ A	
Equipment to Measure AC Current at the listed frequencies ^{FO}			
10 Hz to 20 Hz	2.2 mA to 21.999 9 mA	0.082 % + 0.66 μ A	
20 Hz to 40 Hz	2.2 mA to 21.999 9 mA	0.042 % + 0.46 μ A	
40 Hz to 1 kHz	2.2 mA to 21.999 9 mA	0.017 % + 0.39 μ A	
1 kHz to 5 kHz	2.2 mA to 21.999 9 mA	0.076 % + 4.9 μ A	
5 kHz to 10 kHz	2.2 mA to 21.999 9 mA	0.2 % + 10 μ A	



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Precision Instrument Correction, Inc.

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Electrical

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Equipment to Measure AC Current at the listed frequencies ^{FO}			Fluke 5700A with 5725A GIDEP Manufacturer procedures
10 Hz to 20 Hz	22 mA to 219.999 mA	0.081 % + 7.8 μ A	
20 Hz to 40 Hz	22 mA to 219.999 mA	0.015 % + 10 μ A	
40 Hz to 1 kHz	22 mA to 219.999 mA	0.019 % + 3.9 μ A	
1 kHz to 5 kHz	22 mA to 219.999 mA	0.076 % + 49 μ A	
5 kHz to 10 kHz	22 mA to 219.999 mA	0.21 % + 98 μ A	
Equipment to Measure AC Current at the listed frequencies ^{FO}			
20 Hz to 1 kHz	220 mA to 2.2 A	0.073 % + 44 μ A	
1 kHz to 5 kHz	220 mA to 2.2 A	0.096 % + 78 μ A	
5 kHz to 10 kHz	220 mA to 2.2 A	0.99 % + 220 μ A	
Equipment to Measure AC Current at the listed frequencies ^{FO}			
40 Hz to 1 kHz	2.2 A to 11 A	0.021 % + 2.7 mA	
1 kHz to 5 kHz	2.2 A to 11 A	0.11 % + 0.1 mA	
5 kHz to 10 kHz	2.2 A to 11 A	0.18 % + 1.8 mA	
Equipment to Measure AC Current at the listed frequencies ^{FO}			
10 Hz to 20 Hz	29 μ A to 329.99 μ A	0.24 nA/A + 160 nA	
20 Hz to 45 Hz	29 μ A to 329.99 μ A	0.33 nA/A + 35 nA	
45 Hz to 1 kHz	29 μ A to 329.99 μ A	0.28 nA/A + 5.8 nA	
1 kHz to 5 kHz	29 μ A to 329.99 μ A	1.2 nA/A + 45 nA	
5 kHz to 10 kHz	29 μ A to 329.99 μ A	1.1 nA/A + 100 nA	
10 kHz to 30 kHz	29 μ A to 329.99 μ A	7.3 nA/A + 110 nA	
Equipment to Measure AC Current at the listed frequencies ^{FO}			
10 Hz to 20 Hz	330 μ A to 3.299 99 mA	4.5 μ A/A + 0.68 μ A	
20 Hz to 45 Hz	330 μ A to 3.299 99 mA	0.61 μ A/A + 6 μ A	
45 Hz to 1 kHz	330 μ A to 3.299 99 mA	0.1 μ A/A + 63 nA	
1 kHz to 5 kHz	330 μ A to 3.299 99 mA	0.13 μ A/A + 77 nA	
5 kHz to 10 kHz	330 μ A to 3.299 99 mA	0.99 μ A/A + 170 nA	
10 kHz to 30 kHz	330 μ A to 3.299 99 mA	0.54 μ A/A + 1.4 μ A	
Equipment to Measure AC Current at the listed frequencies ^{FO}			
10 Hz to 20 Hz	3.3 mA to 32.999 9 mA	0.6 μ A/A + 4.3 μ A	
20 Hz to 45 Hz	3.3 mA to 32.999 9 mA	51 nA/A + 6.1 μ A	
45 Hz to 1 kHz	3.3 mA to 32.999 9 mA	140 nA/A + 230 nA	
1 kHz to 5 kHz	3.3 mA to 32.999 9 mA	150 nA/A + 200 nA	
5 kHz to 10 kHz	3.3 mA to 32.999 9 mA	270 nA/A + 190 nA	
10 kHz to 30 kHz	3.3 mA to 32.999 9 mA	110 nA/A + 12 μ A	



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Equipment to Measure AC Current at the listed frequencies ^{FO}			Fluke 5522A GIDEP Manufacturer Procedures
10 Hz to 20 Hz	33 mA to 329.999 mA	0.63 μ A/A + 42 μ A	
20 Hz to 45 Hz	33 mA to 329.999 mA	51 nA/A + 61 μ A	
45 Hz to 1 kHz	33 mA to 329.999 mA	130 nA/A + 2 μ A	
1 kHz to 5 kHz	33 mA to 329.999 mA	170 nA/A + 0.69 μ A	
5 kHz to 10 kHz	33 mA to 329.999 mA	280 nA/A + 1.8 μ A	
10 kHz to 30 kHz	33 mA to 329.999 mA	0.68 μ A/A + 57 μ A	
Equipment to Measure AC Current at the listed frequencies ^{FO}			
10 Hz to 45 Hz	330 mA to 1.099 99 A	89 μ A	
45 Hz to 1 kHz	330 mA to 1.099 99 A	74 μ A/A + 60 μ A	
1 kHz to 5 kHz	330 mA to 1.099 99 A	2.1 mA/A + 0.61 mA	
5 kHz to 10 kHz	330 mA to 1.099 99 A	6.1 mA/A + 0.31 mA	
Equipment to Measure AC Current at the listed frequencies ^{FO}			
10 Hz to 45 Hz	1.1 A to 2.999 99 A	640 μ A	
45 Hz to 1 kHz	1.1 A to 2.999 99 A	610 μ A	
1 kHz to 5 kHz	1.1 A to 2.999 99 A	290 μ A	
5 kHz to 10 kHz	1.1 A to 2.999 99 A	0.79 mA	
Equipment to Measure AC Current at the listed frequencies ^{FO}			
45 Hz to 100 Hz	3 A to 10.999 9 A	1 mA	
100 Hz to 1 kHz	3 A to 10.999 9 A	1.2 mA	
1 kHz to 5 kHz	3 A to 10.999 9 A	180 mA	
Equipment to Measure AC Current at the listed frequencies ^{FO}			
45 Hz to 100 Hz	11 A to 20.5 A	3.5 mA	
100 Hz to 1 kHz	11 A to 20.5 A	1.8 mA	
1 kHz to 5 kHz	11 A to 20.5 A	290 mA	
Equipment to Measure AC Current for Clamp Ammeters at the listed frequencies ^{FO}			Fluke 5522A with 5550A Coil GIDEP Manufacturer procedures
50 Hz to 400 Hz	20 A to 149.9 A	0.06 % + 0.1 A	
50 Hz to 400 Hz	150 A to 1 050 A	0.052 % + 0.88 A	
Equipment to Output AC Current at the listed frequencies ^{FO}			Keysight 3458A, option 002 GIDEP Manufacturer procedures
10 Hz to 20 Hz	Up to 100 μ A	0.033 % + 400 nA	
20 Hz to 45 Hz	Up to 100 μ A	0.033 % + 150 nA	
45 Hz to 100 Hz	Up to 100 μ A	0.03 % + 60 nA	
100 Hz to 5 kHz	Up to 100 μ A	0.009 8 % + 4.2 nA	



