



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
& ANSI/NCSI 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

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

<i>Initial Accreditation Date:</i>	<i>Issue Date:</i>	<i>Expiration Date:</i>
January 16, 2003	October 4, 2021	December 31, 2023
<i>Revision Date:</i>	<i>Accreditation No.:</i>	<i>Certificate No.:</i>
October 7, 2022	59282	L21-589-R1

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 Losonsky 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	0.28 dB	IET Labs, Inc. 1986 Omnical Sound Level Calibrator NA 17-20SA-21
	104 dB	0.65 dB	
	94 dB	0.56 dB	
	84 dB	0.72 dB	
	74 dB	0.85 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 Meters ^{FO}	4.66 μ s/cm	0.62 μ s/cm	Certified Conductivity Reference Solutions Traceable through NIST PIC-PHEC-001
	999 μ s/cm	4.6 μ s/cm	
	1 440 μ s/cm	4.6 μ s/cm	
	9 980 μ s/cm	40 μ s/cm	
	99 835 μ s/cm	360 μ s/cm	
pH Meters ^{FO}	4, 7, 10 pH	0.01 pH	Certified pH Reference Solutions Traceable through NIST PIC-PHEC-001

Dimensional

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
Angle Blocks ^F	0° to 90°	0.001 °	Square and Angle Blocks LVDT with Amplifier Flatness Table NA 17-20MD-78
Angle Gages ^F	0° to 120°	0.000 84°	Video Measuring System PIC-KEYE-001
Angle Blocks ^F	90° to 18 inches (90° to 457.2 mm)	190 μ in (4.83 μ m)	LVDT with Amplifier Surface Plate NA 17-20MD-78
Bench Center ^F Center Parallelism Base Flatness	Up to 24 inches [Up to 609.6 mm]	(5.6 + 4.8L) μ in [(0.14 + 0.12) μ m]	Square and Angle Blocks LVDT with Amplifier Surface Plate T.O. 33K6-4-1219-1



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Bore Gages/Intramics ^F	0.15 in to 0.825 in (3.81 mm to 20.955 mm)	(7.6 + 4.8D) μ in [(0.19 + 0.12D) μ m]	Lab Master, Gage Blocks, Cylindrical Rings NA 17-20MD-142
	0.826 in to 1.510 in (20.98 mm to 38.354 mm)	(7.6 + 0.45D) μ in [(0.19 + 0.01D) μ m]	
	1.511 in to 2.510 in (38.379 mm to 63.754 mm)	(4.5 + 0.3D) μ in [(0.11 + 0.008D) μ m]	
	2.511 in to 4.510 in (63.779 mm to 114.554 mm)	(2.9 + 0.043D) μ in [(0.07 + 0.001D) μ m]	
	4.511 in to 6.510 in (114.579 mm to 165.354 mm)	(9 + 4D) μ in [(0.23 + 0.1D) μ m]	
	6.511 in to 7.000 in (165.379 mm to 177.8 mm)	(25 + 5.3D) μ in [(0.64 + 0.13D) μ m]	
Calipers ^{FO}	up to 6 in (up to 152.4 mm)	(3.6 + 1.9L) μ in [(0.09 + 0.05L) μ m]	Gage Blocks, NA 17-20MD-07
	6.000 5 in to 12 in (152.41 mm to 304.8 mm)	(3.3 + 0.8L) μ in [(0.08 + 0.02L) μ m]	
	12.000 5 in to 18 in (304.81 mm to 457.2 mm)	(20 + 1.5L) μ in [(0.51 + 0.038L) μ m]	
	18.0005 in to 24 in (457.21 mm to 609.6 mm)	(23 + 1.3L) μ in [(0.58 + 0.03L) μ m]	
	24.000 5 in to 36 in (609.6 mm to 914.4 mm)	(20 + 1.8L) μ in [(0.51 + 0.05L) μ m]	
	36.000 5 in to 48 in (914.41 mm to 1219.2mm)	(10 + 1.8L) μ in [(0.25 + 0.05L) μ m]	
	48.0005 in to 60 in (1219.21 mm to 1524 mm)	(24 + 2L) μ in [(0.61 + 0.06L) μ m]	
	60.000 5 in to 72 in (1524.1 mm to 1828.8 mm)	(18 + 1.7L) μ in [(0.46 + 0.04L) μ m]	
Chamfer and Countersink Gages ^F	up to 6 in (up to 152 mm)	29 μ in (0.74 μ m)	Chamfer Rings, Gage Blocks T.O. 33K6-4-2732-1
Coating Thickness ^F	up to 0.060 in thick (up to 1.524 mm thick)	(0.36 + 0.025L) mils [(0.009 + 0.64L) mm]	Comparison to Master Films NA 17-20MD-163



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Concentricity Gage ^F	N/A	5.4 μ m (0.14 μ m)	LVDT with Amplifier Master Pin Gages T.O. 33K6-4-889-1
Cylindrical Plug Gages ^F	0.001 in to 13 in (0.025 4 mm to 330.2 mm)	(3.1 + 2.3L) μ m [(0.06 + 0.08L) μ m]	Grade 0 reference Gage Blocks Lab Master 175 GIDEP
Cylindrical Ring Gages ^F	0.04 in to 14 in (1.016 mm to 355.6 mm)	(3.1 + 2.3D) μ m [(0.08 + 0.06D) μ m]	
Depth Measuring Instruments, Gages and Micrometers ^{FO}	up to 6 in (up to 152.4 mm)	(3.6 + 2.1L) μ m [(0.09 + 0.05L) μ m]	Gage Blocks T.O. 33K6-4-17-1
	6.000 1 in to 12 in (152.41 mm to 304.8 mm)	(9.2 + 3.3L) μ m [(0.23 + 0.08L) μ m]	
	12.000 1 in to 18 in (304.81 mm to 457.2 mm)	(23 + 1.5L) μ m [(0.58 + 0.04L) μ m]	
	18.000 1 in to 24 in (457.21 mm to 609.6 mm)	(26 + 1.2L) μ m [(0.66 + 0.03L) μ m]	
Flatness ^{FO} -Anvils, Spindles, Gage Stands, and Gage Blocks	up to 3 in diameter (up to 50.8 mm diameter)	2 μ m (0.05 μ m)	Optical Flat under Monochromatic Light Source GIDEP
Gage Block - ^F Length	0.01 in to 0.21 in (0.254 mm to 5.334 mm)	3.4 μ m (0.086 μ m)	Gage Blocks, Gage Block Comparator, Lab Master 175 T.O. 33K6-4-1-1
	0.03125 in to 4 in (0.25 mm to 101.6 mm)	(2.8 + 1.4L) μ m [(0.07 + 0.04L) μ m]	
	2 in (50 mm)	5.7 μ m (0.145 μ m)	
	3 in (75 mm)	7.2 μ m (0.183 μ m)	
	4 in (100 mm)	8.9 μ m (0.226 μ m)	
	5 in to 20 in (127 mm to 508 mm)	(3.1 + 2.3L) μ m [(0.08 + 0.06L) μ m]	
Gage Block - ^F Parallelism	up to 4 in (up to 101.6 mm)	1.2 μ m (0.03 μ m)	
	5 in to 20 in (127 mm to 508 mm)	2.7 μ m (0.07 μ m)	



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Height Gages ^{FO} Dial, Digital, and Vernier	up to 12 in (up to 304.8 mm)	(76 + 15L) μ in [(1.93 + 0.38L) μ m]	Gage Blocks, Surface Plate, NA 17-20MD-17, NA 17-20MD-62
	12.000 1 in to 18 in (304.81 mm to 457.2 mm)	(62 + 8.3L) μ in [(1.57 + 0.21L) μ m]	
	18.000 1 in to 24 in (457.21 mm to 609.6 mm)	(100 + 8L) μ in [(2.54 + 0.2L) μ m]	
	24.000 1 in to 36 in (609.61 mm to 914.4 mm)	(54 + 4.7L) μ in [(1.37 + 0.12L) μ m]	
	36.000 1 in to 48 in (914.41 mm to 1219.2 mm)	(62 + 3.8L) μ in [(1.57 + 0.1L) μ m]	
	48.000 1 in to 60 in (1 219.21 mm to 1524 mm)	(82 + 3.7L) μ in [(2.08 + 0.09L) μ m]	
Height Masters ^F	up to 12 in (up to 304.8 mm)	(7.7 + 3.3L) μ in [(0.2 + 0.08L) μ m]	Gage Blocks, LVDT with Amplifier, NA 17-20MD-26
	up to 18 in (up to 457.2 mm)	(5.2 + 5.8L) μ in [(0.13 + 0.15L) μ m]	
	up to 24 in (up to 609.6 mm)	(9.3 + 4.9L) μ in [(0.24 + 0.12L) μ m]	
Inside / Outside Measurement ^F Non-Contact	up to 6 in (up to 152.4 mm)	29 μ in (0.74 μ m)	Video Measuring System, PIC-KEYE-001
Inside / Outside Measurement ^F Inside Contact	0.04 to 14 in (1 to 355 mm)	(4.3 + 1.4L) μ in [(0.11 + 0.04L) μ m]	Lab Master 175, GIDEP
Inside / Outside Measurement ^F Outside Contact	up to 20 in (up to 508 mm)	(4.3 + 1.4L) μ in [(0.11 + 0.04L) μ m]	
Indicators Digital/Dial	up to 0.05 in	(4.6 + 4.54L) μ in	Calibration Tester,
Indicator/ Bore gages with Removable Indicator ^{FO}	up to 1.27 mm	(0.12 + 0.12L) μ m	PIC-DIND-001
Indicators Digital/Dial Indicator/ Bore gages with Removable Indicator ^{FO}	up to 0.2 in (up to 5.08 mm)	(4.7 + 1.1L) μ in [(0.12 + 0.03L) μ m]	Calibration Tester, PIC-DIND-001
Indicators Digital/Dial Indicator/ Bore gages with Removable Indicator ^{FO}	up to 1 in (up to 25.4 mm)	(42 + 26L) μ in [(1.07 + 0.66L) μ m]	Indicator Calibrator, PIC-DIND-001
Indicators Digital/Dial Indicator/ Bore gages with Removable Indicator ^{FO}	up to 4 in (up to 101.6 mm)	(2.8 + 1.5L) μ in [(0.07 + 0.04L) μ m]	Gage Blocks PIC-DIND-001
Indicators Test ^{FO}	up to 0.06 in (up to 1.524 mm)	(3.81 + 2.7L) μ in [(0.1 + 0.07L) μ m]	Calibration Tester, Gage Blocks PIC-DIND-001
Laser Bench Micrometer ^{FO}	0.005 in to 1.00 in (0.127 mm to 25.4 mm)	(4 + 0.53L) μ in [(0.1 + 0.01L) μ m]	Master Cylinders, T.O. 33K6-4-981-1



