



TORONTECH

THERMAL VACUUM TEST CHAMBER



Thermal Vacuum Test Chamber - ToronTVT™ 600

ToronTVT™ 600 is a multi-function thermal vacuum test chamber combining thermal vacuum conditioning with integrated PVD thin film deposition in a compact SS304 sliding-door cabinet. The 30, 40, or 50 cm chamber features feather-touch, electro-polished interior and exterior surfaces with KF25, CF40, and 1-inch feedthroughs with 200 °C resistant viton o-rings. Turbomolecular and mechanical pumps achieve 10^{-8} Torr base pressure, with Inficon wide-range vacuum measurement covering 1000 to 10^{-8} Torr. A 1.5-hour cycle at 10^{-7} Torr supports multiple daily experiments.

Four thermal inorganic evaporation sources and two to six PID-controlled organic effusion cells (25 to 600 °C, ± 1 °C) provide deposition capability alongside e-beam, sputtering, and vacuum furnace applications in the same chamber. A dual-channel 0.1 Å/s thickness controller monitors deposition rate and cumulative film thickness across active sources. Sample rotation at 2 to 30 rpm with a 100 to 600 °C rotating substrate heater promotes film uniformity during deposition. A 100 mm UV-blocking front window with rotatable protection shutter enables visual process monitoring.

Fully automatic computer control with touch screen panel manages all system functions; single-phase 220VAC, 16A power simplifies facility installation. Automatic closed-loop water cooling protects all sources and plasma components during operation. The KF25, CF40, and 1-inch feedthrough configuration with 200 °C viton o-rings supports measurement and process connections for both TVAC testing and deposition workflows. Thermal vacuum testing and thin film deposition can be performed in the same pump-down cycle, reducing process time and maintaining vacuum integrity.

APPLICATIONS

Thermal Vacuum Test Chamber - ToronTVT™ 600 Applications

The ToronTVT™ 600 serves laboratories requiring both thermal vacuum environmental testing and PVD thin film deposition without separate dedicated tools for each function. Its cabinet format, combined process capability, and automated control

make it suited to programs that need thermal conditioning and thin film coating in the same workflow.

- **Thermal Vacuum Environmental Testing:** thermal vacuum cycling of electronic components, sensors, and small assemblies under controlled temperature and vacuum conditions for performance verification and failure analysis
- **OLED and Organic Electronic Device Research:** thermal vacuum conditioning of organic device stacks combined with in-situ deposition of organic emitter, transport, and metallic contact layers without breaking vacuum
- **Perovskite and Hybrid Solar Cell Research:** combined vacuum conditioning and thin film deposition of perovskite absorber, charge transport, and contact layers for photovoltaic device research programs
- **Semiconductor Component Testing and Coating:** thermal vacuum testing of semiconductor components followed by in-situ metallic contact or passivation film deposition in the same vacuum environment
- **Materials Outgassing and Surface Coating Research:** thermal vacuum conditioning of candidate materials for outgassing characterization, with integrated surface modification or thin film coating capability
- **University and Research Laboratory TVAC Programs:** compact automated thermal vacuum platform for academic programs requiring both environmental testing and thin film coating without separate tool investments



FEATURES

Thermal Vacuum Test Chamber - ToronTVT™ 600 Key Features

The ToronTVT™ 600 integrates thermal vacuum conditioning, organic and inorganic PVD deposition, 10-channel thermocouple monitoring, and Inficon vacuum measurement in a compact SS304 sliding-door cabinet with automated touch screen control.

- **Prismatic SS304 Chamber (30/40/50 cm) with Sliding Doors:** compact cabinet format with direct-access sliding doors for ergonomic sample loading, source configuration, and substrate transfer
- **Feather-Touch Electro-Polished Interior and Exterior Surfaces:** clean chamber surfaces reduce outgassing and particulate contamination for both thermal vacuum testing and deposition processes
- **10-Channel Thermocouple Temperature Monitoring:** up to 10 independent thermocouple channels provide full spatial temperature mapping of test articles and chamber surfaces during thermal vacuum tests
- **4 Thermal Inorganic and 2 to 6 Organic Evaporation Sources:** simultaneous access to inorganic thermal sources and organic effusion cells enables in-situ thin film deposition within the same thermal vacuum cycle
- **PID-Controlled Effusion Cells (25 to 600 °C, ±1 °C):** Knudsen effusion cells for precise organic material evaporation with the temperature stability required for organic semiconductor and OLED emitter deposition
- **Multi-Mode Deposition Capability:** thermal evaporation, e-beam, sputtering, and vacuum furnace applications in a single chamber for flexible process configurations
- **Turbomolecular and Mechanical Pump Stack, 10⁻⁸ Torr Base Pressure:** pump combination provides the base vacuum required for both thermal vacuum testing and high-purity thin film deposition
- **Inficon Wide-Range Vacuum Measurement (1000 to 10⁻⁸ Torr):** Inficon vacuum measurement from atmospheric to base vacuum covering all TVAC and deposition operating modes
- **Automatic Vent, Throttle, and Isolation Valves:** comprehensive valve control for all pressure transitions; the isolation valve maintains chamber vacuum between experiments
- **0.1 Å/s Dual-Channel Precision Thickness and Rate Measurement:** simultaneous thickness and deposition rate monitoring across two independent deposition source channels

