



**SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005 AND ANSI/NCSL
Z540-1-1994 (R2002)**

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TESTING

Valid to: **March 29, 2019**

Certificate Number: **ACT-1512**

Mechanical

Specific Tests and/or Properties Measured	Specification, Standard, Method, or Test Technique	Items, Materials or Product Tested	Key Equipment or Technology
Metals and Metallic Components	Metallographic Evaluation: Sample Preparation Macroetch / Microetch, Inclusion Rating, Intergranular Corrosion, Photomicrography / Light Microscopy Case Depth	ASTM E3, ASTM E340, E381, E407, ASTM E45 (Method A), ASTM A262 (Practice A and E), ASTM E883, SAE J423	Microscopes with Automatic Stages, Image Characterization and Automatic Microhardness Testers with Mapping
Metals and Metallic Components	Average Grain Size	ASTM E1382, ASTM E112,	Image Analysis Microscopes and Software
Ductile Iron and Ductile Iron Components	Determining Nodularity and Nodule Count Using Image Analysis	ASTM E2567	Image Analysis Microscopes and Software
Metals and Metallic Components	Hardness: Rockwell (HRA, HRBW, HRC, HREW, HRRW, HRMW, HR15N, HR30N, HR45N, HR15T, HR30T, HR45T); Brinell (500 kgf to 3 000 kgf) Micro-hardness (Vickers, Knoop); Leeb	ASTM E18 ASTM E10 ASTM E384 ASTM A956	Digital Automatic Testers
Steels	Determining Hardenability of Steel (end-quench or Jominy)	ASTM A255	Furnace Quench Device Hardness Tester



Mechanical

Specific Tests and/or Properties Measured	Specification, Standard, Method, or Test Technique	Items, Materials or Product Tested	Key Equipment or Technology
Metals, Metallic Components, Systems and Assemblies	Failure Analysis	Atrona MET-08 utilizing Test Methods in this Scope of Accreditation	Equipment/technologies per this Scope of Accreditation
Internal and External Threaded Fasteners, Washers and Rivets	Mechanical Properties	ASTM F606 ASTM F606M ISO 898	Digital Testers with Various Load Cells
Metals Carbon, low and high alloy steels, cast irons, tool steel, stainless steel, aluminum, copper, and nonferrous	Chemical Composition by Spark Atomic Emission Spectrometry	ASTM E415, E1086, E1251, E1999	Optical Emission Spectrometry (OES)/Atomic Emission Spectrometry (AES) Analyzer
Steel, Iron, Nickel and Cobalt	Determination of Carbon and Sulfur by Infrared (IR) Absorption Analysis	ASTM E1019 Method A	IR Analyzer
All types of Metals, Components, and Assemblies	Salt Fog	ASTM B117	Salt Fog Chamber
All types of Metals and Non Metal Components, and Assemblies	Cleanliness Evaluation	JDS-G169, IE2500 and Customer Supplied Test Methods or Methods Developed by the Lab Approved by the Client directly related to tests listed	Scale, Stereoscope, filters
Metal and Metallic Components	Magnetic Particle Inspection	ASTM E1444	Magnetic Particle Equipment
Metal and Metallic Components	Liquid Dye Penetrant Examination	ASTM E165	Liquid Dye Penetrant Equipment
Metal and Metallic Components	EDS Quantitative Analysis	ASTM E1508	EDAX
Metal and Metallic Components	Notched Bar Impact (Charpy)	ASTM E23	Full Size and Sub-Size
Powder Metals	Apparent Hardness of Powdered Metals	MPIF Standard 43/ASTM B962	
Powder Metals	Determination of Density of Compacted and Sintered Powder Metallurgy (PM) Products	MPIF Standard 42	Mettler Balance and Density Kit
Metals, Wires, Rods, Fasteners, Plates, Plastics, Components, and Assemblies	Tensile Mechanical Properties	ASTM A370, E8/E8M	Tensile tester (Up to 100 000 lbf)
Aluminum Magnesium Products	Tension Mechanical Properties	ASTM B557	Tensile tester (Up to 100 000 lbf)



