

WHY

A multinational technology company needed a reliable way to validate satellite components under true space-like conditions. They sought a system that could ensure mission-critical performance from launch through orbit.

HOW

Dynavac engineered a compact yet high-performance 3.5-foot Thermal Vacuum System capable of reproducing extreme temperature and pressure environments with exceptional uniformity and repeatability.

WHAT

The result was a fully integrated test platform with advanced thermal control, deep vacuum performance, and user-friendly automation, enabling precise, multi-part satellite testing in a single chamber.

THE CHALLENGE

To expand its global satellite manufacturing program, the customer needed a thermal vacuum solution that could reliably test multiple components at once while ensuring each part experienced identical environmental conditions. Traditional liquid nitrogen injection systems couldn't deliver the temperature uniformity or control precision required for their expanded test protocols.

In addition, the system had to fit within an existing facility footprint, offer safe and intuitive operation for around-the-clock testing, and meet strict requirements for both high vacuum and rapid, repeatable thermal cycling. The customer required a partner with deep space-simulation expertise who could provide a turnkey, dependable solution.



THE SOLUTION

Dynavac delivered a custom 3.5-foot by 4-foot TVAC System specifically optimized for satellite component qualification. The chamber combines a robust vacuum vessel with a roll-away access door, a high-performance pumping package, and a fully integrated thermal shroud and platen assembly. Together, these subsystems create a precisely controlled test environment capable of achieving 1×10^{-6} Torr while cycling between -180°C and $+150^{\circ}\text{C}$.

To achieve the superior uniformity the program demanded, Dynavac incorporated a Gaseous Nitrogen Thermal Conditioning Unit that circulates conditioned nitrogen through the chamber's shroud and platen. This approach ensures consistent temperatures within 4°C across the entire test surface—performance not possible with LN_2 -based systems. An advanced control system with automated pumpdowns, thermal recipes, trend monitoring, and API-enabled remote operation gave operators complete command of the testing process, backed by built-in alarms and safety features for maximum protection.

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Special Features

- Operating temperature range: -180°C to +150°C
- Achieves and maintains 1×10^{-6} Torr vacuum levels
- Temperature uniformity within 4°C across the entire platen
- Integrated shroud and platen (30" diameter \times 40" length) for stable thermal and optical conditions
- Dynavac Gaseous Nitrogen Thermal Conditioning Unit for precise and repeatable thermal control
- Roll-away chamber door for easy test article access
- Automated control platform with thermal recipes, pumpdowns, trend graphs, and full API integration
- Built-in alarms, interlocks, emergency shutdown, power-loss protection, and lockout/tag-out features

