



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

Dirats Laboratories

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TESTING

Valid to: May 17, 2013

Certificate Number: AT – 1546

Table with 5 columns: FIELD OF TEST, ITEMS, MATERIALS OR PRODUCTS TESTED, SPECIFIC TESTS OR PROPERTIES MEASURED, SPECIFICATION, STANDARD METHOD OR TECHNIQUE USED, \*DETECTION LIMIT/ RANGE/ EQUIPMENT. Rows include tests for Chemical Analysis, Carbon/Sulfur Analysis, Nitrogen/Oxygen Analysis, Hydrogen Analysis, Atomic Absorption, X-Ray Diffraction, and XRF-ED Analysis.



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|----------------------|---|---|---|--|
| Chemical             | Ni, Cu and Steel Alloys                     | Chemical Analysis   | ICP-MS  | PE Elan 6100DRC<br>ICP-MS                              |
| Chemical             | Metal Alloys                                | Differential Thermal Analysis                                     | ASTM E794   | TA Instruments Thermal Analyzer                        |
| Chemical             | Al and Cu Alloys                            | Electrical Conductivity using Electromagnetic Method              | ASTM E1004  | Magnatest FM-120 Conductivity Meter                    |
| Chemical             | Feebly Magnetic Materials                   | Magnetic Permeability   | ASTM A342   | Severn Engineering Co.<br>Permeability Indicator #3404 |
| Chemical             | Platings and Coatings                       | Coating Weight Determination                                      | ASTM A90, A428, B137 and B767                           | Analytical Balance                                     |
| Chemical             | Powders                                     | Determination of Flow Rate Of Metal Powders                       | ASTM B213   | Hall Flowmeter funnel and Analytical Balance           |
| Chemical             | Powders                                     | Wet and Dry Particle Size Distribution                            | ASTM B214   | Ro-Tap Sieve Shaker                                    |
| Chemical             | Powders                                     | Density   | ASTM B311   | Analytical Balance                                     |
| Chemical             | Powders                                     | Light Scattering Particle Size Distribution                       | ASTM B822   | Honeywell Microtrac SRA 150 Particle Size Analyzer     |
| Chemical             | Powders and Solids                          | Loss on Ignition, Organic Content and Acid Insolubles             | Gravimetric Determination                               | Analytical Balance<br>Analytical Furnace               |
| Chemical             | Free Flowing Metal Powders                  | Apparent Density Determination                                    | ASTM B212   | Hall Flowmeter funnel and Analytical Balance           |
| Chemical             | Non-Free Metal Flowing Powders              | Apparent Density Determination                                    | ASTM B417   | Carney Flowmeter funnel and Analytical Balance         |
| Chemical             | Sintered Parts And Oil-Impregnated Bearings | Determination Of Density, Oil Content And Interconnected Porosity | ASTM B962 and B963                                      | Analytical Balance                                     |

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| Chemical                        | Carbon / Graphite Shapes                   | Bulk Density                                 | ASTM C838   | Analytical Balance  |
| Chemical                        | Liquids                                    | Viscosity                                    | ASTM D445 and D446                                      | Viscometer, Temperature Bath                                    |
| Chemical                        | Water                                      | Chloride and Fluoride Ion                    | ASTM D512   | Fisher Accumet Ion Analyzer                                     |
| Chemical                        | Solids                                     | Specific Gravity                             | ASTM D792   | Analytical Balance  |
| Mechanical – Metallurgical Exam | Metallics, Composites and Ceramics         | Preparation of Specimens                     | ASTM E3   | Olympus GX71 Metallurgical Microscope 25x – 1000x magnification |
| Mechanical – Metallurgical Exam | Metals                                     | Microetching                                 | ASTM E407   | Olympus GX71 Metallurgical Microscope 25x – 1000x magnification |
| Mechanical – Metallurgical Exam | Metals                                     | Macroetching                                 | ASTM E340, E381   | Olympus GX71 Metallurgical Microscope 25x – 1000x magnification |
| Mechanical – Metallurgical Exam | Metals                                     | Grain Size                                   | ASTM E112, E930 and E1382                               | Olympus GX71 Metallurgical Microscope 25x – 1000x magnification |
| Mechanical – Metallurgical Exam | Metallics, Composites and Ceramics         | Photomicrography                             | ASTM E883   | Olympus GX71 Metallurgical Microscope 25x – 1000x magnification |
| Mechanical – Metallurgical Exam | Metals                                     | Depth of Decarburization                     | ASTM E1077  | Olympus GX71 Metallurgical Microscope 25x – 1000x magnification |
| Mechanical – Metallurgical Exam | Metals                                     | Case Depth/ Carburization                    | ASTM E384   | Olympus GX71 Metallurgical Microscope 25x – 1000x magnification |
| Mechanical – Metallurgical Exam | Metals                                     | Inclusion Content                            | ASTM E45, E1245   | Olympus GX71 Metallurgical Microscope 25x – 1000x magnification |
| Mechanical – Metallurgical Exam | Metals                                     | Intergranular Attack                         | ASTM A262   | Olympus GX71 Metallurgical Microscope 25x – 1000x magnification |

