



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

ELEMENT BROKEN ARROW
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MECHANICAL

Valid To: September 30, 2024

Certificate Number: 1089.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following types of tests on fasteners, metals, alloys, adhesives and sealants, aircraft components, automotive components, coatings, films, packaging; gaskets, seals and packings; composites; plastics and polymers; pipes, hoses, rubber and rubber products.

<u>Test</u>	<u>Test Method(s)</u>
<u>Metallurgical Testing</u>	
Tension	ASME Section IX; BS EN 895:1995 (Withdrawn 2011) ¹ ; EN10002-1:2001 (Withdrawn 2009) ¹ ; ASTM A370 (Sections 6-14), A770/770M, A1034/1034M ² , B557, B557M, E8/E8M, E111; ISO 4136, 6892-1
Bend	API 1104; ASME Section IX; ASTM A6/A6M, A370 (Section 15), E190, E290; AWS D1.1/D1.1M, D1.5/D1.5M, D17.1/D17.1M, B2.1/B2.1M; EN910 (Withdrawn 1996) ¹ ; ISO 15614-1, 5173; SOP A203
Hardness	
Portable Hardness	ASTM A1038, E110; SOP A206
Brinell (3000 kgf)	ASTM A370 (Section 17), F606/F606M, E10; ISO 6506-1
Rockwell (A, B, C, E, F, H)	ASTM E18, A370 (Section 18), F606/F606M; ISO 6508-1; NASM-1312-6
Superficial (15N, 30N, 45N, 15T, 30T, 45T, 15W)	ASTM E18, A370 (Section 18); ISO 6508-1; NASM-1312-6
Vickers (1 to 10) kg	ASTM E92, F606/F606M; BS EN 1043-1:1996 (Withdrawn 2011) ¹ ; ISO 6507-1, 9015-1
Charpy Impact (-325 to 80) °F (U- and V- Notch)	ASTM A370 (Section 20-27), E23, A923; ISO 148-1
Flattening	API 1104; ASTM A370 (Section A.2.5.1.1); A530/A530M (Section 21), A1016/A1016M (Section 19), A999/A999M (Section 21), A450/A450M (Section 18); SOP A208

<u>Test</u>	<u>Test Method(s)</u>
<u>Metallurgical Testing (cont'd)</u>	
Flare & Flange Test	ASTM A370 (Section A.2.5.1.4, A.2.5.1.5), A450/A450M, A1016A/A1016M
Nick Breaks	API 1104; AWS B4.0
Electrical Conductivity	ASTM E1004; EN 2004-1, EN 2004-7
Visual Examination	ASME Section IX
Fillet Weld Fracture	ASME Section IX
<u>Tensile Test of Fasteners</u>	
Axial Tensile (Up to ½ in)	ASTM A370 (Section A3.2), E8/E8M, F606/F606M; NASM-1312-8
Proof Load (Interior & exterior thread)	ASTM A370 (Section A3.2), F606/F606M; NASM-1312-8
Wedge Tensile (Up to ½ in)	ASTM A370 (Section A3.2.1.6), F606/F606M; SAE J429
<u>Shear Test of Fasteners</u>	
Double	ASTM B565, F606/F606M; NASM-1312-13
<u>Torque Tests of Fasteners</u>	
Threaded Fasteners	NASM-1312-31
Self-Locking Nuts	NASM-25027, 85730
<u>Metallographic Evaluation</u>	
Metallographic Preparation	ASTM E3
Grain Size	ASTM E112, E930, E1382
Macro Etching	ASTM E340, E381
Micro Etching	ASTM E407
Microstructure	ASTM A247
Inclusion Content	ASTM E45 (Method A)
Case Depth	ASTM E1077; SAE J423
Visual and Macroscopic Evaluation of Welds	AMS-STD-1595A 1998 (Cancelled 2002) ¹ ; API 1104; ASME Sec IX, VIII-Div 1; AWS B2.1/B2.1M, B2.2/B2.2M, D1.1/D1.1M, D1.2/D1.2M, D1.4/D1.4M, D1.5/D1.5M, D1.6/D1.6M, D17.1/D17.1M; BS EN 287-1 (Withdrawn 2011) ¹ , 1321:1997 (Withdrawn 2013) ¹ ; BS EN ISO 15614-1, 15614-8; ISO 5817, 15614-5, 17637, 17639; CSA W47.1; EN ISO 9606-1, 9606-4; NAVSEA S9074-AQ-GIB-010/248
Microhardness	
Knoop (100-1000) gf	ASTM B578, E92, E384, F606/F606M; NASM 1312-6; NAVSEA S9074-GIB-010/248
Vickers (100-1000) gf	ASTM B578, E92, E384, F606/F606M; BS EN 1043-1:1996 (Withdrawn 2011) ¹ ; ISO 9015-1, 6507-1; NASM 1312-6