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Equipment to Output AC Current at the listed frequencies ^{FO}			Keysight 3458A, option 002 GIDEP Manufacturer procedures
10 Hz to 20 Hz	100 μ A to 1 mA	0.022 % + 4 μ A	
20 Hz to 45 Hz	100 μ A to 1 mA	0.022 % + 1.5 μ A	
45 Hz to 100 Hz	100 μ A to 1 mA	0.019 % + 0.61 μ A	
100 Hz to 5 kHz	100 μ A to 1 mA	0.021 % + 0.6 μ A	
5 kHz to 20 kHz	100 μ A to 1 mA	0.02 % + 0.61 μ A	
20 kHz to 50 kHz	100 μ A to 1 mA	0.044 % + 4 μ A	
50 kHz to 100 kHz	100 μ A to 1 mA	0.14 % + 5.6 μ A	
Equipment to Output AC Current at the listed frequencies ^{FO}			Keysight 3458A, option 002 GIDEP Manufacturer procedures
10 Hz to 20 Hz	1 mA to 10 mA	0.022 % + 40 μ A	
20 Hz to 45 Hz	1 mA to 10 mA	0.022 % + 15 μ A	
45 Hz to 100 Hz	1 mA to 10 mA	0.024 % + 6 μ A	
100 Hz to 5 kHz	1 mA to 10 mA	0.019 % + 0.02 μ A	
5 kHz to 20 kHz	1 mA to 10 mA	0.024 % + 6 μ A	
20 kHz to 50 kHz	1 mA to 10 mA	0.044 % + 40 μ A	
50 kHz to 100 kHz	1 mA to 10 mA	0.14 % + 56 μ A	
Equipment to Output AC Current at the listed frequencies ^{FO}			
10 Hz to 20 Hz	10 mA to 100 mA	0.022 % + 400 μ A	
20 Hz to 45 Hz	10 mA to 100 mA	0.022 % + 150 μ A	
45 Hz to 100 Hz	10 mA to 100 mA	0.02 % + 60 μ A	
100 Hz to 5 kHz	10 mA to 100 mA	0.053 % + 3.4 μ A	
5 kHz to 20 kHz	10 mA to 100 mA	0.02 % + 60 μ A	
20 kHz to 50 kHz	10 mA to 100 mA	0.044 % + 400 μ A	
50 kHz to 100 kHz	10 mA to 100 mA	0.14 % + 560 μ A	
Equipment to Output AC Current at the listed frequencies ^{FO}			
10 Hz to 20 Hz	100 mA to 1 A	0.022 % + 4 μ A	
20 Hz to 45 Hz	100 mA to 1 A	0.022 % + 1.6 μ A	
45 Hz to 100 Hz	100 mA to 1 A	0.02 % + 0.8 μ A	
100 Hz to 5 kHz	100 mA to 1 A	0.02 % + 9 μ A	
5 kHz to 20 kHz	100 mA to 1 A	0.3 % + 200 μ A	
20 kHz to 50 kHz	100 mA to 1 A	0.4 % + 400 μ A	



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Equipment to Output AC Current at the listed frequencies ^{FO}			Keysight 34465A
3 Hz to 5 kHz	1 A to 3 A	40 μ A/A + 0.12 mA	
5 kHz to 10 kHz	1 A to 3 A	0.3 mA/A + 0.6 mA	
Equipment to Output AC Current at the listed frequencies ^{FO}			
3 Hz to 5 kHz	3 A to 10 A	0.83 mA/A + 6 mA	
5 kHz to 10 kHz	3 A to 10 A	1.5 mA/A + 4 mA	
Equipment to Measure AC Current at the listed frequencies ^{FO}			Keysight 3458A current shunts GIDEP
40 Hz to 1 kHz	1 A to 50 A	2.67 mA/A + 8.99 mA	
40 Hz to 1 kHz	1 A to 100 A	0.42 mA/A + 3.61 mA	
Equipment to Measure AC Current at the listed frequencies ^{FO}			Keysight 34465A current shunts GIDEP
10 Hz to 20 kHz	1 A to 50 A	3.6 mA/A + 9.44 mA	
10 Hz to 20 kHz	1 A to 100 A	1.6 mA/A + 33.75 mA	
Equipment to Measure AC Phase ^{FO}			Fluke 5522A GIDEP
10 Hz to 65 Hz	Up to 360 °	0.017 °	
65 Hz to 500 Hz	Up to 360 °	0.04 °	
500 Hz to 1 kHz	Up to 360 °	0.059 °	
1 kHz to 5 kHz	Up to 360 °	0.36 °	
5 kHz to 10 kHz	Up to 360 °	0.68 °	
10 kHz to 30 kHz	Up to 360 °	1.7 °	
Equipment to Measure AC Voltage at the listed frequencies ^{FO}			Fluke 5700A with 5725A GIDEP
10 Hz to 20 Hz	Up to 2.199 999 mV	56 nV/V + 1.1 μ V	
20 Hz to 40 Hz	Up to 2.199 999 mV	0.33 μ V/V + 0.93 μ V	
40 Hz to 20 kHz	Up to 2.199 999 mV	0.64 μ V/V + 1.8 μ V	
20 kHz to 50 kHz	Up to 2.199 999 mV	0.83 μ V/V + 0.83 μ V	
50 kHz to 100 kHz	Up to 2.199 999 mV	0.48 % + 0.24 μ V	
100 kHz to 300 kHz	Up to 2.199 999 mV	0.96 % + 0.78 μ V	
300 kHz to 500 kHz	Up to 2.199 999 mV	0.86 % + 3.8 μ V	
500 kHz to 1 MHz	Up to 2.199 999 mV	0.61 % + 4.9 μ V	
Equipment to Measure AC Voltage at the listed frequencies ^{FO}			
10 Hz to 20 Hz	2.2 mV to 21.999 99 mV	10 μ V	
20 Hz to 40 Hz	2.2 mV to 21.999 99 mV	3.6 μ V	
40 Hz to 20 kHz	2.2 mV to 21.999 99 mV	2.5 μ V	
20 kHz to 50 kHz	2.2 mV to 21.999 99 mV	7.4 μ V	



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Equipment to Measure AC Voltage at the listed frequencies ^{FO}			Fluke 5700A with 5725A GIDEP
50 kHz to 100 kHz	2.2 mV to 21.999 99 mV	11 μ V	
100 kHz to 300 kHz	2.2 mV to 21.999 99 mV	5.6 μ V	
300 kHz to 500 kHz	2.2 mV to 21.999 99 mV	28 μ V	
500 kHz to 1 MHz	2.2 mV to 21.999 99 mV	83 μ V	
Equipment to Measure AC Voltage at the listed frequencies ^{FO}			
10 Hz to 20 Hz	22 mV to 219.999 9 mV	100 μ V	
20 Hz to 40 Hz	22 mV to 219.999 9 mV	25 μ V	
40 Hz to 20 kHz	22 mV to 219.999 9 mV	9.7 μ V	
20 kHz to 50 kHz	22 mV to 219.999 9 mV	6.4 μ V	
50 kHz to 100 kHz	22 mV to 219.999 9 mV	12 μ V	
100 kHz to 300 kHz	22 mV to 219.999 9 mV	42 μ V	
300 kHz to 500 kHz	22 mV to 219.999 9 mV	130 μ V	
500 kHz to 1 MHz	22 mV to 219.999 9 mV	200 μ V	
Equipment to Measure AC Voltage at the listed frequencies ^{FO}			
10 Hz to 20 Hz	220 mV to 2.199 999 V	1.1 mV	
20 Hz to 40 Hz	220 mV to 2.199 999 V	0.29 mV	
40 Hz to 20 kHz	220 mV to 2.199 999 V	29 μ V/V + 4.5 μ V	
20 kHz to 50 kHz	220 mV to 2.199 999 V	19 μ V/V + 9 μ V	
50 kHz to 100 kHz	220 mV to 2.199 999 V	7.3 μ V/V + 58 μ V	
100 kHz to 300 kHz	220 mV to 2.199 999 V	0.019 % + 33 μ V	
300 kHz to 500 kHz	220 mV to 2.199 999 V	0.041 % + 85 μ V	
500 kHz to 1 MHz	220 mV to 2.199 999 V	0.15 % + 130 μ V	
Equipment to Measure AC Voltage at the listed frequencies ^{FO}			Fluke 5700A with 5725A GIDEP
10 Hz to 20 Hz	2.2 V to 21.999 99 V	11 mV	
20 Hz to 40 Hz	2.2 V to 21.999 99 V	3.2 mV	
40 Hz to 20 kHz	2.2 V to 21.999 99 V	1.1 mV	
20 kHz to 50 kHz	2.2 V to 21.999 99 V	0.51 mV	
50 kHz to 100 kHz	2.2 V to 21.999 99 V	0.59 mV	
100 kHz to 300 kHz	2.2 V to 21.999 99 V	1.7 mV	
300 kHz to 500 kHz	2.2 V to 21.999 99 V	7.3 mV	
500 kHz to 1 MHz	2.2 V to 21.999 99 V	14 mV	



