OX-TRAN® Model 2/21

The Standard for Oxygen Transmission Rate Testing of Flat Films & Finished Packages

- Systems are Certified Traceable to N.I.S.T.
- Windows® based software interface
- Highest precision Coulox® Oxygen Sensor

CFR21 **Part 11** Compliant
Validation Services Now Available

Modular Design

Only MOCON systems comply with the following standards:
ASTM D-3985 films
ASTM F-1927 films
DIN 53380 films
JIS K-7126 films
ASTM F-1307 packages
ISO CD 15105-2

mocon®
Over 35 Years of Permeation Experience

Made in USA

Master Base Control Systems to Fit Your Application and Budget... Plus additional Satellite Modules Allow You to Design and E-X-P-A-N-D Your Own System.

Consider the OX-TRAN 2/21's flexibility in your application. Choose from five Master Base Control Systems and five Satellite Application Modules, each providing different test capabilities. Combine a Master Base Control System with as many as nine Satellite Application Modules for a maximum of 20 test cells per system. The Coulox oxygen sensor is contained in each module for high accuracy and maximum throughput.

Includes Computer with Printer and WinPerm™ Permeability Software

- Sophisticated Windows® based software control with a high speed computer & printer
- Up to 10 modules (20 test cells) can be incorporated, each containing a high performance oxygen sensor for maximum throughput
- No sensor calibration required
- Computer-determined equilibrium and barometric pressure compensation
- Double-cell film testing mode for increased sensitivity
- RS-232-C output

Optional Package Environmental Chamber (PEC)

- Package testing under select environments
- Compatible with any Master or Satellite L, H, S, or T module

Powerful Software

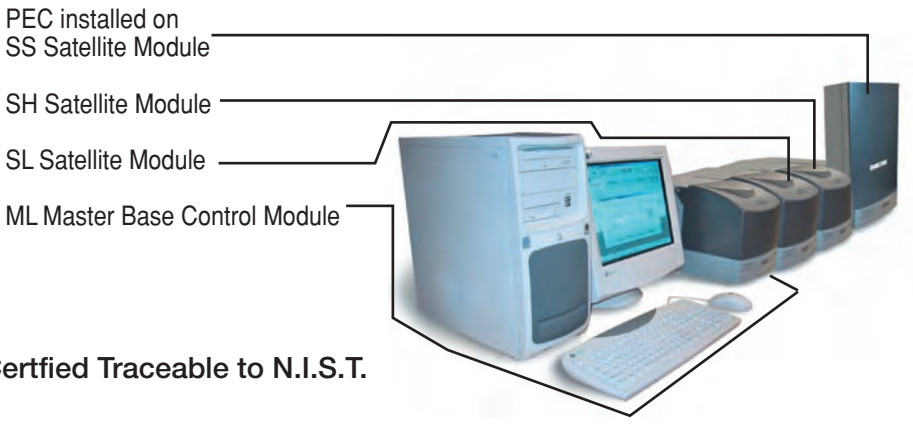
MOCON's WinPerm™ Permeability software interface is designed for speed and ease of use. Value added features include:

- Quickstart – Quickly choose standard ASTM, ISO, JIS or userdefined test conditions and immediately begin testing
- Preprogrammed module and test set-up may be saved and stored for later use
- Test results are automatically converted to Excel format for export and further data manipulation
- Test results are available in individual detailed or multitest summary format
- Linkable to PERM•NET 2000, MOCON's powerful test and data management system

RH Control with Sensor directly at test site

Digital pressure and flow controls allow for simple "set and forget" relative humidity generation. A single setting achieves critical "real world" RH conditions quickly and precisely with minimal operation involvement – and importantly the RH sensor is directly at the sample site. A theoritical calculation of RH away from the sample site is not accurate.

Example System Configuration: 8 test cells, testing films and packages

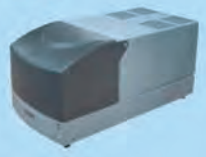


Systems are Certfied Traceable to N.I.S.T.

ADD ONE...