Mechanical

Specific Tests and/or Properties Measured	Specification, Standard, Method, or Test Technique	Items, Materials or Product Tested	Key Equipment or Technology
Fasteners, Components, and Assemblies	Torque Measurement	Customer-supplied or client-approved Lab-developed Test Methods	Torque wrench
Fasteners, Components, and Assemblies	Surface Discontinuity	ASTM F788/F788M, F812/F812M	
Fasteners, Components, and Assemblies	Carburization and Decarburization	ASTM F2328, F2328M	
Metal and Metallic Components	Shear Strength	ASME B18.8.2, MIL-STD-1312 Test 13, MIL-STD-1312 Test 20, and Customer Supplied Test Methods or Methods Developed by the Lab and Approved by the Client directly related to tests listed	Torque wrench, Tensile Tester (Up to 100 000 lbf)
Coating properties of component parts	Tape Adhesion	GM9071P	
Plating properties of component parts	Plating Thickness	GMW4205, GMW4700	Microscope
Organic and Inorganic Solids, Liquids and Gases	Material Identification	ASTM E1252 ASTM D3677 ASTM E204 ASTM E334	Infrared Spectrometer Bio-Rad Excalibur w/ UMA500 Microscope Internal ATR
Organic and Inorganic Solids, Liquids and Polymers	Enthalpies of Fusion, Crystallization, Melting Temperature, Glass Transition Temperature, Oxygen Index	ASTM D3418 ASTM E793 ASTM E794 ASTM E1356 ASTM D3895	Differential Scanning Calorimeter TA DSC Q2000
Organic and Inorganic Solids, and Polymers	Material Composition, Volatile Materials, Combustion, Ash, Filler Content Carbon Black	ASTM E1131 ASTM D1603	Thermogravimetric Analyzer TA TGA Q500
Organic and Inorganic Solids, and Polymers	Glass Transition CTE	ASTM E831	Thermal Mechanical Analyzer TA TMA 2940
Polymers, Plastics and Composites	Ash Content	ASTM D482 ASTM D5630	High Temperature Furnace
Polymers	Melt Flow Rate	ASTM D1238	Tinius Olsen Flow Indexer



Mechanical

Specific Tests and/or Properties Measured	Specification, Standard, Method, or Test Technique	Items, Materials or Product Tested	Key Equipment or Technology
Organic and Inorganic Solids	Density Specific Gravity	ASTM D792	Precision Balance
Polymers	Durometer Hardness	ASTM D2240	Durometer A and D
Polymers	Hardness Rockwell R, L and M	ASTM D785	HR500 Mitutoyo Hardness Tester
Polymers	Flexural Modulus	ASTM D790	Digital Testers with Various Load Cells
Polymers	Water Absorption of Plastics	ASTM D570	Mettler Balance and Oven

Dimensional ¹

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Dimensional Measurement	Length: Up to 10 in Height: Up to 5 in Radius: Up to 1 in Angle: (0 to 360)° Height: Up to 38 in	(280 + 30L) μin (280 + 30L) μin 340 μin 0.043° (180 + 3L) μin	Optical Comparator Digital height gage

CALIBRATION

Length – Dimensional Metrology ¹

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Amplifier - Electronic	Up to 1 in	(21 + 4L) μin	Gage Blocks
Anvil Parallelism ²	Up to 1 in (1 to 24) in	16 μin 110 μin	Optical Parallel Gage Blocks
Angle gage block	Up to 5° Up to 15° Up to 30° Up to 45°	2.3” 3.6” 6.5” 11”	Gage blocks, 10 in sine bar, surface plate, electronic amplifier.
Bench Centers	Up to 48 in	150 μin	Master Arbors, Electronic Amplifier
Bench Center ²	Up to 48 in	160 μin	Master Arbors, 50 μin Test Indicator