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Equipment to Measure AC Voltage at the listed frequencies ^{FO}			Fluke 5700A with 5725A GIDEP
10 Hz to 20 Hz	22 V to 219.999 9 V	110 mV	
20 Hz to 40 Hz	22 V to 219.999 9 V	40 mV	
40 Hz to 20 kHz	22 V to 219.999 9 V	20 mV	
20 kHz to 50 kHz	22 V to 219.999 9 V	13 mV	
50 kHz to 100 kHz	22 V to 219.999 9 V	16 mV	
100 kHz to 300 kHz	22 V to 219.999 9 V	16 mV	
300 kHz to 500 kHz	22 V to 219.999 9 V	61 mV	
500 kHz to 1 MHz	22 V to 219.999 9 V	63 mV	
Equipment to Measure AC Voltage at the listed frequencies ^{FO}			
30 kHz to 50 kHz	220 V to 750 V	600 μ V/V	
50 kHz to 100 kHz	220 V to 750 V	670 μ V/V + 1 V	
Equipment to Measure AC Voltage at the listed frequencies ^{FO}			
40 Hz to 1 kHz	220 V to 1 100 V	90 μ V/V + 1 mV	
1 kHz to 20 kHz	220 V to 1 100 V	170 μ V/V + 1 mV	
20 kHz to 30 kHz	220 V to 1 100 V	610 μ V/V + 3 mV	
Equipment to Measure AC Voltage at the listed frequencies ^{FO}			Fluke 5522A GIDEP
45 Hz to 1 kHz	33 V to 329.999 V	85 μ V/V + 5.6 mV	
1 kHz to 10 kHz	33 V to 329.999 V	82 μ V/V + 8.3 mV	
10 kHz to 20 kHz	33 V to 329.999 V	150 μ V/V + 6.1 mV	
20 kHz to 50 kHz	33 V to 329.999 V	130 μ V/V + 1 mV	
50 kHz to 100 kHz	33 V to 329.999 V	730 μ V/V + 16 mV	
Equipment to Measure AC Voltage at the listed frequencies ^{FO}			
45 Hz to 1 kHz	330 V to 1 020 V	60 μ V/V + 8.2 mV	
1 kHz to 5 kHz	330 V to 1 020 V	27 μ V/V + 6.1 mV	
5 kHz to 10 kHz	330 V to 1 020 V	48 μ V/V + 69 mV	
Equipment to Output AC Voltage at the listed frequencies ^{FO}			Keysight 3458A GIDEP AC Band \leq 2 MHz
1 Hz to 40 Hz	Up to 10 mV	0.03 % + 3 μ V	
40 Hz to 1 kHz	Up to 10 mV	0.02 % + 1.1 μ V	
1 kHz to 20 kHz	Up to 10 mV	0.03 % + 1.1 μ V	
20 kHz to 50 kHz	Up to 10 mV	0.099 % + 1.1 μ V	
50 kHz to 100 kHz	Up to 10 mV	0.5 % + 1.1 μ V	
100 kHz to 300 kHz	Up to 10 mV	4 % + 2 μ V	



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Equipment to Output AC Voltage at the listed frequencies ^{FO}			AC Band \geq 2 MHz
100 kHz to 1 MHz	Up to 10 mV	1.3 % + 4.9 μ V	
1 MHz to 4 MHz	Up to 10 mV	7.1 % + 4.9 μ V	
4 MHz to 8 MHz	Up to 10 mV	20 % + 8 μ V	
Equipment to Output AC Voltage at the listed frequencies ^{FO}			Keysight 3458A GIDEP AC Band \leq 2 MHz
1 Hz to 40 Hz	10 mV to 100 mV	0.007 % + 4 μ V	
40 Hz to 1 kHz	10 mV to 100 mV	0.007 % + 2 μ V	
1 kHz to 20 kHz	10 mV to 100 mV	0.014 % + 2 μ V	
20 kHz to 50 kHz	10 mV to 100 mV	0.03 % + 2 μ V	
50 kHz to 100 kHz	10 mV to 100 mV	0.08 % + 2 μ V	
100 kHz to 300 kHz	10 mV to 100 mV	0.3 % + 10 μ V	
300 kHz to 1 MHz	10 mV to 100 mV	0.067 % + 260 μ V	
1 MHz to 2 MHz	10 mV to 100 mV	1.5 % + 10 μ V	
1 MHz to 4 MHz	10 mV to 100 mV	1.4 % + 120 μ V	
4 MHz to 8 MHz	10 mV to 100 mV	0.24 % + 0.86 mV	
8 MHz to 10 MHz	10 mV to 100 mV	15 % + 0.1 mV	
Equipment to Output AC Voltage at the listed frequencies ^{FO}			
1 Hz to 40 Hz	100 mV to 1 V	0.007 % + 0.04 mV	
40 Hz to 1 kHz	100 mV to 1 V	0.0014 % + 23 μ V	
1 kHz to 20 kHz	100 mV to 1 V	0.002 % + 6.1 μ V	
20 kHz to 50 kHz	100 mV to 1 V	0.017 % + 13 μ V	
50 kHz to 100 kHz	100 mV to 1 V	0.027 % + 22 μ V	
100 kHz to 300 kHz	100 mV to 1 V	0.16 % + 140 μ V	
300 kHz to 1 MHz	100 mV to 1 V	0.66 % + 0.56 mV	
1 MHz to 2 MHz	100 mV to 1 V	0.68 % + 0.33 mV	
1 MHz to 4 MHz	100 mV to 1 V	1.4 % + 1.1 mV	
4 MHz to 8 MHz	100 mV to 1 V	0.97 % + 0.33 mV	
8 MHz to 10 MHz	100 mV to 1 V	3.6 % + 2.6 mV	
Equipment to Output AC Voltage at the listed frequencies ^{FO}			AC Band \leq 2 MHz
1 Hz to 40 Hz	1 V to 10 V	0.007 % + 0.4 mV	
40 Hz to 1 kHz	1 V to 10 V	0.013 % + 89 μ V	
1 kHz to 20 kHz	1 V to 10 V	0.0036 % + 1 μ V	
20 kHz to 50 kHz	1 V to 10 V	0.013 % + 99 μ V	
50 kHz to 100 kHz	1 V to 10 V	0.018 % + 10 μ V	
100 kHz to 300 kHz	1 V to 10 V	0.17 % + 100 μ V	



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Equipment to Output AC Voltage at the listed frequencies ^{FO}			AC Band \leq 2 MHz
300 kHz to 1 MHz	1 V to 10 V	0.46 % + 3.1 mV	AC Band \geq 2 MHz
1 MHz to 2 MHz	1 V to 10 V	1.2 % + 6 mV	
1 MHz to 4 MHz	1 V to 10 V	2.6 % + 20 mV	
4 MHz to 8 MHz	1 V to 10 V	0.95 % + 3.5 mV	
8 MHz to 10 MHz	1 V to 10 V	1.6 % + 17 mV	
Equipment to Output AC Voltage at the listed frequencies ^{FO}			AC Band \leq 2 MHz
1 Hz to 40 Hz	10 V to 100 V	0.02 % + 4 mV	
40 Hz to 1 kHz	10 V to 100 V	7.8 μ V/V + 1.1 mV	
1 kHz to 20 kHz	10 V to 100 V	78 μ V/V + 0.52 mV	
20 kHz to 50 kHz	10 V to 100 V	0.016 % + 1.1 mV	
50 kHz to 100 kHz	10 V to 100 V	0.093 % + 7.3 mV	
100 kHz to 300 kHz	10 V to 100 V	0.077 % + 9.3 mV	
300 kHz to 1 MHz	10 V to 100 V	1.5 % + 10 mV	Keysight 3458A GIDEP AC Band \leq 2 MHz
Equipment to Output AC Voltage at the listed frequencies ^{FO}			
1 Hz to 40 Hz	100 V to 1 000 V	0.04 % + 40 mV	
40 Hz to 1 kHz	100 V to 1 000 V	0.059 % + 50 mV	
1 kHz to 20 kHz	100 V to 1 000 V	0.12 % + 100 mV	
20 kHz to 50 kHz	100 V to 1 000 V	0.12 % + 99 mV	
50 kHz to 100 kHz	100 V to 1 000 V	0.3 % + 20 mV	
Equipment to Output AC Voltage at the listed frequencies ^{FO}			Vitrek 4700
50 Hz to 400 Hz	100 V to 10 000 V	64 μ V/V + 260 mV	
50 Hz to 400 Hz	1 000 V to 50 000 V	0.7 mV/V + 180 mV	Vitrek 4700, Vitrek HVL-70
Equipment to Measure Capacitance – Ranged ^{FO}			Fluke 5522A
10 Hz to 10 kHz	220 pF to 399.9 pF	0.12 % + 840 fF	
10 Hz to 10 kHz	0.4 nF to 1.099 9 nF	0.77 pF/F + 2.1 pF	
10 Hz to 3 kHz	1.1 nF to 3.299 9 nF	0.83 pF/F + 1.1 pF	
10 Hz to 1 kHz	3.3 nF to 10.999 9 nF	0.5 pF/F + 2.8 pF	
10 Hz to 1 kHz	11 nF to 32.999 9 nF	56 fF/F + 44 pF	
10 Hz to 1 kHz	33 nF to 109.999 nF	0.72 pF/F + 18 pF	
10 Hz to 1 kHz	110 nF to 329.999 nF	1.2 pF/F + 0.1 pF	
10 Hz to 600 Hz	0.33 μ F to 1.099 99 μ F	0.44 nF/F + 0.33 nF	
10 Hz to 300 Hz	1.1 μ F to 3.299 99 μ F	1 nF/F + 0.3 nF	
10 Hz to 150 Hz	3.3 μ F to 10.999 9 μ F	1.3 nF/F + 2 nF	
10 Hz to 120 Hz	11 μ F to 32.999 9 μ F	3.3 nF/F + 43 nF	