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| Mechanical – Metallurgical Exam    | Titanium Alloys                            | Alpha Case  | GE P3TF19  | Olympus GX71 Metallurgical Microscope<br>25x – 1000x magnification  |
| Mechanical – Metallurgical Exam    | Metals                                     | Grain Size  | Acetate Replica of Etched Structure  | Olympus GX71 Metallurgical Microscope<br>25x – 1000x magnification/tape   |
| Mechanical – Metallurgical Exam    | Coatings and Platings                      | Thickness by Cross Section  | ASTM B487  | Olympus GX71 Metallurgical Microscope<br>25x – 1000x magnification  |
| Mechanical – Metallurgical Exam    | Coatings and Platings                      | Microhardness of Coatings   | ASTM B578  | 10 – 1000g load Instron Tukon 2100B Microindentation  |
| Mechanical – Metallurgical Exam    | Coatings and Platings                      | Adhesion  | ASTM B571  | Bend, Grinding Wheel, Sharp Instrument  |
| Mechanical – Metallurgical Exam    | Coatings and Platings                      | Wet Tape Adhesion   | FED-STD-141 Method 6301  | 3M Tape   |
| Mechanical - Environmental Testing | Metals, Coatings and Platings              | Salt Spray  | ASTM B117, FED-STD-141 Method 6061   | AES MX-9200 and Auto Technology Salt Fog Corrosion Chamber  |
| Mechanical - Environmental Testing | Metals, Coatings and Platings              | Humidity  | FED-STD-141 Method 6201, MIL-STD-753 Method 101 and MIL-STD-810              | Thermotron and Blue M Humidity Chamber  |
| Mechanical - Environmental Testing | Stainless Steel Parts                      | Chemical Passivation Treatments                                     | ASTM A967  | AES MX-9200 and Auto Technology Salt Fog Corrosion Chamber  |
| Mechanical - Environmental Testing | Metals                                     | Corrosion Susceptibility  | ASTM A262 A, B, E  | Olympus GX71 Metallurgical Microscope<br>25x – 1000x magnification and Struers Lectropol Bench Top Electrolytic Polisher-Etcher |
| Mechanical - Environmental Testing | Copper Alloys                              | Mercurous Nitrate   | ASTM B14   | Zeiss Discovery V12 Stereoscope and Nikon SMZ-10A Stereoscopic Wide Field Metallurgical Macroscopic                             |
| Mechanical                         | Metals                                     | Metallographic evaluations, Weld Geometry and Mechanical Properties | ASME Section IX, AWS D1.1, D1.2, D1.5, D17.1 and NAVSEA S9074-AQ-GIB-010/248 | Various Metallographic and Mechanical Equipment   |