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Length/Height/End Standard ^F (Fixed)	1 in (25.4 mm)	7.7 μ in (0.2 μ m)	Gage Blocks, LVDT with Amplifier, NA 17-20MD-76
	2 in (50.8 mm)	8.7 μ in (0.22 μ m)	
	3 in (76.2 mm)	9.9 μ in (0.25 μ m)	
	4 in (101.6 mm)	11 μ in (0.28 μ m)	
	5 in (127 mm)	14 μ in (0.36 μ m)	
	6 in (152.4 mm)	16 μ in (0.41 μ m)	
	7 in (177.8 mm)	17 μ in (0.43 μ m)	
Length/Height/End Standard ^F (Fixed)	8 in (203.2 mm)	19 μ in (0.48 μ m)	Gage Blocks, LVDT with Amplifier, NA 17-20MD-76
	9 in (228.6 mm)	20 μ in (0.51 μ m)	
	10 in (254 mm)	21 μ in (0.53 μ m)	
	11 in (279.4 mm)	24 μ in (0.61 μ m)	
	12 in (304.8 mm)	24 μ in (0.61 μ m)	
	16 in (406.4 mm)	33 μ in (0.84 μ m)	
	20 in (508 mm)	40 μ in (1.02 μ m)	
Length/Height/End Standard ^F (Ranged)	up to 6 in (up to 152.4 mm)	(3.9 + 2.2L) μ in [(0.1 + 0.06L) μ m]	Gage Blocks, LVDT with Amplifier, NA 17-20MD-76
	6.000 1 in to 12 in (152.41 mm to 304.8 mm)	(24 + 0.17L) μ in [(0.61 + 0.004L) μ m]	
	12.00 0 1 in to 18 in (304.81 mm to 457.2 mm)	(8 + 1.8L) μ in [(0.2 + 0.05L) μ m]	
	18.000 1 in to 24 in (457.21 mm to 609.6 mm)	(21 + 4.2L) μ in [(0.54 + 0.11L) μ m]	
	24.000 1 in to 36 in (609.6 mm to 914.4 mm)	(25 + 1.8L) μ in [(0.64 + 0.05L) μ m]	
	36.000 1 in to 48 in (914.41 mm to 1 219.2 mm)	(26 + 1.8L) μ in [(0.66 + 0.05L) μ m]	
	48.000 1 in to 60 in (1 219.21 mm to 1 524 mm)	(120 + 0.25L) μ in [(3.05 + 0.01L) μ m]	



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Levels ^F	up to 18 in (up to 457.2 mm)	(18 + 2.2L) μ in [(0.46 + 0.06L) μ m]	Gage Blocks, Surface Plate, PIC-LEVL-001
Micrometers Inside ^{FO}	up to 6 in (up to 152.4 mm)	(8.2 + 0.06L) μ in [(0.21 + 0.002L) μ m]	Gage Blocks, T.O. 33K6-4-661-1
	up to 12 in (up to 304.8 mm)	(19 + 0.09L) μ in [(0.48 + 0.00L) μ m]	
	12.000 1 in to 32 in (304.82 mm to 812.8 mm)	(52 + 1.3L) μ in [(1.32 + 0.03L) μ m]	
	32.000 1 in to 57 in (812.81 mm to 14 47.8 mm)	(84 + 0.28L) μ in [(2.13 + 0.01L) μ m]	
	57.0001 in to 82 in (1 447.81 mm to 2 082.8 mm)	(79 + 1.2L) μ in [(2.01 + 0.03L) μ m]	
Micrometers Outside ^{FO}	up to 6 in (up to 152.4 mm)	(3.7 + 1.7L) μ in [(0.09 + 0.04L) μ m]	Gage Blocks, NA 17-20MD-06
	6.000 1 in to 12 in (152.41 mm to 304.8 mm)	(9.2 + 3.3L) μ in [(0.23 + 0.08L) μ m]	
	12.000 1 in to 18 in (304.81 mm to 457.2 mm)	(11 + 2.5L) μ in [(0.28 + 0.06L) μ m]	
	18.000 1 in to 24 in (457.21 mm to 609.6 mm)	(15 + 2L) μ in [(0.38 + 0.05L) μ m]	
	24.000 1 in to 30 in V609.61 mm to 762 mm)	(12 + 2.2L) μ in [(0.3 + 0.06L) μ m]	
	30.000 1 in to 36 in (762.01 mm to 914.4 mm)	(11 + 2L) μ in [(0.28 + 0.05L) μ m]	
	36.000 1 in to 42 in (914.41 mm to 1 066.8 mm)	(10 + 2.2L) μ in [(0.26 + 0.06L) μ m]	
	42.000 1 in to 48 in (1066.81 mm to 1 219.2 mm)	(6.6 + 2L) μ in [(0.17 + 0.05L) μ m]	
	48.000 1 in to 54 in (1 219.21 mm to 1 371.6 mm)	(17 + 2.5L) μ in [(0.43 + 0.06L) μ m]	
	54.000 1 in to 60 in (1 371.61 mm to 1 524 mm)	(25 + 1.7L) μ in [(0.64 + 0.04L) μ m]	
	Microscope ^{FO} Linearity (X and Y)	up to 4 in (up to 101.6 mm)	
Microscope ^{FO} Angular	up to 12 in (up to 304.8 mm)	0.001 °	Angle Blocks T.O. 33K6-4-1268-1
Mu-Checker/Gage Amplifier and Probe ^{FO}	up to 0.05 in (up to 1.5 mm)	(15 + 7.7L) μ in [(0.38 + 0.2) μ m]	Gage Blocks, T.O. 33K6-4-1021-1
Optical Comparator X and Y Stage Movement ^{FO}	0.5 to 12 in (12.7 mm to 304.8 mm)	(78 + 10L) μ in [(1.98 + 0.25L) μ m]	Gage Blocks, Glass Scale, GIDEP
Optical Comparator Angularity ^{FO}	0° to 360°	0.001 °	Angle Blocks, GIDEP



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Optical Comparator Squareness of Y axis to X axis ^{FO}	(12 in of Y axis travel or maximum Y axis travel if maximum is less than 12 in)	0.001 °	Gage Blocks, Parallel/Angle Blocks GIDEP
Optical Comparator Magnification ^{FO}	10X	0.029 %	Gage Blocks, Glass Scale GIDEP
	20X		
	31.25X		
	50X		
	62.5X		
	100X		
Optical Flats ^F	up to 3 in diameter (up to 76.2 mm diameter)	2 μ in (0.05 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 μ in (0.05 μ m)	Comparison to Master optical Flat NA 17-20ML-31
Optical Parallels ^F Parallelism	up to 3 in diameter (up to 76.2 mm diameter)	1.2 μ in (0.03 μ m)	Gage Block Comparator
Protractors ^F Bevel, Electronic, and Vernier	0° to 90°	0.001 °	Angle Blocks, Surface Plate, LVDT with Amplifier GIDEP
Radius Length ^F	up to 6 in (up to 152.4 mm)	29 μ in (0.74 μ m)	Video Measuring System P119, PIC Q1 10-16
Rulers ^F	up to 12 in (up to 304.8 mm)	29 μ in (0.74 μ m)	Video Measuring System, Gage Blocks, PIC-RULE-003
	12 in to 144 in (304.8 mm to 3657.6 mm)	(95 + 0.74L) μ in [(2.41 + 0.02L) μ m]	
Sine Bars/Plates ^F	up to 5 in (up to 127 mm)	180 μ in (4.57 μ m)	Squares, Angle Blocks LVDT with Amplifier , Gage Blocks, TO 33K6-4-120-1
Spheres ^F Diameter	up to 6 in (up to 152 mm)	(4.3 + 1.4D) μ in (0.11 + 0.04D) μ m	Lab Master 175, T.O. 33K6-4-1181-1
Squares ^F Squareness	up to 18 in (up to 457.2 mm)	190 μ in (4.83 μ m)	Square, Gage Blocks, Surface Plate, LVDT with Amplifier, GIDEP
Squares ^F Blade Parallelism	up to 18 in (up to 457.2 mm)	(5.6 + 6.4L) μ in (0.14 + 0.16L) μ m)	
Straightness and Straight Edges ^F	up to 72 in (up to 1828.8 mm)	(3 + 2.9L) μ in (0.08 +0.07L) μ m)	LVDT with Amplifier, TO 33K6-4-144-1



