

# MTVAC Thermal Vacuum Chamber

The Medium Thermal VAcuum Chamber (MTVAC) is a compact thermal vacuum chamber for testing and qualification of space equipment and satellites, located at Azimut Space facilities.

Developed internally, it allows the creation of custom-made test set-ups for the most complex tests, in a very wide range of temperature, conditions and interfaces.



Figure 1. MTVAC facility closed

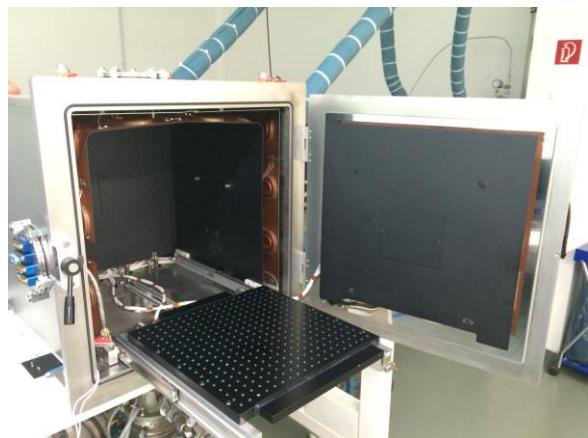


Figure 2. MTVAC facility open with cold plate in mounting position

The MTVAC is designed to provide a flexible environmental test system to simulate outer space under varying thermal conditions, allowing for development testing as well as formal qualification according to ECSS rules, with extremely advantageous conditions.

An advanced monitoring system allows the setting of specific and precise environmental conditions, while keeping all boundaries and unit under test constantly monitored. Customers can follow the tests in person or remotely, via remote connections to the dedicated controlling system.

## Key features and benefits

- Turbo-molecular pump system for high-vacuum performance
- Thermal control via chiller and Liquid Nitrogen (selectable)
- Black coated shroud, with double cooling circuit
- Fully extractable, thermally controlled aluminium cold plate
- Automated control and logging system, for chamber and UUT (Unit Under Test)
- Additional 4k Cold finger, based on a MacMahon Cryocooler
- PID-controlled, high-power supplies for high-power, high-temperature heating
- Available flanges for custom interfaces (visual, fluidic, mechanical)

## Specifications

<b>Usable volume (inside Shroud)</b>	520 x 520 x 520 [mm <sup>3</sup> ]
<b>Vacuum level</b>	< 10E-6 mbar
<b>Temperature range in chiller operation</b>	-70 to 150°C
<b>Temperature range in LN2 operation</b>	-160°C to 200°C (-196°C to 400°C on coldfinger)
<b>Temperature Range Cryocooler</b>	-265°C to 80°C
<b>Heating power (max)</b>	6kW
<b>Electrical feedthroughs available for user</b>	4 x 50 pin Sub-D; 4 x SMA (HF); others
<b>Mechanical Interfaces</b>	6 x M8 internal hoisting points M6 hole pattern on Cold plate (25mm raster) Cold finger feedthrough, secondary controlled cold plate. Flanges for windows, gas ports, cold finger ports, mechanical actuators and custom feedthroughs
<b>Additional Interfaces</b>	



**Figure 3.** Four Sub-D connectors (50 pins) for data acquisition



**Figure 4.** LN2 front connector and MTVAC window

## Materials

<b>Double-circuit shroud</b>	Copper, Black (painted)
<b>Cold plate</b>	Aluminium, black Anodized
<b>Coaxial SMA feedthroughs</b>	Brass, Stainless Steel, Nickel, Gold
<b>Sub-D connectors</b>	Steel, Zinc, Tin, Gold, Gold Flash, others

## Configurations

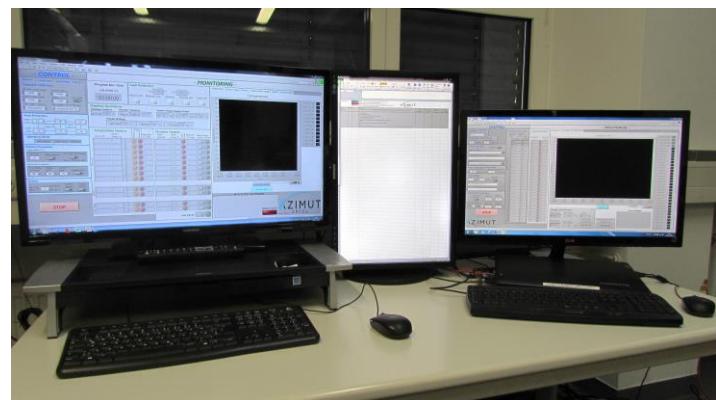
The MTVAC has a black coated thermal shroud, with a double cooling circuit, and one fully extractable aluminum cold plate, offering separately-controllable conductive and radiative interfaces for the simulation of various thermal environments (enclosure, orbital, planetary).