<u>Test</u>	<u>Test Method(s)</u>
<u>Metallographic Evaluation (cont'd)</u>	
Microscopic Determination of	
Constituent Percent	ASTM A800/A800M, E562, E1245
Plating Thickness	ASTM B487; ISO 1463; NASM-1312-12
Failure Analysis	SOP-G200, ASM Handbook Volume 11 (using test methods contained in this scope)
Hydrostatic Pressure Testing	SOP G202; ASTM E1003-13
Scanning Electron Microscope/Energy Dispersive Spectroscopy	ASTM B748, E1508, ASM Handbook Volume 12
<u>Environmental Exposure Simulation</u>	
Effects of Liquids (Rubber)	ASTM D471
Oven Ageing (Rubber)	ASTM D573
<u>Hardness</u>	
Durometer Type: A, M, D	ASTM D2240
<u>Impact</u>	
Izod/Charpy	ASTM D256, D4812, D6110; ISO 179-1, 180
<u>Mechanical Properties</u>	
Tensile	ASTM C297/C297M, D412, D638, D695, D1414, D1708; ISO-527-1
Compression	ASTM D695
Peel	ASTM D1876, D3167
Shear	ASTM D1002, D2344/D2344M
Tear	ASTM D624
Compression Set	ASTM D395 (Method B)
Flexural Properties of Plastics	ASTM D790; ISO-178
<u>Physical Properties</u>	
Density/Specific Gravity	ASTM D792, D297
Taber Abrasion	ASTM D4060; MIL-A-8625
<u>Corrosion/Environmental Testing</u>	
Coating Evaluation	ASTM D610, D714, D1654, D3359
Humidity	ASTM D1735, D4585/D4585M
Salt Spray (Fog)	ASTM B117, G85 (Annex A1)
UV (Xenon, Fluorescent)	ASTM G151, G154, G155

I. Dimensional Testing³

Parameter	Range	CMC ⁴ (±)	Technique / Standards
Linear ⁵	Up to 1 in Up to 2 in Up to 6 in	0.000054 in 0.0002 in 0.001 in	Digital Micrometer/ASME Y14.5 Optical Comparator/ASME Y14.5 Calipers/ASME Y14.5
Angle ⁵	(0 to 45)°	0.048°	Optical Comparator/ASME Y14.5

¹ This laboratory’s scope contains withdrawn or superseded methods. As a clarifier, this indicates that the applicable method itself has been withdrawn or is now considered “historical” and not that the laboratory’s accreditation for the method has been withdrawn.

² This laboratory meets the requirements of *ASTM E329 Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection* for the testing of steel construction materials, steel reinforcing bars, and qualification of welding personnel.

³ This laboratory offers commercial dimensional testing service only.

⁴ Calibration and Measurement Capability (CMC) is the smallest uncertainty of measurement that a laboratory can achieve within its scope of accreditation when performing more or less routine measurements of nearly ideal measurement standards or nearly ideal measuring equipment. Calibration and Measurement Capabilities represent expanded uncertainties expressed at approximately the 95 % level of confidence, usually using a coverage factor of $k = 2$. The actual measurement uncertainty of a specific measurement performed by the laboratory may be greater than the CMC due to the behavior of the customer’s device and to influences from the circumstances of the specific measurement.

⁵ This test is not equivalent to that of a calibration.



Accredited Laboratory

A2LA has accredited

ELEMENT BROKEN ARROW

Broken Arrow, OK

for technical competence in the field of

Mechanical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).



Presented this 11th day of October 2022.

A blue ink signature of Mr. Trace McInturff, written in a cursive style.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 1089.01
Valid to September 30, 2024

For the types of tests to which this accreditation applies, please refer to the laboratory's Mechanical Scope of Accreditation.