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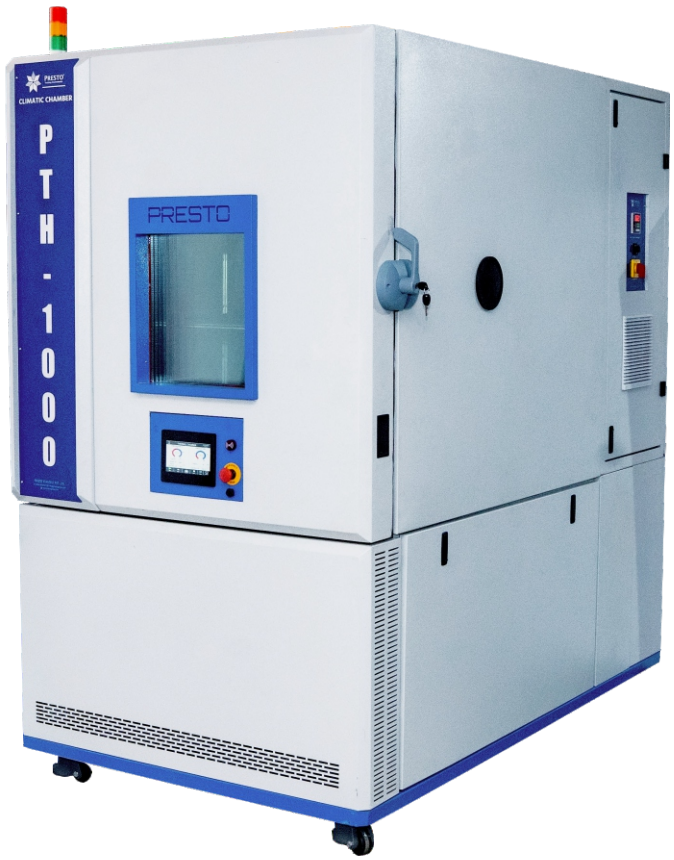
Rapid Temperature Change Chamber



Model :PTH10K

The Rapid Temperature Change Chamber is a high-performance testing system and is used for extreme and sudden temperature variations. The chamber assists manufacturers in assessing a product's reliability and durability when subjected to extreme environments. The chamber quickly cycles between extreme temperatures while being able to accurately control the environmental temperature.

Rapid temperature change chamber also enables fast detection of weak points in the material, components and assemblies. Thus, manufacturers can have higher performance, quality and reliability of products prior to their introduction into the marketplace. The chamber is most useful when evaluating electronic devices, automobile parts, aerospace equipment and all types of industrial products.

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Performance Data

Temperature Range	-70°C to +180°C
Temperature Accuracies	±0.1°C to ±1.2°C measured at control sensor Resolution: 0.1°C
Temperature Uniformity*	< 1000 Litres: ≤1.5°C. 1000 to 2000 Litres: ≤2.0°C. > 2000 Litres: ≤2.5°C.
Temperature Rate of Change	Heating & Cooling: 10°C/min average as per IEC 60068 3-5 for above temperature range Measured at control sensor between +155°C to -45°C in an empty chamber Heating & Cooling: 5°C/min linear from +120°C to -40°C in an empty chamber
Relative Humidity	10% to 98% in the climatic range of 10°C to +85°C
Humidity Accuracies	Set Point Fluctuation: ±3% RH
Noise level	Below 75 dBA (measured at 1-meter distance)

Features

- Exterior body constructed using minimum 2 mm thick CRCS sheets, finished with high-quality powder coating for superior durability, precision, and aesthetics.
- Internal test chamber made of high-grade stainless steel for corrosion resistance and long service life.
- Chamber structure is welded using automated X-ray welding technology, ensuring warp-free construction with 100% air- and water-tight leak-proof integrity.
- The inner chamber and outer body are insulated with high-density mineral wool, eliminating air pockets and minimizing heat loss and thermal conduction.
- Multi-level diagonal airlock sealing using silicone rubber ensures excellent air tightness and thermal isolation.
- Integrated LED illumination inside the chamber with configurable auto cut-off timing.
- Multi-layer vacuum-insulated viewing window with nitrogen-filled air gaps and built-in thermal control defog heater for clear visibility.
- Equipped with door open sensors, enabling automatic safety shutdown and on-screen alerts during operation.
- Feed-through access ports (Ø115 mm / Ø65 mm) provided on either the right or left side for connecting test specimens under active test conditions.
- Mounted on 4-inch heavy-duty caster wheels along with levelling pads for easy installation, movement, and stability.
- Heavy-duty door hinges with up to 120° swing, designed for smooth, friction-free operation.
- Supplied with one adjustable stainless steel rod-type shelf for flexible specimen placement within the test space.

