

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.



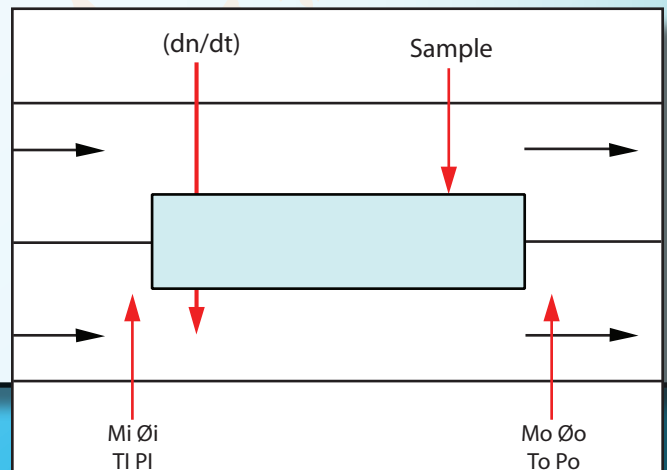
Principle of Operation

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
 i = inlet o = outlet P = total pressure



Specifications

Humidity (ϕ) measurement

Range: 5 - 95%
 Accuracy: $\pm 2\%$

Humidity (ϕ) control

Range: 0 - 100%
 Accuracy: $\pm 1.5\%$ ($\phi = 0.5$)
 $\pm 5\%$ (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: $\pm 2\%$

Mass Flow Transducers

Range: 5 L/min
 Accuracy: 1%

Mass Flow Controller

Range: 2000 cc/min
 Accuracy: 1%

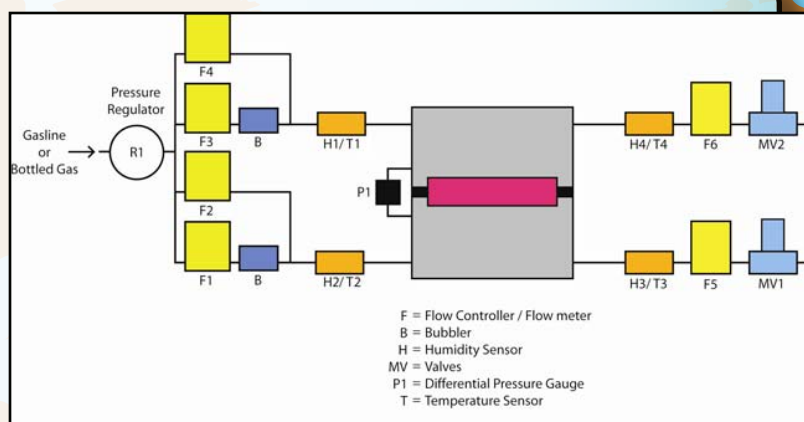
Instrument

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

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