

MATERIALS TESTING SUBDIVISION

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Material Tests

Mechanical testing of metallic materials

- static strength tests (tension, compression, bending),
- strain/load-controlled low & high cycle fatigue tests,
- creep tests.

We are able to prepare specimens for tests in Machining Workshop (according to the ASTM standards or other standards requested by the client).



Head of Materials Testing Subdivision
Wojciech Manaj, Ph.D. Eng.
phone: (+48) 22 846 00 11 ext. 285
e-mail: wojciech.manaj@ilot.edu.pl

Head of Materials Testing Laboratory
Alicja Kaznowska, M.Sc. Eng.
phone: (+48) 22 846 00 11 ext. 526
e-mail: alicja.kaznowska@ilot.edu.pl

Materials Tests - Fatigue Tests

Test type	Specimens and tested elements	Load range	Test temperature	Equipment
Low Cycle Fatigue tests (LCF), strain or load controlled	Specimens in accordance with ASTM or other standards (length up to 500 mm)	Tension and compression load: up to 250 kN Frequency: up to 10 Hz	up to 1100°C	26 test rigs (MTS 310, MTS 810, Instron servohydraulic)
High Cycle Fatigue tests (HCF)	Specimens in accordance with ASTM or other standards (length up to 100 mm)	Tension and compression load: up to 250 kN Frequency: up to 60 Hz	up to 1100°C	26 test rigs (MTS 310, MTS 810, Instron servohydraulic)
Static strength tests (tension, compression, bending)	Specimens in accordance with ASTM or other standards (length up to 800 mm)	Tension and compression load: up to 250 kN	up to 1100°C	14 test rigs (MTS 810, Instron servohydraulic)
Creep tests, Stress Rupture	Specimens in accordance with ASTM or other standards (length up to 150 mm)	Tension load: up to 50 kN	up to 1100°C	36 test rigs (creeps), including 14 with lift to cycle tests (LCF Long Dwell)



Non-destructive Tests

We offer:

- tests of full structures, components and their elements,
- detection and definition/diagnostics of technological and exploitation defects,
- detection of defects such as: material discontinuities - external and internal (blisters, cracks, inclusions, delaminations, laps, cold shuts, leaks, welded joints defects, etc.),
- development of methodologies and test programs at different stages of the production process in the industrial, field and laboratory environments,
- temporary tests and non-standard non-destructive condition diagnostics, including preparation of manuals and technical documentation,
- development and organisation of training courses.

Magnetic tests

Scope:

- detection of surface and subsurface defects of ferromagnetic materials.

Equipment:

Defectoscope yoke Y6 Magnaflux, Parker, Bycosin magnets, fluorescents and black magnetic ink Magnaflux, UV and white light, magnetic indicator strips, references.

Ultrasonic tests

Scope:

- detection of internal material discontinuities and identification of locations, configurations and sizes of discontinuities,
- ultrasonic thickness measurements.

Equipment:

GE Inspection Technologies Phasor XS defectoscope with technical probes and references, Thickness Gage PVX.

Penetrant tests

Scope:

- detection of open surface discontinuities of non-porous materials: metallic and non-metallic.

Equipment:

Magnaflux penetrants, UV and white light, light meters, references.



Ultrasonic test

Visual tests

Scope:

- detection of surface discontinuities and shape defects of the elements using optical instruments,
- assessment of the surface quality,
- quality control after repair.

Equipment:

Equipment used for fiber endoscope testing (OLYMPUS IF-4D, camera Olympus, monitor JVC).

Eddy current tests

Scope:

- testing of materials with electrical conductivity,
- detection of surface and subsurface defects, coating thickness measurements, comparative structural studies.

Equipment:

GE Inspection Technologies Phasec 3d and Institute Dr Förster defectoscopes with sets of specialized probes and references for defects, conductivity and the corrosion degree.

Radiographic tests

Scope:

- detection of internal material defects,
- volumetric testing of objects,
- testing of glued, welded and soldered joints,
- verification testing of assemblies, testing of electronic components and subassemblies.

Equipment:

Computer Tomograph system v|tome|x L 240 GE Inspection Technologies.

X-ray diffraction testing

Scope:

- measurement of residual stresses in the samples provided by the client,
- measurement of stresses at points of construction, facilities, etc,
- measurements of stress "in situ".

