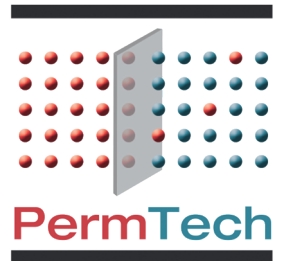


# GAS PERMEABILITY MEASUREMENT INSTRUMENTS



## TotalPerm

O<sub>2</sub>, CO<sub>2</sub> & H<sub>2</sub>O

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### SINGLE CELL

O<sub>2</sub>, CO<sub>2</sub> and H<sub>2</sub>O permeability tester with embedded controls of temperature and relative humidity.



- 3 sensors inside
- Sequential analysis
- Lowest cost solution
- Broad measuring range
- Long life detectors
- Fully software driven
- Barometric compensation
- Graphic software interface
- Automatic humidity adjustment
- No sample cutting required
- Package analysis accessory

TotalPerm complies with the norms DIN 53380-3, ASTM D3985, F2622, F1927, F1307, JIS K-7126, ISO 15105-2 for OTR measurements, with the norm ASTM F2476 for CO<sub>2</sub>TR measurements and with the norms ASTM F1249, TAPPI T557, JIS K-1729, ISO 15106-2 for WVTR measurements.

TotalPerm is the only instrument on the market, based on patented technology, that performs permeability measurements on three different kind of gases. TotalPerm is offered with three different sensors for oxygen, carbon dioxide and water vapour. In this way TotalPerm has the ability to characterize the barrier properties of the film with three different gases testing exactly the same surface, avoiding the need of substituting the sample.

With this instrument it is possible to measure plastic films, monolayer or multilayer barrier films, metallized or with surface coating, laminated or coextruded, especially those used for food, beverage, pharmaceutical and electronics packaging applications.

TotalPerm, as well as performing tests of permeability through thin films, can be equipped with modular accessories to carry out measurements on packaging containers of various types such as bag-inbox, PET bottles and packages.

TotalPerm 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 TotalPerm ExtraSolution® guarantees maximum simplicity of operation.

You can plan a list of measurements on the same sample using different gases and conditions which are then run automatically by the software.

Choosing TotalPerm is the best choice that makes life in the laboratory easier and reduces both costs and space.

Why buy three different instruments if you can do all the measurements you need using simply one TotalPerm?

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## MultiPerm

$O_2-H_2O$ ,  $O_2-CO_2$ ,  $H_2O-CO_2$

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SINGLE OR DOUBLE CELL

$O_2$ ,  $CO_2$  and  $H_2O$  permeability tester  
with embedded controls of  
temperature and relative humidity.



- 2 sensors inside
  - $O_2 - H_2O$
  - $O_2 - CO_2$
  - $H_2O - CO_2$
- Analysis start independent for each sample
- Automatic generator and humidity controls
- Broad measuring range
- Long life detectors
- Upgradeable with:
  - $CO_2$  sensor
  - WVTR sensor
  - $O_2$  sensor
- Fully software driven
- Barometric compensation
- Graphic software interface
- Automatic humidity adjustment
- No sample cutting required
- Package analysis accessory

MultiPerm complies with the norms DIN 53380-3, ASTM D3985, F2622, F1927, F1307, JIS K-7126, ISO 15105-2 for OTR measurements, with the norm ASTM F2476 for  $CO_2$ TR measurements and with the norms ASTM F1249, TAPPI T557, JIS K-1729, ISO 15106-2 for WVTR measurements.

MultiPerm is the only instrument on the market, based on patented technology, that performs permeability measurements on two different kinds of gases. MultiPerm is offered with two sensors to be chosen by the customer either oxygen, carbon dioxide or water vapour. In this way MultiPerm has the ability to characterize the barrier properties of the film with two different gases testing exactly the same surface, avoiding the need of substituting the sample.

With this instrument it is possible to measure plastic films, monolayer or multilayer barrier films, metallised or with surface coating, laminated or coextruded, especially those used for food, beverage, pharmaceutical and electronics packaging applications.

MultiPerm, as well as performing tests of permeability through thin films, can be equipped with modular accessories to carry out measurements on packaging containers of various types such as bag-in-box, PET bottles and packages.

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 maximum simplicity of operation.

You can plan a list of measurements on the same sample using different gases and conditions that are going to be run automatically by the software. Choosing MultiPerm is the best choice that makes the life in the laboratory easier and reduces both costs and space.

