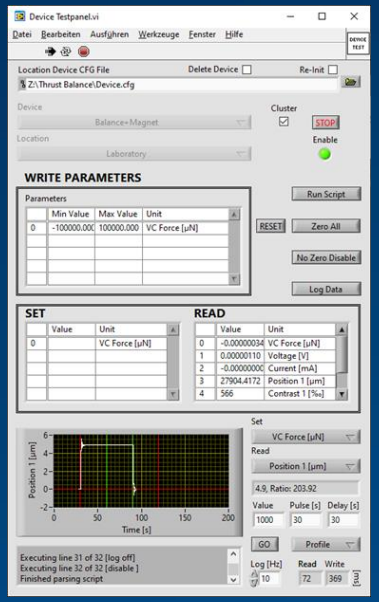
LabView DAQ Software

LabView Software

- ✓ Data acquisition with NI, LabJack and Others
- ✓ Closed-loop or Open-loop balance operation
- ✓ Operate multiple devices and thrusters
- ✓ Automated calibration
- ✓ Dedicated script language



About us

Our development team with expertise in plasma physics and aerospace engineering has many years of experience in the development and operation of electric propulsion systems and thrust balances. Ranging from electrothermal-, electrostatic-, electromagnetic thrusters to photonic force measurements with steady-state lasers in solar-sail applications. In our laboratories at the Institute of Aerospace Engineering at Technische Universität Dresden in Germany we continuously improve our equipment in space-like environments.

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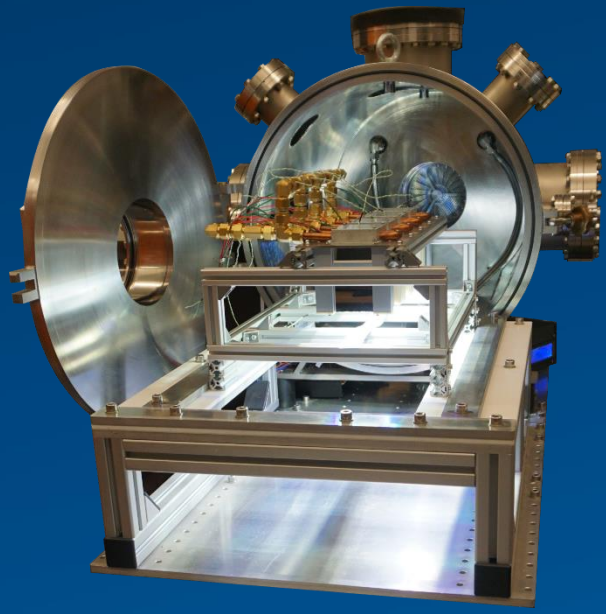
GWT Gesellschaft für Wissens- und Technologietransfer

TECHNISCHE UNIVERSITÄT DRESDEN



Test Services

Electric Propulsion Testing, Thrust Measurements, Plasma Diagnostics, Thermal Vacuum, Solar Simulator, Atomic Oxygen Facility

Institute of Aerospace Engineering

Electric Propulsion Testing

Thorough characterizations of electric propulsion systems regarding thrust and operating parameters are essential to verify their abilities in space applications. We provide innovative thrust balances and testing environments for this exact purpose and more!

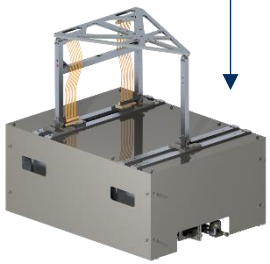
Ten vacuum facilities enable long-duration tests of propulsion system with thrust measurements and plasma diagnostics. Our two largest chambers provide a **testing volume of (1.4x1.5x2.5) m³** for the rectangular chamber and a diameter of 0.9 m with 1.5 m length for the cylindrical chamber.

Dedicated magnetic fields can be generated in a large volume with Helmholtz-coils or even cancel Earth's magnetic field.

High-resolution thrust measurements, either direct or indirect, are achieved with seismic isolation of test chambers and state of the art thrust balances. With **up to 10 kg EP-system-mass** we achieve a wide measurement range from **millinewton to nanonewton**.