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Equipment to Measure Capacitance – Ranged ^{FO}			Fluke 5522A
10 Hz to 80 Hz	33 μ F to 109.999 μ F	1.5 nF/F + 23 nF	
Up to 50 Hz	110 μ F to 329.999 μ F	5 nF/F + 0.64 μ F	
Up to 20 Hz	0.33 mF to 1.099 9 mF	1.8 μ F/F + 0.61 μ F	
Up to 6 Hz	1.1 mF to 3.299 99 mF	1.7 μ F/F + 1.3 μ F	
Up to 2 Hz	3.3 mF to 10.999 9 mF	1.8 μ F/F + 3.6 μ F	
Up to 0.6 Hz	11 mF to 32.999 9 mF	1.8 μ F/F + 13 μ F	
Up to 0.2 Hz	33 mF to 110 mF	1.6 μ F/F + 44 μ F	
Equipment to Output Capacitance – Ranged ^{FO}			Keysight E4980AL
(20 Hz to 300 kHz)	1 pF to 1 mF	0.082 % + 4.8 pF	
Equipment to Measure DC Current ^{FO}	Up to 220 μ A	35 pA/A + 13 nA	Fluke 5700A GIDEP
	220 μ A to 2.2 mA	110 nA/A + 19 nA	
	2.2 mA to 22 mA	14 nA/A + 140 nA	
	22 mA to 220 mA	23 nA/A + 460 nA	
	220 mA to 2.2 A	42 μ A/A + 17 μ A	
	2.2 A to 11 A	500 μ A/A + 400 μ A	
	Up to 329.999 μ A	9.1 pA/A + 2.2 nA	Fluke 5522A GIDEP
	330 μ A to 3.299 99 mA	13 nA/A + 18 nA	
	3.3 mA to 32.999 9 mA	12 nA/A + 140 nA	
	33 mA to 329.999 mA	27 nA/A + 1.1 μ A	
330 mA to 1.099 99 A	9.2 μ A/A + 30 μ A		
1.1 A to 2.999 99 A	56 μ A/A + 34 μ A		
3 A to 10.999 9 A	50 μ A/A + 220 μ A		
11 A to 20.5 A	170 μ A/A + 1.1 mA		
Equipment to Measure DC Current for Clamp Ammeters ^{FO}	20 A to 149.9 A	0.27 % + 0.01 A	Fluke 5522A/ with 5500A COIL GIDEP
	150 A to 1 050 A	0.25 % + 0.1 A	



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Equipment to Output DC Current ^{FO}	Up to 100 nA	13 μ A/A + 11 pA	Keysight 3458A option 2
	100 nA to 1 μ A	1.7 μ A/A + 6.2 pA	
	1 μ A to 10 μ A	0.95 μ A/A + 39 pA	
	10 μ A to 100 μ A	0.91 fA/A + 340 pA	
	100 μ A to 1 mA	1 μ A/A + 5.4 nA	
	1 mA to 10 mA	1.7 μ A/A + 61 nA	
	10 mA to 100 mA	2.9 μ A/A + 390 nA	
	100 mA to 1 A	10 μ A/A + 97 μ A	
	1 A to 50 A	2.67 mA/A + 0.82 mA	Fluke 3458A current shunts
	1 A to 100 A	0.42 mA/A + 5.3 mA	
	1 A to 500 A	0.28 mA/A + 0.8 mA	GIDEP
	1 A to 3 A	260 μ A/A + 130 μ A	Keysight 34465A
	3 A to 10 A	160 μ A/A + 500 μ A	
	1 A to 50 A	3.6 mA/A + 0.75 mA	Keysight 34465A current Shunts GIDEP
	1 A to 100 A	1.6 mA/A + 1.69 mA	
1 A to 500 A	0.36 mA/A + 7.5 mA		
Equipment to Measure DC Voltage ^{FO}	Up to 220 mV	12 μ V/V + 470 nV	Fluke 5700A GIDEP
	220 mV to 2.2 V	6.4 μ V/V + 1.5 μ V	
	2.2 V to 11 V	1.8 μ V/V + 2.8 μ V	
	11 V to 22 V	1 μ V/V + 22 μ V	
	22 V to 220 V	3.3 μ V/V + 180 μ V	
	220 V to 1 100 V	5.2 μ V/V + 70 μ V	
	Up to 329.999 9 mV	1.8 μ V/V + 1 μ V	Fluke 5522A GIDEP
	330 mV to 3.299 999 V	3.1 μ V/V + 2.7 μ V	
	3.3 V to 32.999 99 V	4.1 μ V/V + 36 μ V	
	33 V to 329.999 9 V	2.9 μ V/V + 360 μ V	
330 V to 1 020 V	1.2 μ V/V + 4.6 mV		
Equipment to Output DC Voltage ^{FO}	Up to 100 mV	2 μ V/V + 2.2 μ V	Keysight 3458A, option 002 GIDEP
	100 mV to 1 V	20 nV/V + 280 nV	
	1 V to 10 V	1.3 μ V/V + 680 nV	
	10 V to 100 V	1.7 μ V/V + 12 μ V	
	100 V to 1 000 V	4.3 μ V/V + 740 μ V	
	100 V to 10 000 V	140 μ V/V + 57 mV	Vitrek 4700
	1 000 V to 70 000 V	180 μ V/V + 5.7 V	Vitrek 4700, Vitrek HVL-70



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Equipment to Measure Inductance Fixed Point ^{FO}	100 mH	0.13 mH	Keysight E4980AL/Inductor GIDEP Vitretek 4700, Vitrek HVL-70
Equipment to Measure Resistance Fixed Points 4 – Wire ^{FO}	0.001 Ω	22 $\mu\Omega$	Standard Resistors, Keysight 3458A, option 002 GIDEP
	0.01 Ω	22 $\mu\Omega$	
	0.1 Ω	25 $\mu\Omega$	
	1 Ω	71 $\mu\Omega$	
	10 Ω	74 $\mu\Omega$	
	100 Ω	180 $\mu\Omega$	
	1 k Ω	3.1 m Ω	
	10 k Ω	73 m Ω	
	100 k Ω	72 m Ω	
	1 M Ω	7.1 Ω	
	10 M Ω	370 Ω	
Equipment to Measure Resistance Fixed Points ^{FO}	0 Ω	6.8 $\mu\Omega$	Fluke 5700A GIDEP
	1 Ω	120 $\mu\Omega$	
	1.9 Ω	240 $\mu\Omega$	
	10 Ω	380 $\mu\Omega$	
	19 Ω	420 $\mu\Omega$	
	100 Ω	530 $\mu\Omega$	
	190 Ω	860 $\mu\Omega$	
	1 k Ω	14 m Ω	
	1.9 k Ω	4.8 m Ω	
	10 k Ω	36 m Ω	
	19 k Ω	77 m Ω	
	100 k Ω	250 m Ω	
	190 k Ω	670 m Ω	
	1 M Ω	5.1 Ω	
	1.9 M Ω	9.1 Ω	
	10 M Ω	140 Ω	
	19 M Ω	370 Ω	
100 M Ω	7.4 k Ω		



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Equipment to Measure Resistance Fixed Points ^{FO} 1 k Ω to 10 k Ω Decade	1 k Ω	3.4 m Ω	IET HRRS-F-9-1k-5kV-WT GIDEP
	2 k Ω	6.9 m Ω	
	3 k Ω	11 m Ω	
	4 k Ω	16 m Ω	
	5 k Ω	22 m Ω	
	6 k Ω	28 m Ω	
	7 k Ω	35 m Ω	
	8 k Ω	42 m Ω	
	9 k Ω	50 m Ω	
	10 k Ω	58 m Ω	
Equipment to Measure Resistance Fixed Points ^{FO} 10 k Ω to 100 k Ω Decade	10 k Ω	30 m Ω	
	20 k Ω	50 m Ω	
	30 k Ω	68 m Ω	
	40 k Ω	86 m Ω	
	50 k Ω	100 m Ω	
	60 k Ω	120 m Ω	
	70 k Ω	140 m Ω	
	80 k Ω	160 m Ω	
	90 k Ω	180 m Ω	
	100 k Ω	200 m Ω	
Equipment to Measure Resistance Fixed Points ^{FO} 100 k Ω to 1 000 k Ω Decade	100 k Ω	88 m Ω	
	200 k Ω	1.8 Ω	
	300 k Ω	3.1 Ω	
	400 k Ω	4.5 Ω	
	500 k Ω	6.0 Ω	
	600 k Ω	7.6 Ω	
	700 k Ω	9.3 Ω	
	800 k Ω	11 Ω	
	900 k Ω	13 Ω	
	1 000 k Ω	15 Ω	



