

Versatile and patented method of Oxygen Permeation Analysis for packages, bottles and film

The PermMate can also be used for headspace measurement, leak detection and shelf life determination.



Applications

Test laboratories Universities and Institutes Packaging manufacturers
 PET Bottle manufacturers Food & Beverage manufacturers

Features & Benefits

- Oxygen permeability testing of complete packages
- Shelf life analysis using adhesive septas
- New patented concept of measuring
- Lower cost of ownership than optical / fluorescent quenching technique
- High test capacity, the instrument is able to handle an almost unlimited number of samples
- Data logging and traceability
- Packages can be tested using a wide variety of testing conditions e.g. temperature and humidity
- Versatile research and development product
- Requires no expensive consumables
- Ability to perform O₂ headspace analysis
- Automatic flushing and calculation of volume

Patented Method

The PermMate utilizes a patented method which involves extracting a small amount of gas at intervals until the rate of uptake of O_2 is the same as the last test, then the test is complete.

This method has particular advantage over optical/fluorescence quenching technique.

- No operator calculations required. The PermMate computes direct measurements.
- Can be used on non-transparent and non-translucent packages.

- No need for 'Dot' sensors to be attached inside the package.
- No extra apparatus required.
- No errors due to temperature dependence of the fluorescence signal.
- The PermMate calculates the volume of the container.
- No errors or calculation required due to batches of 'dots' having unique calibration data.
- No errors due to mis-alignment of the fluorescence reader.



Cost Effective Design

The PermMate's design enables the measurement of the oxygen ingress of the package and calculates the O_2 transmission rate. It can test numerous packages simultaneously. Comparable analysers are often limited to 1 to 8 packages. In addition, it can determine volume, headspace $O_2\%$ measurements and nitrogen flushing of packages.

Volume Test

An additional feature of the PermMate is the ability to determine the volume of the packages to be tested. This is an important factor influencing the oxygen permeability calculation of the package.

Knowing the volume of the finished package can be a valuable tool in monitoring the total gas consumption during production and can provide documentation of volume for transportation requirements.

Real Life Test

The PermMate provides the solution of testing permeability of finished packages and is able to test the oxygen permeability at different test conditions e.g temperature and humidity. The permeability and barrier qualities of a foil changes when it is shaped into a finished package. As a result, the shelf life of food products can be affected.

Exact Measurement

The exact impact on the permeability can be established thus resulting in better knowledge about the shelf life of the product. Sample extraction can be as low as 3.5ml for each measurement.

Easy to Use

The PermMate system combines the PermMate gas flush unit and a headspace gas analyser to measure the Ambient Oxygen Ingress rate of packages in controlled environments.

After testing, the packages can be stored in controlled environments.

It is also possible to store them in environments to experience the full lifetime cycle of a package.

The PermMate is controlled via the included simple to use PC software.

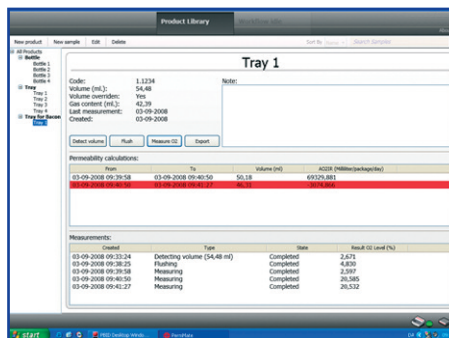
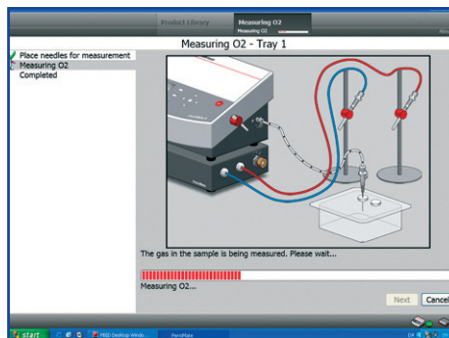
AO₂IR Measuring Principle

If a package with a low internal oxygen content is left at ambient oxygen level (20.9%) for a period of time, the oxygen level inside the package will increase. If the package is leak free this increase will be due to the permeation through the material. This is known as the AO₂IR (Ambient Oxygen Ingress Rate), and thus the permeation can be calculated.

