



THERMAL VACUUM (TVAC) TEST CHAMBERS AND SPACE SIMULATION SYSTEMS

Thermal Vacuum (TVAC) Test Chambers and Space Simulation Systems

Thermal vacuum (TVAC) test chambers simulate high vacuum and extreme temperatures to validate hardware for space-like conditions. ToronTVAC™ systems support repeatable pump-down, stable thermal boundaries, and controlled cycling for unit-level testing through full-satellite programs. Labs use TVAC to uncover temperature-driven drift, thermal interface problems, and vacuum-dependent failure modes before deployment. These platforms also support thermal balance work where comparable runs and clean operating conditions matter. Use the lineup below to match chamber scale and capability to your test article.

General Description of TVAC Testing

TVAC testing recreates two core space conditions: low pressure and controlled thermal loading. A vacuum chamber reduces convective heat transfer, so heat flow becomes dominated by radiation and conduction. Heat sinks and cold plates create defined thermal boundaries to drive thermal cycling or thermal balance profiles. Controlled pressure and clean vacuum practices help maintain test stability during long runs. Many programs also need instrumentation density, cable routing space, and repeatable fixturing for consistent setups.

ToronTVAC™ systems Lineup

ToronTVAC™ systems cover component-level verification, subsystem validation, and large-scale satellite testing. Each configuration pairs a vacuum chamber with thermal hardware to control the heat transfer boundary around the test article. Model selection usually comes down to chamber envelope, pressure targets, thermal range, uniformity, and ramp rate. Larger platforms add higher channel count control, heat flux simulation, and contamination control features. Choose a system that supports your fixture layout and the way your program measures pass/fail.

ToronTVAC™ 800

A compact TVAC platform for unit-level verification and routine thermal cycling under vacuum. It fits electronics modules, control units, and sensor subassemblies where setup efficiency and repeatability matter.

ToronTVAC™ 1000

A unit-level TVAC test system with practical cold plate size for conduction-driven setups. It supports qualification, acceptance, and investigation workflows where pressure stability and temperature uniformity influence decisions.

ToronTVAC™ 1200 Series

A component-level TVAC system sized for satellite subsystems and instrument modules. The series supports repeatable thermal cycling and thermal balance work with stable thermal interfaces across multiple configurations.

ToronTVAC™ 1500 Series

A larger-envelope TVAC chamber for bigger units and assemblies that need room for fixturing and instrumentation. It supports controlled cycling for qualification, acceptance, and verification after design or process changes.

ToronTVAC™ 2400

A large-scale TVAC chamber for bigger hardware with heat sink and heater cage support for thermal cycling and “cold-black” style conditions. It is designed for programs that need controlled pump-down, stable setpoints, and documented pressure control sequences.

ToronTVAC™ 3600

A full-satellite TVAC platform for thermal balance and pre-launch validation of complete satellites and major assemblies. It supports external heat flux simulation, contamination control, deep cold boundaries, and high channel count data acquisition.

TVAC System for Electric Propulsion and Micro-Force Work

Space programs often pair TVAC validation with propulsion testing and precision force measurement. These platforms support thruster ignition, long-duration validation, and micro-thrust characterization under controlled vacuum conditions. They can be used alongside TVAC chambers to cover performance, stability, and verification workflows across a broader test

plan. Select these systems when background pressure control and low-noise measurement are part of the requirement. Each platform is designed around repeatable setups and predictable vacuum behavior.

ToronEPP™ 1000

A focused electric propulsion performance test platform for Hall thruster evaluation with controlled operating pressure during propellant flow. It supports performance mapping and stability checks where background pressure affects measurements.

ToronPP™ 2000

A higher-capacity electric propulsion performance system for higher propellant flow and expanded diagnostics access. It fits long-duration campaigns and comparative benchmarking across thruster designs.

ToronEPP™ 2200 Series

A modular electric propulsion performance test system for ignition and lifetime testing of small to medium-power Hall thrusters. It adds flexibility with optional axial and lateral chamber modules plus calibration and subsystem checks.

ToronEP™ 3000 G

A dedicated ground ignition platform for repeatable Hall thruster ignition tests under controlled vacuum and thermal conditioning. It supports integrated or selective subsystem ignition verification before endurance campaigns.

ToronAMS™ 2500

A micro-force and actuator measurement platform combining vacuum simulation, vibration isolation, and high-accuracy thrust evaluation. It supports micro-thrust characterization, model correlation, and low-noise measurements for space hardware.

Why Choose ToronTVAC™ Systems

ToronTVAC™ platforms are built around repeatability, stable thermal boundaries, and dependable vacuum performance. Programs benefit when pump-down behavior, setpoint stability, and uniform thermal exposure remain consistent across

runs. Chamber envelopes are sized to support real fixture layouts, instrumentation, and cable routing needs. Configurations scale from unit-level verification to full-satellite thermal balance testing with multi-zone heat flux control. Teams can standardize test workflows across R&D, qualification, acceptance, and investigation work without changing the measurement philosophy.

How to Select the Right System

Match the chamber envelope to your largest fixture, instrumentation, and routing plan. Confirm operating pressure and ultimate pressure targets based on your hardware sensitivity and outgassing needs. Align thermal range, uniformity, and ramp rate to your cycling profile and stability requirements. Consider contamination control and heat flux simulation if optics or sensitive surfaces are part of the program. High channel count control and data acquisition become important as the test article grows.

Typical TVAC Workflow in Aerospace Labs

Test teams usually start with fixture design, sensor placement planning, and cable routing checks. Pump-down profiles and stabilization steps are verified before thermal cycling begins. Thermal balance runs validate boundary conditions and heat transfer assumptions for the hardware configuration. Extended holds can be used to monitor drift, stability, and vacuum-dependent behaviors. Post-test inspection and data review close the loop for acceptance decisions or engineering changes.



Torontech Inc.

251 Consumers Road, Suite 1200
Toronto, Ontario, M2J 4R3, Canada 

Phone: +1 416 368 2721 | Fax: +1 416 981 7652
Email: info@torontech.com

Torontech, LLC

601 Brickell Key Drive, Suite 700
Miami, FL 33131, USA 

Toll-Free: 1-866-383-7919
Email: sales@torontech.com

Torontech ME FZE

Meydan Grandstand, 6th Floor,
Meydan Road, Nad Al Sheba,
Dubai-261440, UAE 

Phone: +971 488 19252
Email: me@torontech.com