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Equipment to Measure Resistance Fixed Points ^{FO} 1 M Ω to 10 M Ω Decade	1 M Ω	7.5 Ω	IET HRRS-F-9-1k-5kV-WT GIDE
	2 M Ω	100 Ω	
	3 M Ω	170 Ω	
	4 M Ω	240 Ω	
	5 M Ω	320 Ω	
	6 M Ω	410 Ω	
	7 M Ω	500 Ω	
	8 M Ω	600 Ω	
	9 M Ω	700 Ω	
	10 M Ω	810 Ω	
Equipment to Measure Resistance Fixed Points ^{FO} 10 M Ω to 100 M Ω Decade	10 M Ω	33 Ω	
	20 M Ω	74 Ω	
	30 M Ω	120 Ω	
	40 M Ω	180 Ω	
	50 M Ω	240 Ω	
	60 M Ω	310 Ω	
	70 M Ω	390 Ω	
	80 M Ω	470 Ω	
	90 M Ω	560 Ω	
	100 M Ω	650 Ω	
Equipment to Measure Resistance Fixed Points ^{FO} 100 M Ω to 1 000 M Ω Decade	100 M Ω	520 Ω	
	200 M Ω	1.2 k Ω	
	300 M Ω	2 k Ω	
	400 M Ω	2.9 k Ω	
	500 M Ω	3.9 k Ω	
	600 M Ω	5 k Ω	
	700 M Ω	6.2 k Ω	
	800 M Ω	7.5 k Ω	
	900 M Ω	8.6 k Ω	
	1 000 M Ω	10 k Ω	



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Equipment to Measure Resistance Fixed Points ^{FO} 1 G Ω to 10 G Ω Decade	1 G Ω	5.4 k Ω	IET HRRS-F-9-1k-5kV- WT GIDE
	2 G Ω	12 k Ω	
	3 G Ω	20 k Ω	
	4 G Ω	29 k Ω	
	5 G Ω	39 k Ω	
	6 G Ω	47 k Ω	
	7 G Ω	59 k Ω	
	8 G Ω	72 k Ω	
	9 G Ω	86 k Ω	
	10 G Ω	100 k Ω	
Equipment to Measure Resistance Fixed Points ^{FO} 10 G Ω to 100 G Ω Decade	10 G Ω	580 k Ω	IET HRRS-F-9-1k-5kV- WT GIDEP
	20 G Ω	830 k Ω	
	30 G Ω	1 M Ω	
	40 G Ω	1.2 M Ω	
	50 G Ω	1.4 M Ω	
	60 G Ω	1.5 M Ω	
	70 G Ω	1.6 M Ω	
	80 G Ω	1.8 M Ω	
	90 G Ω	1.9 M Ω	
	100 G Ω	2.1 M Ω	
Equipment to Measure Resistance Fixed Points ^{FO} 100 G Ω to 1 000 G Ω Decade	100 G Ω	0.78 M Ω	
	200 G Ω	1.4 M Ω	
	300 G Ω	2.2 M Ω	
	400 G Ω	3.1 M Ω	
	500 G Ω	4.1 M Ω	
	600 G Ω	5.2 M Ω	
	700 G Ω	6.4 M Ω	
	800 G Ω	7.6 M Ω	
	900 G Ω	8.9 M Ω	
	1 000 G Ω	10 M Ω	



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Equipment to Measure Resistance Variable ^{FO}	Up to 10.999 9 Ω	9 $\mu\Omega/\Omega$ + 22 $\mu\Omega$	Fluke 5522A GIDEP
	11 Ω to 32.999 9 Ω	11 $\mu\Omega/\Omega$ + 31 $\mu\Omega$	
	33 Ω to 109.999 9 Ω	11 $\mu\Omega/\Omega$ + 130 $\mu\Omega$	
	110 Ω to 329.999 9 Ω	7.7 $\mu\Omega/\Omega$ + 180 $\mu\Omega$	
	330 Ω to 1.099 99 k Ω	3.7 $\mu\Omega/\Omega$ + 3 m Ω	
	1.1 k Ω to 3.299 99 k Ω	44 $\mu\Omega/\Omega$ + 34 m Ω	
	3.3 k Ω to 10.999 9 k Ω	14 $\mu\Omega/\Omega$ + 39 m Ω	
	11 k Ω to 32.999 99 k Ω	20 $\mu\Omega/\Omega$ + 78 m Ω	
	33 k Ω to 109.999 9 k Ω	14 $\mu\Omega/\Omega$ + 38 m Ω	
	110 k Ω to 329.999 9 k Ω	29 $\mu\Omega/\Omega$ + 1.7 Ω	
	330 k Ω to 1.099 999 M Ω	9.1 $\mu\Omega/\Omega$ + 2.1 Ω	
	1.1 M Ω to 3.299 999 M Ω	30 $\mu\Omega/\Omega$ + 17 Ω	
	3.3 M Ω to 10.999 99 M Ω	120 $\mu\Omega/\Omega$ + 340 Ω	
	11 M Ω to 32.999 99 M Ω	100 $\mu\Omega/\Omega$ + 340 Ω	
	33 M Ω to 109.999 9 M Ω	170 $\mu\Omega/\Omega$ + 2.3 k Ω	
	110 M Ω to 329.999 9 M Ω	400 $\mu\Omega/\Omega$ + 21 k Ω	
330 M Ω to 1 100 M Ω	2.3 m Ω/Ω + 480 k Ω		
Equipment to Output Resistance ^{FO}	Up to 10 Ω	0.67 $\mu\Omega/\Omega$ + 21 $\mu\Omega$	Keysight 3458A GIDEP
	10 Ω to 100 Ω	0.8 $\mu\Omega/\Omega$ + 80 $\mu\Omega$	
	100 Ω to 1 k Ω	3.1 $\mu\Omega/\Omega$ + 140 $\mu\Omega$	
	1 k Ω to 10 k Ω	2.9 $\mu\Omega/\Omega$ + 100 $\mu\Omega$	
	10 k Ω to 100 k Ω	600 n Ω/Ω + 28 m Ω	
	100 k Ω to 1 M Ω	7 $\mu\Omega/\Omega$ + 430 m Ω	
	1 M Ω to 10 M Ω	38 $\mu\Omega/\Omega$ + 24 Ω	
	10 M Ω to 100 M Ω	170 $\mu\Omega/\Omega$ + 1.1 k Ω	
	100 M Ω to 1 G Ω	1.4 m Ω/Ω + 91 k Ω	



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Oscilloscopes ^{FO}			Fluke 5522A/SC1100 GIDEP
AC Square Wave Signal Into 1 M Ω	1.0 mVpp to 130 Vpp	210 μ V/V + 12 μ V	
Into 50 Ω	1.0 mVpp to 6.6 Vpp	0.11 % + 7.1 μ V	
AC Square Wave Frequency	10 Hz to 10 kHz	120 μ Hz/Hz + 1.8 μ Hz	
DC Signal Into 1 M Ω	up to \pm 130 V	40 μ V/V + 33 μ V	
Into 50 Ω	up to \pm 6.6 V	0.2 % + 33 μ V	
Edge - Aberrations	within 2 ns from 50 % of rising edge	<(3 % of output + 2 mV)	
	2 ns to 5 ns	<(2 % of output + 2 mV)	
	5 ns to 15 ns	<(1 % of output + 2 mV)	
	after 15 ns	<(0.5 % of output + 2 mV)	
Edge - Amplitude Range	5 mVpp to 2.5 Vpp	0.35 % + 58 μ V	
Edge - Frequency Range	1 kHz to 10 MHz	53 mHz/Hz + 0.014 mHz	
Edge - Rise Time	1 kHz to 10 MHz (24 to 350) ps	13 ps	
Level Sine Wave Amplitude (5 mV to 5.5 V)	50 kHz Reference	0.42 % + 37 μ V	
	50 kHz to 100 MHz	3.6 % + 120 μ V	
	100 MHz to 300 MHz	4 % + 140 μ V	
	300 MHz to 600 MHz	6 % + 240 μ V	
	600 MHz to 1 100 MHz	7 % + 290 μ V	
(5 mV to 3.5 V) Flatness	50 kHz to 100 MHz	1.5% + 100 μ V	
	100 MHz to 300 MHz	2% + 100 μ V	
	300 MHz to 600 MHz	4% + 100 μ V	
(5 mV to 3.5 V) Frequency Range	600 MHz to 1 100 MHz	5% + 100 μ V	
	50 kHz to 1 100 MHz	51 mHz/Hz + 0.11 mHz	
Time Marker	1 ns to 5 ns	56 as/s + 30 as	
	10 ns	640 as	
	20 ns to 50 ns	73 as/s + 33 as	
	100 ns to 20 ms	85 ps/s + 6 ps	
	50 ms to 5 s	17 μ s/s + 33 μ s	