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| Mechanical                            | Metals                                     | Axial Fatigue                                | ASTM E606, E466   | Instron and MTS servo-hydraulic testing machines   |
| Mechanical                            | Metals                                     | R Curve and Fracture Toughness               | ASTM E399   | Instron and MTS servo-hydraulic testing machines   |
| Mechanical                            | Metals                                     | Crack Growth<br>DADN, Compliance,<br>PD      | ASTM E647   | Instron and MTS servo-hydraulic testing machines   |
| Non-Metallic<br>Mechanical<br>Testing | Coatings                                   | Abrasion                                     | ASTM D4060  | Taber Abraser  |
| Mechanical                            | Metal fasteners                            | Tensile<br>Axial and Wedge                   | ASTM A370, E8, F606,<br>F606M<br>and MIL-STD-1312-8     | Tinius Olsen, Instron and MTS servo-hydraulic testing machines and MTS Electromechanical testing machines  |
| Mechanical                            | Metal fasteners                            | Proof  | ASTM A370, E8,<br>F606, F606M<br>and MIL-STD-1312-8     | Tinius Olsen, Instron and MTS servo-hydraulic testing machines and MTS Electromechanical testing machines  |
| Mechanical                            | Metal fasteners                            | Single<br>and Double Shear                   | F606, F606M<br>and MIL-STD-1312-13                      | Tinius Olsen, Instron and MTS servo-hydraulic testing machines and MTS Electromechanical testing machines  |
| Mechanical                            | Metal fasteners                            | Hardness                                     | F606, F606M<br>and NASM 1312 Method 6                   | Scales A, B, C, E, F, G, 15N, 30N, 15T, and 30T<br>Wilson Rockwell Series 2000<br>Hardness Tester  |
| Mechanical                            | Metal fasteners                            | Creep, Stress Rupture                        | NASM 1312-6   | Applied Test Systems Series 2330 Stress Rupture Machines with 20:1 Lever arm ratio, 3:1 Lever arm ratio and Applied Test Systems Series 2140 direct loader |
| Mechanical                            | Metal fasteners                            | Fatigue - Axial                              | ASTM E466,<br>NASM 1312-11, 111                         | Instron and MTS servo-hydraulic testing machines   |
| Mechanical                            | Metals                                     | Rockwell and<br>Superficial Hardness         | ASTM A370, E18  | Scales A, B, C, E, F, G, 15N, 30N, 15T, and 30T<br>Wilson Rockwell Series 2000<br>Hardness Tester  |
| Mechanical                            | Metals                                     | Brinell Hardness                             | ASTM A370, E10  | Detroit Testing<br>Model 3000HBE<br>Brinell Hardness Tester  |



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| Mechanical           | Metals                                     | Microhardness<br>Knoop & Vickers             | ASTM E384   | Instron Tukon 2100B<br>Microindentation  |
| Mechanical           | Metals                                     | Tension<br>TS, YS, EL, RA                    | ASTM A370, E8, E8M,<br>B557 and E345                    | Tinius Olsen, Instron and MTS<br>servo-hydraulic testing machines<br>and MTS Electromechanical<br>testing machines   |
| Mechanical           | Metals                                     | Tensile Elevated<br>Temperature              | ASTM E21  | Tinius Olsen, Instron and MTS<br>servo-hydraulic testing machines<br>and MTS Electromechanical<br>testing machines   |
| Mechanical           | Metals                                     | Tensile Low<br>Temperature                   | ASTM E21  | Tinius Olsen, Instron and MTS<br>servo-hydraulic testing machines<br>and MTS Electromechanical<br>testing machines   |
| Mechanical           | Metals                                     | Single<br>and Double Shear                   | ASTM B565   | Tinius Olsen, Instron and MTS<br>servo-hydraulic testing machines<br>and MTS Electromechanical<br>testing machines   |
| Mechanical           | Metals                                     | Bend   | ASTM A370   | Bend Tester  |
| Mechanical           | Metals                                     | Ductility<br>Bend or Flaring                 | ASTM E190, E290   | Bend Tester,<br>Flare Diameter   |
| Mechanical           | Metals                                     | Charpy Impact<br>and Izod                    | ASTM A370, E23  | Tinius Olsen   |
| Mechanical           | Metals                                     | Creep, Stress Rupture                        | ASTM E139, E292   | Applied Test Systems Series<br>2330 Stress Rupture Machines<br>with 20:1 Lever arm ratio or 3:1<br>Lever arm ratios and Applied<br>Test Systems Series 2140<br>direct loader |
| Mechanical           | Coated Plated<br>Specimens                 | Hydrogen<br>Embrittlement                    | ASTM F519   | Type 1a specimen<br>Applied Test Systems Series<br>2330 Stress Rupture Machines<br>with 20:1 Lever Arm ratio   |
| Mechanical           | Metals                                     | End Quench<br>Hardenability –<br>Jominy      | ASTM A255   | HRC<br>Wilson Rockwell Series 2000<br>Hardness Tester  |
| Mechanical           | Sheet Metals                               | Superplastic Testing                         | ASTM E2448  | MTS Electromechanical<br>testing machines  |

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| Mechanical    | Thermal Spray Coatings              | Adhesion Strength                     | ASTM C633  | Tinius Olsen, Instron and MTS servo-hydraulic testing machines and MTS Electromechanical testing machines |

**Notes:**

1. \* = As Applicable
2. This scope is part of and must be included with the Certificate of Accreditation No. AT-1546




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Vice President

