

www.extrasolution.it

The new frontier of barrier measurements



ExtraSolution S.r.l.

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ExtraSolution produces instruments for measuring barriers to gases through films, bags, little containers used in food or pharmaceutical packaging and other objects such as bottles, caps and taps used in beverage industries. ExtraSolution's Perm Line includes instruments for testing oxygen permeability (O₂TR), water vapour (WVTR) permeability and carbon dioxide permeability (CO₂TR). ExtraSolution develops its instruments in cooperation with some leader sector companies, with constant and careful attention in matching the needs of the industrial R&D and the quality control labs. Thanks to its user-friendly interface, the reliability and the excellent quality price ratio of the instruments, ExtraSolution reached immediately a remarked position in the european panorama of permeability measurements.

ExtraSolution is a spin-off company of the University of Pisa and that works in close cooperation with different research labs and it's capable of developing advanced solutions for any customer's specific requirement. Preferring ExtraSolution means choosing a product, a quality and a post-sale support all "Made in Italy". ExtraSolution has been a finalist of the Italian National Innovation Award 2004.

All the ExtraSolution instruments

- are completely automated and have a high working simplicity;
- do not need preliminary preparation of the sample to carry out the analysis;
- automatically regulate the temperature with a stability of ± 0.1 C and relative humidity with an accuracy of $\pm 1.5\%$;
- automatically set the carrier flow depending on the sensitivity required;
- are equipped with a barometric compensation system;
- present the results in standard units $\text{cm}^3 \cdot \text{m}^{-2} \cdot 24\text{h}^{-1} \cdot \text{bar}^{-1}$ (O₂ and CO₂ film), $\text{g} \cdot \text{m}^{-2} \cdot 24\text{h}^{-1} \cdot \text{bar}^{-1}$ (H₂O film), $\text{cm}^3 \cdot \text{pkg}^{-1} \cdot 24\text{h}^{-1}$ (O₂ and CO₂ package);
- are equipped with PC, LCD 17" display and colour inkjet printer;
- save a continuous data back-up to the disk and can recover measurements even with a black-out;
- save the final data and report both in text format as well as in HTML for an easy communication of the results via Internet;
- print the reports and stop automatically when measurement operations have finished.



MultiPerm: the new frontier of barrier measurements

MultiPerm is the first, and by the moment, the only instrument present on the market that allows simultaneous measurements of the barrier of two different gases on two different samples. With MultiPerm the instruments for permeability testing make a step forward. After the launching of the first instrument for O₂TR and WVTR simultaneous measurements, now ExtraSolution, thanks to its researchers innovation capability, offers to the customers the possibility of choosing the couple of sensors that will be mounted in the instrument.

In fact, MultiPerm is offered with two sensors chosen among oxygen, water vapour or carbon dioxide and in different versions: single cell or double cell.

MultiPerm, besides performing measures of permeability through thin films, can be equipped with modular accessories to carry out measurements on packaging containers of various types. MultiPerm stands as the ideal solution for companies that produce or use barrier packaging and want the highest performance in a single instrument at competitive prices.

The special software MultiPerm-ExtraSolution® guarantees the highest working simplicity.

MultiPerm O₂ - H₂O

| | |
|---|--|
| Test range O ₂ | 0.005-20000 cm ³ ·m ⁻² ·24h ⁻¹ ·bar ⁻¹ |
| Test range H ₂ O | 0.002-500 g·m ⁻² ·24h ⁻¹ ·bar ⁻¹ |
| Test samples size | 50 cm ² |
| Test temperature range | 10-50 C ± 0.1 C |
| Relative humidity O ₂ cell (O ₂ side) | 0-95% ± 1.5% |
| Relative humidity H ₂ O cell (moist N ₂ side) | 5-95% ± 1.5% |
| Carrier flow (N ₂) | 10-75 ml/min |
| N ₂ purity gas | Pure gas (5.0 or 5.5 P.A.) |
| O ₂ purity gas | Purity ≥ 99.5% < 1% residual humidity required |
| N ₂ pressure | 1.5-2.0 bar |
| O ₂ pressure | 1.5 bar |
| Gas connection (2) | Standard Swagelok ¼" |
| Software | LabView based with RS-232 interface |
| Desktop PC with preinstalled software | Windows XP Professional, 17" LCD monitor, colour ink-jet printer |
| Power Supply | 220 V, 50 Hz (800 W max.) |
| Apparatus size (cm) | 53 W/58 D/22 H + cell 8 cm |

ExtraSolution reserve the rights to change technical specification without notice.