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Soldering Irons/Stations ^{FO}	120 °C to 1 000 °C	0.26 °C	Fluke 5522A Thermocouple K Input PIC-SS-102
	248 °F to 1 832 °F	0.47 °F	
Temperature Calibration, Equipment to Measure Thermocouple ^F			Ectron 1140A , SPRT with Readout and Ice Bath GIDEP
Type E	-175 °C to 950 °C	0.029 °C	
	-283 °F to 1 742 °F	0.053 °F	
Type K	-200 °C to 1 200 °C	0.037 °C	
	-328 °F to 2 192 °F	0.066 °F	
Type J	-105 °C to 1 100 °C	0.039 °C	
	-157 °F to 2 012 °F	0.070 °F	
Type N	-175 °C to 1 000 °C	0.051 °C	
	-283 °F to 1 832 °F	0.092 °F	
Type T	-135 °C to 300 °C	0.045 °C	
	-211 °F to 572 °F	0.082 °F	
Temperature Calibration, Equipment Simulate Thermocouple ^F			Ectron 1140A , SPRT with Readout and Ice Bath GIDEP
Type E	-175 °C to 950 °C	0.016 °C	
	-283 °F to 1 742 °F	0.029 °F	
Type K	-200 °C to 1 200 °C	0.031 °C	
	-328 °F to 2 192 °F	0.056 °F	
Type J	-105 °C to 1 100 °C	0.021 °C	
	-157 °F to 2 012 °F	0.038 °F	
Type N	-175 °C to 1 000 °C	0.041 °C	
	-283 °F to 1 832 °F	0.073 °F	
Type T	-135 °C to 300 °C	0.036 °C	
	-211 °F to 572 °F	0.065 °F	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type B ^{FO}	250 °C to 350 °C	0.95 °C	Electrical Simulation of Thermocouple Output (Ectron 1140A) GIDEP
	350 °C to 445 °C	0.74 °C	
	450 °C to 580 °C	0.58 °C	
	580 °C to 750 °C	0.45 °C	
	750 °C to 1 000 °C	0.37 °C	
	1 000 °C to 1 820 °C	0.29 °C	



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Temperature Calibration, Indication and Control Equipment used with Thermocouple Type C ^{FO}	Up to 250 °C	0.20 °C	Electrical Simulation of Thermocouple Output (Ectron 1140A) GIDEP
	250 °C to 1 000 °C	0.16 °C	
	1 000 °C to 1 500 °C	0.18 °C	
	1 500 °C to 1 800 °C	0.21 °C	
	1 800 °C to 2 000 °C	0.23 °C	
	2 000 °C to 2 250 °C	0.29 °C	
	2 250 °C to 2 315.6 °C	0.32 °C	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type E ^{FO}	-270 °C to -245 °C	1.20 °C	
	-245 °C to -195 °C	0.18 °C	
	-195 °C to -155 °C	0.10 °C	
	-155 °C to -90 °C	0.08 °C	
	-90 °C to 15 °C	0.07 °C	
	15 °C to 890 °C	0.06 °C	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type J ^{FO}	890 °C to 1 000 °C	0.07 °C	
	-210 °C to -180 °C	0.12 °C	
	-180 °C to -120 °C	0.10 °C	
	-120 °C to -50 °C	0.08 °C	
	-50 °C to 990 °C	0.07 °C	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type K ^{FO}	990 °C to 1 200 °C	0.07 °C	
	-270 °C to -255 °C	2.20 °C	
	-255 °C to -195 °C	0.70 °C	
	-195 °C to -115 °C	0.12 °C	
	-115 °C to -55 °C	0.09 °C	
	-55 °C to 1 000 °C	0.07 °C	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type N ^{FO}	1 000 °C to 1 372 °C	0.08 °C	Electrical Simulation of Thermocouple Output (Ectron 1140A) GIDEP
	-270 °C to -260 °C	5 °C	
	-260 °C to -200 °C	1 °C	
	-200 °C to -140 °C	0.23 °C	
	-140 °C to -70 °C	0.15 °C	
	-70 °C to 25 °C	0.12 °C	
	25 °C to 160 °C	0.10 °C	
160 °C to 1 300 °C	0.09 °C		



Certificate of Accreditation: Supplement

Precision Instrument Correction, Inc.

933 Mariner Street, Brea CA 92821
 Contact Name: Gregg Phone: 714-671-6018

Accreditation is granted to the facility to perform the following calibrations:

Electrical

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (\pm)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type R ^{FO}	-50 °C to -30 °C	0.65 °C	Electrical Simulation of Thermocouple Output (Ectron 1140A) GIDEP
	-30 °C to 45 °C	0.55 °C	
	45 °C to 160 °C	0.40 °C	
	160 °C to 380 °C	0.30 °C	
	380 °C to 775 °C	0.26 °C	
	775 °C to 1 768.1 °C	0.22 °C	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type S ^{FO}	-50 °C to -30 °C	0.62 °C	
	-30 °C to 45 °C	0.56 °C	
	45 °C to 105 °C	0.40 °C	
	105 °C to 310 °C	0.33 °C	
	310 °C to 615 °C	0.29 °C	
	615 °C to 1 768.1 °C	0.26 °C	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type T ^{FO}	-270 °C to -255 °C	1.80 °C	
	-255 °C to -240 °C	0.49 °C	
	-240 °C to -210 °C	0.30 °C	
	-210 °C to -150 °C	0.18 °C	
	-150 °C to -40 °C	0.12 °C	
	-40 °C to 100 °C	0.08 °C	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type L ^{FO}	-200 °C to -100 °C	0.37 °C	Electronic Simulation of Thermocouple Fluke 5522A GIDEP
	-100 °C to 800 °C	0.26 °C	
	800 °C to 900 °C	0.17 °C	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type U ^{FO}	-200 °C to 0 °C	0.56 °C	
	Up to 600 °C	0.27 °C	
Temperature Calibration, Indication and Control Equipment used with RTD Type Pt 385, 100 Ω ^{FO}	-200 °C to -80 °C	0.05 °C	Electronic Simulation of RTD Fluke 5522A GIDEP
	-80 °C to 0 °C	0.05 °C	
	Up to 100 °C	0.07 °C	
	100 °C to 300 °C	0.09 °C	
	300 °C to 400 °C	0.10 °C	
	400 °C to 630 °C	0.12 °C	
	630 °C to 800 °C	0.23 °C	



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Temperature Calibration, Indication and Control Equipment used with RTD Type Pt 3916, 100 Ω ^{FO}	-200 °C to -190 °C	0.25 °C	Electronic Simulation of RTD Fluke 5522A GIDEP
	-190 °C to -80 °C	0.04 °C	
	-80 °C to 0 °C	0.05 °C	
	Up to 100 °C	0.06 °C	
	100 °C to 260 °C	0.07 °C	
	260 °C to 300 °C	0.08 °C	
	300 °C to 400 °C	0.09 °C	
	400 °C to 600 °C	0.10 °C	
Temperature Calibration, Indication and Control Equipment used with RTD Type Pt 3926, 100 Ω ^{FO}	-200 °C to -80 °C	0.05 °C	
	-80 °C to 0 °C	0.05 °C	
	Up to 100 °C	0.07 °C	
	100°C to 300 °C	0.09 °C	
	300 °C to 400 °C	0.10 °C	
	400 °C to 630°C	0.12 °C	
Temperature Calibration, Indication and Control Equipment used with RTD Type Pt 385, 200 Ω ^{FO}	-200 °C to -80 °C	0.04 °C	
	-80 °C to 0 °C	0.04 °C	
	Up to 100 °C	0.04 °C	
	100 °C to 260 °C	0.05 °C	
	260 °C to 300 °C	0.12 °C	
	300 °C to 400 °C	0.13 °C	
	400 °C to 600 °C	0.14 °C	
Temperature Calibration, Indication and Control Equipment used with RTD Type Pt 385, 500 Ω ^{FO}	-200 °C to -80 °C	0.04 °C	
	-80 °C to 0 °C	0.05 °C	
	Up to 100 °C	0.05 °C	
	100 °C to 260 °C	0.06 °C	
	260 °C to 300 °C	0.08 °C	
	300 °C to 400 °C	0.08 °C	
	400 °C to 600 °C	0.09 °C	
	600 °C to 630 °C	0.11 °C	



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Temperature Calibration, Indication and Control Equipment used with RTD Type Pt 385, 1000 Ω ^{FO}	-200 °C to -80 °C	0.03 °C	Electronic Simulation of RTD Fluke 5522A GIDEP
	-80 °C to 0 °C	0.03 °C	
	Up to 100 °C	0.04 °C	
	100 °C to 260 °C	0.05 °C	
	260 °C to 300 °C	0.06 °C	
	300 °C to 400 °C	0.07 °C	
	400 °C to 600 °C	0.07 °C	
Temperature Calibration, Indication and Control Equipment used with RTD Type PtNi, 120 Ω ^{FO}	-80 °C to 0 °C	0.08 °C	
	Up to 100 °C	0.08 °C	
	100 °C to 260 °C	0.14 °C	
Temperature Calibration, Indication and Control Equipment used with RTD Type Cu 427, 10 Ω ^{FO}	-100 °C to 260 °C	0.30 °C	
Welders ^{FO} AC Voltage (10 Hz to 20 kHz) AC Current (10 Hz to 20 kHz) DC Voltage DC Current	up to 750 V	0.37 mV/V + 340 mV	Keysight 34465A, Current Shunt GIDEP
	up to 100 A	0.42 mA/A + 160 mA	
	up to 1 000 V	400 nV/V + 5 mV	
	up to 500 A	0.36 mA/A + 7.5 mA	
Wrist Strap/Footwear and Workstation Monitors ^{FO}	675 k Ω	1.7 k Ω	Calibration Unit Desco 07010 and Charleswater 99090 33K1-4-2338-1
	825 k Ω	2 k Ω	
	8.5 M Ω	1.1 k Ω	
	11.5 M Ω	29 k Ω	
	35 M Ω	140 k Ω	
	40 M Ω	140 k Ω	
	80 M Ω	660 k Ω	
	120 M Ω	2.2 M Ω	