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For Technical Details see Table at Page 5

## Perme

### Oxygen, Water, Carbon Dioxide

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#### SINGLE OR DOUBLE CELL

Permeability tester with embedded controls of temperature and relative humidity.



- Broad measuring range
- Long life detectors
- Upgradeable with:  
CO<sub>2</sub> sensor  
WVTR sensor
- Fully software driven
- Barometric compensation
- Graphic software interface
- Automatic humidity adjustment
- No sample cutting required
- Package analysis accessory

Perme complies with the norms DIN 53380-3, ASTM D3985, F2622, F1927, F1307, JIS K-7126, ISO 15105-2 for OTR measurements, with the norm ASTM F2476 for CO<sub>2</sub>TR measurements and with the norms ASTM F1249, TAPPI T557, JIS K-1729, ISO 15106-2 for WVTR measurements.

Perme is an instrument for testing the permeability through plastic films, monolayer or multilayer barrier films, metallised or with surface coating, laminated or coextruded used especially for food, beverage, pharmaceutical and electronics packaging applications.

Perme, as well as performing measurements of permeability through thin films, can be equipped with modular accessories to carry out measurements on packaging containers of various types such as bag-in-box, PET bottles and packages.

Predisposition for the transformation with the addition of sensor for WVTR (with permeability test) or CO<sub>2</sub>TR (CO<sub>2</sub>TR permeability test) also in humid conditions.

The software Perme ExtraSolution® allows the user to work with full autonomy after only a few hours of training.

The principal parameters such as temperature, relative humidity, conditioning time and automatic end of measurement, are requested at the start of the software and then it is all automatic.

Moreover it is possible to plan a list of measurements on the same sample at different test conditions that are going to be run automatically by the instrument. In this way any human action is reduced to the minimum and any possible errors eliminated.

The software stabilizes the parameters with high accuracy and precision over all the measurement. Testing conditions (temperature, relative humidity, concentration, ...) are shown both as numeric data and graphical representation and saved in an PDF file and in text file to allow the full compatibility with any other software.

All the gas flows are electronically controlled so that the instrument is immune to changes of pressure both in the gas line and atmospheric.

The single point closure system and the special design of the chamber eliminates the need of cutting the samples to be tested.

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## Data Sheet

	Technical Details TotalPerm / MultiPerm / Perme	Technical Details CarboPack BT	Technical Details PermeH2
Test Range O <sub>2</sub>	0.01-1000 cm <sup>3</sup> ·m <sup>-2</sup> ·24h <sup>-1</sup> ·bar <sup>-1</sup> (unmasked)  0.2-25000 cm <sup>3</sup> ·m <sup>-2</sup> ·24h <sup>-1</sup> ·bar <sup>-1</sup> (masked)		
Test Range CO <sub>2</sub>	0.25-9000 cm <sup>3</sup> ·m <sup>-2</sup> ·24h <sup>-1</sup> ·bar <sup>-1</sup> (unmasked)  50-180000 cm <sup>3</sup> ·m <sup>-2</sup> ·24h <sup>-1</sup> ·bar <sup>-1</sup> (masked)	0.0013-100 cm <sup>3</sup> ·pkg <sup>-1</sup> ·24h <sup>-1</sup>	
Test Range H <sub>2</sub> O	0.002-100 g·m <sup>-2</sup> ·24h <sup>-1</sup> (unmasked)  0.04-2000 g·m <sup>-2</sup> ·24h <sup>-1</sup> (masked)		
Test Range H <sub>2</sub>			0.3-9000 cm <sup>3</sup> ·m <sup>-2</sup> ·24h <sup>-1</sup> ·bar <sup>-1</sup> (unmasked) 70-180000 cm <sup>3</sup> ·m <sup>-2</sup> ·24h <sup>-1</sup> ·bar <sup>-1</sup> (masked)
Test Sample size	50 cm <sup>2</sup> - About 2,5 mm thickness max	Packages, boxes, PET bottles, corks, ...	50 cm <sup>2</sup> - About 2,5 mm thickness max
Test temperature range	10-50 °C ± 0.1 °C	10-50 °C ± 0.1 °C	10-50 °C ± 0.1 °C
Relative humidity (N <sub>2</sub> side)	0%, 30-90%	0%, 30-90%	0%, 30-90%
Relative humidity O <sub>2</sub> /CO <sub>2</sub> /H <sub>2</sub> (O <sub>2</sub> /CO <sub>2</sub> /H <sub>2</sub> side)	0%, 5-95% ± 1.5%		0%
Relative humidity H <sub>2</sub> O (wet side)	5-95% ± 1.5%		
Carrier flow (N <sub>2</sub> )	12-36 ml/min automatically controlled	10-75 ml/min, automatically controlled	12-36 ml/min automatically controlled
Carrier gas	N <sub>2</sub> 5.0 + 1%H <sub>2</sub> mix	N <sub>2</sub> pure (5.0 or 5.5 P.A.)	N <sub>2</sub> 5.0
O <sub>2</sub> /CO <sub>2</sub> /H <sub>2</sub> purity gas	≥ 99.95% / ≥ 99.99%		≥ 99.99%
N <sub>2</sub> pressure	2.0 bar	2.0 bar	2.0 bar
O <sub>2</sub> /CO <sub>2</sub> /H <sub>2</sub> pressure	1.5-2.0 bar		1.5-2.0 bar
Gas Connections	1 or 2 or 3 x Standard Ham-Let 1/8"	1 x Standard Ham-Let 1/8"	2 x Standard Ham-Let 1/8"
Software	LabView based with USB interface	LabView based with USB interface	LabView based with USB interface
PC with preinstalled software	Windows™ OS and LCD monitor	Windows™ OS and LCD monitor	Windows™ OS and LCD monitor
Power supply	110-220 AC 50-60 Hz	110-220 AC 50-60 Hz	110-220 AC 50-60 Hz
Apparatus size (cm)	41 W/61 D/31 H	41 W/61 D/31 H	41 W/61 D/31 H



