

INFRARED WATER VAPOR TRANSMISSION RATE TESTER (3-CELL)



Infrared Water Vapor Transmission Rate Tester (3-Cell) - ToronWVTR™ Ir3

Three-Chamber Modulated Infrared Sensor WVTR Analyzer for High-Barrier Films and Packages

The ToronWVTR™ Ir3 is a 3-cell infrared WVTR tester that measures the water vapor transmission rate of flexible films, sheeting, and finished packages. The instrument uses the modulated infrared sensor method, a fast, sensor-based technique that reads permeated water vapor in a dry carrier stream. Three chambers test three specimens at once, and a 0.005 g/m²·24h detection floor resolves the very low rates of high-barrier foils and metallized films. Built around ASTM F1249 and ISO 15106-2, it serves packaging, pharmaceutical, and materials labs.

The ToronWVTR™ Ir3 tests both flat films and, with optional fixtures, finished packages, so one instrument covers material screening and package QC at higher throughput. Water-bath temperature control holds all three chambers at a set point across a 5°C to 95°C range, and controlled relative humidity reproduces real storage conditions. High-purity nitrogen carries permeated moisture to the sensors, and digital carrier-flow control keeps each sweep stable.

One-button operation runs each test automatically, and live data curves let operators follow water vapor, temperature, and humidity in real time. Traceable reference-film calibration keeps results defensible for audits, and overload protection guards the pressure, moisture, and temperature circuits. The ToronWVTR™ Ir3 (3-Cell Infrared Water Vapor Transmission Rate Tester) suits high-barrier film, flexible-packaging, pharmaceutical, and R&D labs that test several samples at a time.

APPLICATIONS

Infrared Water Vapor Transmission Rate Tester (3-Cell) - ToronWVTR™ Ir3 Applications

The ToronWVTR™ Ir3 suits multi-sample moisture barrier testing where transmission rates are low and fast, sensitive measurement matters.

- **High-Barrier and Metallized Films:** measures the very low water vapor transmission of foils, aluminized films, and coated barriers across several samples per run.
- **Flexible Packaging and Converting:** qualifies laminates, metallized films, and coatings during development and production QC.
- **Pharmaceutical and Medical Packaging:** verifies the moisture barrier of blister foils, sachets, and pouches for moisture-sensitive drug products.
- **Food and Beverage Packaging:** measures moisture ingress through films and finished packs that protect dry and moisture-sensitive products.
- **High-Barrier Film R&D:** compares EVOH, SiOx, AlOx, and coated structures side by side where low WVTR must be measured quickly.
- **Electronics and Photovoltaic Encapsulation:** screens ultra-high-barrier films that protect moisture-sensitive electronic and PV components.
- **Finished Package Testing:** measures whole-package WVTR for pouches, bottles, and trays with optional package fixtures.
- **Contract and Third-Party Testing Labs:** supports parallel high-barrier WVTR testing across client materials and specifications.



Standards

The ToronWVTR™ Ir3 is designed to align with internationally recognized infrared-sensor test methods for water vapor transmission rate measurement.

- ASTM F1249 - Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor
- ISO 15106-2 - Plastics: Film and Sheeting: Determination of Water Vapour Transmission Rate: Part 2: Infrared Detection Sensor Method
- TAPPI T557 - Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor
- JIS K 7129 - Plastics: Film and Sheeting: Determination of Water-Vapour Transmission Rate: Instrumental Method

FEATURES

Infrared Water Vapor Transmission Rate Tester (3-Cell) - ToronWVTR™ Ir3

Key Features

The ToronWVTR™ Ir3 combines a sensitive infrared sensor with three-chamber throughput for fast, low-level WVTR measurement.

- **Infrared Sensor Method:** a modulated infrared detector reads water vapor in the carrier stream directly, giving fast, sensitive WVTR measurement for high-barrier films.
- **Three Independent Test Chambers:** three specimens run at once, each with its own sensor and result, raising throughput for QC and R&D labs.
- **Low Detection Floor:** reads down to 0.005 g/m²·24h, resolving the very low transmission rates of foils, metallized films, and coated barriers.
- **Film and Package Testing:** tests flat films and, with optional fixtures, finished packages such as pouches and bottles.

