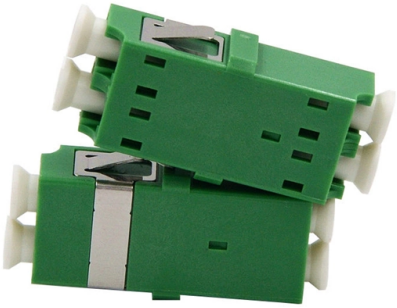
Dimensions and parameters of a constant temperature cabinet for quantum communication



Overview

Constant Climate Cabinet | Environmental Test High performance and reliability come in a compact package, for a wide range of temperature/humidity testing.

Key Takeaways

High-precision constant temperature cabinets provide stable thermal environments with advanced control, insulation, and monitoring, suitable for sensitive quantum communication experiments. Cabinet Structure and DimensionsHigh-precision constant temperature cabinets typically consist of a cabinet body with a heat conduction cavity, surrounded by a vacuum heat insulation layer and a metal outer shell for thermal stability and minimal heat loss. Common laboratory models, such as ESPEC's LHU series, offer internal volumes of 105 liters and 206 liters, accommodating various experimental setups.

The cabinet may include serpentine heating wires along the inner walls and a ventilation assembly at the bottom to ensure uniform temperature distribution.

Temperature Control and Stability

These cabinets use semiconductor refrigeration modules combined with evaporators and redundant heating elements to maintain precise temperatures. Temperature gradients are typically limited to ±0. 5°C to ±1°C, with overall variation within 5°C across the chamber.

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The system allows programmable temperature profiles, often with multiple steps per program, enabling complex thermal sequences for quantum experiments.

Humidity and Environmental Control

For quantum communication devices sensitive to moisture, some cabinets provide humidity control with integrated sensors and alarms for over- or under-humidity conditions. Touchscreen controllers allow timing, humidity, and temperature adjustments, ensuring a stable environment for optical or superconducting components.

Monitoring and Connectivity

Modern cabinets support remote monitoring and control via Ethernet or web browser, allowing users to track temperature and humidity in real time and adjust settings without physical access. Data logging is possible through USB ports or networked storage, and program patterns can be shared between multiple units for synchronized experiments.

Power and Operational Parameters

Typical laboratory cabinets operate on 230V, 50Hz single-phase power, with energy-efficient refrigeration systems and cross-output control to reduce peak current. Modular refrigeration devices with high- and low-pressure protections ensure stable operation and low energy consumption.

Summary

For quantum communication applications, a constant temperature cabinet should provide: Precise temperature control with minimal gradients (±0. 5–1°C)Optional humidity control for sensitive optical or superconducting componentsHigh-quality thermal insulation (vacuum layers and metal shell)Programmable temperature profiles and remote monitoringAdequate internal volume (100–200 liters or customized)Reliable power and energy-efficient operation These features ensure a stable, low-noise thermal environment, critical for maintaining coherence and performance in quantum communication experiments.

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Article Content

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High performance and reliability come in a compact package, for a wide range of temperature/humidity testing needs. Continuous improvement in the design of

SK-185 Pole Mounted Constant Temperature Communication Cabinet

The SK-185 is a pole-mounted, constant temperature communication cabinet that measures 600x650x595mm and can hold a 10U x 19-inch rack. It has a 200W TEC air conditioner, phenolic

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Temperature and humidity control system: 7-inch touch screen, the system has the functions of temperature control, humidity control, timing and over-temperature and over-humidity alarm; It is

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Continuous improvement in the design of constant-temperature (and humidity) cabinets now with remote monitoring and control via PC Ethernet connection and

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High performance and reliability come in a compact package, for a wide range of temperature/humidity testing needs. Continuous improvement in the design of constant-temperature (and humidity)

Thermal Capacity Mapping of Cryogenic Platforms for Quantum

Here we present a design tool for cryogenic platform development with applicability to quantum computing and other cryogenic technologies.

Constant Climate Cabinet

With a capacity range from 100 L to 1000 L, and the option for customizing larger working chamber volumes, these cabinets offer a temperature range of -70/-40/-20℃ to 150℃, with a temperature

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The invention relates to a constant temperature box, in particular to an automatic adjustment type constant temperature box used for heat performance testing of various electronic...

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Modern constant temperature and humidity cabinets are marvels of engineering, integrating advanced technologies to achieve unparalleled control and usability. Precision Control

New quantum device operates at room temperature for stable qubits

New nanoscale quantum platform operates at room temperature without extreme cooling The chip uses engineered silicon structures and specialized materials to stabilize qubits without

Room-Temperature Quantum Device Could Transform

This stabilizes the quantum state that makes quantum communication possible.” The team is continuing to refine the device and is also testing other

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Continuous improvement in the design of constant-temperature (and humidity) cabinets now with remote monitoring and control via PC Ethernet connection and web browser. The line-up consists of six

Scalable room temperature | Harvard Office of Technology Development

Browse Technologies Scalable room temperature solid-state quantum information processor A team of Harvard, CalTech and Max-Planck-Institute physicists led by Mikhail D. Lukin has proposed an

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How could this new type of room-temperature qubit usher in the next ...

Following this process, the researchers observed quantum coherence in these four electrons in a quintet state for over 100 nanoseconds at room temperature (one nanosecond is a

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