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Surface Plates ^{FO} Flatness	up to 12 in (up to 304.8 mm)	(5 + 5.5L) μ in [(0.13 + 0.14) μ m]	LVDT with Amplifier, TO 33K6-4-2696-1
	12 in to 114 in (304.8 mm to 2 895.6 mm)	24 μ in (0.6 μ m)	Auto Collimator, NA17-20MD-17
Surface Plates ^{FO} Repeatability	0.002 in (0.05 mm)	24 μ in (0.6 μ m)	Repeat O Meter, NA17-20MD-17
Surface Roughness Instrument / Profilometer ^F	118 μ in Ra (2.99 μ m Ra)	1 μ in (0.03 μ m)	Roughness Specimen, ASME B46.1-2009
Tapered Thread Plug ^F			Video Measuring System Master Taper plug Gage Blocks
Lead ^F	27 to 8 TPI	29 μ in (0.74 μ m)	
Major Diameter ^F	up to 6 in (up to 150 mm)	(100 + 0.1D) μ in [(2.54 + 0.0025D) μ m]	Lab Master 175 PIC-TAPR-001, SAE AS7105B,
Pitch Diameter ^F	up to 6 in (up to 150 mm)	(127.5 + 0.1D) μ in [(3.24 + 0.0025D) μ m]	ASME B1.20.5-1991, ASME B1.20.1-1983
Tapered Thread Ring ^F Taper	up to 6 in (up to 150 mm)	(127.5 + 0.1D) μ in [(3.24 + 0.0025D) μ m]	Gage Blocks, Lab Master 175
Tapered Thread Ring ^F Thickness / Step Height	up to 6 in (up to 150 mm)	(4.3 + 1.4L) μ in [(0.11 + 0.04L) μ m]	NA17-20MD-149, SAE AS7105B, ASME B1.20.5-1991, ASME B1.20.1-1983
Thread Plug Major Diameter ^F	up to 13 in (up to 330.2 mm)	(6 + 2.5D) μ in [(0.15 + 0.06D) μ m]	Gage Blocks, Lab Master 175 ANSI/ASME B1.16 B1.2
Thread Plug Pitch Diameter ^F	up to 13 in (up to 330.2 mm)	(39 + 2.5D) μ in [(0.99 + 0.06D) μ m]	H28 Hdbk, GIDEP
Thread Ring Gages ^F	up to 13 in (up to 330.2 mm)	(39 + 2.5D) μ in [(0.99 + 0.06D) μ m]	Lab Master 175, Set Thread Plug Gages
Thread Wires ^F	up to 0.5 in (up to 12.7 mm)	(8.2 + 0.1D) μ in [(0.21 + 0.003D) μ m]	Lab Master 175, Master Pin TO 33K6-4-119-1
V-Blocks ^F Parallelism	up to 12 in (up to 304.8 mm)	(5.6 + 1.5L) μ in [(0.14 + 0.04L) μ m]	Square, LVDT with Amplifier, Surface Plate, TO 33K6-4-553-1
V-Blocks ^F Perpendicularity	up to 12 in (up to 304.8 mm)	180 μ in (4.57 μ m)	



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Dimensional

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
Video Measuring System Keyence ^{FO}	up to 12 in	21 μ m	Master Pin, IMI334E_1
Wire Crimpers ^F	up to 12 in (up to 304.8 mm)	29 μ m (0.74 μ m)	Video Measuring System, OPTP03-ZC-2009 (GIDEP)
1-2-3 & 2-4-6 Blocks ^F Parallelism	1 - 2 - 3 & 2 - 4 - 6 in	(12 + 5.6L) μ m [(0.3 + 0.14L) μ m]	LVDT with Amplifier, TO 33K6-4-731-1
1-2-3 & 2-4-6 Blocks ^F Squareness		180 μ m (4.57 μ m)	

Electrical

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Equipment to Measure AC Current at the listed frequencies ^{FO}			Fluke 5700A, GIDEP
10 Hz to 20 Hz	Up to 220 μ A	100 nA	
20 Hz to 40 Hz	Up to 220 μ A	12 nA	
40 Hz to 1 kHz	Up to 220 μ A	0.004 % + 2.4 nA	
1 kHz to 5 kHz	Up to 220 μ A	0.023 % + 1.4 nA	
5 kHz to 10 kHz	Up to 220 μ A	0.019 % + 7.2 nA	
Equipment to Measure AC Current at the listed frequencies ^{FO}			
10 Hz to 20 Hz	220 μ A to 2.2 mA	1 μ A	
20 Hz to 40 Hz	220 μ A to 2.2 mA	0.2 μ A	
40 Hz to 1 kHz	220 μ A to 2.2 mA	0.1 μ A	
1 kHz to 5 kHz	220 μ A to 2.2 mA	0.15 μ A	
5 kHz to 10 kHz	220 μ A to 2.2 mA	0.56 μ A	
Equipment to Measure AC Current at the listed frequencies ^{FO}			
10 Hz to 20 Hz	2.2 mA to 22 mA	10 μ A	
20 Hz to 40 Hz	2.2 mA to 22 mA	0.95 μ A	
40 Hz to 1 kHz	2.2 mA to 22 mA	0.95 μ A	
1 kHz to 5 kHz	2.2 mA to 22 mA	0.94 μ A	
5 kHz to 10 kHz	2.2 mA to 22 mA	5.4 μ A	



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Equipment to Measure AC Current at the listed frequencies ^{FO}			Fluke 5700A, GIDEP
10 Hz to 20 Hz	22 mA to 220 mA	94 μ A	
20 Hz to 40 Hz	22 mA to 220 mA	26 μ A	
40 Hz to 1 kHz	22 mA to 220 mA	10 μ A	
1 kHz to 5 kHz	22 mA to 220 mA	12 μ A	
5 kHz to 10 kHz	22 mA to 220 mA	80 μ A	
Equipment to Measure AC Current at the listed frequencies ^{FO}			Fluke 5700A, GIDEP
20 Hz to 1 kHz	220 mA to 2.2 A	0.41 μ A	
1 kHz to 5 kHz	220 mA to 2.2 A	0.19 μ A	
5 kHz to 10 kHz	220 mA to 2.2 A	0.73 μ A	
Equipment to Measure AC Current at the listed frequencies ^{FO}			Fluke 5522A, GIDEP
10 Hz to 20 Hz	29 μ A to 329.99 μ A	400 nA	
20 Hz to 45 Hz	29 μ A to 329.99 μ A	0.002 % + 16 nA	
45 Hz to 1 kHz	29 μ A to 329.99 μ A	0.046 % + 27 nA	
1 kHz to 5 kHz	29 μ A to 329.99 μ A	0.25 % + 440 nA	
5 kHz to 10 kHz	29 μ A to 329.99 μ A	0.042 % + 120 nA	
10 kHz to 30 kHz	29 μ A to 329.99 μ A	0.43 % + 280 nA	
Equipment to Measure AC Current at the listed frequencies ^{FO}			
10 Hz to 20 Hz	330 μ A to 3.2999 9 mA	4.1 μ A	
20 Hz to 45 Hz	330 μ A to 3.2999 9 mA	0.2 μ A	
45 Hz to 1 kHz	330 μ A to 3.2999 9 mA	0.006 % + 21 nA	
1 kHz to 5 kHz	330 μ A to 3.2999 9 mA	0.005 5 % + 26 nA	
5 kHz to 10 kHz	330 μ A to 3.2999 9 mA	0.008 % + 30 nA	
10 kHz to 30 kHz	330 μ A to 3.2999 9 mA	0.009 4 % + 12 nA	
Equipment to Measure AC Current at the listed frequencies ^{FO}			
10 Hz to 20 Hz	3.3 mA to 32.999 9 mA	38 μ A	
20 Hz to 45 Hz	3.3 mA to 32.999 9 mA	3.5 μ A	
45 Hz to 1 kHz	3.3 mA to 32.999 9 mA	0.007 8 % + 940 nA	
1 kHz to 5 kHz	3.3 mA to 32.999 9 mA	0.005 4 % + 1.4 μ A	
5 kHz to 10 kHz	3.3 mA to 32.999 9 mA	0.011 % + 0.84 μ A	
10 kHz to 30 kHz	3.3 mA to 32.999 9 mA	0.003 1 % + 3 μ A	



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Equipment to Measure AC Current at the listed frequencies ^{FO}			Fluke 5522A, GIDEP
10 Hz to 20 Hz	33 mA to 329.999 mA	370 μ A	
20 Hz to 45 Hz	33 mA to 329.999 mA	22 μ A	
45 Hz to 1 kHz	33 mA to 329.999 mA	0.039 % + 6 μ A	
1 kHz to 5 kHz	33 mA to 329.999 mA	0.032 % + 8 μ A	
5 kHz to 10 kHz	33 mA to 329.999 mA	0.015 % + 5.1 μ A	
10 kHz to 30 kHz	33 mA to 329.999 mA	0.029 % + 5 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	0.0075 % + 7.3 μ A	
1 kHz to 5 kHz	330 mA to 1.099 99 A	0.14 % + 430 μ A	
5 kHz to 10 kHz	330 mA to 1.099 99 A	0.77 % + 1.9 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 100 Hz	1.1 A to 2.999 99 A	610 μ A	
100 Hz to 1 kHz	1.1 A to 2.999 99 A	290 μ A	
1 kHz to 5 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
50 Hz to 400 Hz	20 A to 149.9 A	1.1 % + 0.5 A	
50 Hz to 400 Hz	150 A to 1 050 A	0.27 % + 0.33 A	



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Equipment to Output AC Current at the listed frequencies ^{FO}			Keysight 3458A, GIDEP
10 Hz to 5 kHz	Up to 100 μ A	0.027 % + 31 nA	
10 Hz to 5 kHz	100 μ A to 1 mA	0.11 % + 100 nA	
10 Hz to 100 kHz	1 mA to 10 mA	0.025 % + 60 nA	
10 Hz to 100 kHz	10 mA to 100 mA	0.038 % + 1.2 μ A	
10 Hz to 50 kHz	100 mA to 1 A	0.03 % + 6 μ A	
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	3.6 mA/A + 49 mA	
40 Hz to 1 kHz	1 A to 100 A	35.4 mA/A + 30 mA	
Equipment to Measure AC Power PF=1 ^{FO} 45 Hz to 1 kHz, 33 mV to 1020 V			Fluke 5522A, GIDEP
(3.3 to 1020) mA	11 μ W to 330 W	0.012 %	
(0.33 to 3) A	11 mW to 3 kW	0.035 %	
(3 to 20.5) A	100 mW to 20.5 kW	0.033 %	
Equipment to Measure AC Phase ^{FO} 0° to 360°	45 Hz to 65 Hz	0.017°	Fluke 5522A, GIDEP
	65 Hz to 500 Hz	0.04°	
	500 Hz to 1 kHz	0.059°	
	1 kHz to 5 kHz	0.36°	
	5 kHz to 10 kHz	0.68°	
	10 kHz to 30 kHz	1.7°	
Equipment to Measure AC Voltage at the listed frequencies ^{FO}			Fluke 5700A, GIDEP
10 Hz to 20 Hz	Up to 2.2 mV	1.5 μ V	
20 Hz to 40 Hz	Up to 2.2 mV	1.1 μ V	
40 Hz to 20 kHz	Up to 2.2 mV	0.5 μ V/V + 1.9 μ V	
20 kHz to 50 kHz	Up to 2.2 mV	2.9 μ V	
50 kHz to 100 kHz	Up to 2.2 mV	1.8 μ V	
100 kHz to 300 kHz	Up to 2.2 mV	22 μ V	
300 kHz to 500 kHz	Up to 2.2 mV	24 μ V	
500 kHz to 1 MHz	Up to 2.2 mV	7.4 μ V	
10 Hz to 20 Hz	Up to 2.2 mV	1.5 μ V	



