



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

ELEMENT BROKEN ARROW
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MECHANICAL

Valid To: September 30, 2020

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 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 Methods</u> |
|--|---|
| <u>Metallurgical Testing</u> | |
| Tension | ASME Section IX; ASTM A370 (Sections 6-14), A770/770M, A1034/1034M ² , B557, B557M, E8/E8M, E111; BS EN 895:1995 (Withdrawn 2011) ¹ ; EN10002-1:2001 (Withdrawn 2009) ¹ ; ISO 4136, 6892-1 |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API 1104; ASME Section IX; ASTM A6/A6M, A370 (Section 15), E190, E290; AWS D1.1/D1.1M, D1.5/D1.5M, D17.1/D17.1M; EN910 (Withdrawn 1996) ¹ ; ISO 15614-1, ISO 5173; AWS B2.1/B2.1M, SOP A203 |
| Hardness | |
| Portable Hardness | ASTM A1038; 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| Vickers (1 to 10) kg | ASTM E92, F606/F606M; BS EN 1043-1:1996 (Withdrawn 2011) ¹ ; ISO 6507-1, 9015-1 |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; 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 |
| Flare & Flange Test | ASTM A370 (Section A.2.5.1.4, A.2.5.1.5) |
| Nick Breaks | API 1104; AWS B4.0 |
| Electrical Conductivity | ASTM E1004 |

| <u>Test</u> | <u>Test Methods</u> |
|--|--|
| <u>Metallurgical Testing (cont'd)</u> | |
| 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> | |
| Single | ASTM B565, F606/F606M; NASM-1312-20 |
| 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>Rivet Testing</u> | |
| Blind Rivet Test | MIL-R-7885; NAS 1687 |
| Solid Rivet Drivability Test | BPS-R-131; NASM-5674 |
| Panel Fastener Tests | NASM-1312-22, 1312-23 |
| <u>Metallographic Evaluation</u> | |
| Metallographic Preparation | ASTM E3 |
| Grain Size | ASTM E112, E930, E1382 |
| Macro Etching | ASTM E340, E381 |
| Micro Etching | ASTM E407 |
| Nodularity and Nodule Count | ASTM E2567 |
| 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 ; BS EN 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 |

| <u>Test</u> | <u>Test Methods</u> |
|---|---|
| <u>Metallographic Evaluation (cont'd)</u> | |
| 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 |
| 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 |
| 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> | |
| Gardner | ASTM D2794 |
| Izod/Charpy | ASTM D256, D4812, D6110; ISO 179-1, 180 |
| | |
| <u>Mechanical Properties</u> | |
| Tensile | ASTM C297/C297M, D412, D638, D695, D1414, D1708, D3039/D3039M; ISO-527-1 |
| Compression | ASTM D695, D6641/D6641M |
| Peel | ASTM D1781, 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> | |
| Brittleness | ASTM D746 (Type A), D2137 (Method A); ISO-974 |
| Density/Specific Gravity | ASTM D792, D297 |
| Taber Abrasion | ASTM D4060; MIL-A-8625 |

| Test | Test Methods |
|--|-------------------------------|
| Corrosion/Environmental Testing | |
| 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 1 in Up to 2 in Up to 6 in | 0.0009 in 0.0008 in 0.0002 in 0.001 in | Dial indicator/ASME Y14.5 Digital indicator/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 17025:2005 *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 13th day of November 2018.

A blue ink signature of the Senior Director of Accreditation Services.

Senior Director, Accreditation Services
For the Accreditation Council
Certificate Number 1089.01
Valid to September 30, 2020
Revised January 28, 2019

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