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Mechanical

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Durometers ^F Spring Force Types: A, B, O	up to 750 gf	0.02 % + 0.12 gf	ASTM D2240 Weight Scale
Types: C, D	up to 4 100 gf	0.005 % + 0.5 gf	Weight Scale
Types: CF	up to 10 000 gf	0.006 4 % + 0.36 gf	Weight Scale
Types: OO, OOO	up to 2 610 gf	0.01 % + 0.19 gf	Weight Scale
Types: M	up to 2 610 gf	0.01 % + 0.19 gf	Weight Scale
Indentor Length ^F	up to 1 in	(47 + 5.3L) μ in	Video Measuring System
Indirect Verification of Leeb Hardness Testers ^{FO}	HLD 170 HLD to 960 HLD	9.7 HLD	ASTM A956 and calibrated Leeb Hardness Test Blocks
Indirect Verification of Rockwell Hardness Testers ^{FO} - HRA	20 HRA to 70 HRA	0.55 HRA	ASTM E18 and calibrated Rockwell Hardness Test Blocks
	70.01 HRA to 79 HRA	0.48 HRA	
	79.01 HRA to 84 HRA	0.41 HRA	
- HRB	40 HRB to 60 HRB	1.58 HRB	
	60.01 HRB to 88 HRB	1.05 HRB	
	88.01 HRB to 100 HRB	1.05 HRB	
- HRC	20 HRC to 35 HRC	0.77 HRC	
	35.01 HRC to 60 HRC	0.53 HRC	
	60.01 HRC to 71 HRC	0.43 HRC	
- HRE	70 HRE to 84 HRE	1.01 HRE	
	84.01 HRE to 93 HRE	1.02 HRE	
	93.01 HRE to 150 HRE	1.00 HRE	
- HR15N	70 HR15N to 78 HR15N	0.63 HR15N	
	78.01 HR15N to 90 HR15N	0.61 HR15N	
	90.01 HR15N to 92 HR15N	0.61 HR15N	
Indirect Verification of Rockwell Hardness Testers ^{FO} HR30N	40 HR30N to 55 HRN30	1.01 HR30N	ASTM E18 and calibrated Rockwell Hardness Test Blocks
	55.01 HR30N to 77 HR30N	0.75 HR30N	
	77.01 HR30N to 82 HR30N	0.62 HR30N	
HR45N	20 HR45N to 37 HRN45N	1.04 HR45N	
	37.01 HR45N to 66 HR45N	1.01 HR45N	
	66.01 HR45N to 72 HR45N	0.65 HR45N	



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HR15T W	74 HR15T to 79 HR15T	1.02 HR15T	ASTM E18 and calibrated Rockwell Hardness Test Blocks
	79.01 HR15T to 85 HR15T	1.02 HR15T	
	85.01 HR15T to 93 HR15T	1.07 HR15T	
HR30T	42 HR30T to 57 HR30T	1.03 HR30T	
	57.01 HR30T to 70 HR30T	1.02 HR30T	
	70.01 HR30T to 87 HR30T	1.05 HR30T	
HR45T	13 HR45T to 33 HR45T	1.02 HR45T	
	33.01 HR45T to 53 HR45T	1.05 HR45T	
	53.01 HR45T to 73 HR45T	1.01 HR45T	
Pressure ^{FO} Measuring and Sourcing Devices	-10 inH ₂ O to 10 inH ₂ O	0.022 % + 0.016 in.H ₂ O	
	-15 psi to 30 psi -30 inHg to 60 inHg	0.011 % + 0.005 2 psi 0.011 % + 0.011 in.Hg	Additel ADT681-02-CP30
	Up to 100 psi	0.001 2 % + 0.027 psi	Additel ADT681-02-GP100
	-12 psi to 300 psi -24.4 inHg to 610 inHg	0.029 % + 0.016 psi 0.029 % + 0.033 in.Hg	Fluke 2700G-BG2M
	-15 psi to 500 psi -30 inHg to 1 018 inHg	0.096 % + 0.044 psi 0.096 % + 0.090 in.Hg	Omega DPG4000-500
	Up to 1 000 psi	0.015 % + 0.12 psi	Additel ADT681-02-GP1K
	Up to 3 000 psi	0.017 % + 0.22 psi	Fluke 2700G-G20M
	Up to 5 000 psi	0.001 % + 0.43 psi	Additel ADT681-02-GP5K
	Up to 10 000 psi	0.018 % + 0.34 psi	Fluke 2700G-G70M
	Up to 30 000 psi	0.007 5 % + 6.9 psi	Additel ADT681-10-GP30K
	- 60 to 60 in.H ₂ O	0.002 9 % + 0.000 25 in.H ₂ O	Ruska 7252i
	Up to 300 psi	0.008 7 % + 0.000 1 psi	Fluke 2700G-G20M
	0.2 to 25 psi	0.001 1 % of rdg + 0.000 01 psi	Ruska 2465
	2 to 1 000 psi	0.001 7 % of rdg + 0.000 06 psi	
	100 psi to 3 000 psi	0.003 6 % of rdg + 0.000 02 psi	Ruska 2470
	90 psi to 40 000 psi	0.007 % of Reading	DH-Budenberg CPB3800HP
Torque Measuring Equipment ^F Transducers, Tester, and Analyzer	up to 10 lbf·in	0.011 % + 0.002 4 lbf·in	Torque Wheel/Arm 2.5, 5, 10 & 40 in with Weights, GIDEP
	5 lbf·in to 100 lbf·in	0.01 % + 0.004 8 lbf·in	
	100 lbf·in to 3 000 lbf·in	0.011 % + 0.011 lbf·in	
	200 lbf·ft to 2 000 lbf·ft	0.089 % + 0.13 lbf·ft	



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Mechanical

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Torque Sourcing Equipment ^{FO} Wrenches, Watches, Drivers and Multipliers	8 ozf·in to 80 ozf·in	0.093 % Reading + 0.021 ozf·in	Mountz BMX80z GIDEP
	5 lbf·in to 50 lbf·in	0.053 % of Reading + 0.02 lbf·in	Mountz BMX50i
	5 lbf·in to 100 lbf·in	0.52 % of Reading + 0.012 lbf·in	Larson UTWCS
	25 lbf·in to 250 lbf·in	0.32 % of Reading + 0.13 lbf·in	Mountz BMX250i
	25 lbf·in to 500 lbf·in	0.32 % of Reading + 0.21 lbf·in	Larson UTWCS
	150 lbf·in to 3 000 lbf·in	0.12 % of Reading + 1.4 lbf·in	Larson UTWCS
	25 lbf·ft to 250 lbf·ft	0.061 % of Reading + 0.047 lbf·ft	AWS QCMF-250
	75 lbf·ft to 750 lbf·ft	0.27 % of Reading + 0.048 lbf·ft	AWS TT-QC-750F
200 lbf·ft to 2 000 lbf·ft	0.22 % of Reading + 0.23 lbf·ft	AWS QCMF-2000	

Thermodynamic

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (\pm)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Infrared Temperature ^F Measuring Instruments	-15 °C to 120 °C	0.015 % + 0.25 °C	Fluke 4180
	35 °C to 500 °C	0.13 % + 0.16 °C	Fluke 4181 GIDEP
Oven/Chamber Temperature Uniformity Measure ^{FO}	32 °F to 1 800 °F	0.045 % + 1.1 °F	Fluke 1586A w/ Type K Thermocouple GIDEP/AMS2750
	32 °F to 1 400 °F	0.086 % + 0.6 °F	Fluke 1586A w/ Type K Thermocouple GIDEP/AMS2750
Temperature and Humidity Measuring instruments ^{FO}	-70 °C to 180 °C	0.085 °C	Vaisala M170/HMP77 GIDEP
	-94 °F to 356 °F	0.153 °F	
	10 % RH to 95 % RH	0.763 % RH	
Temperature Measuring Instruments ^{FO} Glass, Bi-Metallic, & Electronic Thermometers, Temperature Probes	Fixed Point 0 °C	0.005 7 °C	Fluke 1594A w/ SPRT and Ice Bath
	-80 °C to 20 °C	0.002 % + 0.005 4 °C	Fluke 1594A w/ SPRT, Baths, and Field Metrology Well GIDEP
	25 °C to 150 °C	0.001 6 % + 0.018 °C	
	25 °C to 250 °C	0.001 7 % + 0.004 8 °C	
	50 °C to 660 °C	0.015 % + 0.031 °C	
Temperature Sourcing Instruments ^{FO} Temperature Bath, Dry Well Calibrators	-197 °C to 660 °C	0.001 3 % + 0.002 6 °C	Fluke 1594A w/SPRT
	-197 °C to 660 °C	0.005 2 % + 0.029 °C	Fluke 1502A w/SPRT GIDEP
Thermocouple Probes and Wires ^F Types E, J, K, N, T	-80 °C to 0 °C	0.16 °C	Temperature Baths, Ectron 1140A Fluke 1594A w/SPRT, and Field Metrology Well
	Up to 150 °C	0.13 °C	
	25 °C to 250 °C	0.12 °C	
	50 °C to 660 °C	0.013 % + 0.13 °C	