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Equipment to Measure AC Voltage at the listed frequencies ^{F0}			Fluke 5700A, GIDEP
10 Hz to 20 Hz	2.2 mV to 22 mV	10 μ V	
20 Hz to 40 Hz	2.2 mV to 22 mV	3.6 μ V	
40 Hz to 20 kHz	2.2 mV to 22 mV	2.5 μ V	
20 kHz to 50 kHz	2.2 mV to 22 mV	7.4 μ V	
50 kHz to 100 kHz	2.2 mV to 22 mV	11 μ V	
100 kHz to 300 kHz	2.2 mV to 22 mV	5.6 μ V	
300 kHz to 500 kHz	2.2 mV to 22 mV	28 μ V	
500 kHz to 1 MHz	2.2 mV to 22 mV	83 μ V	
Equipment to Measure AC Voltage at the listed frequencies ^{F0}			
10 Hz to 20 Hz	22 mV to 220 mV	100 μ V	
20 Hz to 40 Hz	22 mV to 220 mV	25 μ V	
40 Hz to 20 kHz	22 mV to 220 mV	9.7 μ V	
20 kHz to 50 kHz	22 mV to 220 mV	6.4 μ V	
50 kHz to 100 kHz	22 mV to 220 mV	12 μ V	
100 kHz to 300 kHz	22 mV to 220 mV	42 μ V	
300 kHz to 500 kHz	22 mV to 220 mV	130 μ V	
500 kHz to 1 MHz	22 mV to 220 mV	200 μ V	
Equipment to Measure AC Voltage at the listed frequencies ^{F0}			
10 Hz to 20 Hz	220 mV to 2.2 V	1.1 mV	
20 Hz to 40 Hz	220 mV to 2.2 V	0.29 mV	
40 Hz to 20 kHz	220 mV to 2.2 V	27 μ V/V + 7.5 μ V	
20 kHz to 50 kHz	220 mV to 2.2 V	31 μ V/V + 3.5 μ V	
50 kHz to 100 kHz	220 mV to 2.2 V	3.3 μ V/V + 56 μ V	
100 kHz to 300 kHz	220 mV to 2.2 V	200 μ V/V + 42 μ V	
300 kHz to 500 kHz	220 mV to 2.2 V	450 μ V/V + 95 μ V	
500 kHz to 1 MHz	220 mV to 2.2 V	1.7 mV/V + 100 μ V	
Equipment to Measure AC Voltage at the listed frequencies ^{F0}			
10 Hz to 20 Hz	2.2 V to 22 V	11 mV	
20 Hz to 40 Hz	2.2 V to 22 V	3.2 mV	
40 Hz to 20 kHz	2.2 V to 22 V	1.1 mV	
20 kHz to 50 kHz	2.2 V to 22 V	0.51 mV	
50 kHz to 100 kHz	2.2 V to 22 V	0.59 mV	
100 kHz to 300 kHz	2.2 V to 22 V	1.7 mV	
300 kHz to 500 kHz	2.2 V to 22 V	7.3 mV	



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Equipment to Measure AC Voltage at the listed frequencies ^{FO}			Fluke 5700A, GIDEP
500 kHz to 1 MHz	2.2 V to 22 V	14 mV	
Equipment to Measure AC Voltage at the listed frequencies ^{FO}			
10 Hz to 20 Hz	22 V to 220 V	110 mV	
20 Hz to 40 Hz	22 V to 220 V	40 mV	
40 Hz to 20 kHz	22 V to 220 V	20 mV	
20 kHz to 50 kHz	22 V to 220 V	13 mV	
50 kHz to 100 kHz	22 V to 220 V	16 mV	
100 kHz to 300 kHz	22 V to 220 V	16 mV	
300 kHz to 500 kHz	22 V to 220 V	61 mV	
500 kHz to 1 MHz	22 V to 220 V	63 mV	
Equipment to Measure AC Voltage at the listed frequencies ^{FO}			Fluke 5522A, GIDEP
50 Hz to 1 kHz	220 V to 1 100 V	44 μ V + 9 mV	
Equipment to Measure AC Voltage at the listed frequencies ^{FO}			
45 Hz to 1 kHz	33 V to 329.999 V	0.12 mV/V + 0.74 mV	
1 kHz to 10 kHz	33 V to 329.999 V	0.11 mV/V + 3.7 mV	
10 kHz to 20 kHz	33 V to 329.999 V	0.22 mV/V + 40 μ V	
20 kHz to 50 kHz	33 V to 329.999 V	0.29 mV/V + 22 mV	
50 kHz to 100 kHz	33 V to 329.999 V	0.29 mV/V + 22 mV	
Equipment to Measure AC Voltage at the listed frequencies ^{FO}			
45 Hz to 1 kHz	330 V to 1 020 V	31 μ V/V + 1.8 mV	
1 kHz to 5 kHz	330 V to 1 020 V	33 mV	
5 kHz to 10 kHz	330 V to 1 020 V	31 μ V/V + 24 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	
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	Keysight 3458A, GIDEP AC Band \geq 2 MHz



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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	0.033 % + 3 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	0.31 % + 0.26 mV	
300 kHz to 1 MHz	10 mV to 100 mV	0.52 % + 11 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	0.9 % + 49 μ V	
4 MHz to 8 MHz	10 mV to 100 mV	0.11 % + 0.84 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 μ V	
40 Hz to 1 kHz	100 mV to 1 V	0.0048 % + 1.9 μ V	
1 kHz to 20 kHz	100 mV to 1 V	0.0028 % + 0.1 μ V	
20 kHz to 50 kHz	100 mV to 1 V	0.019 % + 16 μ V	
50 kHz to 100 kHz	100 mV to 1 V	0.043 % + 41 μ V	
100 kHz to 300 kHz	100 mV to 1 V	0.25 % + 240 μ V	
300 kHz to 1 MHz	100 mV to 1 V	0.63 % + 0.62 mV	
1 MHz to 2 MHz	100 mV to 1 V	0.58 % + 70 μ V	
1 MHz to 4 MHz	100 mV to 1 V	1 % + 0.15 mV	
4 MHz to 8 MHz	100 mV to 1 V	4 % + 0.8 μ V	
8 MHz to 10 MHz	100 mV to 1 V	15 % + 1 mV	



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Equipment to Output AC Voltage at the listed frequencies ^{FO}			Keysight 3458A, GIDEP 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	0.012 % + 74 μ V	
1 kHz to 20 kHz	1 V to 10 V	0.0022 % + 24 μ V	
20 kHz to 50 kHz	1 V to 10 V	0.019 % + 0.16 mV	
50 kHz to 100 kHz	1 V to 10 V	0.0027 % + 0.14 mV	
100 kHz to 300 kHz	1 V to 10 V	0.075 % + 0.36 mV	
300 kHz to 1 MHz	1 V to 10 V	0.47 % + 2.4 mV	
1 MHz to 2 MHz	1 V to 10 V	0.44 % + 1.3 mV	
1 MHz to 4 MHz	1 V to 10 V	0.56 % + 11 mV	
4 MHz to 8 MHz	1 V to 10 V	0.65 % + 3.5 mV	
8 MHz to 10 MHz	1 V to 10 V	2.8 % + 14 mV	
Equipment to Output AC Voltage at the listed frequencies ^{FO}			
1 Hz to 40 Hz	10 V to 100 V	0.02 % + 4 mV	
40 Hz to 1 kHz	10 V to 100 V	0.019 % + 0.16 mV	
1 kHz to 20 kHz	10 V to 100 V	0.0017 % + 0.41 mV	
20 kHz to 50 kHz	10 V to 100 V	0.0054 % + 0.3 mV	
50 kHz to 100 kHz	10 V to 100 V	0.098 % + 8.1 mV	
100 kHz to 300 kHz	10 V to 100 V	0.092 % + 2.1 mV	
300 kHz to 1 MHz	10 V to 100 V	1.5 % + 10 mV	
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	0.015 % + 13 mV	
1 kHz to 20 kHz	100 V to 1 000 V	0.08 % + 78 mV	
20 kHz to 50 kHz	100 V to 1 000 V	0.079 % + 74 mV	