Master Base Control Systems (each contains 2 test cells)

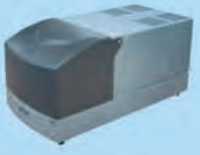
ML



- Dual film test cell module
- Blue Sensor for ultra sensitivity
- Precise control of relative humidity
- Temperature Control 10 C to 40 C
- Computer and printer

OR

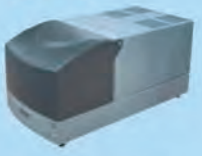
MH



- Dual film test cell module
- Red Sensor for high sensitivity
- Precise control of relative humidity
- Temperature Control 10 C to 40 C
- Computer and printer

OR

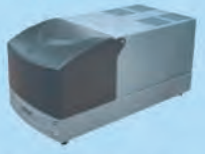
MS



- Dual film test cell module
- Red Sensor for high-sensitivity
- Temperature Control 5 C to 50 C
- Computer and printer

OR

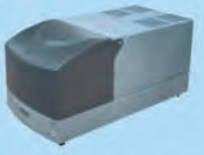
MD



- Dual film test cell module
- Red Sensor for high-sensitivity
- Temperature Control 20 C to 50 C
- Computer and printer

OR

MT



- Dual film test cell module
- Green Sensor for high range
- Computer and printer

**Currently not available with N.I.S.T. Certification*

AND FROM THE CHOICES BELOW, UP TO 9 SATELLITE MODULES CAN BE ADDED— NOW OR LATER...

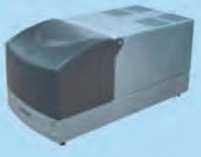
Satellite Application Modules (each contains 2 test cells, up to 9 modules per Master Base)

PEC CAN BE INSTALLED ON L, H, S or T

SL

- Dual film test cell module
- Blue Sensor for ultra sensitivity
- Precise control of relative humidity
- Temperature Control 10 C to 40 C

SH

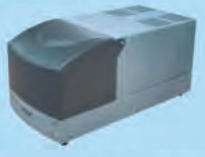


- Dual film test cell module
- Red Sensor for high sensitivity
- Precise control of relative humidity
- Temperature Control 10 C to 40 C

SS

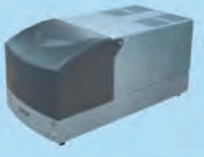
- Dual film test cell module
- Red Sensor for high-sensitivity
- Temperature Control 5 C to 50 C

SD



- Dual film test cell module
- Red Sensor for high-sensitivity
- Temperature Control 20 C to 50 C

ST



- Dual film test cell module
- Green Sensor for high range

**Currently not available with N.I.S.T. Certification*

Effects of Temperature and Relative Humidity on High-Barrier Material Films and Packages

Barrier Film Testing

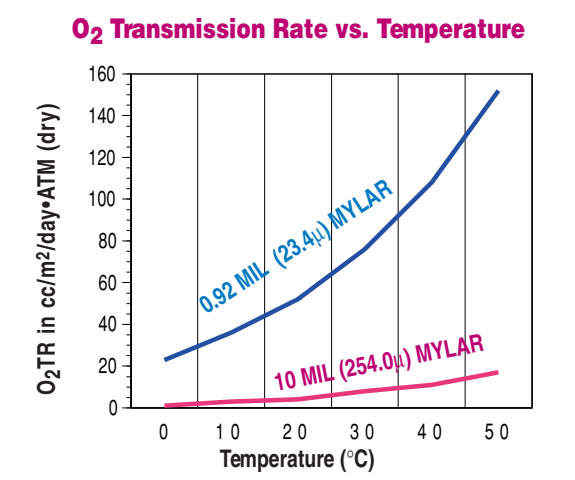


Figure 1. The thicker the material (MYLAR® shown here), the better barrier to oxygen transmission. The answers documented during testing will tell you how thick and what barrier material will best suit your project. Incoming quality control will also have a specification to measure vendor performance.