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Time and Frequency

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Equipment to Measure and Source Frequency ^{FO}	1 μ Hz to 30 MHz	98 nHz/Hz + 0.9 μ Hz	Keysight 33519B
	1 Hz to 10 MHz	1.2 μ Hz/Hz + 84 μ Hz	HP 3458A
	0.1 Hz to 225 MHz	310 pHz/Hz + 0.79 mHz	Agilent 53181A Counter
	100 MHz to 3 GHz	370 pHz/Hz + 1 mHz	
Stop Watches/Timer ^{FO}	up to 24 hrs	0.062 s / 24 h	Time Base Method
	up to 86 400 s	0.000 21 sec/hr + 0.33 sec	Photo Totalize Method NIST 960-12
	up to 86 400 s	0.001 1 sec/hr + 0.46 sec	Direct Comparison
Tachometer – Contact ^F	10 RPM to 50 000 RPM	0.002 2 % + 0.011 RPM	Ideal Aerosmith
Tachometer - Non-Contact ^{FO}	up to 99 999 RPM	0.006 %	Generator with LED

Mass, Force, and Weighing Devices

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (\pm)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Force Gauge/Load Cell-Tension & Compression Measuring and Sourcing Devices ^{FO}	up to 10 gf	0.42 mgf/gf + 1.5 mgf	Class 3 Standard Weights GIDEP
	10 gf to 100 gf	0.011 mgf/gf + 1.9 mgf	
	100 gf to 500 gf	0.023 mgf/gf + 0.6 mgf	
	1 lbf to 10 lbf	0.006 1 ozf/lbf + 0.013 ozf	NIST Class F Weights
	10 lbf to 50 lbf	0.000 8 ozf/lbf + 0.066 ozf	
	up to 300 lbf	0.001 5 % + 0.001 8 lbf	Load Cell with Indicator
	up to 1 000 lbf	0.001 5 % + 0.005 8 lbf	
	up to 5 000 lbf	0.001 4 % + 0.015 lbf	
up to 10 000 lbf	0.001 3 % + 0.028 lbf		
Weights Non-Classified Weights ^{FO} (Ranged)	1 mg to 5 g	3.2 μ g/g + 6.8 μ g	Direct Reading Method Sartorius MC 5 GIDEP
	1 g to 220 g	1.5 μ g/g + 19 μ g	Comparison Method Mettler Toledo XP205
	200 g to 10 000 g	4.3 μ g/g + 8.7 mg	Comparison Method A&D, MC-10K
	10 000 g to 34 000 g	98 μ g/g + 54 mg	Comparison Method
Weights Non-Classified Weights ^{FO} (Fixed)	10 g	0.028 mg	Comparison Method Mettler Toledo XP205
	20 g	0.051 mg	
	30 g	0.067 mg	
	50 g	0.057 mg	
	100 g	0.08 mg	
	200 g	0.22 mg	



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Mass, Force, and Weighing Devices

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Weights Non-Classified Weights ^{FO} (Fixed)	300 g	2.5 mg	Comparison Method A&D, MC-10K
	500 g	2.5 mg	
	1 kg	2.8 mg	
	2 kg	4.8 mg	Comparison Method A&D, MC-10K GIDEP
	4 kg	5.6 mg	
	5 kg	5.8 mg	Comparison Method A&D, MC-10K GIDEP
	10 kg	9 mg	
	20 kg	220 mg	Comparison Method Mettler Toledo PM34-K

Mass, Force, and Weighing Devices

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Analytical and Precision Balance & Scales ^{FO}	1 mg	1.5 μ g	Ultra and Class 1 Standard Weight GIDEP
	10 mg	24 μ g	
	20 mg	3.2 μ g	
	50 mg	7.6 μ g	
	100 mg	1.2 μ g	
	200 mg	1.4 μ g	
	500 mg	1.7 μ g	
	1 g	6 μ g	
	2 g	6.9 μ g	
	3 g	6.3 μ g	
	5 g	7 μ g	
	10 g	10 μ g	
	20 g	16 μ g	
	30 g	45 μ g	
	50 g	26 μ g	
	100 g	55 μ g	
	200 g	0.19 mg	
	300 g	0.16 mg	
	500 g	0.3 mg	
	1 kg	0.57 mg	
2 kg	1 mg		
4 kg	2.2 mg		



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Analytical and Precision Balance & Scales ^{FO}	5 kg	2.7 mg	Ultra and Class 1 Standard Weight GIDEP
	10 kg	5.3 mg	
	20 kg	10 mg	
Floor and Bench Scales ^{FO}	0.001 lb to 1 lb	$(1.90 \times 10^{-6} + 1.40 \times 10^{-4} \text{ Wt}) \text{ lbs}$	NIST Class F Weights GIDEP
	1 lb to 10 lb	$(1.30 \times 10^{-4} + 8.90 \times 10^{-6} \text{ Wt}) \text{ lbs}$	
	10 lb to 50 lb	$(1.60 \times 10^{-3} + 2.50 \times 10^{-6} \text{ Wt}) \text{ lbs}$	
	50 lb to 100 lb	$(9.50 \times 10^{-4} + 1.50 \times 10^{-5} \text{ Wt}) \text{ lbs}$	
	100 lb to 200 lb	$(1.20 \times 10^{-2} + 1.30 \times 10^{-4} \text{ Wt}) \text{ lbs}$	
	200 lb to 500 lb	$(2.00 \times 10^{-3} + 6.00 \times 10^{-5} \text{ Wt}) \text{ lbs}$	
	500 lb to 1 000 lb	$(1.90 \times 10^{-2} + 2.60 \times 10^{-5} \text{ Wt}) \text{ lbs}$	
	1 000 lb to 1 500 lb	$(1.90 \times 10^{-2} + 2.60 \times 10^{-5} \text{ Wt}) \text{ lbs}$	
	1 500 lb to 2 000 lb	$(2.00 \times 10^{-3} + 2.00 \times 10^{-5} \text{ Wt}) \text{ lbs}$	

1. The CMC (Calibration and Measurement Capability) stated for calibrations included on this scope of accreditation represents the smallest measurement uncertainty attainable by the laboratory when performing a more or less routine calibration of a nearly ideal device under nearly ideal conditions. It is typically expressed at a confidence level of 95 % using a coverage factor k (usually equal to 2). The actual measurement uncertainty associated with a specific calibration performed by the laboratory will typically be larger than the CMC for the same calibration since capability and performance of the device being calibrated and the conditions related to the calibration may reasonably be expected to deviate from ideal to some degree.
2. The laboratories range of calibration capability for all disciplines for which they are accredited is the interval from the smallest calibrated standard to the largest calibrated standard used in performing the calibration. The low end of this range must be an attainable value for which the laboratory has or has access to the standard referenced. Verification of an indicated value of zero in the absence of a standard is common practice in the procedure for many calibrations but by its definition it does not constitute calibration of zero capacity.
3. The presence of a superscript F means that the laboratory performs calibration of the indicated parameter at its fixed location.
4. The presence of a superscript FO means that the laboratory performs calibration of the indicated parameter both at its fixed location and onsite at customer locations.
5. Measurement uncertainties obtained for calibrations performed at customer sites can be expected to be larger than the measurement uncertainties obtained at the laboratories fixed location for similar calibrations. This is due to the effects of transportation of the standards and equipment and upon environmental conditions at the customer site which are typically not controlled as closely as at the laboratories fixed location.
6. The term L represents length in inches or millimeters as appropriate to the uncertainty statement



Certificate of Accreditation: Supplement

Precision Instrument Correction, Inc.

933 Mariner Street, Brea CA 92821

Contact Name: Gregg Phone: 714-671-6018

Accreditation is granted to the facility to perform the following calibrations:

7. The term "X" preceded by a number represents the number of times a lense system magnifies an image relative to its actual size. CMC stated as "% of magnification" represents the CMC of magnification expressed as a percentage of the total magnification.
8. The term D represents diameter in inches or millimeters as appropriate to the uncertainty statement.
9. The term Wt represents weight in pounds or grams (including SI multiple and submultiple units) appropriate to the uncertainty statement.
10. The term T represents torque in N•m (including SI multiple and submultiple units) for the international system of units (the SI) or ozf•in, lbf•in and lbf•ft for the USC system of units.

