

Case Study

Weiss Technik Engineers Custom Front-to-Back Airflow Chamber for High-Heat AI Hardware Testing

WHY

A leading semiconductor manufacturer required validation of high-performance processing units and AI chips in a controlled environment while managing a continuous 80 kW thermal load generated by active server chassis.

HOW

Weiss Technik engineered a front-to-back airflow chamber combining high-velocity air distribution, a 110 HP refrigeration system, and atomizing humidity control to support stable operation under high thermal loads.

WHAT

The system provides stable and repeatable thermal and humidity performance for high-density electronics testing, effectively dissipating heat while maintaining uniform conditions throughout the workspace.

WHY - the challenge.

As semiconductor power densities increase, environmental testing must keep pace with the higher thermal output of modern AI hardware. The customer required standardized temperature and humidity testing for processing units and AI chips installed in chassis producing a continuous 80 kW live load.

Conventional chambers struggle under these conditions. Elevated thermal output disrupts temperature uniformity and leads to localized hot spots around the unit under test. At the same time, traditional steam-based humidity systems introduce additional heat into the chamber, making overall control more difficult.

The challenge was to develop a system capable of sustaining precise environmental control while continuously managing a very high thermal load without compromising stability or performance.

HOW - the idea.

Weiss Technik designed a custom front-to-back airflow temperature and humidity chamber optimized for chassis-based electronics testing.

The system supplies conditioned air from the front and returns it through the rear, matching the airflow pattern of the unit under test. This high-velocity configuration removes heat efficiently and reduces temperature gradients across the workspace.

Cooling is provided by a 110 HP refrigeration system with a water-cooled condenser, supporting continuous thermal load removal. An atomizing humidity system delivers precise moisture control using high-pressure nozzles without adding heat to the chamber.

This integrated approach ensures consistent temperature and humidity performance under demanding operating conditions.



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WHAT - the solution.

Weiss Technik delivered a high-performance environmental test chamber that maintains precise temperature and humidity control while accommodating extreme heat loads from active electronics.

The system operates across a temperature range of $-10\text{ }^{\circ}\text{C}$ to $+100\text{ }^{\circ}\text{C}$ with controlled performance under an 80 kW live load. Temperature accuracy ranges from $\pm 0.1\text{ }^{\circ}\text{C}$ to $\pm 2.5\text{ }^{\circ}\text{C}$, while humidity is maintained from 10% to 90% RH using an atomizing system that avoids added heat.

The design supports consistent conditions across the workspace, even under continuous high-power operation, minimizing thermal variability during testing. This combination provides a reliable platform for validating advanced semiconductor and AI technologies.



Special Features

- Front-to-back airflow design aligned with chassis-based equipment
- Capable of handling continuous 80 kW thermal load
- Large walk-in workspace of approximately 932 ft³
- Temperature range from $-10\text{ }^{\circ}\text{C}$ to $+100\text{ }^{\circ}\text{C}$
- Temperature accuracy from $\pm 0.1\text{ }^{\circ}\text{C}$ to $\pm 2.5\text{ }^{\circ}\text{C}$ under load
- 110 HP refrigeration system with water-cooled condenser
- Atomizing humidity system for low-heat moisture control
- Humidity range from 10% to 90% RH
- High-velocity airflow to reduce hot spots and gradients
- Integrated cable management and access features
- Quiet operation around 72 to 75 dBA