## CarboPack BT

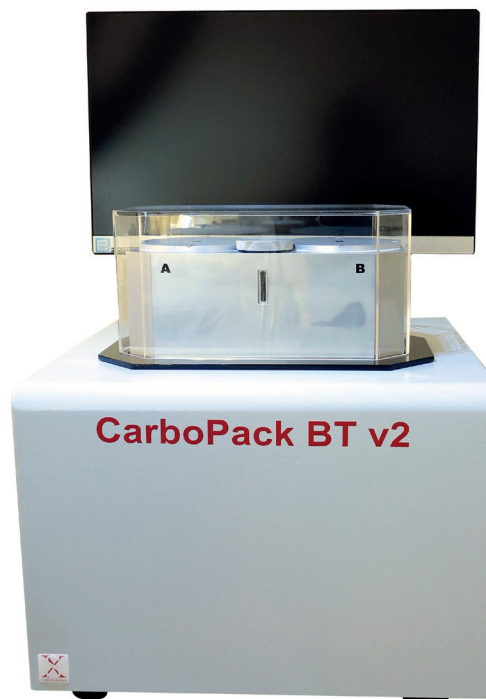
### Carbon Dioxide

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#### DOUBLE CELL

Carbon dioxide permeability tester with embedded controls of temperature.

- High and low carbonated drinks analysis
- PET and Glass bottles (cork leakage)
- Short analysis time
- Fully software driven
- Very low detection limit  $0.0013 \text{ cm}^3/24 \text{ h}$
- Peltier heating / cooling system
- High IR sensor resolution  $0.1 \text{ ppm (CO}_2\text{)}$
- Custom size double chamber
- Barometric compensation
- Sequential analysis
- Graphic software interface
- Points saved
- Data logging



CarboPack BT is an instrument that performs measurements of carbon dioxide permeability for accurate shelf life forecast useful in the beverage and general packaging (bread, cheese, coffee, etc) applications.

CarboPack BT can be used for testing carbon dioxide permeability of carbonated beverages through PET bottles and also through corks (natural and synthetic), crowns of glass bottles filled with sparkling wines or drinks.

Measurements of  $\text{CO}_2\text{TR}$  performed with CarboPack BT are non-destructive and really quick. Usually a measurement takes less than 1 hour and not several weeks or months like other conventional methods need.

CarboPack BT is suitable for testing both the smallest permeations (best detection limit on the market) through materials forming the package and macroscopic leakages caused, for example, by breaks or faulty weldings.

The extreme sensitivity has been reached using a non-dispersive infrared gas sensor based upon a dual wavelength IR detection subsystem, thermostatically controlled and pressure compensated.

Thanks to this and to the proprietary electronic board, CarboPack BT can determine the  $\text{CO}_2\text{TR}$  also in the presence of high values of relative humidity (optional) . In this way it is possible to perform measurements in conditions as close as possible to the real ones and evaluating also the influence of moisture on the  $\text{CO}_2$  permeability of the materials or coatings used for producing the bottles. CarboPack BT is equipped with a cooling-heating thermal control system that verifies the changes of the barrier properties along with temperature. All the functions are software controlled.

