

Case Study

Weiss Technik Engineers Custom Walk-In Temperature/Altitude Chamber for Aerospace Component Testing

WHY

A leading aerospace and communications technology provider required component validation under combined temperature and altitude conditions up to 100,000 ft, including rapid transitions to -65°C at $5^{\circ}\text{C}/\text{min}$ for mixed-material assemblies.

HOW

Weiss Technik engineered a custom $6' \times 10' \times 6'$ walk-in temperature/altitude chamber using a dedicated vacuum system, 40 HP cascade refrigeration, and LN_2 boost to maintain ramp performance at reduced pressure.

WHAT

The system delivers repeatable environmental simulation for aerospace qualification, achieving $5^{\circ}\text{C}/\text{min}$ ramp rates to -65°C under reduced-pressure conditions in a single integrated platform.

WHY - the challenge.

A leading aerospace and communications technology provider required a walk-in altitude chamber capable of simulating conditions up to 100,000 ft while supporting aggressive thermal transitions.

At reduced pressure, air density decreases and limits convective heat transfer, making rapid temperature ramping difficult to achieve. The mixed-material test articles, including aluminum, plastics, and stainless steel, further complicate performance because each material responds to temperature change at a different rate.

Additionally, altitude-rated chambers require thicker structural liners to withstand pressure differentials, increasing thermal mass and further limiting ramp capability.

The challenge was developing a system that could deliver high thermal performance within an altitude-capable chamber design without introducing unnecessary system complexity.

HOW - the idea.

Weiss Technik designed a custom walk-in temperature/altitude chamber with a $72'' \text{ W} \times 120'' \text{ D} \times 72'' \text{ H}$ usable workspace to support mixed aerospace and communication component testing.

A dedicated vacuum pump system simulates site level to 100,000 ft and reaches 90,000 ft in less than 18 minutes. Thermal performance is delivered by dual 40 HP reciprocating cascade refrigeration modules with water-cooled condensers and low-GWP refrigerants.

To achieve the required $5^{\circ}\text{C}/\text{min}$ ramp rate, Weiss Technik implemented a thru-coil LN_2 boost system. This hybrid architecture enables rapid transitions when required while operating efficiently on mechanical refrigeration during steady-state testing.

By matching system capability to the required altitude range, the solution operates within its optimal performance envelope, avoiding unnecessary high-vacuum complexity while exceeding conventional altitude chamber thermal performance.



Case Study

Weiss Technik Engineers Custom Walk-In Temperature/Altitude Chamber for Aerospace Component Testing

WHY

A leading aerospace and communications technology provider required component validation under combined temperature and altitude conditions up to 100,000 ft, including rapid transitions to -65 °C at 5 °C/min for mixed-material assemblies.

HOW

Weiss Technik engineered a custom 6' × 10' × 6' walk-in temperature/altitude chamber using a dedicated vacuum system, 40 HP cascade refrigeration, and LN₂ boost to maintain ramp performance at reduced pressure.

WHAT

The system delivers repeatable environmental simulation for aerospace qualification, achieving 5 °C/min ramp rates to -65 °C under reduced-pressure conditions in a single integrated platform.

WHAT - the solution.

Weiss Technik delivered a high-performance walk-in temperature/altitude chamber that meets stringent aerospace testing requirements while maintaining efficiency and long-term reliability.

The chamber achieves a temperature range of -65°C to +125°C with average ramp rates of 5.0°C per minute, verified using a 500lb mixed-material load. Temperature control accuracy ranges from ±0.1°C to ±1.1°C at site level and ±1.1°C during altitude operation.

Combining precision thermal control, high-altitude simulation, and hybrid refrigeration performance, the system provides reliable environmental validation for aerospace and communication components.



Special Features

- 72" × 120" × 72" walk-in workspace for mixed aerospace component testing
- Altitude simulation from site level to 100,000 ft; ≤18 minutes to 90,000 ft
- -65°C to +125°C temperature range
- 5.0°C/min heating and cooling ramp rates validated with 500 lb mixed load
- Single 40 HP cascade refrigeration with water-cooled condensers
- Thru-coil LN₂ boost system for accelerated transitions
- ±0.1 °C to ±1.1 °C temperature control accuracy
- Solid-state altitude measurement with ±500-1,000 ft accuracy
- Low-GWP refrigerant reducing CO₂ equivalent emissions ~65% vs R-404A
- Quiet package (~72 dBA) and full-access door with heated viewing window and ports