

ELECTROLYTIC WATER VAPOR TRANSMISSION RATE TESTER (SINGLE- CELL)



Electrolytic Water Vapor Transmission Rate Tester (Single-Cell) - ToronWVTR™ E1

Single-Cell Coulometric Electrolytic Sensor WVTR Analyzer for Ultra-High-Barrier Films

The ToronWVTR™ E1 is an electrolytic WVTR tester that measures the water vapor transmission rate of flexible films, sheeting, and finished packages. The instrument uses the electrolytic sensor method, a coulometric technique that electrolyzes every permeated water molecule for an absolute reading. A detection floor of 0.001 g/m²·24h, the lowest in the range, resolves ultra-high-barrier foils, metallized films, and encapsulation materials. Built around methods such as ISO 15106-3 and DIN 53122-2, it serves high-barrier packaging, electronics, and materials labs.

The ToronWVTR™ E1 tests both flat films and, with optional fixtures, finished packages, so one instrument covers material screening and package QC. Water-bath temperature control holds the chamber 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 sensor, and digital carrier-flow control keeps the sweep stable across the run.

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™ E1 (Single-Cell Electrolytic Water Vapor Transmission Rate Tester) suits ultra-high-barrier film, electronics, pharmaceutical, and R&D labs.

APPLICATIONS

Electrolytic Water Vapor Transmission Rate Tester (Single-Cell) - ToronWVTR™ E1 Applications

The ToronWVTR™ E1 suits moisture barrier testing where transmission rates are extremely low and the highest sensitivity is required.

- **Ultra-High-Barrier Films:** measures the very low water vapor transmission of metallized, coated, and multilayer barrier films that other methods cannot resolve.
- **OLED and Flexible Electronics Encapsulation:** screens barrier films that protect moisture-sensitive OLED and flexible display components.
- **Photovoltaic Encapsulation:** tests backsheets and barrier films that shield solar cells from moisture ingress.
- **High-Barrier Flexible Packaging:** qualifies foils, aluminized films, and coated laminates for demanding moisture-barrier applications.
- **Pharmaceutical and Medical Packaging:** verifies the moisture barrier of high-barrier blister foils and pouches for highly moisture-sensitive drugs.
- **Vacuum-Deposited and Coated Barriers:** evaluates SiOx, AlOx, and other thin-film coatings where transmission is very low.
- **Finished Package Testing:** measures whole-package WVTR for pouches, bottles, and trays with optional package fixtures.
- **Barrier Materials Research:** quantifies ultra-low water vapor permeability for advanced barrier development.



Standards

The ToronWVTR™ E1 is designed to align with internationally recognized electrolytic-sensor test methods for water vapor transmission rate measurement.

- ISO 15106-3 - Plastics: Film and Sheeting: Determination of Water Vapour Transmission Rate: Part 3: Electrolytic Detection Sensor Method
- DIN 53122-2 - Testing of Plastics and Elastomer Films, Paper, Board, and Other Sheet Materials: Determination of Water Vapour Transmission Rate: Part 2: Electrolysis Method

FEATURES

Electrolytic Water Vapor Transmission Rate Tester (Single-Cell) - ToronWVTR™ E1 Key Features

The ToronWVTR™ E1 pairs the most sensitive coulometric sensor in the range with a compact single-cell design.

- **Electrolytic Sensor Method:** a phosphorus-pentoxide coulometric cell electrolyzes every permeated water molecule, giving an absolute WVTR measurement grounded in Faraday's law.
- **Ultra-Low Detection Floor:** reads down to 0.001 g/m²·24h, the most sensitive method in the range for ultra-high-barrier foils and encapsulation films.
- **Single-Cell Design:** focuses the sensor and gas path on one specimen, keeping the instrument compact and straightforward to run.
- **Film and Package Testing:** tests flat films and, with optional fixtures, finished packages such as pouches and bottles.
- **Water-Bath Temperature Control:** holds the chamber 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 test.
- **24-Bit Delta-Sigma Data Acquisition:** high-resolution conversion resolves the very low signals produced by ultra-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.
- **Integrated Chamber Temperature Sensing:** a built-in sensor monitors chamber temperature throughout each test.
- **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 electrolytic sensor method measures water vapor transmission by capturing and electrolyzing the moisture that crosses a film. The specimen separates a diffusion cell 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.

The dry carrier gas delivers the permeated water vapor to an electrolytic cell coated with a hygroscopic phosphorus-pentoxide film. The coating absorbs every water molecule, and an applied voltage electrolyzes it into hydrogen and oxygen. Each water molecule contributes a fixed quantity of electrical charge, so the electrolysis current reads out the water vapor flux directly, an absolute measurement grounded in Faraday's law.

The system computes WVTR from the steady-state electrolysis current, the carrier flow, and the test area, or the whole package for finished-package testing. Because it counts water molecules rather than reading an optical or gravimetric signal, the electrolytic method reaches a very low detection floor of 0.001 g/m²·24h, which suits ultra-high-barrier foils, metallized films, and encapsulation materials. Calibration against a reference film keeps each reading traceable.

TECHNICAL SPECIFICATIONS

Electrolytic Water Vapor Transmission Rate Tester (Single-Cell) -
ToronWVTR™ E1 Technical Specifications

Parameter	Specification
Film Test Range (Standard)	0.001 to 52 g/m ² ·24h
Film Test Range (Optional)	0.01 to 1,100 g/m ² ·24h
Film Resolution	0.001 g/m ² ·24h
Package Test Range	0.0001 to 0.5 g/pkg·d (optional)
Package Resolution	0.00001 g/pkg·d

Parameter	Specification
Specimen Amount	1 (single specimen)
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 < 1 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	330 mm (L) × 600 mm (D) × 330 mm (H)
Net Weight	28 kg

Standard Delivery

Item	Description
Main Unit	Single-cell electrolytic WVTR test instrument
Computer	Dedicated control PC

Item	Description
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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