Inverted Pendulum

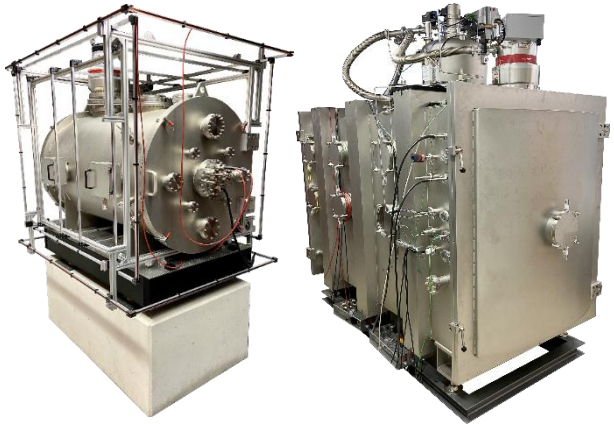
- ✓ Sub-Nanonewton resolution
- ✓ 10kg thruster mass
- ✓ Photon momentum interactions detectable



Compact Pendulum

- ✓ Compact Design
- ✓ 10kg thruster mass
- ✓ Nanonewton resolution
- ✓ High-voltage supply
- ✓ Propellant supply
- ✓ Plasma shielding
- ✓ Direct or indirect measuremments

Reference Customer: ESA Propulsion Laboratory



With this resolution, our balances are not even confined to conventional EP-systems, they can characterize photon-based propulsion systems and solar sail materials, as proven in previous projects [1].

Thermal Vacuum Testing

The cylindrical thermal vacuum chamber with a diameter of 45 cm and a length of 60 cm features customisable flanges for both electrical (Multipin, Coaxial, High Voltage, Thermoelements) and fluid feedthroughs. Larger chambers available on request!

- ✓ reliable pressure levels of $p < 10^{-5}$ mbar
- ✓ dedicated setups for pressures of $p < 10^{-8}$ mbar
- ✓ LAUDA cooling thermostat (-50 °C to 200 °C)
- ✓ Shroud for Liquid Nitrogen (space background)

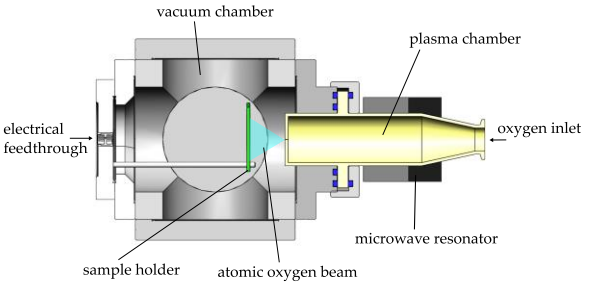
In addition, an **LED-based solar simulator** is available, simulating the solar spectrum in the range of 250 nm to 1100 nm for radiative heating of test samples (see cover sheet).

✓ Spectral Match (SM):	Class B
✓ Spatial Uniformity (SU):	Class C
✓ Temporal Stability (TU):	Class A
✓ Expandeable Area (worse SU)	(8 x 32) cm²

Atomic Oxygen Facility (ATOX)

A cubic vacuum chamber with side length 15 cm is provided for the irradiation of test samples with atomic oxygen (AO), produced in a microwave-based low pressure oxygen plasma.

✓ AO flux	up to $2.5 \cdot 10^{14} \frac{\text{Atoms}}{\text{cm}^2\text{s}}$
✓ Area Exposed to AO:	1 mm² to 160 mm²
✓ Particle Energy :	< 0.05 eV
✓ Sample Temperatures:	20 °C to 35 °C



The ATOX can be used for preliminary LEO degradation testing as well as atomic oxygen sensor calibration. The exposed area of the sample can be restricted by an aperture. Higher areas than the maximum given above can be achieved with a loss of both the level and the homogeneity of AO flux.

Exemplary References:

[1] O. Neunzig, M. Weikert & M. Tajmar: *Thrust measurements and evaluation of asymmetric infrared laser resonators for space propulsion*. CEAS Space Journal 14, 45–62 (2022). https://doi.org/10.1007/s12567-021-00366-4

[2] Peiffer, L., Perfler, C., & Tajmar, M. (2023). Feasibility Study of the Bare-Photovoltaic-Tether Concept: Prototypes and Experimental Performance Evaluation of the Photovoltaic Tether Segment. Aerospace, 10(4), 386.