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Equipment to Output AC Voltage at the listed frequencies ^{FO}			Keysight 3458A, GIDEP, AC Band \leq 2 MHz
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 Fluke 8846A with Fluke 80K-40
50 Hz to 60 Hz	100 V to 10 000 V	510 μ V/V + 250 mV	
50 Hz to 60 Hz	100 V to 40 000 V	1.3 V	
Equipment to Measure Capacitance – Fixed ^{FO}			Keysight E4980AL/Standard Capacitor, Keysight E4980AL/Standard Capacitor, (GenRad) 1403-G Keysight E4980AL/Standard Capacitor, (GenRad) 1409-F Keysight E4980AL/Standard Capacitor, (GenRad) 1409-L Keysight E4980AL/Standard Capacitor, (GenRad) 1409-T
20 Hz to 300 kHz	10 pF	0.0034 pF	
20 Hz to 300 kHz	(0.001 μ F) 1 nF	0.015 pF	
20 Hz to 300 kHz	(0.01 μ F) 10 nF	0.12 pF	
20 Hz to 300 kHz	(0.1 μ F) 100 nF	1.2 pF	
Equipment to Measure Capacitance – Ranged ^{FO}			
20 Hz to 300 kHz	50 pF to 150 pF	0.0012 % + 0.01 fF	
20 Hz to 300 kHz	100 pF to 1000 pF	0.0011 % + 1.3 fF	
20 Hz to 300 kHz	1 nF to 10 nF	0.0013 % + 13 fF	
20 Hz to 300 kHz	10 nF to 100 nF	0.0011 % + 0.13 nF	
20 Hz to 300 kHz	100 nF to 1 μ F	0.37 % + 0.37 nF	Decade Capacitors , (GenRad) (1412 BC), GIDEP Fluke 5522A, GIDEP
10 Hz to 10 kHz	220 pF to 399.9 pF	2.1 pF	
10 Hz to 10 kHz	0.4 nF to 1.0999 nF	0.025 % + 2.2 pF	
10 Hz to 3 kHz	1.1 nF to 3.2999 nF	0.056 % + 1.7 pF	
10 Hz to 1 kHz	3.3 nF to 10.9999 nF	0.083 % + 0.96 pF	
10 Hz to 10 kHz	11 nF to 32.9999 nF	0.1 % + 1 pF	
10 Hz to 10 kHz	33 nF to 109.999 nF	0.091 % + 0.97 pF	
10 Hz to 10 kHz	110 nF to 329.999 nF	0.094 % + 2.8 pF	
10 Hz to 600 Hz	0.33 μ F to 1.09999 μ F	0.091 % + 9.7 pF	
10 Hz to 300 Hz	1.1 μ F to 3.29999 μ F	0.11 % + 220 pF	
10 Hz to 150 Hz	3.3 μ F to 10.9999 μ F	0.059 % + 1.1 nF	
10 Hz to 120 Hz	11 μ F to 32.9999 μ F	0.27 % + 21 nF	



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Equipment to Measure Capacitance – Ranged ^{FO}			Fluke 5522A, GIDEP
0 Hz to 80 Hz	33 μ F to 109.999 μ F	0.29 % + 66 nF	
0 Hz to 50 Hz	110 μ F to 329.999 μ F	0.1 % + 180 nF	
0 Hz to 20 Hz	0.33 mF to 1.0999 mF	0.16 % + 0.43 μ F	
0 Hz to 6 Hz	1.1 mF to 3.29999 mF	0.18 % + 0.84 μ F	
0 Hz to 2 Hz	3.3 mF to 10.9999 mF	0.16 % + 3.7 μ F	
0 Hz to 0.6 Hz	11 mF to 32.9999 mF	0.94 % + 83 μ F	
0 Hz to 0.2 Hz	33 mF to 110 mF	0.17 % + 30 μ F	
Equipment to Output Capacitance – Fixed ^{FO}			Keysight E4980AL, GIDEP
20 Hz to 300 kHz	10 pF	3.4 fF	
20 Hz to 300 kHz	100 pF	59 fF	
20 Hz to 300 kHz	1 000 pF	0.45 pF	
20 Hz to 300 kHz	0.1 μ F	24 fF	
20 Hz to 300 kHz	10 μ F	5.4 nF	
Equipment to Output Capacitance – Ranged ^{FO}			Fluke 5700A, GIDEP
20 Hz to 300 kHz	10 pF to 1 mF	0.0012 % + 0.0033 pF	
Equipment to Measure DC Current ^{FO}	Up to 220 μ A	76 pA/A + 7.8 nA	Fluke 5522A, GIDEP
	220 μ A to 2.2 mA	69 nA/A + 12 nA	
	2.2 mA to 22 mA	14 nA/A + 19 nA	
	22 mA to 220 mA	17 nA/A + 760 nA	
	220 mA to 2.2 A	68 μ A/A + 3.4 μ A	
	Up to 329.999 μ A	26 pA/A + 0.34 pA	Fluke 5522A, GIDEP
	330 μ A to 3.299 99 mA	44 nA/A + 45 nA	
	3.3 mA to 32.999 9 mA	41 nA/A + 0.4 μ A	
	33 mA to 329.999 mA	31 nA/A + 2.9 μ A	
	330 mA to 1.099 99 A	42 μ A/A + 29 μ A	
	1.1 A to 2.999 99 A	13 μ A/A + 29 μ A	
	3 A to 10.999 9 A	0.92 μ A/A + 240 μ A	
	11 A to 20.5 A	350 μ A/A + 240 μ A	
Equipment to Measure DC Current for Clamp Ammeters ^{FO}	20 A to 149.9 A	0.98 % + 0.33 A	Fluke 5522A/ with 5500A COIL, GIDEP
	150 A to 1 050 A	0.26 % + 0.07 A	



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933 Mariner Street, Brea CA 92821

Contact Name: Gregg Losonsky Phone: 714-671-6018

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Equipment to Output DC Current ^{FO}	Up to 100 nA	0.01 pA/A + 49 pA	Keysight 3458A, GIDEP	
	100 nA to 1 μ A	11 pA/A + 47 pA		
	1 μ A to 10 μ A	6 pA/A + 32 pA		
	10 μ A to 100 μ A	13 pA/A + 38 pA		
	100 μ A to 1 mA	1.2 nA/A + 1.2 nA		
	1 mA to 10 mA	2.2 nA/A + 0.2 nA		
	10 mA to 100 mA	20 nA/A + 180 nA		
	100 mA to 1 A	100 μ A/A + 8.2 μ A		
	1 A to 50 A	24 μ A/A + 35 mA	Keysight 3458A, Current Shunts, GIDEP	
	1 A to 100 A	6.2 μ A/A + 62 mA		
	1 A to 500 A	1.2 μ A/A + 70 mA		
Equipment to Output DC Current ^{FO}	Up to 100 μ A	18 nA	Fluke 8846A, GIDEP	
	100 μ A to 1 mA	89 nA		
	1 mA to 10 mA	3 μ A		
	10 mA to 100 mA	29 μ A		
	100 mA to 1 A	240 μ A		
	1 A to 3 A	0.68 mA		
	3 A to 10 A	0.6 mA	Fluke 8846A, Current Shunts, GIDEP	
	1 A to 50 A	1.8 mA		
	1 A to 100 A	1.6 mA		
Equipment to Measure DC Power PF=1 ^{FO} 33 mV to 1 020 V	1 A to 500 A	0.61 mA	Fluke 5522A, GIDEP	
	0.33 mA to 330 mA	11 μ W to 330 W		0.003 %
	0.33 A to 3 A	11 mW to 3 kW		0.001 %
	3 A to 20.5 A	100 mW to 20.5 kW		0.079 %



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Equipment to Measure DC Voltage ^{FO}	Up to 220 mV	14 nV/V + 0.49 μ V	Fluke 5700A, GIDEP
	220 mV to 2.2 V	5.1 μ V/V + 0.71 μ V	
	2.2 V to 11 V	1.6 μ V/V + 1.4 μ V	
	11 V to 22 V	1.7 μ V/V + 3.3 μ V	
	22 V to 220 V	5 μ V/V + 47 μ V	
	220 V to 1 100 V	1.9 μ V/V + 640 μ V	
Equipment to Output DC Voltage ^{FO}	Up to 100 mV	0.45 nV/V + 0.64 μ V	Keysight 3458A, GIDEP
	100 mV to 1 V	5.5 μ V/V + 0.13 μ V	
	1 V to 10 V	3.2 μ V/V + 2.4 μ V	
	10 V to 100 V	3.2 μ V/V + 2 μ V	
	100 V to 1 000 V	3.2 μ V/V + 2.7 μ V	
	100 V to 10 000 V	130 μ V/V + 16 mV	VitreK 4700
	100 V to 40 000 V	1.3 V	Fluke 8846A with Fluke 80K-40
Equipment to Measure Inductance - Fixed Points ^{FO}			Keysight E4980AL/Inductor
20 Hz to 300 kHz	100 μ H	0.5 μ H	Keysight E4980AL/Inductor (GenRad) 1481-AA,
20 Hz to 300 kHz	1 mH	0.004 9 mH	Keysight E4980AL/Inductor (GenRad) 1481-A,
20 Hz to 300 kHz	10 mH	0.05 mH	Keysight E4980AL/Inductor (GenRad) 1481-D,
20 Hz to 300 kHz	100 mH	0.23 mH	Keysight E4980AL/Inductor (GenRad) 1481-G,
20 Hz to 300 kHz	200 mH	0.99 mH	Keysight E4980AL/Inductor (GenRad) 1481-H,
20 Hz to 300 kHz	1 H	0.004 9 H	Keysight E4980AL/Inductor (GenRad) 1481-K.,
20 Hz to 300 kHz	5 H	0.025 H	Keysight E4980AL/Inductor (GenRad) 1481-W,
20 Hz to 300 kHz	10 H	0.05 H	Keysight E4980AL/Inductor UTC DI-3



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Equipment to Measure Resistance Fixed Points 4 – Wire ^{FO}	0.001 Ω	0.91 $\mu\Omega$	Keysight 3458A, Standard Resistor(s), GIDEP
	0.01 Ω	13 $\mu\Omega$	
	0.1 Ω	350 $\mu\Omega$	
	1 Ω	98 $\mu\Omega$	
	10 Ω	3.2 m Ω	
	100 Ω	4.4 m Ω	
	1 k Ω	46 m Ω	
	10 k Ω	930 m Ω	
	100 k Ω	34 Ω	
	1 M Ω	40 Ω	
	10 M Ω	480 Ω	
Equipment to Measure Resistance Fixed Points ^{FO}	0 Ω	11 $\mu\Omega$	Fluke 5700A, GIDEP
	1 Ω	71 $\mu\Omega$	
	1.9 Ω	170 $\mu\Omega$	
	10 Ω	280 $\mu\Omega$	
	19 Ω	250 $\mu\Omega$	
	100 Ω	650 $\mu\Omega$	
	190 Ω	560 $\mu\Omega$	
	1 k Ω	5.2 m Ω	
	1.9 k Ω	6.9 m Ω	
	10 k Ω	27 m Ω	
	19 k Ω	89 m Ω	
	100 k Ω	190 m Ω	
	190 k Ω	770 m Ω	
	1 M Ω	5.7 Ω	
	1.9 M Ω	9.6 Ω	
10 M Ω	140 Ω		



