



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

TENSILE TESTING METALLURGICAL LABORATORY

4520 Willow Parkway
Cleveland, OH 44125

James E Rauckhorst Phone: 216 641 3290

CHEMICAL

Valid To: May 31, 2019

Certificate Number: 0161.01

In recognition of the successful completion of the A2LA evaluation process (including compliance to R223 – Specific Requirements – GE Avation S-400 Accreditation Program), accreditation is granted to this laboratory to perform the following tests on aerospace, nuclear, automotive parts, bar, forgings, castings, fasteners, medical implants, heat treated parts, eyebolts, weldments, coatings, paint, billets, stampings, rebar, wire, buckles, shackles, hitches, hooks, chains, cargo rings, clevis, turnbuckles, inserts and tubular products¹:

<u>Test</u>	<u>Test Method(s)</u>
<u>Spectroscopy</u>	
Optical Emission Spectrochemical Analysis - Argon Path (OES) (Al, As, B, Bi, C, Cd, Co, Cr, Cu, Mg, Mn, Mo, Ni, P, Pb, Sb, Sn, Ti, V, W, Zn)	ASTM E415, E1086, E1251, E1999; TTML C-01
<u>Combustion</u>	
LECO Carbon and Sulfur Analyzer (C, S)	ASTM E1019; TTML C-04
LECO Oxygen, Nitrogen, and Hydrogen Analyzer (O, N, H)	ASTM E1019, E1447; TTML C-03

Note: Testing performed on the following materials: Aluminum, Carbon and Alloy Steel, Copper Alloys (Brass, Bronze), Titanium, Cobalt, Superalloys, Tool Steels, Nickel Alloys, Hadfield Manganese and Stainless Steels.



Accredited Laboratory

A2LA has accredited

TENSILE TESTING METALLURGICAL LABORATORY

Cleveland, OH

for technical competence in the field of

Chemical 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 laboratory also meets the requirements of R223 – Specific Requirements: GE Aviation S400 Accreditation Program. 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 8 January 2009*).



Presented this 15th day of May 2017.

A handwritten signature in black ink, written over a horizontal line.

President and CEO
For the Accreditation Council
Certificate Number 0161.01
Valid to May 31, 2019

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



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TENSILE TESTING METALLURGICAL LABORATORY

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Cleveland, OH 44125

James E Rauckhorst Phone: 216 641 3290

MECHANICAL

Valid To: May 31, 2019

Certificate Number: 0161.02

In recognition of the successful completion of the A2LA evaluation process (including compliance to R223 – Specific Requirements – GE Aviation S-400 Accreditation Program), accreditation is granted to this laboratory to perform the following tests on aerospace, nuclear, automotive parts, bar, forgings, castings, fasteners, medical implants, heat treated parts, eyebolts, weldments, coatings, coils, plates, paint, billets, stampings, rebar, wire, buckles, shackles, hitches, hooks, chains, cargo rings, clevis, turnbuckles, inserts and tubular products¹:

<u>Test</u>	<u>Test Method(s)</u>
<u>Mechanical:</u>	
Ball Punch Deformation (Olsen, Erichsen)	ASTM E643
Bend Test	ASTM A370 (Sec. 15), A489, E190, E290; ISO 5173, 7438
Charpy Impact (-320 to 212)°F	ASTM A370 (Sec. 20-29), A923 (Method B), E23; EN 10045-1; ISO 083, 148
Compression	ASTM E9
Flare Test	ASTM A370 (Sec. A2.5.1.4)
Flattening Test	ASTM A370 (Sec. A2.5.1.1)
Fracture Toughness	ASTM E399, ISO 12135
<u>Hardness:</u>	
Brinell (500, 1500 & 3000) Kg	ASTM E10; ISO 6506, ISO 898-5 (6.1.2)
Rockwell / Superficial Rockwell (HRA, HRBW, HRC, HRD, HREW, HRFW, HRGW, HRHW, HRKW, HR15TW, HR30TW, HR45TW, HR15N, HR30N, HR45N)	ASTM E18, F606/F606M; NASM 1312-6; ISO 6508, ISO 898-5 (6.1.3)
Jominy Hardenability	ASTM A255; SAE J406
<u>Microhardness</u>	
Knoop (100, 200, 500)g	ASTM E384, E92, F606/F606M; NASM 1312-6; ISO 5454

