

Space Qualification Laboratory (LQS)

Type of Infrastructure

Space Qualification test facility

Main technical features

Test Lab facilities accommodate in an ISO8 class cleanroom test articles at any technology readiness level and comply with ISO9001. The test facility and procedures fully comply with the main standards for both mechanical and environmental qualification and acceptance tests in the space, military and aeronautical fields: ESA-ECSS-E-10-03A, MIL-STD-810-C/F/G and RTCA DO -160D.

The test facilities have the following characteristics:

- **Platform for physical properties measurements**
 - Determination of the center of gravity within a sphere with a radius of 1 mm
 - Accuracy on the measurement of the center of mass: $\pm 0.1\%$
 - Determination of the moments of inertia
 - Accuracy on the determination of the moment of inertia: $> \pm 3\%$
- **Centrifuge machine**
 - Up to 8.5 g acceleration (100 RPM)
 - Diameter 2668 mm
 - EUT Maximum dimensions: 500x500x500 mm
 - EUT Maximum weight: 70 kg
 - Slip ring for EUT connection to EGSE
- **Combined Room (vibration-temperature-humidity-pressure)**
 - Temperature Range [-75°, +120°C]
 - Temperature rate 5°C/min
 - Relative humidity 10% - 95%
 - EUT Maximum dimensions: 400x400x400 mm –
 - EUT Maximum weight: 610 kg
 - Maximum altitude: 30 km (≈ 1 mbar=1 hPA)
 - Vibration Test:
 - Force: 35 kN (sine and random) – 70 kN (shock)
 - Random, Sinusoidal, Sine Burst, Sine on Random, Random on Random, Sine Tones
- **Thermal Shock Chamber**
 - Hot chamber temperature range [+40°, +220°C]
 - Cold chamber temperature range [-80°, +60°C]
 - EUT Maximum dimensions: 600x600x1000 mm
 - EUT Maximum weight: 100 kg
 - Automatic movable basket: time to move less than 10 sec
- **Environmental Chamber**
 - Temperature range [-75°, +180°C]
 - Temperature rate 3.5°C/min
 - Relative humidity range 10% - 98%
 - EUT Maximum dimensions: 800x800x1500 mm
 - EUT Maximum weight of the EUT: EUT 70 kg
 - Equipped with a cold plate
- **Space simulator (thermal vacuum chamber)**
 - Temperature Range [-70°, +125°C]
 - Temperature rate 2°C/min (measured on shroud)

- Minimum pressure 10⁻⁶ hPa in less than 3 hours
- EUT Maximum dimensions: 600x600x600 mm
- EUT Maximum weight: 70 kg
- Equipped with a cold plate
- **Vibration Table**
 - Force: 35 kN (sine and random) – 70 kN (shock)
 - EUT Maximum dimensions : 100x100x100 cm
 - EUT Maximum Weight : 600 Kg
 - Vibration: Sine and Random (100G); Shock (200G)
 - Frequency Range: [5Hz – 2 kHz]
 - Slip Table for horizontal excitation
 - Head expander for vertical excitation of large EUT
 - SIEMENS LMS measurement and acquisition HW with 80 ICP input channels and 4 output channels
 - SIEMENS LMS TestLab SW for vibration test management (Random, Sinusoidal, Sine Burst, Sine on Random, Random on Random, Sine Tones)
 - N. 40 miniaturized triaxial ICP accelerometers PCB 356A01
 - N. 20 triaxial ICP accelerometers PCB 356A16
- **Pyroshock test facility**
 - simulation of impulsive excitations due to devices driven by pyrotechnic charge (separation of pitcher stages, fairing opening, payload release, orbital engine ignition).
 - EUT Maximum dimensions: 500x500x500 mm
 - EUT Maximum weight: 30 kg
 - Frequency range: [20-10000 Hz]
 - Maximum acceleration: 5000 g
 - N. 8 triaxial ICP shock accelerometers PCB 350B43

Major investments are underway to upgrade the laboratory's test facilities to include vibration tests on satellites weighing up to 2500 kg, acoustic excitation tests at launch with the DFAN technique, electromagnetic compatibility and susceptibility tests.

Application Domains

The laboratory is aimed at supporting aerospace companies in the design and testing of nano and micro satellites (up to 100 kg) and electronic and mechanical components of space, aeronautical and military systems, providing service activities for qualification and acceptance to operational mechanical and environmental loads according to the following standards: ESA-ECSS-E-10-03A, MIL-STD-810-F/G and RTCA DO-160D

Main measuring instruments/techniques

The Space Qualification Laboratory has a large portfolio of instruments and techniques for reproducing vibrational and environmental loads and for measuring, with surveys of static and dynamic accelerations, strain, temperatures, pressures and humidity.

Operational Status

Fully operative.



Examples of Test Articles tested in LQS