Water Vapor Transmission Analyzer

Applications

The PMI Water Vapor Transmission Analyzer is capable of measuring water vapor transmission through porous media such as textiles, leathers, man made materials, membranes, nonwovens, and fabrics used in numerous high technology components and consumer products manufactured by a variety of industries. The instrument has the unique ability to measure vapor transmission rate over a wide range of humidity, temperature, and pressure under gradients of humidity, temperature, and pressure encountered in application environments.

Principle of Operation

Two independent gas streams are maintained on the two sides of a sample at the desired temperature. Humidity and gas flow rates are measured. The transmission rate through the sample is computed using mass balance.

$$(dn/dt) + [(p_{e'i}\Phi_i / P_i) M_i] = [(p_{e'o}\Phi_o / P_o) M_o]$$

Where

n = moles Φ = humidity   M = flow rate

t = time p_e = equilibrium vapor pressure

í = inlet   o = outlet   P = total pressure
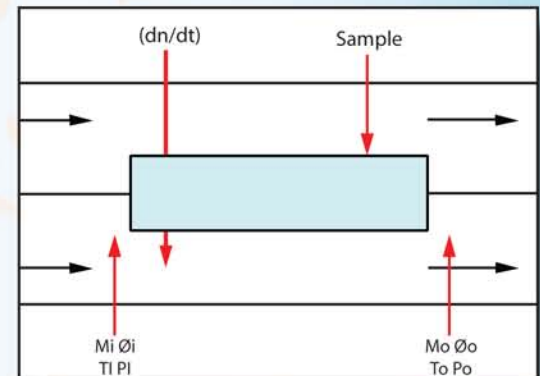
Specifications

Humidity (φ) measurement
Range: 5 - 95%
Accuracy: ± 2%

Humidity (φ) control
Range: 0 - 100%
Accuracy: ± 1.5% ($\varphi = 0.5$)
          ± 5% (high & low φ)

Differential pressure transducers
Range: 4 torr (2 mm Hg)
Accuracy: 0.015%

Temperature
Range: RT - 100 °C
Accuracy: 0.4 °C (low φ) - 0.8 °C
                    (high φ) at 100 °C
Control: ± 2%

Mass Flow Transducers
Range: 5 L/min
Accuracy: 1%

Mass Flow Controller
Range: 2000 cc/min
Accuracy: 1%

Instrument

The sample is enclosed in a sample chamber. A part of the gas flowing through each independent stream is allowed to go through bubblers while the other part bypasses the bubblers and mixes with the gas passing through the bubblers. For maintaining constant humidity in the inlet gas stream, the flow rate in each part of the gas stream is controlled. The gas pressure is controlled by the valve at the end of each gas flow line. The valves automatically control and maintain either zero differential pressure or a finite definite pressure difference. Absolute pressure remains close to the standard pressure. The inlet and outlet flow rates and humidity are measured. The water vapor transmission rate through the sample is computed using the following relation.

$$(dn/dt) = [(p_e/P)\Phi_o - (p_e/P)\Phi_i]M_o/[1 - (p_e/P)\Phi_i]$$

Features

- Humidity on any side can be maintained between 5 and 95%
- Any desired pressure gradient can be maintained.
- Any desired test temperature can be achieved
- Simultaneous pressure and humidity gradients can be maintained
- Flat samples in a wide range of sizes can be accommodated
- Completely automated
  - « Test execution
  - « Data acquisition
  - « Data storage
  - « Data reduction

Other Products

Average Fiber Diameter Analyzer
Bubble Point Tester
Capillary Flow Porometer
Capillary Condensation Flow Porometer
Complete Filter Cartridge Analyzer
Clamp-On Porometer
Compression Porometer
Custom Porometer
Cyclic Compression Porometer
Envelope Surface Area Analyzer
Filtration Media Analyzer
High Flow Porometer
Integrity Analyzer

In-Plane Porometer
Microflow Porometer
Nanopore Flow Porometer
QC Porometer
Diffusion Permeameter
Gas Permeameter
Liquid Permeameter
Vapor Permeameter
Water Vapor Transmission Analyzer
Liquid Extrusion Porosimeter
Mercury/Nonmercury Intrusion Porosimeter
Vacuapore
Water Intrusion Porosimeter (Aquapore)

BET Liquisorb
BET Sorptometer
Gas Pycnometer
Mercury Pycnometer

Also Available:
Testing Services
Consulting Services
Short Courses

Buy   Rent   Lease