Length – Dimensional Metrology ¹

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Bench Micrometer Linear Accuracy	Up to 1 in	22 μin	Gage Blocks
Bench Micrometer ² Linear Accuracy	Up to 1 in	41 μin	Gage Blocks
Bore Micrometer, 3 point	(0.2 to 6) in	(110 + 10L) μin	Plain Ring Gages
Brinell Scope ² Resolution 0.01 mm	Up to 6 mm	0.013 mm	Stage Micrometer
Brinell Scope ² Resolution 0.1 mm	Up to 6 mm	0.12 mm	Stage Micrometer
Caliper Dial / Vernier	Up to 72 in	(600 + 3L) μin	Gage Blocks, Plain Ring Gage
Caliper ² Dial / Vernier	Up to 72 in	(600 + 14L) μin	Gage Blocks, Plain Ring Gage
Caliper Digital	Up to 72 in	(300 + 2L) μin	Gage Blocks, Plain Ring Gage
Caliper ² Dial / Vernier	Up to 72 in	(600 + 14L) μin	Gage Blocks, Plain Ring Gage
Caliper Digital	Up to 72 in	(300 + 2L) μin	Gage Blocks, Plain Ring Gage
Caliper ² Digital	Up to 72 in	(290 + 22L) μin	Gage Blocks, Plain Ring Gage
Caliper Checker Kalmaster	Up to 24 in	(19 + 20L) μin	Gage Blocks, Surface Plate, Electronic Amp
Chamfer Gage, Dial	Up to 2 in	600 μin	Chamfer Ring Gage, Gage Blocks
Chamfer Gage, Dial ²	Up to 2 in	610 μin	Chamfer Ring Gage, Gage Blocks
Depth Micrometer Analog Resolution 0.000 1 in	Up to 12 in	(140 + 10L) μin	Gage Blocks, Surface Plate
Depth Micrometer ² Analog Resolution 0.000 1 in	Up to 12 in	(120 + 31L) μin	Gage Blocks, Surface Plate
Depth Micrometer Analog Resolution 0.001 in	Up to 12 in	(240 + 7L) μin	Gage Blocks, Surface Plate
Depth Micrometer ² Analog Resolution 0.001 in	Up to 12 in	(230 + 25L) μin	Gage Blocks, Surface Plate



Length – Dimensional Metrology ¹

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Depth Micrometer Digital	Up to 12 in	$(90 + 11L) \mu\text{in}$	Gage Blocks, Surface Plate
Depth Micrometer ² Digital	Up to 12 in	$(73 + 33L) \mu\text{in}$	Gage Blocks, Surface Plate
Dial Bore Gage	Up to 0.02 in	120 μin	P&W Supermicrometer
Flatness	Up to 2 in Surface Face	14 μin	Optical Flat
Flatness/ Parallelism	(2 to 24) in	130 μin	Surface Plate, Electronic Amp
Granite Surface Plates ² Local Area Flatness (Repeat Reading) Overall Flatness	Local Area Flatness Up to 96 in Overall Flatness Up to 24 in Up to 48 in Up to 96 in	30 μin 44 μin 62 μin $(5 + (24 \times L/12)) \mu\text{in}$	Repeat meter Planekator/indicator Planekator/indicator Autocollimator
Height Gage Digital Resolution 0.000 1 in	Up to 48 in	$(150 + 13L) \mu\text{in}$	Gage Blocks, Surface Plate
Height Gage ² Digital Resolution 0.000 1 in	Up to 48 in	$(130 + 36L) \mu\text{in}$	Gage Blocks, Surface Plate
Height Gage Digital Resolution 0.000 5 in	Up to 48 in	$(770 + 7L) \mu\text{in}$	Gage Blocks, Surface Plate
Height Gage ² Digital Resolution 0.000 5 in	Up to 48 in	$(750 + 26L) \mu\text{in}$	Gage Blocks, Surface Plate
Height Gage ² Dial/Digital Resolution 0.001 in	Up to 48 in	$(1\ 600 + 3L) \mu\text{in}$	Gage Blocks, Surface Plate
Height Gage ² Dial/Digital Resolution 0.001 in	Up to 48 in	$(1\ 600 + 17L) \mu\text{in}$	Gage Blocks, Surface Plate
Height Master	Up to 24 in	$(36 + 16L) \mu\text{in}$	Gage Blocks, Surface Plate
Indicator Dial/Digital/Electronic Resolution 0.000 02 in	Up to 1 in	$(13 + 12L) \mu\text{in}$	Gage Blocks