MultiPerm O₂ - CO₂

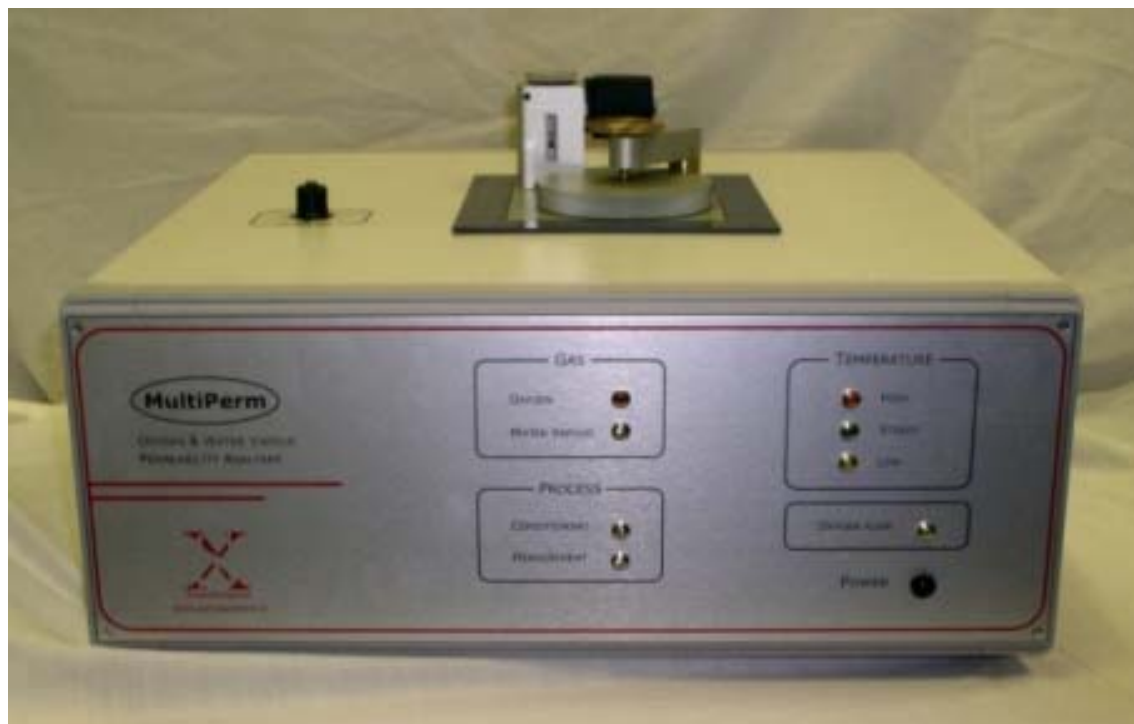
| | |
|---|--|
| Test range O ₂ | 0.005-20000 cm ³ ·m ⁻² ·24h ⁻¹ ·bar ⁻¹ |
| Test range CO ₂ | 1-18000 cm ³ ·m ⁻² ·24h ⁻¹ ·bar ⁻¹ |
| Test samples size | 50 cm ² |
| Test temperature range | 10-50 C ± 0.1 C |
| Relative humidity O ₂ cell (O ₂ side) | 0-95% ± 1.5% |
| Relative humidity CO ₂ cell (CO ₂ side) | 0-95% ± 1.5% |
| Carrier flow (N ₂) | 10-75 ml/min |
| N ₂ purity gas | Pure gas (5.0 or 5.5 P.A.) |
| O ₂ purity gas | Purity ≥ 99.5% < 1% residual humidity required |
| CO ₂ purity gas | Purity ≥ 99.5% < 1% residual humidity required |
| N ₂ pressure | 1.5-2.0 bar |
| O ₂ pressure | 1.5 bar |
| CO ₂ pressure | 1.5 bar |
| Gas connection (3) | Standard Swagelok ¼" |
| Software | LabView based with USB interface |
| Desktop PC with preinstalled software | Windows XP Professional, 17" LCD monitor, colour ink-jet printer |
| Power Supply | 220 V, 50 Hz (800 W max.) |
| Apparatus size (cm) | 70 W/60 D/23 H + cell 8 cm |