- **2 to 30 rpm Sample Rotation with 100 to 600 °C Substrate Heater:** combined rotation and substrate temperature control for uniform deposition and temperature-controlled process conditions
- **100 mm UV-Blocking Front Observation Window with Rotatable Protection Shutter:** large-format visual access during thermal vacuum testing and deposition without UV exposure risk
- **KF25, CF40, and 1-Inch Feedthroughs with 200 °C Resistant Viton O-Rings:** high-temperature feedthrough configuration supporting simultaneous measurement and process connections across all operating modes
- **Fully Automatic Computer Control with Touch Screen Panel:** all TVAC and deposition operations managed automatically through a touch screen interface
- **Automatic Closed-Loop Water Cooling:** automated thermal management of deposition sources and plasma components throughout operation
- **1.5-Hour Experiment Cycle at 10^{-7} Torr:** rapid pump-down and process execution for multiple thermal vacuum tests or deposition runs per day
- **Single-Phase 220VAC, 16A Power Requirement:** standard single-phase electrical connection for straightforward laboratory installation
- **Full Warranty for Materials, Design, and Workmanship:** comprehensive coverage for system components, design quality, and manufacturing

THEORY & METHOD

Theory and Method

The ToronTVT™ 600 combines thermal vacuum conditioning and PVD thin film deposition in a single vacuum cabinet, addressing two laboratory requirements within one pump-down cycle. Conventional workflows use separate TVAC and deposition tools, requiring atmospheric exposure between steps. The shared vacuum environment of the ToronTVT™ 600 allows thermal conditioning and film deposition to occur in sequence without venting, preserving sample cleanliness. The sliding-door cabinet design provides ergonomic access for sample loading and source configuration across both process

modes.

Thermal vacuum testing subjects specimens to controlled combinations of vacuum and temperature to verify performance under simulated environmental conditions. The thermocouple system supports up to 10 independent channels, providing a complete spatial temperature map during the test. Table and shroud temperatures are independently monitored via the LabVIEW-based interface, which logs vacuum level and temperature data per run. The isolation valve maintains chamber vacuum between tests, reducing pump-down time between consecutive runs.

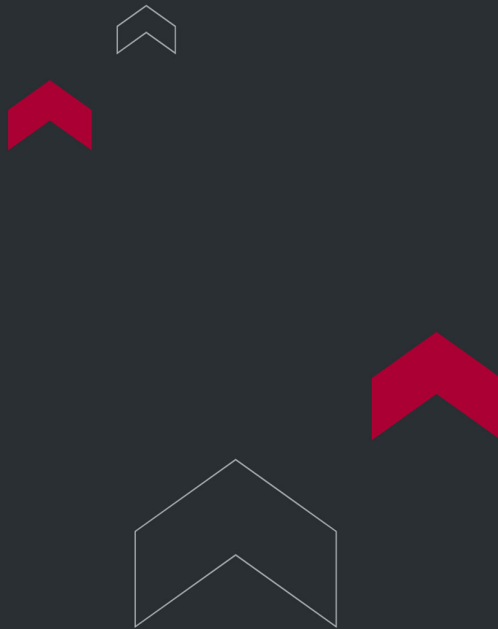
The deposition capability covers thermal evaporation for metallic and organic films, Knudsen effusion cells for organic semiconductors and OLED materials, and optional e-beam and sputtering configurations. Four inorganic thermal sources and two to six PID-controlled organic effusion cells operate within the same chamber volume. PID effusion cell temperature control at 25 to 600 °C with ± 1 °C maintains the flux stability organic materials require. A dual-channel QCM controller at 0.1 Å/s and 2 to 30 rpm substrate rotation complete the deposition process control package.

TECHNICAL SPECIFICATIONS

Thermal Vacuum Test Chamber - ToronTVT™ 600 Technical Specifications

Parameter	Specification
Chamber Material	SS304 (prismatic)
Chamber Sizes	30, 40, or 50 cm
Chamber Access	Sliding doors
Chamber Surface	Feather-touch electro-polished (interior and exterior)
Base Pressure	10 ⁻⁸ Torr (fully loaded system)
Working Vacuum (Cycle Time)	10 ⁻⁷ Torr; ~1.5 hours per experiment

Parameter	Specification
Vacuum Measurement Range	1000 to 10 ⁻⁸ Torr (Inficon system)
Pump Configuration	Turbomolecular + Mechanical
Valve Configuration	Automatic vent, throttle, and isolation valves
Temperature Monitoring	Up to 10 thermocouple channels
Inorganic Thermal Sources	4
Organic Evaporation Sources	2 to 6 effusion cells (Knudsen type)
Effusion Cell Temperature	25 to 600 °C (PID, ±1 °C)
Deposition Modes	Thermal evaporation, e-beam, sputtering, vacuum furnace
Thickness Monitoring	Dual-channel; 0.1 Å/s precision
Sample Rotation Speed	2 to 30 rpm
Substrate Heater	100 to 600 °C (rotating)
Feedthrough Ports	KF25, CF40, 1-inch; 200 °C resistant viton o-rings
Observation Window	100 mm front window; UV-blocking; rotatable protection shutter
Cooling System	Automatic closed-loop water cooling
Control System	Fully automatic computer control; touch screen panel
Voltage	Single phase, 220VAC, 16A (110V is also available)
Warranty	Full (materials, design, and workmanship)



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