

Our equipments

Mechanical tests

- Fatigue machines
 - 14 independently functioning lines of test
 - Capacities from 10 daN to 2,000 daN
 - Controls in force or in displacement (low amplitude, $\pm 50 \mu\text{m}$, with an accuracy of $10 \mu\text{m}$)
 - Frequency from 1 to 30 Hz
- Torsion machine
 - Capacities of 10 N.m and 100 N.m
- Tension-compression machines
 - Capacities from 10 N to 250 kN
 - Extensometer 1,200 mm
- Hardness machines Vickers, shore, Rockwell, Brinell, Vica
- Creep machine
- Impact machines

Metallurgical analysis

- Optical microscopy, infrared microscopy, scanning electron microscopy (SEM)
- Spectrometer X with dispersion of energy coupled with the SEM
- Non-destructive testing devices (penetrant and magnetic particle inspections, radiography)
- Electrochemical measuring machine in specific medium

Chemical analysis

- Spectrophotometry
- Chromatography
- Spectrometry
- X-rays diffraction
- X-rays fluorescence

Ageing

- Climatic chamber (temperature, hygrometry, vibration, UV)
- Salt spray
- Packaging permability

Dimensional control

- Three-dimensional machine
- Profile projector
- Image analysis



Fatigue machine



Three-dimensional machine

Orthopedic implants

Hip - Spinal - Dental implants



Spinal implant in a vertebrectomy construct



Hip implant



Cervical cage



Tibial osteotomy plate



Dental implant

Laboratoire national de métrologie et d'essais

29, avenue Roger Hennequin
78197 TRAPPES Cedex (France)

Tel.: +33 1 30 69 10 00

Fax: +33 1 30 69 12 34

Contact

Medical Devices Division

Sylvain Le Coq

Tel.: +33 1 30 69 14 36

E-mail: sylvain.lecoq@lne.fr



Qualification of implants and their packaging

Fields of competency

To qualify your implants, LNE can offer its multifield teams competencies.

Our services can intervene at the design/development stage of the product for its improvement, or at the final stage in order to determine the relevant characteristics intended to support **regulatory technical files** (CE marking, 510(k) applications...).

The **mechanical tests** can be supplemented by implementing further analyses such as:

- Chemical analysis of employed alloys
- Aging of materials and implants - Corrosion behavior
- Analysis of the degradations
- Characterization of polymers, metals and ceramics
- Characterization of coatings and surface treatment
- Dimensional controls
- Qualification of the packaging

Hip implants

■ Tests performed

- Heads, necks and femoral stems:
 - Determination of the static behavior
 - Determination of properties of endurance

■ Standards used

- ISO 7206-10 ; ISO 7206-4 ; ISO 7206-8
- ASTM F1875 ; ASTM F1440 ; FDA guidance
- NF S 90-448

■ Tests conditions

- Load: up to 2,000 daN
- Optional temperature controlled medium
- Frequency : from 1 to 30 Hz



Fatigue test on femoral stem

Spinal implants

■ Tests performed

- Connection elements of spinal implants
 - Evaluation of the static mechanical properties
 - Evaluation of the fatigue strength
- Spinal implants
 - Evaluation of the static mechanical properties
 - Evaluation of the fatigue strength

■ Standards used

- ASTM F1798; ASTM F1717; ASTM F2077

■ Tests conditions

- Load: from 10 daN to 2,000 daN
- Optional temperature controlled medium
- Frequency: from 1 to 30 Hz



Fatigue test on spinal implant in a vertebrectomy construct

Others implants

■ Tests performed

- **Endo-osseous dental implants:** fatigue tests, in accordance with standard NF EN ISO 14801 and FDA protocol n° 1389
- **Inter-vertebral discs:** determination of the properties of endurance under compression-sharing stress
- **Tibial plates of the knee:** determination of the endurance properties in accordance with standard NF ISO 14879-1
- **Shoulder prostheses:** determination of the static and dynamic properties
- **Osteosynthesis screw:** static torsion tests in accordance with standards NF S 90-414 and ISO 6475
- **Osteosynthesis plates:** determination of static behavior in accordance with ISO 9585
- **Other implants:** specific protocols



Fatigue test on dental implant