High Barrier Film Testing Comparisons

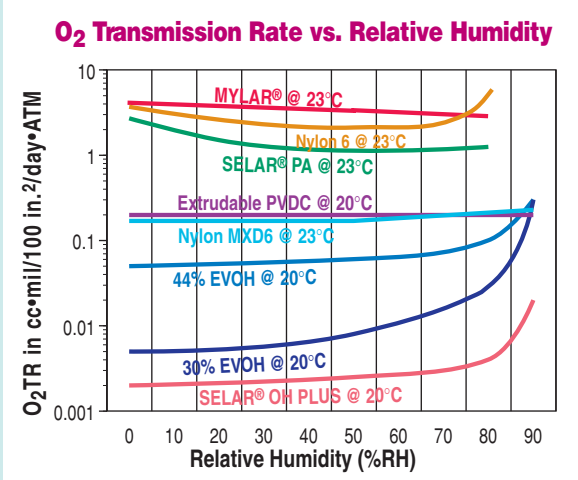


Figure 2. Relative humidity also affects the O_2 transmission rate of a variety of materials as shown above. A variety of combinations of materials, thicknesses, temperatures, and relative humidity can be tested on the OX-TRAN 2/21 System.

Package Testing

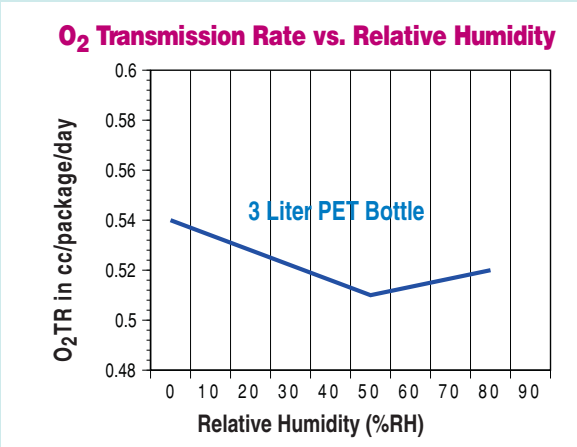


Figure 3. Complete packages can be tested for varied parameters including the effect of relative humidity on O_2 transmission rates. The Package Environmental Chamber (PEC) allows for very flexible package testing considerations.