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Equipment to Measure Resistance Fixed Points ^{FO}	19 M Ω	390 Ω	Fluke 5700A, GIDEP
	100 M Ω	9.1 k Ω	
Equipment to Measure Resistance 1 k Ω to 10 k Ω Decade ^{FO}	1 k Ω	99 m Ω	IET HRRS-F-9-1k-5kV- WT, GIDEP
	2 k Ω	0.25 Ω	
	3 k Ω	0.36 Ω	
	4 k Ω	0.46 Ω	
	5 k Ω	0.62 Ω	
	6 k Ω	0.74 Ω	
	7 k Ω	0.87 Ω	
	8 k Ω	0.97 Ω	
	9 k Ω	0.96 Ω	
	10 k Ω	1.1 Ω	
Equipment to Measure Resistance 10 k Ω to 100 k Ω Decade ^{FO}	10 k Ω	0.47 Ω	
	20 k Ω	0.83 Ω	
	30 k Ω	1.3 Ω	
	40 k Ω	1.7 Ω	
	50 k Ω	2.2 Ω	
	60 k Ω	2.5 Ω	
	70 k Ω	2.9 Ω	
	80 k Ω	3.3 Ω	
	90 k Ω	3.9 Ω	
	100 k Ω	3.4 Ω	



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Equipment to Measure Resistance Fixed Points ^{FO} 100 k Ω to 1 000 k Ω Decade	100 k Ω	13 Ω	IET HRRS-F-9-1k-5kV- WT, GIDEP
	200 k Ω	17 Ω	
	300 k Ω	29 Ω	
	400 k Ω	35 Ω	
	500 k Ω	43 Ω	
	600 k Ω	55 Ω	
	700 k Ω	67 Ω	
	800 k Ω	77 Ω	
	900 k Ω	89 Ω	
	1 000 k Ω	92 Ω	
Equipment to Measure Resistance Fixed Points ^{FO} 1 M Ω to 10 M Ω Decade	1 M Ω	40 Ω	
	2 M Ω	180 Ω	
	3 M Ω	290 Ω	
	4 M Ω	390 Ω	
	5 M Ω	470 Ω	
	6 M Ω	540 Ω	
	7 M Ω	680 Ω	
	8 M Ω	780 Ω	
	9 M Ω	850 Ω	
	10 M Ω	870 Ω	
Equipment to Measure Resistance Fixed Points ^{FO} 10 M Ω to 100 M Ω Decade	10 M Ω	22 k Ω	
	20 M Ω	30 k Ω	
	30 M Ω	65 k Ω	
	40 M Ω	88 k Ω	
	50 M Ω	120 k Ω	
	60 M Ω	310 k Ω	
	70 M Ω	170 k Ω	



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Equipment to Measure Resistance Fixed Points ^{FO} 10 M Ω to 100 M Ω Decade	80 M Ω	170 k Ω	IET HRRS-F-9-1k-5kV- WT, GIDEP
	90 M Ω	170 k Ω	
Equipment to Measure Resistance Fixed Points ^{FO} 100 M Ω to 1 000 M Ω Decade	100 M Ω	170 k Ω	
	100 M Ω	190 k Ω	
	200 M Ω	350 k Ω	
	300 M Ω	380 k Ω	
	400 M Ω	610 k Ω	
	500 M Ω	840 k Ω	
	600 M Ω	980 k Ω	
	700 M Ω	1.2 M Ω	
	800 M Ω	1.4 M Ω	
	900 M Ω	1.7 M Ω	
1 000 M Ω	1.9 M Ω		
Equipment to Measure Resistance Fixed Points ^{FO} 1 G Ω to 10 G Ω Decade	1 G Ω	0.11 M Ω	
	2 G Ω	0.85 M Ω	
	3 G Ω	0.62 M Ω	
	4 G Ω	0.12 M Ω	
	5 G Ω	0.12 M Ω	
	6 G Ω	0.16 M Ω	
	7 G Ω	3.7 M Ω	
	8 G Ω	1.1 M Ω	
	9 G Ω	1.6 M Ω	
	10 G Ω	1.7 M Ω	
Equipment to Measure Resistance Fixed Points ^{FO} 10 G Ω to 100 G Ω Decade	10 G Ω	17 M Ω	
	20 G Ω	19 M Ω	
	30 G Ω	33 M Ω	
	40 G Ω	21 M Ω	
	50 G Ω	16 M Ω	



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Equipment to Measure Resistance Fixed Points ^{FO} 10 G Ω to 100 G Ω Decade	60 G Ω	110 M Ω	IET HRRS-F-9-1k-5kV-WT GIDEP
	70 G Ω	130 M Ω	
	80 G Ω	140 M Ω	
	90 G Ω	160 M Ω	
	100 G Ω	160 M Ω	
Equipment to Measure Resistance Fixed Points ^{FO} 100 G Ω to 1 000 G Ω Decade	100 G Ω	700 M Ω	
	200 G Ω	640 M Ω	
	300 G Ω	760 M Ω	
	400 G Ω	1.9 G Ω	
	500 G Ω	3.1 G Ω	
	600 G Ω	4.8 G Ω	
	700 G Ω	5.9 G Ω	
	800 G Ω	8.2 G Ω	
	900 G Ω	9.5 G Ω	
Equipment to Measure Resistance Variable ^{FO}	0 Ω to 10.999 9 Ω	41 $\mu\Omega/\Omega$ + 99 $\mu\Omega$	Fluke 5522A, GIDEP
	11 Ω to 32.999 9 Ω	3.3 $\mu\Omega/\Omega$ + 61 $\mu\Omega$	
	33 Ω to 109.999 9 Ω	3.2 $\mu\Omega/\Omega$ + 0.15 m Ω	
	110 Ω to 329.999 9 Ω	24 $\mu\Omega/\Omega$ + 2.1 m Ω	
	0.330 k Ω to 1.099 99 k Ω	2.2 m Ω/Ω + 5.2 m Ω	
	1.1 k Ω to 3.299 99 k Ω	6.6 m Ω/Ω + 2.1 m Ω	
	3.3 k Ω to 10.999 9 k Ω	15 m Ω/Ω + 31 m Ω	
	11 k Ω to 32.999 99 k Ω	10 m Ω/Ω + 49 m Ω	
	33 k Ω to 109.999 9 k Ω	14 m Ω/Ω + 0.15 Ω	
	110 k Ω to 329.999 9 k Ω	17 m Ω/Ω + 0.42 Ω	
	0.330 M Ω to 1.099 999 M Ω	11 Ω/Ω + 0.87 Ω	
Equipment to Measure Resistance Variable ^{FO}	1.1 M Ω to 3.299 999 M Ω	39 Ω/Ω + 94 Ω	
	3.3 M Ω to 10.99999 M Ω	25 Ω/Ω + 88 Ω	Fluke 5522A, GIDEP
	11 M Ω to 32.99999 M Ω	33 Ω/Ω + 1.2 k Ω	
	33 M Ω to 109.9999 M Ω	0.95 k Ω/Ω + 23 k Ω	
	110 M Ω to 329.9999 M Ω	0.83 k Ω/Ω + 71 k Ω	
330 M Ω to 1 100 M Ω	3.5 k Ω/Ω + 0.1 M Ω		



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Equipment to Output Resistance ^{FO}	0 to 10 Ω	4.7 $\mu\Omega/\Omega$ + 7.3 $\mu\Omega$	Keysight 3458A, GIDEP
	10 Ω to 100 Ω	2.2 $\mu\Omega/\Omega$ + 32 $\mu\Omega$	
	100 Ω to 1 k Ω	0.29 m Ω/Ω + 0.22 m Ω	
	1 k Ω to 10 k Ω	3.7 m Ω/Ω + 3.2 m Ω	
	10 k Ω to 100 k Ω	1.7 m Ω/Ω + 17 m Ω	
	100 k Ω to 1 M Ω	2 Ω/Ω + 0.01 m Ω	
	1 M Ω to 10 M Ω	38 Ω/Ω + 36 Ω	
	10 M Ω to 100 M Ω	200 Ω/Ω + 1.7 k Ω	
100 M Ω to 1 G Ω	3.8 k Ω/Ω + 0.36 k Ω		
Oscilloscopes ^{FO}			Fluke 5522A/SC1100, GIDEP
AC Square Wave Signal ^{FO} Into 1 M Ω	1.0 mVpp to 130 Vpp	0.1 % + 5.7 μ V	
AC Square Wave Signal ^{FO} Into 50 Ω	1.0 mVpp to 6.6 Vpp	0.26 % + 6.3 μ V	
DC Signal ^{FO} Into 1 M Ω	up to \pm 130 V	0.05 % + 6.6 μ V	
DC Signal ^{FO} Into 50 Ω	up to \pm 6.6 V	0.32 % + 15 μ V	
Edge - Aberrations ^{FO}	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 ^{FO}	5 mVpp to 2.5 Vpp	2 % + 32 μ V	
Edge - Frequency Range ^{FO}	1 kHz to 1 MHz	2.5 Hz/Hz + 2.3 mHz	
Oscilloscopes ^{FO} Edge - Rise Time	1 kHz to 10 MHz (24 to 350) ps	0.037 % + 0.49 ps	
Level Sine Wave ^{FO} Amplitude @ 50 KHz Flatness - Relative to 50 KHz (5 mV to 5.5 V)	5 mV to 5.5 V	2 % + 88 μ V	
	50 KHz Reference	2 % + 88 μ V	
	50 kHz to 100 MHz	2.4 % + 77 μ V	
	100 MHz to 300 MHz	2 % + 54 μ V	
Level Sine Wave ^{FO} Amplitude @ 50 KHz Flatness - Relative to 50 KHz (5 mV to 3.5 V)	300 MHz to 600 MHz	4.2 % + 140 μ V	
	600 MHz to 1 100 MHz	5.1 % + 5 μ V	
Frequency Range	50 KHz to 1 100 MHz	2.6 mHz/Hz + 0.13 mHz	
Square Wave Frequency ^{FO}	10 Hz to 10 KHz	2.5 mHz/Hz + 18 μ Hz	