Equipment:

X-ray diffractometer Xstress3000 with a goniometer G2.

Head of Non-destructive Testing Laboratory
 Józef Krysztofik, M.Sc.
 phone: (+48) 22 846 00 11 ext. 319
 e-mail: jozef.krysztofik@ilot.edu.pl



Material Properties Tests

Capabilities:

- testing of materials structure,
- testing of materials surface including chemical composition analysis,
- fractography tests,
- material properties measurements.

Fractography - SEM:

- testing of metallic and non-metallic specimens,
- very high resolution images of a sample surface.

Scope:

- **Material tests:** surface observations using SE and BSE detectors, determination of the coating thickness.
- **Microscope fracture examinations:** detection of contaminants, microcracks, crack sources, quantitative examinations of the structure of fractures and determination of material homogeneity.

Equipment:

Scanning Electron Microscope Zeiss EVO 25 MA with BSE and SE detectors.

Chemical composition analysis - EDX

Scope:

- chemical composition analysis of specimens,
- material identification,
- identification of contaminants,
- determination of the relative element concentration on the specimen's surface.

Equipment:

EDX detector: XFlash 5010 Bruker, energy resolution 125 eV.

Metallography:

Scope:

- metallographic qualitative and quantitative tests, such as grain size evaluation, non-metallic inclusion size, phase volume fraction, coating thickness.

Metallographic specimens preparation:

Equipment:

- cutting machine with the functions of manual and automatic cutting, cooled by water,
- mounting press for specimens with max diameter Φ 40 mm.
- grinding-polishing machine capable of preparing up to 6 samples at a time.

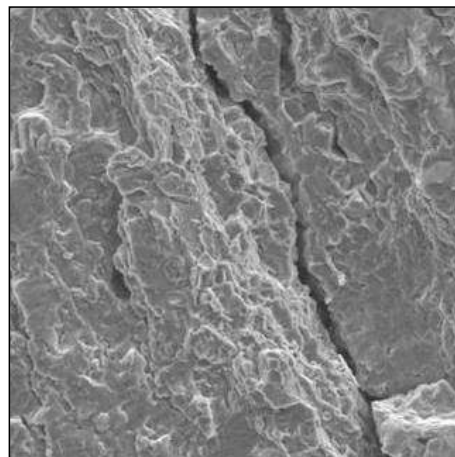
Microstructure analysis

Equipment:

Metallographic microscope Neophot 2, magnification range 50x - 2000x.



Scanning Electron Microscope Zeiss EVO 25 MA



Microscope fracture examination

Surface roughness tests

Equipment:

Surface roughness tester Mitutoyo Surftest SJ-301:

- drive unit: X-axis: measuring range: 12.5 mm,
- measuring speed: 0.25 - 0.5 mm/s,
- detector: range: 350 μm ,
- detecting method: tactile measurement,
- measuring force: 0.75 mN,
- stylus tip: diamond ($60^\circ/2 \mu\text{mR}$),
- evaluation parameters: Ra, Ry, Rz, etc.

Toughness tests

Equipment:

Portable Hardness Tester Mitutoyo:

- measurement in Leeb DL scale, possibility to convert to HV, HB, HRC, HRB scales,
- maximum surface roughness of the sample Ra 10 μm , thickness greater than 5 mm.

Innovatest Hardness Tester:

- vickers Hardness Tester,
- load range:
 - 0.02 - 0.1 Kgf microhardness Vickers,
 - 0.2 - 5 Kgf Vickers hardness at low loading,
 - 10 - 30 Kgf Vickers hardness.

Impact tests:

- tests can be conducted at elevated temperatures in the range of $-196^\circ\text{C} \div 40^\circ\text{C}$,
- charpy impact tests can be performed on standard $10 \times 10 \times 55 \text{ mm}$ as well as on reduced specimens of $7.5 \times 10 \times 55 \text{ mm}$ and $5 \times 10 \times 55 \text{ mm}$.

We are able to prepare specimens for tests in the machining workshop (according to ASTM standards or other standards requested by the client).

Equipment:

Pendulum Charpy Impact Tester:

- complies with PN-EN ISO 148-1, PN-EN 10045 and ASTM E23 standards,
- NIST verification of the current ASTM E23 standard,
- pendulum energy 300 J.