Refrigeration Section (Water-Cooled)

- Mechanical cascade refrigeration system with hermetic / semi-hermetic compressors for achieving low-temperature performance.
- Semi-hermetic compressors are mounted on dual-stage suspension systems using compression springs and rubber bushes, tightened to optimized torque for vibration-free operation.
- Utilizes eco-friendly, non-CFC refrigerants such as R-404A / R-23 in an air-cooled refrigeration configuration.
- Evaporator heat exchanger coils are made from oxidation-resistant materials, with fully collared and bullet-expanded tubes for enhanced heat transfer efficiency.
- Equipped with an automatic bypass control system based on suction pressure and temperature, ensuring stable performance under variable and no-load conditions while maintaining precise temperature control.
- Efficient oil return management system to protect compressors from lubrication failure and ensure long operational life.
- Additional isolation suspension channels with anti-vibration pads are provided to further minimize vibration and noise levels from the compressor system.
- For water-cooled refrigeration systems, the required chilled water must be supplied by the user.

Heating System

- Inconel sheathed / bare nichrome air heaters are used to achieve the desired temperature efficiently and reliably.
- Heaters are strategically positioned within the conditioning section to prevent direct heat radiation onto the test specimens.
- Heater output is controlled using zero-crossing relays / thyristors, ensuring precise temperature control and superior system stability.
- Heaters are electrically isolated using high insulation resistance isolators, preventing earth leakage and enhancing operational safety.

Humidification / De-humidification System

- Self-pressurized, fine-control humidity generator designed to ensure condensation-free operation.
- Automatic humidity purge system integrated based on the set humidity value to maintain stable conditions.
- Humidity generator equipped with:
- Water level float switch

Over-temperature protection thermostat
Inconel immersion heater for efficient vapour generation
Automatic water level control through a water inlet solenoid valve

- Refrigeration-based de-humidification system for achieving low relative humidity (RH) levels with precise control of dew point temperature.
- Independent automatic control of dew point temperature to maintain accurate and stable low RH conditions inside the chamber.
- High-accuracy electronic humidity sensor for direct RH measurement, suitable for operation across a wide temperature range.
- Built-in condensation protection features to prevent moisture formation during thermal transitions, ensuring safe operation for

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Instrumentation and Control

- 7" resistive analog colour touch screen with WVGA (800 × 480 pixels) resolution, supporting 16M colours and LED backlight for clear visibility.
- Up to 4 fully isolated serial communication ports (2 × RS-232 and RS-422/485) for flexible connectivity.
- 10/100 Base-TX Ethernet port for external device communication and remote operation.
- Dual USB host ports for connecting USB mouse, keyboard, and external storage devices.
- 3 user-programmable soft keys with LED indication for quick access to frequently used functions.
- Supports up to 99 programs, each with 99 segments and up to 999 repeat cycles for complex test profiles.
- Nested looping capability within programs and segments to meet diverse testing requirements.
- Graphical program editing interface for faster configuration and easy program visualization.
- Auto PID tuning across the full operating temperature range based on test profile requirements.
- Real-time trend display with user-defined scaling for monitoring performance.
- Three-level security access for controlled user permissions.
- Digital pressure monitoring for refrigeration compressor gases.
- Subsystem/component lifecycle tracking with runtime hour display.
- Calibration due alerts to ensure measurement accuracy and compliance.
- Advanced compressor diagnostics, including monitoring of oil level, discharge temperature, winding temperature, suction temperature, and run hours, with automatic report generation.

Safety and Control

- Electromagnetic interference (EMI) filter on incoming power supply for noise suppression.
- Surge protection system for safeguarding against voltage spikes.
- MPCB protection for all individual three-phase power devices.
- MCB protection for all individual single-phase power devices.
- Comprehensive input power protection including single phasing, phase reversal, under-voltage, and over-voltage protection.
- High and low temperature mechanical safety protection (floating type) for reliable hardware-level safety.
- High and low temperature software safety limits for enhanced operational control.
- Over-temperature thermal protection for heaters to prevent overheating.
- Mechanical high/low pressure safety protection for the refrigeration system.
- Software-based high/low pressure protection for additional refrigeration safety.
- Built-in winding thermal protection for compressors (applicable for semi-hermetic compressors only).
- Compressor oil level protection (OPS) for lubrication safety (applicable for semi-hermetic compressors below 10 HP).
- Compressor high discharge temperature protection to prevent overheating and damage.