The Units being tested can be mounted using screws of different sizes. Different temperature sensors can be placed in the chamber and mounted at the desired locations.

The MTVAC is controlled by a Labview-based monitoring software that allows numerous modifications and the integration of control routines specific to the performed experiments.



**Figure 5.** Front flange with optical window



**Figure 6.** Housekeeping, control and data acquisition

## Testing, Qualifications and Measurements

All sorts of tests can be performed in the MTVAC: development tests, experiments to support technology developments, and all sorts of verifications, from simple acceptance of hardware, to full qualification for flight hardware, according to ECSS and NASA standards, and even long-term life-cycling

Furthermore, all sorts of thermal and thermo-mechanical measurements can be performed with a variety of precision levels and according to a diverse set of standards

## Additional Testing services specifications

**Small vacuum tests, for development**

46x37x39 cm<sup>3</sup>  
p ~2x10<sup>-2</sup> mbar  
T ∈ (-30,+150)°C

**Life cycling with a cryogenic thermal chamber (up to 5000 cycles)**

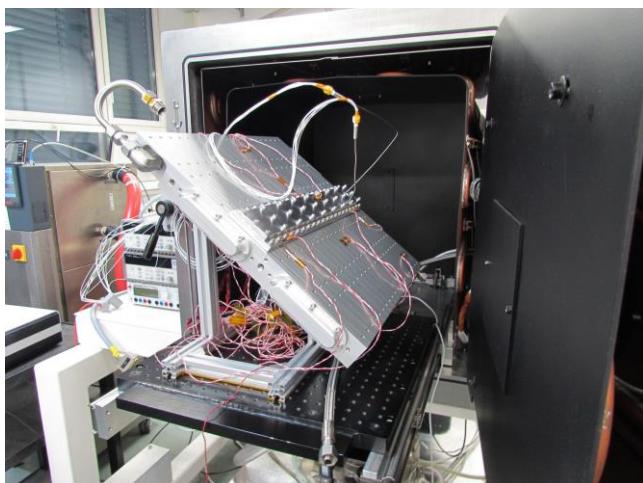
30x39x38 cm<sup>3</sup>  
p = atm (N<sub>2</sub>)  
T ∈ (-135,+135)°C

## Additional options

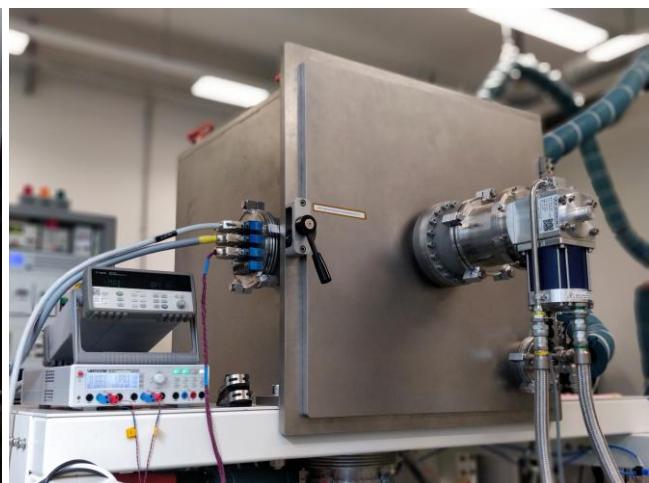
Many additional options are available on demand: assurance of required cleanliness levels for sensible hardware, grounding, and robustness.

### Configurable test systems according to the user's need

- Fully autonomous test operation and remote access
- Data collection via dedicated software



**Figure 8.** Large unit for fluidic testing (vacuum GSE)



**Figure 9.** Cryogenic test with 4K cryocooler

## Chamber production

Thanks to the experiences matured during the realization and operation of the MTVAC, Azimut Space also delivers complete thermal-vacuum systems according to customer specifications.

## Company Background

Azimut Space GmbH is a space thermal specialist, founded in Berlin in 2007, with 15+ years of experience in thermo-mechanical engineering and in the production of flight hardware, offering a full spectrum of thermal products and services for equipment, small and large satellites and launchers.

### CUSTOMERS AND PARTNERS

ESA, DLR, Thales Alenia Space, AIRBUS, OHB, Beyond Gravity, Nanoavionics, TNO, Fraunhofer, Max-Planck, Sonaca, BST, Leonardo, Sodern, Spire, DSI

### DESIGN AND ANALYSIS SOFTWARE

Solidedge, Solidworks, Nastran, Hyperworks, ESATAN

### CONTACT:

Sales & Business Development  
T: +49 30 63926071  
[info@azimutspace.com](mailto:info@azimutspace.com)  
[www.azimutspace.com](http://www.azimutspace.com)

**Azimut Space GmbH**  
Carl-Scheele-Strasse 14  
12489 Berlin - Adlershof  
Germany