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MultiPerm CO₂ - H₂O

| | |
|---|--|
| Test range CO ₂ | 1-18000 cm ³ ·m ⁻² ·24h ⁻¹ ·bar ⁻¹ |
| Test range H ₂ O | 0.002-500 g·m ⁻² ·24h ⁻¹ ·bar ⁻¹ |
| Test samples size | 50 cm ² |
| Test temperature range | 10-50 C ± 0.1 C |
| Relative humidity CO ₂ cell (CO ₂ side) | 0-95% ± 1.5% |
| Relative humidity H ₂ O cell (moist N ₂ side) | 5-95% ± 1.5% |
| Carrier flow (N ₂) | 10-75 ml/min |
| N ₂ purity gas | Pure gas (5.0 or 5.5 P.A.) |
| CO ₂ purity gas | Purity ≥ 99.5% < 1% residual humidity required |
| N ₂ pressure | 1.5-2.0 bar |
| CO ₂ pressure | 1.5 bar |
| Gas connection (2) | Standard Swagelok ¼" |
| Software | LabView based with USB interface |
| Desktop PC with preinstalled software | Windows XP Professional, 17" LCD monitor, colour ink-jet printer |
| Power Supply | 220 V, 50 Hz (800 W max.) |
| Apparatus size (cm) | 70 W/60 D/23 H + cell 8 cm |

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PermeO₂ is our model for measuring the oxygen transmission rate (O₂TR) through plastic films with a temperature and relative humidity controlled system.

PermeO₂ is offered in two different versions: single cell, double cell.

PermeO₂

| | |
|---|--|
| Test range | 0.005-20000 cm ³ ·m ⁻² ·24h ⁻¹ ·bar ⁻¹ |
| Test samples size | 50 cm ² |
| Test temperature range | 10-50 C ± 0.1 C |
| Relative humidity (O ₂ side) | 0-95% ± 1.5% |
| Carrier flow (N ₂) | 10-75 ml/min |
| N ₂ purity gas | Pure gas (5.0 or 5.5 P.A.) |
| O ₂ purity gas | Purity ≥ 99.5% < 1% residual humidity required |
| N ₂ pressure | 1.5-2.0 bar |
| O ₂ pressure | 1.5 bar |
| Gas connection (2) | Standard Swagelok ¼" |
| Software | LabView based with USB interface |
| Desktop PC with preinstalled software | Windows XP Professional, 17" LCD monitor, colour ink-jet printer |
| Power Supply | 220 V, 50 Hz (800 W max.) |
| Apparatus size (cm) | 53 W/48 D/22 H + cell 8 cm |

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PermeH₂O is our model for measuring the water vapour transmission rate (WVTR) through plastic films with a temperature and relative humidity controlled system.

PermeH₂O is offered in two different versions: single cell, double cell.