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Time Marker ^{FO}	1 ns to 5 ns	7 ps/s + 0.1 ps	Fluke 5522A/SC1100, GIDEP
	10 ns	71 ps	
	20 ns to 50 ns	7 ps	
	100 ns to 20 ms	0.61 ps/s + 0.71 ps	
	50 ms to 5 s	50 μ s/s + 2.4 μ s	
Soldering Irons/Stations ^{FO}	120 °C to 1 000 °C 248 °F to 1 832 °F	0.26 °C 0.47 °F	Fluke 5522A Thermocouple K, Input PIC-102
Temperature Calibration, Equipment to Measure and Simulate Thermocouple ^{FO} Type E ^{FO}	-175 °C to 950 °C	0.042 °C	Ectron 1140A , SPRT with Readout and Ice Point, GIDEP
	-283 °F to 1 742 °F	0.08 °F	
Temperature Calibration, Equipment to Measure and Simulate Thermocouple ^{FO} Type K ^{FO}	-200 °C to 1 200 °C	0.071 °C	
	-328 °F to 2 192 °F	0.13 °F	
Temperature Calibration, Equipment to Measure and Simulate Thermocouple ^{FO} Type J ^{FO}	-105 °C to 1 100 °C	0.051 °C	Ectron 1140A , SPRT with Readout and Ice Point, GIDEP
	-157 °F to 2 012 °F	0.09 °F	
Temperature Calibration, Equipment to Measure and Simulate Thermocouple ^{FO} Type N ^{FO}	-175 °C to 1 000 °C	0.081 °C	
	-283 °F to 1 832 °F	0.15 °F	
Temperature Calibration, Equipment to Measure and Simulate Thermocouple ^{FO} Type T ^{FO}	-135 °C to 300 °C	0.064 °C	
	-211 °F to 572 °F	0.12 °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}	0 °C to 250 °C	0.20 °C	Electrical Simulation of Thermocouple Output (Ectron 1140A)
	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}	-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	
	990 °C to 1 200 °C	0.07 °C	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type K ^{FO}	-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	
	-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		



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933 Mariner Street, Brea CA 92821

Contact Name: Gregg Losonsky 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)
	-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	0.63 °C	
	-255 °C to -240 °C	0.24 °C	
	-240 °C to -210 °C	0.16 °C	
	-210 °C to -150 °C	0.14 °C	
	-150 °C to -40 °C	0.63 °C	
	-40 °C to 100 °C	0.24 °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	
	0 °C 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	
	0 °C 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	
	0 °C 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 -190 °C	0.25 °C	
	-80 °C to 0 °C	0.05 °C	
	0 °C to 100 °C	0.07 °C	
	100 °C to 300 °C	0.09 °C	
	300 °C to 400 °C	0.10 °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	
	0 °C 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	
	0 °C 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	
Temperature Calibration, Indication and Control Equipment used with RTD Type Pt 385, 500 Ω ^{FO}	-200 °C to -80 °C	0.03 °C	
	-80 °C to 0 °C	0.03 °C	
	0 °C to 100 °C	0.04 °C	
	100 °C to 260 °C	0.05 °C	



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Welders ^{FO} AC Voltage (10 Hz to 20 kHz)	1 V to 750 V	350 μ V/V + 48 mV	Fluke 8846A, GIDEP
Welders ^{FO} AC Current (10 Hz to 20 kHz)	1 A to 500 A	1.8 mA	Fluke 8846 A with 500 A Current Shunt, GIDEP
Welders ^{FO} DC Voltage	Up to 1 000 V	9.6 μ V/V + 41.4 mV	Fluke 8846A, GIDEP
Welders ^{FO} DC Current	Up to 500 A	0.61 mA	Fluke 8846 A with 500 A Current Shunt, GIDEP

Mechanical

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
Indirect Verification of Leeb Hardness Testers – HLD ^{FO}	170 HLD to 960 HLD	9.5 HLD	ASMT A956 and Calibrated Leeb Hardness Test Blocks
Indirect Verification of Rockwell Hardness Testers - HRA ^{FO}	20 HRA to 66 HRA	0.68 HRA	ASTM E18 and Calibrated Rockwell Hardness Test Block
	66 HRA to 79 HRA	0.66 HRA	
	79 HRA to 84 HRA	0.50 HRA	
Indirect Verification of Rockwell Hardness Testers - HRB ^{FO}	40 HRB to 59 HRB	1.99 HRB S	
	60 HRB to 79 HRB	1.32 HRB S	
	80 HRB to 100 HRB	1.32 HRB S	
Indirect Verification of Rockwell Hardness Testers - HRC ^{FO}	20 HRC to 31 HRC	0.94 HRC	
	31 HRC to 55 HRC	0.69 HRC	
	56 HRC to 65 HRC	0.56 HRC	
Indirect Verification of Rockwell Hardness Testers - HREW ^{FO}	70 HREW to 80 HREW	1.15 HREW	
	80 HREW to 91 HREW	1.19 HREW	
	91 HREW to 150 HREW	1.10 HREW	
Indirect Verification of Rockwell Hardness Testers - HR15N ^{FO}	70 HR15N to 77 HR15N	0.68 HR15N	
	77 HR15N to 88 HR15N	0.70 HR15N	
	89 HR15N to 92 HR15N	0.68 HR15N	
Indirect Verification of Rockwell Hardness Testers - HR15T ^{FO}	74 HR15T to 80 HR15T	1.20 HR15T W	
	81 HR15T to 86 HR15T	1.19 HR15T W	
	87 HR15T to 93 HR15T	1.39 HR15T W	



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Indirect Verification of Rockwell Hardness Testers - HR30N ^{FO}	42 HR30N to 50 HR30N	1.15 HR30N	ASTM E18 and Calibrated Rockwell Hardness Test Block	
	51 HR30N to 73 HR30N	0.96 HR30N		
	74 HR30N to 82 HR30N	0.75 HR30N		
Indirect Verification of Rockwell Hardness Testers - HR30T ^{FO}	43 HR30T to 57 HR30T	1.26 HR30T		
	57 HR30T to 70 HR30T	1.21 HR30T		
	70 HR30T to 83 HR30T	1.33 HR30T		
Indirect Verification of Rockwell Hardness Testers - HR45N ^{FO}	20 HR45N to 32 HR45N	1.27 HR45N		
	32 HR45N to 62 HR45N	1.21 HR45N		
	62 HR45N to 72 HR45N	0.79 HR45N		
Indirect Verification of Rockwell Hardness Testers - HR45T ^{FO}	13 HR45T to 33HR45T	1.21 HR45T		
	33 HR45T to 53HR45T	1.33 HR45T		
	53 HR45T to 73HR45T	1.16 HR45T		
Durometer ^F				Weight Scale, ASTM D2240, PIC-DURO-001,
Types A, B, O	up to 750 gf	0.12% + 0.22 gf		
Types C, D	up to 4 100 gf	0.0057% + 0.16 gf		
Types CF	up to 34 000 gf	0.0019% + 0.11 gf		
Types OO, OOO, M	up to 2 610 gf	0.069% + 0.23 gf		
Indentor Length	Up to 1 in	29 μ m	Video Measuring System/ PIC-DURO-001	
Pressure Measuring and Sourcing Devices ^{FO}	0.2 psia to 16 psia (-10 inH ₂ O to 10 inH ₂ O)	0.002 % + 0.00015 psia (0.004 % + 0.0033 inH ₂ O)	Mensor 14500, GIDEP Fluke 700G01, GIDEP	
	-15 psi to 30 psi -30 inHg to 60 inHg	0.002 % + 0.006 psi 0.002 % + 0.012 inHg)	Additel ADT681-02-CP30-PSI-N,	
	up to 100 psi	0.002 % + 0.013 psi	Additel ADT681-02-CP100-PSI-N, GIDEP	
	-12 psi to 300 psi (-24.4 inHg to 610 inHg)	0.008 % + 0.012 psi (0.008 & + 0.024 inHg)	Fluke 2700G-BG2M, GIDEP	
	-12 psi to 500 psi (-24.4 inHg to 1 018 inHg)	0.018 % + 0.014 psi (0.018 % + 0.029 inHg)	Omega DPI603, GIDEP	
	Up to 1 000 psi	0.13 psi	Additel ADT681-02-GP1K-N, GIDEP	



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Mechanical

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
Pressure Measuring and Sourcing Devices ^{FO}	up to 3 000 psi	0.0043 % + 0.21 psi	Fluke 2700G-G20M, GIDEP
	up to 5 000 psi	0.018 % + 0.33 psi	Additel ADT681-02-GP5K-N, GIDEP
	up to 10 000 psi	0.048 % + 0.05 psi	Fluke 2700G-G70M, GIDEP
	up to 30 000 psi	0.017 % + 6.9 psi	Additel ADT681-02-GP30K-N, GIDEP
	up to 15 psi	0.0012 % + 0.000 01 psi	Ruska 2465, GIDEP
	up to 600 psi	0.0056 % + 0.000 2 psi	
	100 psi to 3 000 psi	0.0036 % + 0.000 02 psi	Ruska 2470, GIDEP
	90 psi to 40 000 psi	0.007 %	DH-Budenberg CPB3800HP, GIDEP
Torque Measuring Equipment ^{FO} Transducers, Testers, and Analyzers	up to 10 lbf in	0.047 % + 0.0015 lbf in	Torque Wheel Arm 2.5, 5, 10, & 40 in With Class F Weights GIDEP
	up to 160 ozf in	0.047 % + 0.024 ozf in	
	5 lbf in to 100 lbf in	0.056 % + 0.000 8 lbf in	
	100 lbf in to 3 000 lbf in	0.022 %	
	8.33 lbf ft to 250 lbf ft	0.022 %	
	200 lbf ft to 2 000 lbf ft	0.071 %	
Torque Sourcing Equipment ^{OF} Wrenches, Watches, Drivers And Multipliers	8 ozf in to 80 ozf in	0.24 % + 0.05 ozf in	Mountz BMX80Z, GIDEP
	5 lbf in to 50 lbf in	0.016 % + 0.022 lbf in	Mountz BMX50i, GIDEP
	5 lbf in to 100 lbf in	0.034 % + 0.066 lbf in	Larson UTWCS, GIDEP
	50 lbf in to 250 lbf in	0.098 % + 0.23 lbf in	Mountz BMX250it, GIDEP
Torque Sourcing Equipment ^{OF} Wrenches, Watches, Drivers And Multipliers	50 lbf in to 500 lbf in	0.16 % + 0.28 lbf in	Larson UTWCS, GIDEP
	300 lbf in to 3 000 lbf in	0.082 % + 1.9 lbf in	
	25 lbf ft to 250 lbf ft	0.082 % + 0.158 lbf ft	
	50 lbf ft to 500 lbf ft	0.013 % + 0.55 lbf ft	Mountz BMX500F, GIDEP
	75 lbf ft to 750 lbf ft	0.26 % + 0.14 lbf ft	AWS TT-Q-750F, GIDEP
	200 lbf ft to 2 000 lbf ft	0.34 % + 0.32 lbf ft	AWS QCMF-2000, GIDEP