Analytical Software Tools

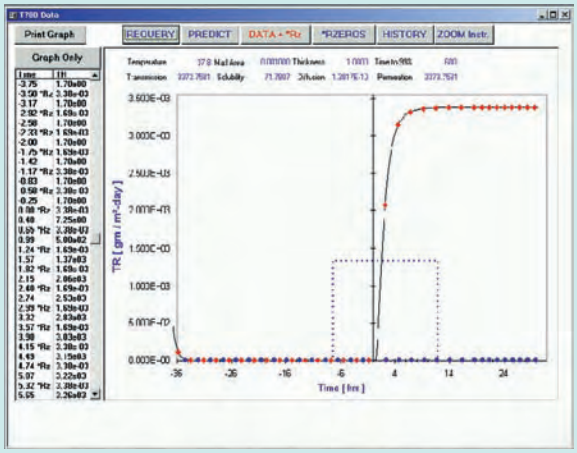
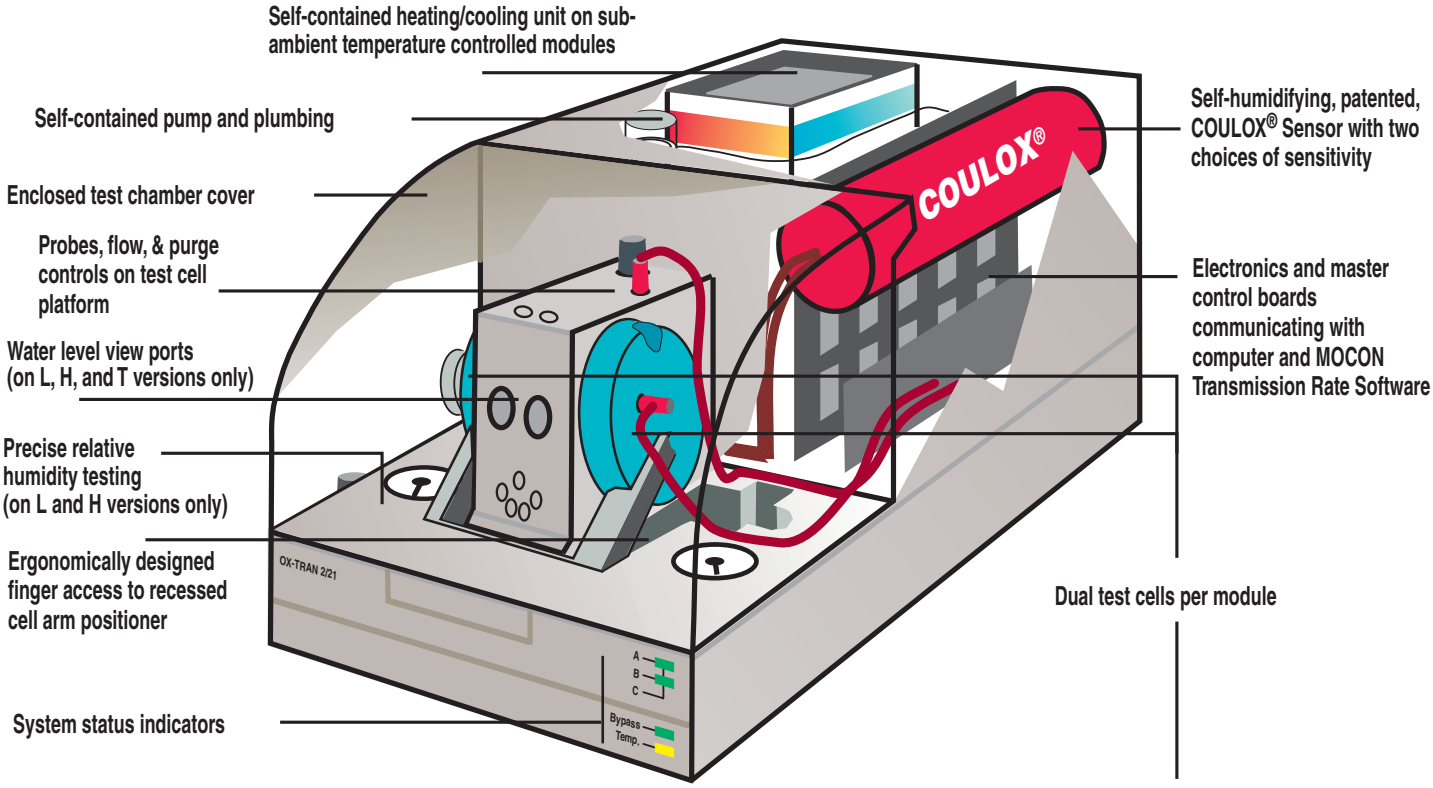


Figure 4. The OX-TRAN 2/21 System utilizes software which provides a variety of reporting formats to fit your needs. Sophisticated, yet easy to use, transmission rate software for system operation and control will produce test results such as graphs, tables, or numerical listings as you desire.

MYLAR and SELAR are registered trademarks of E.I. DuPont

The OX-TRAN 2/21 Provides Maximum



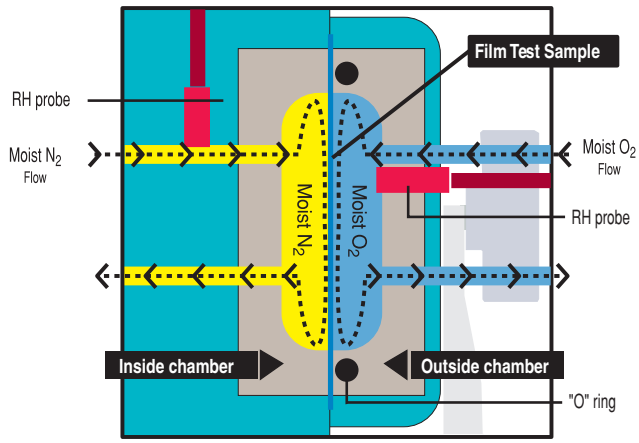
Principle of Operation

Setting the worldwide standard for permeation testing, the OX-TRAN 2/21 system uses a patented coulometric sensor (COULOX®) to detect oxygen transmission through both flat materials and packages. This high performance sensor (three models available, each with distinct ranges for higher accuracy) provides parts-per-billion sensitivity even in the presence of water vapor. The Coulox sensor is an intrinsic or absolute sensor that does not require calibration. Calibration films are provided to ensure the entire system is performing to the highest MOCON precision and accuracy standards.

