



## **AMETEK MOCON SERVICES FOR PERMEATION AND PACKAGE TESTING**

Expert lab testing services for breathable and barrier films, materials, and package integrity.

## The importance of permeation testing



Most materials and packages permeate at some level — i.e., gas and vapors move through them at differing rates (Fig. 1). This movement (or permeation rate), impacts the function of the material and its ability to maintain a product’s performance or shelf life. Some products, such as a drug-coated stent, need a high-barrier package to prevent degradation. At the other extreme, fresh produce packaging must allow in oxygen so the product can “breathe.”

Inadequate barriers can lead to food spoiling before its expiration date, faulty products and negative brand perception. By contrast, excessively high barrier materials, or “over packaging,” such as the use of foils and complex material structures, increase cost and material waste. Manufacturers must achieve optimal barrier properties for the most cost-effective and environmentally sound packaging production.

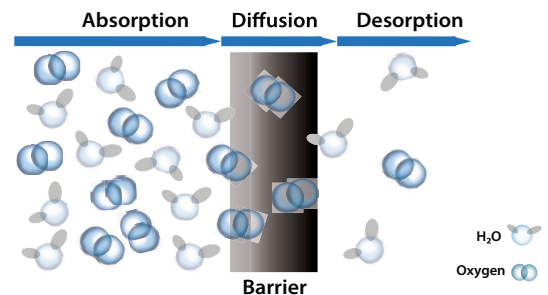


Fig. 1 Gas diffusion diagram

## The importance of whole package testing



Many manufacturers believe that once data is established for a chosen material type, no further testing is needed. This is not true. The package forming process not only creates the opportunity for leaks at seams and seals, but it also creates processing “wear and tear” that can impact the original barrier performance. For this reason, it’s crucial to test the entire package to ensure it will perform as expected; this gives manufacturers the opportunity to fix issues before entering large-scale production. For the food and beverage industry, and especially companies that rely on Modified Atmosphere Packaging (MAP), this is key to ensuring the necessary environment is maintained.

## How our lab helps

It takes more than specialized equipment to accurately determine barrier and package performance. With over 50 years of permeation expertise, the AMETEK MOCN permeation testing laboratory leads the way with industry-recognized and custom test methods, purpose-built instruments, and experienced applications specialists. Our testing helps our clients to:

- Extend and validate shelf life claims
- Address problems that have arisen during R&D
- Obtain the data to develop more sustainable packaging solutions



## Why to choose the AMETEK MOCON Permeation & Package Testing Lab

There are benefits to choosing the world's largest permeation laboratory for your film and package testing needs. Our lab is equipped with world-class Water Vapor Transmission Rate (WVTR/MVTR), Oxygen Transmission Rate (OTR) and Carbon Dioxide Transmission Rate (CO<sub>2</sub>TR) permeation analyzers, plus specialized package testing equipment for MAP evaluation, seal integrity, burst testing, and leak detection.

You'll also have peace of mind knowing we work diligently to obtain and maintain our ISO/IEC 17025:2017 accreditation, and that our instruments and methods are the basis for many ASTM test methods. Our lab has the volume of equipment needed to take on large-scale projects, and our years of experience with unique, hard-to-test and niche materials means we can address almost any challenge.



### Industries we serve:



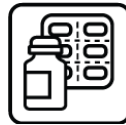
Food & Beverage



Consumer Products



Healthcare



Pharmaceutical



Packaging & Converters

## Services beyond the lab



Our highly trained and experienced applications specialists can assist you in a range of areas related to barrier testing.

### Custom Solutions

AMETEK MOCON offers a range of specialized testing cartridges, both for film and whole-package testing. Many of these were developed based on specific customer feedback and needs – and we can offer that service to you. For highly niche, difficult-to-test materials, especially in the sustainable and biodegradable market, we can develop custom cartridges and fixtures that allow you to independently test samples and obtain more reliable and repeatable data.

### Education

Our expert applications specialists can educate your personnel, researchers, and engineers on theories and factors associated with permeation and package testing.