- **Water-Bath Temperature Control:** holds all three chambers at a set point across a 5°C to 95°C range for standardized, isothermal testing.
- **Controlled Relative Humidity Testing:** conditions the gas streams to a set RH so results reflect real storage conditions for moisture-sensitive barriers.
- **Digital Carrier-Flow Control:** adjustable nitrogen sweep keeps carrier flow stable and repeatable across each cell.
- **24-Bit Delta-Sigma Data Acquisition:** high-resolution conversion resolves the low signals produced by high-barrier films.
- **One-Button Automated Testing:** a single command runs the complete sequence automatically, reducing operator effort and variability.
- **Overload Protection:** pressure, moisture-sensor, and temperature protection circuits guard the instrument during unattended runs.
- **Independent Temperature Sensing per Chamber:** each of the three chambers carries its own temperature sensor for accurate, independent control.
- **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.
- **Real-Time Data Curves:** on-screen plots of water vapor, temperature, and humidity let operators judge test progress and stability.
- **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

The infrared sensor method measures water vapor transmission by detecting the moisture that crosses a film into a dry carrier stream. Within each cell, the specimen separates the chamber into two sides. A humid nitrogen stream at a set relative humidity flows over the upstream face, while dry nitrogen sweeps the downstream face. The humidity gradient across the film drives water vapor toward the dry side.

Water vapor permeates the film and enters the dry carrier gas, which delivers it to a modulated infrared sensor. Water molecules absorb infrared radiation at a characteristic wavelength, so the sensor reads the attenuation of the beam as a direct measure of water vapor concentration in the carrier stream. The signal climbs until permeation reaches a steady state.

The system computes WVTR for each specimen from the steady-state sensor signal, the carrier flow, and the test area, or the whole package for finished-package testing. Calibration against a reference film of known WVTR ties each reading to a traceable value. Three cells run in parallel with independent results, so a single loading yields three WVTR values, while the infrared sensor's speed and sensitivity suit high-barrier foils and metallized films.

TECHNICAL SPECIFICATIONS

Infrared Water Vapor Transmission Rate Tester (3-Cell) - ToronWVTR™ Ir3
Technical Specifications

Parameter	Specification
Film Test Range (Standard)	0.005 to 42 g/m²·24h
Film Test Range (Optional)	0.05 to 1,000 g/m²·24h
Film Resolution	0.001 g/m²·24h
Package Test Range	0.0001 to 0.3 g/pkg·d (optional)

Parameter	Specification
Package Resolution	0.00001 g/pkg·d
Specimen Amount	3, independent
Temperature Range	5°C to 95°C
Temperature Accuracy	±0.1°C
Humidity Range	0% RH; 35% to 90% RH; 100% RH (standard condition 90% RH)
Humidity Accuracy	±1% RH
Test Area	50 cm ²
Specimen Size (Film)	≥ 150 mm × 94 mm; thickness < 3 mm
Specimen Size (Package)	Max Ø120 mm × 400 mm
Carrier Gas	99.999% Nitrogen
Carrier Flow	0 to 200 ml/min
Gas Interface	1/8 inch
Voltage	AC 220 V, 50 Hz (110V is also available)
Dimensions	730 mm (L) × 590 mm (W) × 350 mm (H)
Net Weight	56 kg

Standard Delivery

Item	Description
Main Unit	Three-chamber infrared WVTR test instrument

Item	Description
Computer	Dedicated control PC
Control Software	Instrument operation and data-analysis software
Temperature Controller	Water-bath temperature control unit
Tank Regulator	Regulates carrier gas supply pressure
PCIe Acquisition Card	Data acquisition interface for the control PC
Communication Cable	Connects the instrument to the control PC
Sample Cutter	Prepares specimens to the required test size
Vacuum Grease	Seals the specimen at the chamber interface

Optional Accessories

Item	Description
Package Fixtures	Adapters for testing finished packages such as pouches and bottles
Reference Film	Certified film for traceable calibration
Vacuum Grease	Additional sealing grease for specimen mounting
Sample Cutter	Additional specimen-preparation cutter
Laboratory Data Management System	Centralized data management and reporting software



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