Length – Dimensional Metrology ¹

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Indicator ² Dial/Digital/Electronic, Resolution 0.000 02 in	Up to 1 in	(8 + 36L) μin	Gage Blocks
Indicator Dial/Digital/Electronic Resolution 50 μin	Up to 4 in	(36 + 8L) μin	Gage Blocks, Surface Plate
Indicator ² Dial/Digital/Electronic Resolution 50 μin	Up to 4 in	(36 + 25L) μin	Gage Blocks, Surface Plate
Indicator Dial/Digital/Electronic 0.000 1 in Resolution	Up to 4 in	(61 + 8L) μin	Gage Blocks, Surface Plate
Indicator ² Dial/Digital/Electronic Resolution 0.000 1 in	Up to 4 in	(51 + 26L) μin	Gage Blocks, Surface Plate
Indicator Dial/Digital/Electronic Resolution 0.000 5 in	Up to 4 in	(300 + 2L) μin	Gage Blocks, Surface Plate
Indicator ² Dial/Digital/Electronic Resolution 0.000 5 in	Up to 4 in	(300 + 8L) μin	Gage Blocks, Surface Plate
Indicator Dial/Digital/Electronic Resolution 0.001 in	Up to 4 in	(610 + 2L) μin	Gage Blocks, Surface Plate
Indicator ² Dial/Digital/Electronic, Resolution 0.001 in	Up to 4 in	(610 + 3L) μin	Gage Blocks, Surface Plate
Indicator Dial/Digital/Electronic Resolution 0.002 mm	Up to 4 in	(48 + 9L) μin	Gage Blocks, Surface Plate
Indicator ² Dial/Digital/Electronic Resolution 0.002 mm	Up to 4 in	(48 + 20L) μin	Gage Blocks, Surface Plate
Indicator Dial/Digital/Electronic Resolution 0.01 mm	Up to 4 in	(240 + 2L) μin	Gage Blocks, Surface Plate
Indicator ² Dial/Digital/Electronic Resolution 0.01 mm	Up to 4 in	(240 + 9L) μin	Gage Blocks, Surface Plate