<u>Test</u>	<u>Test Method(s)</u>
Vickers (300 g, 500 g, 1000 g, 10 Kg)	ASTM E92, E384, F606/F606M; NASM 1312-6; ISO 6507, ISO 898-5 (6.1.1)
Pencil Hardness	ASTM D3363
Tape Adhesion	ASTM D3359
Stress Rupture (Up to 1500)°F w/ Smooth, Notch and Combination Bars Tensile	ASTM E139, E292; ISO 204; NASM 1312-14
Room Temperature (Up to 400K for Ultimate Tension, Yield, Modulus)	ASTM A48, A370 (Sec. 6-14), A770, B557, E8/E8M; DIN 50125; EN 10002 (Withdrawn 2001) ² , 10164; JIS Z2201, Z2241; NASM 1312-8; ISO 6892-1
R Value	ASTM E517
N Value	ASTM E646
Elevated Temperature (Up to 1500)°F	ASTM E21; NASM 1312-18

Fastener:

Discontinuities	ASTM F788, F812; SAE J122, J123 (Cancelled 2012) ² ; ISO 6157
Ductility	SAE J78, J81
Hydrogen Embrittlement / Debrittlement	ASTM F519, F606/F606M; NASM 1312-5
Verification (Stress Durability)	USCAR-5, USCAR-7
Prevailing Torque	IFI 100/107
Proof (Internal & External Threads)	ASTM A370 (Annex A3), F606; SAE J429, J995; ISO 898-2, -6
Rotational Capacity (RoCap)	AASHTO M164 (Withdrawn 2005) ² ; ASTM A325 (Sec. 10.2), F3125
Tensile	
Axial Tensile	ASTM F606/F606M; ISO 898-1
Wedge Tensile	ASTM F606/F606M; ISO 898-1
Screw Thread Insert	MIL-I-45914A
Shear / Double Shear	ASTM F606; NASM 1312-13, 1312-20
Torque Tension	ISO 16047
Torque Testing	ASTM F738 (Sec. 10.2.4), F880 (Sec. 12.3), F912 (Sec. 11.2); IFI 101; ISO 898-5 (6.3), -7
Turnbuckle Test	ASTM F1145

Metallographic Evaluation:

Alpha Case	ASTM E407; TTML LI-019
Banding / Orientation of Microstructures	ASTM E1268; ASM Handbook (Vol. 9)
Case Depth	SAE J423, ISO 18203
Carburization	SAE J121 (Cancelled 2013) ²

<u>Test</u>	<u>Test Method(s)</u>
Depth of Decarburization / Chord Method	ASTM A574, E1077, F2328; SAE J121, SAE ARP 1820, ISO 898-5 (6.2)
Ferrite Rating	AMS 2315
Graphite in Castings / Nodularity	ASTM A247; GM9095P
Grain Size (Comparison Method)	ASTM E112, E930
Inclusion Rating / Microcleanliness	ASTM E45 (Method A & D)
Metallographic Specimen Preparation	ASTM E3
Macro / Micro Etch	ASTM A604, E340, E381, E407
Photomicrography	ASTM E883
Plating Thickness / Coating Thickness	ASTM B487

Material Property Analysis:

Coating Weight	ASTM A90, A428; NASM 1312-12
Conductivity	ASTM E1004
Surface Roughness / Surface Finish	ASME B46.1
Adhesion of Metallic Coatings	ASTM B571 (Methods 3, 4, 7, 8, 9)

Corrosion:

Corrosion Test	ASTM A923 (Method A & C)
Intergranular Corrosion (IGA)	ASTM A262 (Practice A & E)
Salt Spray	ASTM B117; ISO 9227
Humidity	ASTM D1735; ISO 7253
Corrodokote	ASTM B380

Other:

Failure Analysis (using the test technologies listed above)	TTML LI-011; ASM Metals Handbook Vol. 11
Heat Treat ³	SAE-AMS-H6875, AMS 2750
Weld Evaluation – PQR, WPS	ASME Section IX, AWS D1.1, D1.5

¹Testing performed on the following materials: Aluminum, Carbon and Alloy Steel, Copper Alloys (Brass, Bronze), Titanium, Cobalt, Superalloys, Tool Steels, Nickel Alloys and Stainless Steels.

²This 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.

³Heat Treatment Performed Only on Samples Prior to Testing. (Heat Treat Capability) including age, anneal, austenitize, bake, heat resistance, normalize, PWHT (Post Weld), stress relieve, quench & temper, 24 hour on nuts.



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