$\text{CO}_2$  is revealed by measuring the spectrum of absorbance at the wavelength of  $4.3 \mu\text{m}$  so as claimed in the ASTM F2476 norm.

## PermeH<sub>2</sub>

### Hydrogen

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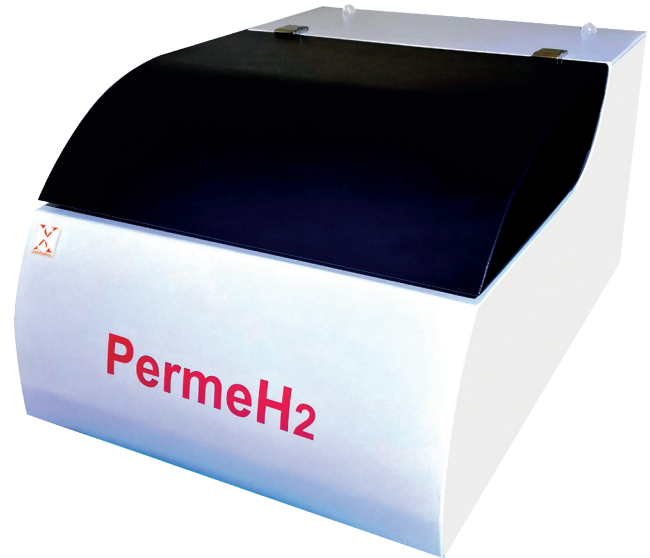
#### SINGLE OR DOUBLE CELL

Hydrogen permeability tester with embedded controls of temperature and relative humidity.

- PC-controlled measuring system with automatic end of measurement
- System able to perform measurements at different relative humidity values
- Equipped with an excellent thermostat system that automatically regulates the temperature from 10 °C to 50 °C with a stability of  $\pm 0.1$  °C
- No need for preliminary sample preparations
- Automatic regulation of carrier gas flow according to the required sensitivity
- Automatic barometric compensation system
- Results expressed in standard units:  $\text{cm}^3 \cdot \text{m}^{-2} \cdot 24\text{h}^{-1} \cdot \text{bar}^{-1}$
- Supplied complete with PC (Windows OS) and 17" LCD monitor
- PermeH<sub>2</sub> software included

PermeH<sub>2</sub> is an instrument for testing the hydrogen permeability through plastic films, monolayer or multilayer barrier films, metallised or with surface coating, laminated or coextruded and any flat material used to storage containers, tank walls, but also technological membranes (PEM) in the energy industry as well as protective coatings for metal surfaces.

The system is controlled via PC on a Windows™ operating system via a USB communication port, the management software has been created on the LabView™ platform with both textual and graphical interface, with multilingual functions, with the possibility of remote control of the



instrument, the management of various users with differentiated access and complete log of all accesses and functions. Access also via video cameras and QR code reading.

The principal parameters such as temperature, relative humidity, conditioning time and automatic end of measurement, are requested at the start of the software and then it is all automatic.

Moreover it is possible to plan a list of measurements on the same sample at different test conditions that are going to be run automatically by the instrument. In this way any human action is reduced to the minimum and any possible errors eliminated.

The software stabilizes the parameters with high accuracy and precision over all the measurement. Testing conditions (temperature, relative humidity, concentration, ...) are shown both as numeric data and graphical representation and saved in an .pdf file and in text file to allow the full compatibility with any other software.

The instrument can also read and record barometric pressure and ambient temperature.

All the gas flows are electronically controlled so that the instrument is immune to changes of pressure both in the gas line and atmospheric.

The single point closure system and the special design of the chamber eliminates the need of cutting the samples to be tested.

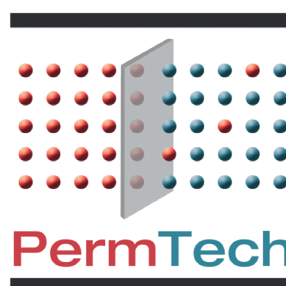
The hydrogen test gas, before being released into the environment, is premixed with nitrogen in order to guarantee a maximum concentration of hydrogen output lower than 4% in order to prevent any risk of fire and explosion.

Light indicators on the measuring cell, also replicated on the software, inform the user about the possibility of opening the cell safely only when there is certainty of the absence of hydrogen in the measuring cell.

PermeH<sub>2</sub> complies with the norm DIN 53380-3.

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For Technical Details see Table at Page 5



**EXTRASOLUTION**  
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