PermeH₂O

| | |
|---|---|
| Test range | 0.002-500 g·m ⁻² ·24h ⁻¹ ·bar ⁻¹ |
| Test samples size | 50 cm ² |
| Test temperature range | 10-50 C ± 0.1 C |
| Relative humidity (moist N ₂ side) | 5-95% ± 1.5% |
| Carrier flow (N ₂) | 10-75 ml/min |
| N ₂ purity gas | Pure gas (5.0 or 5.5 P.A.) |
| N ₂ pressure | 1.5-2.0 bar |
| Gas connection (1) | Standard Swagelok ¼" |
| Software | LabView based with RS-232 interface |
| Desktop PC with preinstalled software | Windows XP Professional, 17" LCD monitor, colour ink-jet printer |
| Power Supply | 220 V, 50 Hz (800 W max.) |
| Apparatus size (cm) | 53 W/48 D/22 H + cell 8 cm |

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PermeCO₂ is our model for measuring the carbon dioxide transmission rate (CO₂TR) through plastic films with a temperature and relative humidity controlled system.

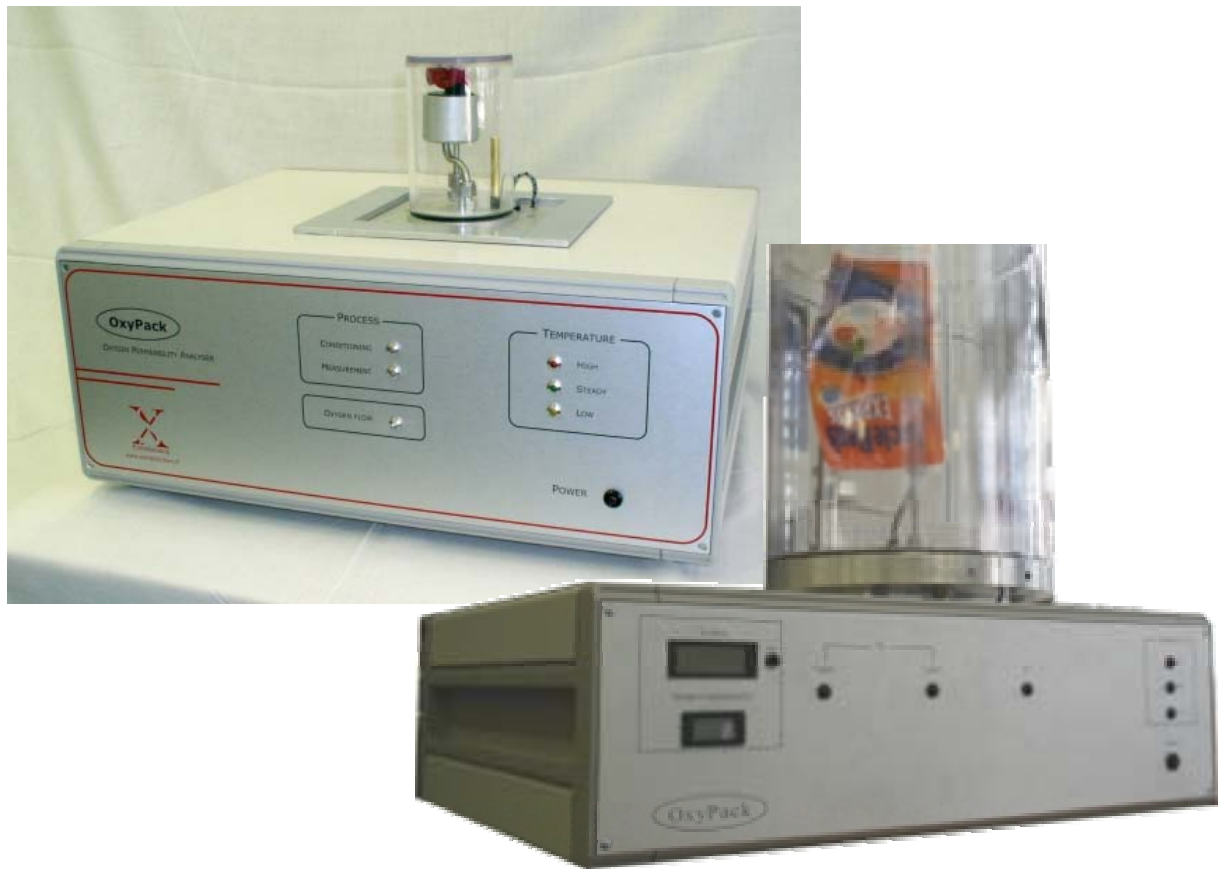
PermeCO₂ is offered in two different versions: single cell, double cell.

