

GRAVIMETRIC WATER VAPOR TRANSMISSION RATE TESTER (3-CELL)



Gravimetric Water Vapor Transmission Rate Tester (3-Cell) - ToronWVTR™ C3

Three-Station Weighing-Method WVTR Analyzer for Film and Package Development

The ToronWVTR™ C3 is a 3 cell water vapor transmission rate tester that measures the WVTR of plastic films, aluminum foil, aluminized films, and composite laminates. The instrument uses the gravimetric weighing method, a direct technique that weighs the moisture crossing a barrier. Three stations test three specimens together, a practical fit for material development and side-by-side comparison. Built around methods such as ASTM E96 and ISO 2528, it delivers standards-based moisture barrier data.

Automatic temperature and humidity control hold the chamber at a set condition across a 15°C to 60°C range, so results follow recognized test conditions. A precision balance weighs each dish on a schedule, and a 24-bit delta-sigma converter resolves small mass changes for high-barrier foils and metallized films. Controlled air velocity across the specimen keeps the measurement repeatable across successive tests.

One-button operation runs the full sequence automatically, and live data curves let operators follow mass change, temperature, and humidity as the test proceeds. Traceable reference-film calibration keeps results defensible for audits and certification. The ToronWVTR™ C3 (Gravimetric 3-Cell Water Vapor Transmission Rate Tester) suits flexible-packaging, food, pharmaceutical, and materials R&D labs that need dependable moisture barrier data.

APPLICATIONS

Gravimetric Water Vapor Transmission Rate Tester (3-Cell) - ToronWVTR™ C3 Applications

The ToronWVTR™ C3 supports moisture barrier development and QC wherever water vapor ingress affects product quality, shelf life, or stability.

- **Flexible Packaging R&D:** compares candidate laminates, metallized films, and coatings on moisture barrier during structure development.
- **Food and Beverage Packaging:** measures moisture ingress through films, foils, and laminates that protect dry and moisture-sensitive products.
- **Pharmaceutical and Medical Packaging:** verifies the moisture barrier of blister foils, sachets, and pouches for hygroscopic drug products.
- **Composite and Laminated Films:** characterizes water vapor transmission of multilayer and aluminized structures during formulation and QC.
- **Aluminum Foil and Metallized Materials:** measures very low moisture transmission where the gravimetric method performs well.
- **Paper, Board, and Coatings:** evaluates the moisture barrier of coated papers, boards, and organic coating films.
- **Building and Construction Materials:** tests the moisture barrier of membranes, coatings, and sheet materials per ASTM E96.
- **Academic and Materials Research:** quantifies WVTR for barrier material studies and standards correlation.



Standards

The ToronWVTR™ C3 is designed to align with internationally recognized gravimetric test methods for water vapor transmission rate measurement.

- ISO 2528 - Sheet Materials: Determination of Water Vapour Transmission Rate (WVTR): Gravimetric (Dish) Method
- ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials
- ASTM D1653 - Standard Test Methods for Water Vapor Transmission of Organic Coating Films
- DIN 53122-1 - Testing of Plastics and Elastomer Films, Paper, Board, and Other Sheet Materials: Determination of Water Vapour Transmission Rate: Part 1: Gravimetric Method
- JIS Z 0208 - Testing Methods for Determination of the Water Vapour Transmission Rate of Moisture-Proof Packaging Materials (Dish Method)
- TAPPI T464 - Water Vapor Transmission Rate of Sheet Materials at High Temperature and Humidity

FEATURES

Gravimetric Water Vapor Transmission Rate Tester (3-Cell) - ToronWVTR™ C3 Key Features

The ToronWVTR™ C3 pairs the gravimetric reference method with three-station testing and automated conditioning.

- **Gravimetric Weighing Method:** a direct mass measurement of permeated moisture, the recognized reference approach for WVTR and high-barrier materials.
- **Three-Station Continuous Testing:** three independent specimens run together, a practical throughput for development and routine QC.
- **Automated Precision Weighing:** scheduled automatic weighing removes the manual weighing errors of a traditional dish test.