Measuring process

Measuring the oxygen permeability of a package with the PermMate is a easy 6 step process*. Each step is automated and controlled by the PermMate and its user-friendly PC software. The user is guided through each step with the help of the software prompts.

- Create a new test sample.
- Determine the volume of the package, using the automatic volume detection function. (Optional)
- Flush the package with N₂ automatically to the desired starting level e.g. 0.2% O₂.
- Let the package stabilise in a temperature/humidity stable environment.
- Make at least two O₂ content measurements in the package leaving the package in a stable environment between the measurements.
- Calculate the oxygen permeability of the package.



* The number of steps may vary depending on the application. However, a typical test consists of 6 steps.

R&D

The PermMate is an important tool for all types of packaging research and development. The instrument is extremely versatile and can be used for a wide variety of temperature/relative humidity conditions. Typical usage includes:

- Packaging design - influence of material choices and thickness.
- Shelf life prediction.
- Ability to measure over a long period e.g. weekly measurements for a year.
- Work with multiple samples at the same time.

Technical Specifications

PermMate

Description

Dimensions	285W x 70H x 215D (mm)
Weight	3kg
Ingress Protection	IP40

Power Requirements

Power Supply	90-260 VAC, 50-60 Hz, Maximum 15W
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Package flushing

Flow	330ml/min. approximate
Lower flushing limit	0.03% O ₂ depending on supply gas
Typical flushing time	8 minutes (Package of 1/2 litre PET bottle from 20.9% O ₂ to 1% O ₂)
Gas	Nitrogen 5.0 or similar. Maximum recommended O ₂ content 5 ppm.

Package volume determination

Accuracy	Better than $\pm 7.5\%$ relative
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Permeability calculation

Accuracy	Better than $\pm 7.5\%$ relative
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Duration of permeability measurements

Expected minimum time for a 1/2 litre package with an AO₂IR (OTR) of 0.001 cc/package/day = 25 days

Expected minimum time for a 1/2 litre package with an AO₂IR (OTR) of 0.1 cc/package/day = 6 hours

Headspace Analyser

Sensor Type

Oxygen 0 to 100%, Zirconia, solid state, ultra low volume

Response time

3 seconds

Accuracy: Oxygen

10 to 100% 0.2% absolute (max 2% of reading) and ± 1 on the last digit.
1 to 9.99% 0.02% absolute (max 2% of reading) and ± 1 on the last digit.
0 to 0.999% 0.005 % absolute and ± 1 on the last digit.

Range selection

Automatic to 3 decimal places
Oxygen: 0.001% to 99.9%

Display type

Wide angle 95mm x 55mm 4.5" High Resolution Touchscreen LCD

Operating conditions

Sample and ambient temperature: 5 to 40°C

Sample connections

Needle probe, can piercing station or direct syringe injection

Alarms

Programmable high/low limits for each measured gas, individual setting for up to 99 product, user and production line codes.
Screen and printed display of high/low alarm conditions

Internal datalog

Stores over 1000 measurement results and alarm conditions

Communications interfaces

Serial computer interface for reports and data logging

Auto diagnostic routine

Initiated upon power up

Auto-cal

Auto calibration routine standard

Auto pass/fail

User programmable. Screen and printed display of alarm conditions

Auto test sequencing

Initiated by sample probe insertion into pack

Power Requirements

Mains power	90-260 Vac, $\pm 10\%$, 50/60Hz – Automatically sensed
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Options

Bar code Reader
Note: O₂ and CO₂ headspace analyser also available.

Systech Illinois have over 25 years experience of providing analysis solutions for a wide range of industries. From our manufacturing plants in the UK and U.S we produce gas analysers for industrial process industries, headspace analysers for monitoring gas flushing of food products, and our range of permeation analysers.

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