PermeCO₂

| | |
|--|--|
| Test range | 1-18000 cm ³ ·m ⁻² ·24h ⁻¹ ·bar ⁻¹ |
| Test samples size | 50 cm ² |
| Test temperature range | 10-50 C ± 0.1 C |
| Relative humidity (CO ₂ side) | 0-95% ± 1.5% |
| Carrier flow (N ₂) | 10-75 ml/min |
| N ₂ purity gas | Pure gas (5.0 or 5.5 P.A.) |
| CO ₂ purity gas | Purity ≥ 99.5% < 1% residual humidity required |
| N ₂ pressure | 1.5-2.0 bar |
| CO ₂ pressure | 1.5 bar |
| Gas connection (2) | Standard Swagelok ¼" |
| Software | LabView based with USB interface |
| Desktop PC with preinstalled software | Windows XP Professional, 17" LCD monitor, colour ink-jet printer |
| Power Supply | 220 V, 50 Hz (800 W max.) |
| Apparatus size (cm) | 53 W/58 D/22 H + cell 8 cm |

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OxyPack, CarboPack and PackPerm: everything that isn't a film

With its special Pack line, ExtraSolution accepts the challenge of three dimensional packaging. The versatility of this kind of instruments will allow users to measure the gas permeation through everything that isn't a film. You will be able to measure objects usually not used for packaging but whose gas barrier properties are vital. Besides bags, trays, synthetic corks, screw and crown caps, we indicate for example plastic tubes, tanks and paints.



OxyPack is our model for measuring the oxygen transmission rate (O_2TR) through bags, little containers, bottles, stoppers, taps and other products for packaging application with a temperature and relative humidity controlled system.

OxyPack

| | |
|---------------------------------------|--|
| Test range | 0.0001-500 $cm^3 \cdot pkg^{-1} \cdot 24h^{-1}$ |
| Test samples size | About 5 litre volume max |
| Test temperature range | 10-50 C \pm 0.1 C |
| Relative humidity (O_2 side) | 0-95% |
| Carrier flow (N_2) | 10-75 ml/min |
| N_2 purity gas | Pure gas (5.0 or 5.5 P.A.) |
| O_2 purity gas | Purity \geq 99.5% < 1% residual humidity required |
| N_2 pressure | 1.5-2.0 bar |
| O_2 pressure | 1.5 bar |
| Gas connection (2) | Standard Swagelok 1/4" |
| Sample connection (2) | Standard Swagelok 1/8" |
| Software | LabView based with USB interface |
| Desktop PC with preinstalled software | Windows XP Professional, 17" LCD monitor, colour ink-jet printer |
| Power Supply | 220 V, 50 Hz (800 W max.) |
| Apparatus size (cm) | 53 W/48 D/22 H + cell 30 cm |

ExtraSolution reserve the rights to change technical specification without notice.

CarboPack is our model for measuring the carbon dioxide transmission rate (CO_2TR) through bags, trays, bottles, stoppers, taps and other products for packaging application with a temperature and relative humidity controlled system.

CarboPack

| | |
|---------------------------------------|--|
| Test range | 0.01-90 $cm^3 \cdot pkg^{-1} \cdot 24h^{-1}$ |
| Test samples size | About 5 litre volume max |
| Test temperature range | 10-50 C \pm 0.1 C |
| Relative humidity (CO_2 side) | 0-95% |
| Carrier flow (N_2) | 10-75 ml/min |
| N_2 purity gas | Pure gas (5.0 or 5.5 P.A.) |
| CO_2 purity gas | Purity \geq 99.5% < 1% residual humidity required |
| N_2 pressure | 1.5-2.0 bar |
| CO_2 pressure | 1.5 bar |
| Gas connection (2) | Standard Swagelok 1/4" |
| Sample connection (2) | Standard Swagelok 1/8" |
| Software | LabView based with USB interface |
| Desktop PC with preinstalled software | Windows XP Professional, 17" LCD monitor, colour ink-jet printer |
| Power Supply | 220 V, 50 Hz (800 W max.) |
| Apparatus size (cm) | 53 W/48 D/22 H + cell 30 cm |