Length – Dimensional Metrology ¹

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Indicator Calibrator Resolution 0.000 05 in	Up to 1 in	60 μin	Gage Blocks, Electronic Amplifier
Indicator Calibrator Resolution 0.000 01 in	Up to 1 in	21 μin	Gage Blocks, Electronic Amplifier
Length Standards	(1 to 60) in	(34 + 14L) μin	Gage Blocks, Surface Plate, Electronic Amp
Levels	Up to 0.000 5 in/ ft	190 μin/ft	Gage Blocks, Surface Plate, Plug Gages
Levels ²	Up to 0.000 5 in/ ft	200 μin/ft	Gage Blocks, Surface Plate, Plug Gages
Micrometer, Inside	(1 to 10) in	(34 + 23L) μin	P&W Supermicrometer, Gage Blocks
Micrometer, Inside	(10 to 40) in	(34 + 14L) μin	Gage Blocks, Surface Plate, Electronic Amp
OD Micrometer Digital Linear Accuracy	Up to 48 in	(25 + 14L) μin	Gage Blocks
OD Micrometer ² Digital Linear Accuracy	Up to 48 in	(35 + 37L) μin	Gage Blocks
OD Micrometer Analog Linear Accuracy	Up to 48 in	(51 + 13L) μin	Gage Blocks
OD Micrometer ² Analog Linear Accuracy	Up to 48 in	(36 + 37L) μin	Gage Blocks
Plain Plug Gage (Mahr)	Up to 20 in	(13 + 26L) μin	Mahr CiM Gage Blocks
Plain Plug Gage (P&W Supermicrometer)	Up to 10 in	(34 + 23L) μin	P&W Supermicrometer Gage Blocks
Plain Ring Gage	(0.125 to 14) in	(11 + 9L) μin	Mahr CiM Gage Blocks
Protractor	0° to 360°	0.058°	Sine Bar, Gage Blocks
Sine Bar	Up to 20 in	(34 + 14L) μin	Gage Blocks, Electronic Amplifier, Surface Plate
Squares, Steel	Up to 24 in	(59 + 9L) μin	Granite Square, Surface Plate
Taper Thread Plug Pitch Diameter	(0.062 5 to 4) in	(130 + 10L) μin	P&W Supermicrometer Taper Block, Wires



Length – Dimensional Metrology ¹

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Taper Thread Plug Major Diameter	(0.062 5 to 4) in	(81 + 14L) μin	P&W Supermicrometer Taper Block
Taper Thread/Plain Plug Step Height	Up to 1 in	230 μin	Gage Blocks Surface Plate Electronic Amp
Taper NPTF 6 Step Plain Plug Diameter	(0.062 5 to 4) in	(81 + 14L) μin	P&W Supermicrometer Taper Block
Taper Thread Rings	(0.062 5 to 3) in Pitch Diameter at End Step Height	(290 + 110PD) μin 230 μin	Taper Thread Plugs, Gage Blocks, Electronic Amp
Thread Ring Gage Pitch Diameter	(0.072 to 1) in (1 to 7.5) in	(94 + 17L) μin (120 + 3PD) μin	Thread Set Plugs Mahr CiM
Thread Measuring Wires	Up to 0.25 in	16 μin	Mahr CiM Thread Measuring Rolls
Thread Plug Gage Pitch Diameter	Up to 10 in	(94 + 17L) μin	P&W Supermicrometer Gage Blocks Thread Measuring Wires
Thread Roll Gage Elements Lead Flank Angle	(0.01 to 0.5) in (0 to 45) °	(280 + 80L) μin 0.043 °	Optical Comparator
Universal Length Measuring Machine	Up to 12 in Up to 2 lbf	(2.3 + 4.1L) μin 0.0074 lbf	Gage Blocks Force Gage
V Block	(6 x 6 x 6) in	130 μin	Granite Square, Surface Plate, Electronic Amp
Extensometers ²	Up to 1 in	(51 + 26L) μin	Extensometer Calibrator
Optical Comparator ² X, Y Linear Accuracy Angle Accuracy	X, Y: Up to 6 in X, Y: Up to 12 in Angle: (90, 180, 270, 360)°	(120 + 34L) μin (300 + 34L) μin 0.024°	Glass Scale, Magnification Scale, Sphere Kit; Angle Square



Mass¹

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Rockwell Hardness Testers ²	HRA Low Mid High	0.83 HRA 0.58 HRA 0.51 HRA	Certified Test Blocks
	HRBw Low Mid High	1.4 HRBW 1.6 HRBW 0.92 HRBW	
	HRC Low Mid High	0.90 HRC 0.63 HRC 0.60 HRC	
	HREw Low Mid High	1.1 HREW 0.89 HREW 0.77 HREW	
	HR15N Low Mid High	0.87 HR15N 0.87 HR15N 0.68 HR15N	
	HR30N Low Mid High	1.1 HR30N 0.87 HR30N 0.78 HR30N	
	HR45N Low Mid High	0.85 HR45N 0.84 HR45N 0.75 HR45N	
	HR15TW Low Mid High	1.7 HR15TW 1.3 HR15TW 1.4 HR15TW	
	HR30TW Low Mid High	1.6 HR30TW 1.2 HR30TW 1.4 HR30TW	
	HR 45TW Low Mid High	1.6 HR45TW 1.3 HR45TW 1.5 HR45TW	