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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 Measuring Equipment ^F	-15 °C to 120 °C	0.37 % + 0.29 °C	Fluke 4180, Fluke 9132, GIDEP
	50 °C to 500 °C	0.15 % + 0.56 °C	
Oven/Chamber Temperature Uniformity Measure ^{FO}	32 °F to 2 400 °F	0.10 % + 2 °F	Fluke 1586A with Type K Thermocouple, GIDEP
	-112 °F to 1 400 °F	0.016 % + 2.01 °F	Fluke 1586A with Type J Thermocouple, GIDEP
Temperature and Humidity Measuring and Sourcing Devices ^{FO}	-70 °C to 180 °C	0.2 °C	Vaisala M170/HMP77, GIDEP
	-94 °F to 356 °F	0.36 °F	
	Up to 40 % RH	1.6 % RH	
	40 % RH to 97 % RH	0.97 % RH	
Temperature Measuring Instruments Glass, Bi-Metallic, and Electronic Thermometers/ Temperature Probes ^{FO}	Fixed Point 0 °C	0.006 °C	Fluke 1586Aw/ SPRT and Ice Bath,
	-80 °C to 0 °C	0.004 % + 0.058 °C	Temperature Bath, Fluke 1586A w/ SPRT and Field Metrology Well, GIDEP
	0 °C to 100 °C	0.0032 % + 0.022 °C	
	50 °C to 660 °C	0.011 % + 0.04 °C	
Temperature Sourcing Instruments Temperature Baths Dry Well Calibrators ^{FO}	-197 °C to 660 °C	0.0002 % + 0.017 °C	Fluke 1586A w/SPRT, GIDEP
Thermocouple Input ^{FO}	-210 °C to 1 200 °C	0.096 °C	Thermocouple Measurement Fluke 5522A, GIDEP
Thermocouple Probe and Wires Types E, J, K, N, and T ^F	Fixed Point 0 °C	0.246 °C	Fluke 1586Aw/ SPRT and Ice Bath,
	-80 °C to 0 °C	0.004 % + 0.69 °C	Temperature Bath Ectron 1140A And Field Metrology Well, GIDEP
	0 °C to 100 °C	0.0032 % + 0.27 °C	
	50 °C to 660 °C	0.011 % + 0.20 °C	



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

Time and Frequency

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
Equipment to Measure Frequency ^{FO}	3 Hz to 1 MHz	12 μ Hz/Hz + 250 μ Hz	Fluke 8846A, Keysight 3458A, Agilent 53181A, GIDEP
	1 Hz to 10 MHz	19 μ Hz/Hz + 69 μ Hz	
	0.1 Hz to 225 MHz	1.6 mHz	
	100 MHz to 3 GHz	650 μ Hz/Hz + 50 mHz	
Equipment to Source Frequency ^{FO}	0.01 Hz to 2 MHz	2.6 μ Hz/Hz + 250 μ Hz	Fluke 5522A, GIDEP
	10 Hz to 1.1999 MHz	73 μ Hz/Hz + 20 μ Hz	Fluke 5700A, GIDEP
Stopwatches/Timer ^{FO}	up to 24 hr	0.032 s / 24 h	Timometer, Time Base Method NIST 960-12
	up to 86 400 s	0.51 s	Photo Totalize Method, Function Generator, Frequency Counter, High Speed Camera NIST 960-12
	up to 86 400 s	0.000 51 s/hr + 0.57 s	Direct Comparison, Stopwatch, NIST 960-12
Tachometers – Contact ^F	10 RPM to 50 000 RPM	0.001 9 % + 0.011 RPM	Ideal Aerosmith, GIDEP
Tachometers – Non-Contact ^{FO}	Uup to 99 999 RPM	0.008 2 %	Generator w/LED, GIDEP



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

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 ^{FO} Measuring and Sourcing Devices	0 g to 10 gf	0.0028 mgf/g + 0.056 mgf	Ultra and Class 1, Standard Weights, GIDEP	
	10 g to 100 gf	0.0013 mgf/g + 0.008 mgf		
	100 g to 500 gf	0.0019 mgf/g + 0.13 mgf		
		1 lbf to 5 lbf	0.005 % + 0.000 37 lbf	NIST Class F Weights, GIDEP
		5 lbf to 10 lbf	0.003 % + 0.000 07 lbf	
		10 lbf to 50 lbf	0.009 % + 0.000 59 lbf	
		50 lbf to 100 lbf	0.0036 % + 0.002 1 lbf	
		Up to 300 lbf	0.0018 % + 0.000 73 lbf	
		Up to 1 000 lbf	0.0018 % + 0.002 3 lbf	
		Up to 5 000 lbf	0.0019 % + 0.005 3 lbf	Load Cell with Indicator, GIDEP
Up to 10 000 lbf		0.076 % + 0.84 lbf		
Weights Non-Classified Weights (Ranged) ^{FO}	1 mg to 5 g	2.5 μ g/g + 9.4 μ g	Direct Reading Method, Sartorius MC 5, GIDEP	
	5 g to 220 g	0.98 μ g/g + 53 μ g	Comparison Method, Mettler Toledo XP205	
	200 g to 10 000 g	4.9 μ g/g + 2.5 mg	Comparison Method, A&D, MC-10K	
	10 000 g to 34 000 g	12 mg/g + 0.2 g	Comparison Method, Mettler Toledo PM34-K	
Weights Non-Classified Weights (Fixed) ^{FO}	10 g	0.066 mg	Comparison Method, Mettler Toledo XP205	
	20 g	0.07 mg		
	30 g	0.14 mg		
	50 g	0.11 mg		
	100 g	0.15 mg		
	200 g	0.26 mg		
		300 g	2.5 mg	Comparison Method, A&D, MC-10K
		500 g	2.6 mg	
		1 kg	2.6 mg	
		2 kg	3.6 mg	
		4 kg	3.6 mg	
		5 kg	7.3 mg	
		10 kg	19 mg	
		20 kg	0.21 g	
			Comparison Method, Mettler Toledo PM34-K	



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Analytical and Precision Balance/Scale ^{FO}	1 mg	0.006 7 mg	Ultra and Class 1 Standard Weights, GIDEP
	10 mg	0.016 mg	
	20 mg	0.021 mg	
	50 mg	0.15 mg	
	100 mg	0.003 3 mg	
	200 mg	0.001 6 mg	
	500 mg	0.004 2 mg	
	1 g	0.051 mg	
	2 g	0.011 mg	
	3 g	0.024 mg	
	5 g	0.022 mg	
	10 g	0.021 mg	
	20 g	0.031 mg	
	30 g	0.13 mg	
	50 g	0.093 mg	
	100 g	0.14 mg	
	200 g	0.25 mg	
	300 g	0.4 mg	
	500 g	0.81 mg	
	1 kg	0.9 mg	
2 kg	3.2 mg		
4 kg	3 mg		
5 kg	12 mg		
10 kg	21 mg		
20 kg	190 mg		
Scales/Balances ^{FO}	200 g	0.25 mg	Class 1 Standard Weights, GIDEP
	300 g	0.4 mg	
	500 g	0.81 mg	
	1 kg	0.9 mg	
	2 kg	3.2 mg	
	4 kg	3 mg	
	5 kg	12 mg	
	10 kg	21 mg	
20- kg	190 mg		



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Floor and Bench Scales ^{FO}	0.001 lb to 1 lb	$(3.31 \times 10^{-6} + 4.19 \times 10^{-7} \text{ Wt}) \text{ lb}$	NIST Class F Weights, GIDEP
	1 lb to 10 lb	$(3.09 \times 10^{-4} + 7.94 \times 10^{-8} \text{ Wt}) \text{ lb}$	
	10 lb to 50 lb	$(7.94 \times 10^{-4} + 1.01 \times 10^{-7} \text{ Wt}) \text{ lb}$	
	50 lb to 100 lb	$(8.60 \times 10^{-4} + 1.74 \times 10^{-7} \text{ Wt}) \text{ lb}$	
	100 lb to 200 lb	$(6.39 \times 10^{-3} + 1.46 \times 10^{-8} \text{ Wt}) \text{ lb}$	
	200 lb to 500 lb	$(3.31 \times 10^{-3} + 1.21 \times 10^{-7} \text{ Wt}) \text{ lb}$	
	500 lb to 1 000 lb	$(1.32 \times 10^{-2} + 4.85 \times 10^{-8} \text{ Wt}) \text{ lb}$	
	1 000 lb to 1 500 lb	$(6.61 \times 10^{-2} + 2.43 \times 10^{-7} \text{ Wt}) \text{ lb}$	
	1 500 lb to 2 000 lb	$(8.60 \times 10^{-4} + 1.74 \times 10^{-7} \text{ Wt}) \text{ lb}$	

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. Example: Outside Micrometer^{FO} would mean that the laboratory performs this calibration 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. Example: Outside Micrometer^{FO} would mean that the laboratory performs this calibration 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
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



Certificate of Accreditation: Supplement

Precision Instrument Correction, Inc.

933 Mariner Street, Brea CA 92821

Contact Name: Gregg Losonsky Phone: 714-671-6018

Accreditation is granted to the facility to perform the following calibrations:
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.
11. Capabilities not limited to specific items noted in Disciplines.