# PERMEATION & PACKAGE TESTING CAPABILITIES

SERVICE BROCHURE

## ASTM Permeation Test Methods

| Test Description  | Test Method               | Description  | Test Range   | Industry/Sample Types   |
|---|---------------------------|--|--|---|
| Oxygen Transmission Rate (OTR)                                | ASTM D3985*               | Film testing with dry gases                                | 0.005 to 2000 cc/(m <sup>2</sup> ·day)                                     | Food, Medical, Building Materials, Rubber & Electronics   |
|   | ASTM F1927*               | Film testing with humidified gases                         | 0.005 to 2000 cc/(m <sup>2</sup> ·day)                                     | Food, Medical, Building Materials, Rubber & Electronics   |
|   | OX-TRAN 10X D3985 & F1927 | High barrier film and package testing                      | 0.0005 to 200 cc/(m <sup>2</sup> ·day)                                     | Electronics and Medical Devices<br><i>Ultra-high barriers need to perform like glass or metal</i>         |
|   | ASTM F1307*               | Package testing with dry or humidified gases               | 0.00003 to 1 cc/(package day)  | <b>Full packages:</b> pouches, trays, bottles, devices, tubing, seals, gaskets, and single dose packaging |
|   | ASTM F2622                | Low barrier film testing                                   | 0.5 to 144,000 cc/(m <sup>2</sup> ·day)                                    | Highly breathable, non-porous materials   |
|   | ASTM F3136                | Low barrier film or package testing                        | 100 to 100,000+ cc/(m <sup>2</sup> ·day) or 0.2 to 2,000+ cc/(package day) | Extremely high OTR measurement of perforated materials and leak packages                                  |
| Water Vapor Transmission Rate (WVTR/MVTR)                     | ASTM F1249*               | Wide range of film, coatings and package component testing | 0.005 to 1,000 cc/(m <sup>2</sup> ·day)                                    | Food, Medical, Building Materials, Rubber & Electronics   |
|   | ASTM F3299                | Ultra-high barrier film and package testing                | 0.05mg to 5 g/(m <sup>2</sup> ·day)  | Electronics, OLEDs, Solar Panels, Encapsulations and Medical Devices                                      |
|   | ASTM E96                  | Low barrier testing  | 0.5 to 10,000 g/(m <sup>2</sup> ·day)                                      | Used with porous samples that can't be analyzed with instrument methods – such as paper                   |
| Carbon Dioxide Transmission Rate Testing (CO <sub>2</sub> TR) | ASTM F2476*               | Film and package testing                                   | 1 to 80,000 cc/(m <sup>2</sup> ·day)                                       | Beverage, Food, Medical, Building Materials & Electronics   |

\*Most common transmission rate test methods

## Common Permeation Test Conditions

| Transmission Rate Analysis       | Common Test Conditions                | Alternate Test Conditions  |
|----------------------------------|---------------------------------------|--|
| Oxygen Transmission Rate         | 23°C (73.4°F) and dry gases           | <b>Refrigerated:</b> 5°C with 100% RH or dry gases<br><b>Room Temperature:</b> 23°C with 50% RH<br><b>Accelerated Temperature:</b> 40°C with 100% RH or 90% RH |
| Water Vapor Transmission Rate    | 37.8°C (100°F) with 100% RH or 90% RH |  |
| Carbon Dioxide Transmission Rate | 23°C (73.4°F) and dry gases           |  |

## Package Integrity Test Methods and Other ASTM Methods

| Test Description                                      | Test Method   | Typical Samples   |
|---|---|---|
| Headspace % O <sub>2</sub> , % CO <sub>2</sub>        | Dansensor Headspace Analyzer  | Modified Atmosphere Packaged Samples found with Food and Pharmaceuticals  |
| Small Headspace % O <sub>2</sub>                      | ASTM F2714 – OpTech-O <sub>2</sub> Analyzer                                       | Very small volume packages found with Food and Pharmaceuticals            |
| Burst Testing of Packages                             | ASTM F2054 (restrained) and ASTM F1140 (unrestrained) with Lippke 5000 Instrument | Sealed packages for Food, Electronics, Pharmaceutical and Medical Devices |
| Seal Integrity Testing via Pressure Decay of Packages | ASTM F1140 with Lippke 5000 Instrument  | Sealed packages for Food, Electronics, Pharmaceutical and Medical Devices |



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