NEXUS Hardness: Hardness measurements and microhardness HV



Stand to test impact

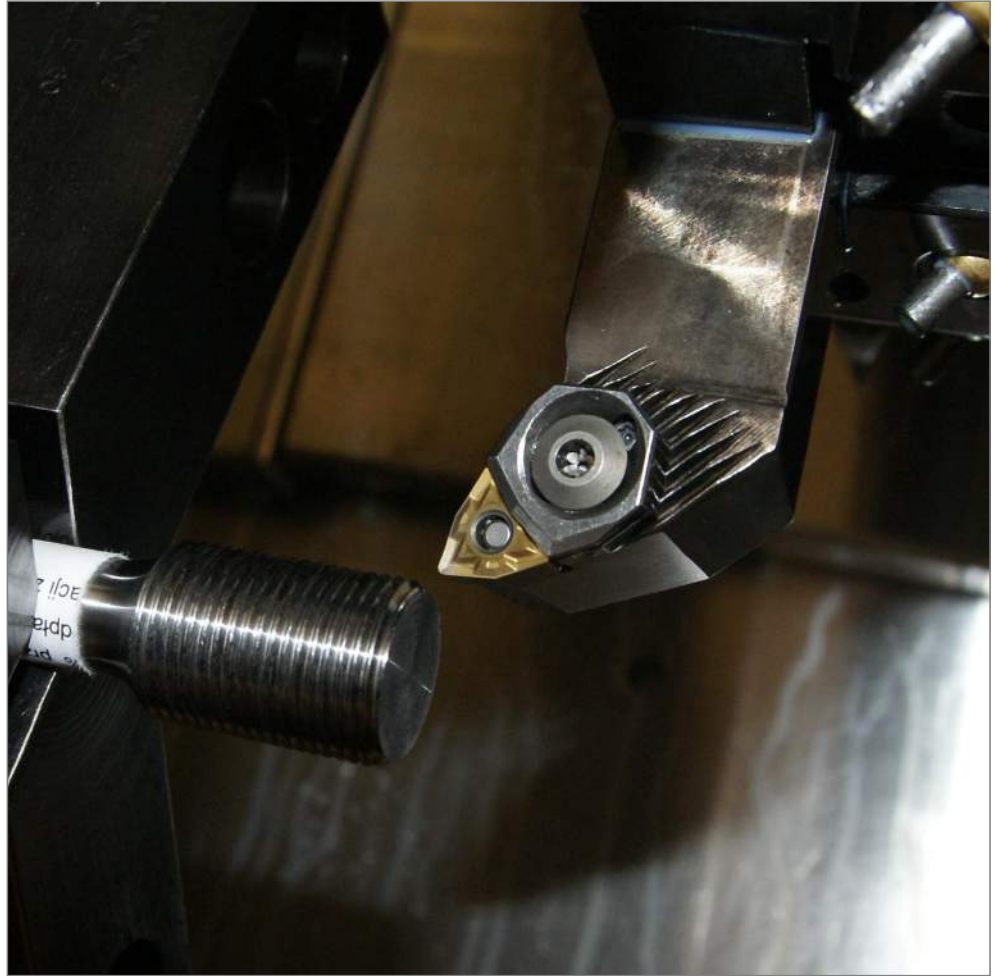
Preparation of Specimens

Scope:

- preparation of specimens for:
 - strength tests (Static Tension, Creep, Impact, Stress Rupture),
 - fatigue tests (low and high cycle fatigue).
- machining of tough materials used in aircraft engines, e.g. nickel or titanium alloys,
- specimens are machined according to international standards (e.g. ASTM) and according to specifications provided by the client.

Equipment:

- lathe CNC AVIA Turn 35,
- milling machine CNC 3 axing FNE 40 N,
- shaft grinder RUP 280 × 500,
- flat grinder FSG I 640-ADII,
- wire EDM machine BP-09d,
- wire EDM CNC machine Mitsubishi BA8,
- two-column band saw PTS 400.



MITSUBISHI BA8 Hollowing

Milling machine CNC 3 axing FNE 40 N

Institute of Aviation
al. Krakowska 110/114
02-256 Warsaw
phone: (+48) 22 846 00 11
fax: (+48) 22 846 44 32
e-mail: ilot@ilot.edu.pl

www.ilot.edu.pl
www.facebook.com/instituteofaviation
www.twitter.com/AviationPoland