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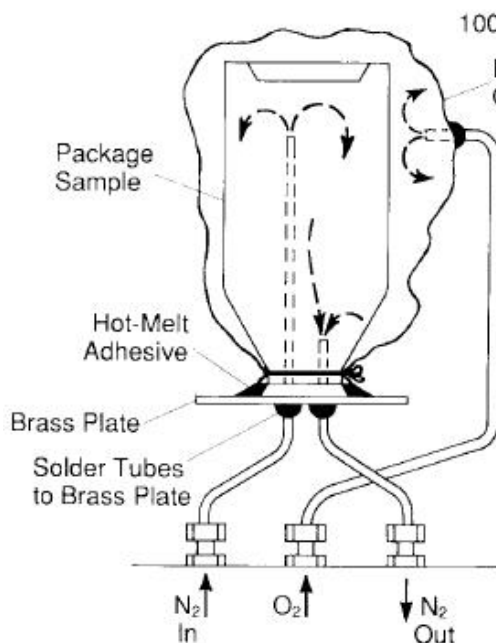
PackPerm is our model for measuring the oxygen transmission rate (O_2TR) through corks, bottles, stoppers, taps, boxes and other products in the packaging application. Differently from OxyPack, measures performed with PackPerm are carried out in air at room conditions.

PackPerm is offered in two different versions: single cell, double cell.

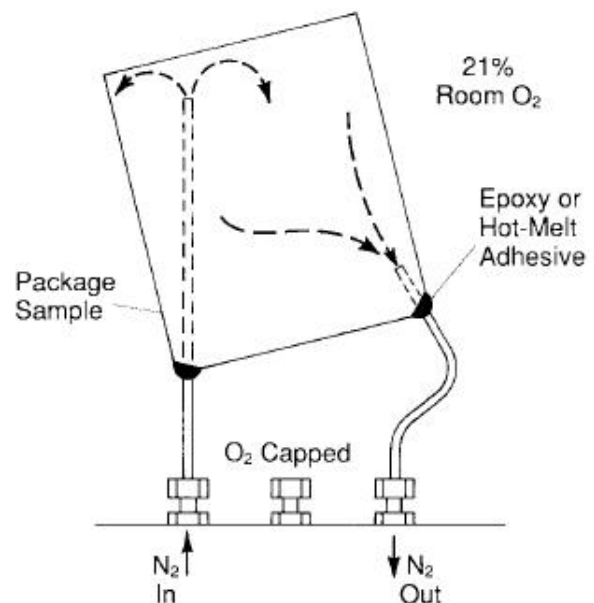
PackPerm

| | |
|---------------------------------------|--|
| Test range | 0,0001-50 $cm^3 \cdot pkg^{-1} \cdot 24h^{-1}$ |
| Test samples size | Boxes, closures, corks, taps, ... |
| Oxygen concentration | Air (20,95% O_2) |
| Test temperature range | Room temperature monitored by software |
| Test relative humidity range | Room relative humidity monitored by software |
| Carrier flow (N_2) | 10-75 ml/min |
| N_2 purity gas | Pure gas (5.0 or 5.5 P.A.) |
| N_2 pressure | 1.5-2.0 bar |
| Gas connection (1) | Standard Swagelok 1/4" |
| Sample connection (2) | Standard Swagelok 1/8" |
| Software | LabView based with USB interface |
| Desktop PC with preinstalled software | Windows XP Professional, 17" LCD monitor, colour ink-jet printer |
| Power Supply | 220 V, 50 Hz (800 W max.) |
| Apparatus size (cm) | 53 W/48 D/22 H + cell 30 cm |

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OxyPack test method



PackPerm test method