- **Automatic Temperature and Humidity Control:** the chamber holds a set condition without manual adjustment, so tests match recognized standard conditions.
- **Controlled Air Velocity:** adjustable airflow across the specimen keeps the boundary layer thin and results repeatable.
- **24-Bit Delta-Sigma Data Acquisition:** high-resolution conversion resolves the small mass changes produced by high-barrier foils and films.
- **One-Button Automated Testing:** a single command runs the complete sequence automatically, reducing operator effort and variability.
- **Real-Time Data Curves:** on-screen plots of mass change, temperature, and humidity let operators judge test progress and stability.
- **Built-In Ambient Monitoring:** an internal temperature and humidity sensor logs room conditions with every test for better traceability.
- **Multiple Test Modes:** selectable modes adapt the instrument to different materials and barrier levels.
- **Traceable Reference-Film Calibration:** calibration against certified reference films keeps results defensible for QC release and certification audits.
- **Laboratory Data Management Integration:** connects to lab data management software for centralized records, review, and reporting.

THEORY & METHOD

Theory and Method

Weighing-method WVTR testing measures how much moisture passes through a film by weighing a sealed dish assembly over time. The film is clamped over a dish that contains a desiccant, which holds the underside dry. Placed in a chamber at a fixed temperature and humidity, the assembly experiences a water-vapor pressure gradient: moist on the chamber side, dry beneath the film.

Moisture migrates through the film and is trapped by the desiccant, so the dish steadily gains weight. A precision balance records that gain at set intervals. The steady-state slope of weight against time, divided by the exposed area, yields the WVTR in g/m²·24h, a value tied directly to the mass that crossed the film.

Because it weighs the moisture rather than reading a sensor, the gravimetric method serves as a primary reference, which helps method correlation and high-barrier foil work. Airflow across the specimen limits surface resistance so the film governs the result. Three stations run together under automatic temperature and humidity control, which supports side-by-side comparison of candidate materials.

TECHNICAL SPECIFICATIONS

Gravimetric Water Vapor Transmission Rate Tester (3-Cell) - ToronWVTR™
C3 Technical Specifications

Parameter	Specification
Measurement Range	0.1 to 19,000 g/m ² ·24h (standard)
Test Accuracy	0.01 g/m ² ·24h
Specimen Amount	3, independent
Temperature Range	15°C to 60°C
Temperature Accuracy	±0.1°C
Differential Humidity Range	Room to 95% RH (standard condition 90% RH)
Humidity Accuracy	±1% RH
Test Area	28.26 cm ²

Parameter	Specification
Specimen Size	Ø76 mm
Air Velocity	0.5 to 2.5 m/s (customization available)
Test Chamber Volume	36 L
Gas Supply	Air
Gas Interface	Ø8 mm
Voltage	AC 220 V, 50 Hz (110V is also available)
Dimensions	650 mm (L) × 550 mm (W) × 475 mm (H)
Net Weight	67 kg

Standard Delivery

Item	Description
Main Unit	Three-station gravimetric WVTR test instrument
Computer	Dedicated control PC
Control Software	Instrument operation and data-analysis software
Test Dishes (3)	Gravimetric test dishes for the three stations
Desiccant Tube	Supplies desiccant for the dry side of each dish
Pressure Regulator	Regulates the air supply pressure
Automatic Moisture Filter	Conditions incoming air for stable humidity
Calibration Weight	Reference weight for balance calibration

Item	Description
Communication Cable	Connects the instrument to the control PC
Sample Cutter	Prepares specimens to the required test size

Optional Accessories

Item	Description
Reference Film	Certified film for traceable calibration
Air Drying Device	Additional air-drying for low-humidity test conditions
Sample Cutter	Additional specimen-preparation cutter
Laboratory Data Management System	Centralized data management and reporting software



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