Flat film samples are clamped into the diffusion cell, which is then purged of residual oxygen using an oxygen-free carrier gas. The carrier gas is routed to the sensor until a stable zero has been established. Pure (99.9%) oxygen is then introduced into the outside chamber of the diffusion cell. Molecules of oxygen diffusing through the film to the inside chamber are conveyed to the sensor by the carrier gas.

Side View of Test Cell Diagram

Not to scale.



Various system configurations allow you to simultaneously condition and test materials over a wide range of temperature and relative humidity conditions similar to a package's actual storage environment. For example, the film test cell in the OX-TRAN 2/21, ML Module incorporates RH probes on both sides of the film to ensure precise control of the monitored RH levels.

Product Selection Information

Module Choices for System Configuration

	MD	SD	MS	SS	MH	SH	ML	SL	MT	ST
O_2TR Test Range:										
Note 1 Below							X	X		
Note 2 Below	X	X	X	X	X	X				
Note 3 Below									X	X
Sensor:										
Red COULOX Sensor	X	X	X	X	X	X				
Blue COULOX Sensor							X	X		
Green COULOX Sensor									X	X
Test Temperature Range:										
20 C to 50 C	X	X								
5 C to 50 C			X	X						
10 C to 40 C					X	X	X	X		
10 C to 35 C									X	X
Standard Testing:										
Films - Dry or Ambient	X	X	X	X	X	X	X	X	X	X
Packages - Dry or Ambient	X	X	X	X	X	X	X	X	X	X
Films or Packages at Unknown Wet RH									X	X
Controlled RH Testing:										
Films - 0%, and 35% to 90% RH ±3%					X	X	X	X		
Packages - 0%, and 35% to 90% RH ±3%					X	X	X	X		
Test Samples Size:										
Films - 5 in. x 5 in. (12.7 cm x 12.7 cm)									X	X
Films - 4.25 in. x 4.25 in. (10.8 cm x 10.8 cm)	X	X	X	X	X	X	X	X		
Packages - Up to 3 liters per package	X	X	X	X	X	X	X	X		
Controlled RH - Up to 2 liters per package					X	X	X	X		
RH PLUS Easy RH Control					X	X	X	X		
Test Cells per Module, Two - 50cm^2 Test Cells	X	X	X	X	X	X	X	X	X	X
Expandable up to 10 modules (20 test cells)	X		X		X		X		X	
Computer, Monitor, Printer and WinPerm™ Software	X	X	X	X	X	X	X	X	X	X
Automatic Temperature Monitor & Control	X	X	X	X	X	X	X	X	X	X
Barometric Pressure Compensator (optional)	X	X	X	X	X	X	X	X	*X	X

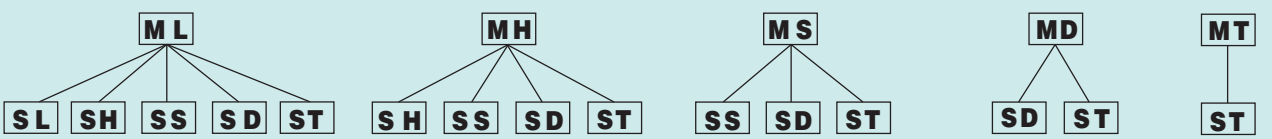
Specifications provided on request.

* Included in price on MT

		cc/m^2/day	cc/100 in^2/day	cc/pkg./day
Note #1	Unmasked	0.005 to 200	0.0003 to 13	0.000025 to 1.0
	Masked	0.05 to 2,000	0.003 to 130	N/A
Note #2	Unmasked	0.05 to 200	0.003 to 13	0.00025 to 1.0
	Masked	0.5 to 2,000	0.03 to 130	N/A
Note #3	Unmasked	775 to 155,000	50 to 10,000	7.75 to 1,550

This instrument is ETL listed,
Conforms to UL Std. 1262, is
Certified to CAN/CSA C22.2 No. 151,
and Complies with CE Product Safety,
Electromagnetic Emission & Susceptability

Possible OX-TRAN 2/20 System Configurations starting with Master Base Control System:



U.S. Patent #4,973,395
MOCON reserves the right to change specifications without notice as part of our continuous program of product improvement.

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