ANSI-ASQ National Accreditation Board

Mass ¹

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Brinell Hardness Testers ²	HBW 10/500 Low HBW 10/500 Mid HBW 10/500 High HBW 10/3 000 Low HBW 10/3 000 Mid HBW 10/3 000 High	2.3 HBW 2.1 HBW 2.5 HBW 9.3 HBW 5.3 HBW 13 HBW	Certified Test Blocks
Vickers/Knoop Microhardness Testers ²	HK 100 gf High HK 500 gf Low HK 500 gf High HV 100 gf Low HV 500 gf Low HV 500 gf High HV 1 000 gf High HV 5 000 gf Low HV 5 000 gf High	23 HK 16 HK 36 HK 26 HV 12 HV 37 HV 11 HV 13 HV 26 HV	Certified Test Blocks
Durometers	Type A (0 to 100) Duro Type M (0 to 100) Duro	1.2 Duro A 1.6 Duro M	Three Beam Balance Digital Balance
Pressure (Hydraulic/ Pneumatic)	Up to 500 psig (500 to 3 000) psig (3 000 to 10 000) psig (10 000 to 15 000) psig	0.30 psig 2 psig 9.3 psig 44 psig	Master Pressure Gages
Magnetic Particle Inspection Machine (Magnaflux)	Ammeter: Up to 4 kA Timer: Up to 10 s White light: Up to 190 fc Black light: Up to 1900 μ W/cm ² Gauss meter: Up to 100 G 50 lb weight test 30 lb weight test 10 lb weight test	69 A + 2 A/kA 0.012 s + 0.005 s/s 1.6 fc + 0.05 fc/fc 71 μ W/cm ² 0.77 G + 0.12 G/G 2.8 g 1.7 g 1.2 g	Current shunt Timer White light meter Black light meter Gauss meter ASTM Class F weight ASTM Class F weight ASTM Class 7 weight
Vacuum	(0 to 24) in Hg	0.6 in Hg	Master Pressure Gage
Profilometer	Ra: (10 to 20) μ in Ra: (110 to 120) μ in	2.6 μ in 3.4 μ in	Master Three Patch Reference Standard
Profilometer Standard	Ra: (10 to 20) μ in Ra: (110 to 120) μ in	2.6 μ in 3.4 μ in	MTI SJ-400 Profilometer
Tensile/Compression Testing Machines ²	(12 to 300) lbf (200 to 5 000) lbf (5 000 to 25 000) lbf (25 000 to 100 000) lbf	0.16 lbf 3.1 lbf 15 lbf 110 lbf	Master Load Cells and Digital Indicator



Mass ¹

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Torque Wrenches ²	Up to 50 lbf·in Up to 400 lbf·in Up to 1000 lbf·in Up to 250 lbf·ft Up to 600 lbf·ft	0.24 lbf·in 1.6 lbf·in 3.7 lbf·in 1 lbf·ft 2.4 lbf·ft	CDI Torque Calibrator

Notes:

1. Calibration and Measurement Capability (CMC) is expressed in terms of the measurement parameter, measurement range, expanded uncertainty of measurement and reference standard, method, and/or equipment. The expanded uncertainty of measurement is expressed as the standard uncertainty of the measurement multiplied by a coverage factor of 2 ($k=2$), corresponding to a confidence level of approximately 95%.
2. On-site calibration service is available for this parameter, since on-site conditions are typically more variable than those in the laboratory, larger measurement uncertainties are expected on-site than what is reported on the accredited scope
3. This scope is formatted as part of a single document including Certificate of Accreditation No. ACT-1512.



Vice President