

Capillary Flow Porometer

Applications

The PMI Capillary Flow Porometer is used for R&D and quality control in industries worldwide such as filtration, nonwovens, pharmaceutical, biotechnology, healthcare, household, food, hygienic products, fuel cells, water purification, and battery. Samples often tested include: filter media, membranes, paper, powders, ceramics, battery separators, and health care products.



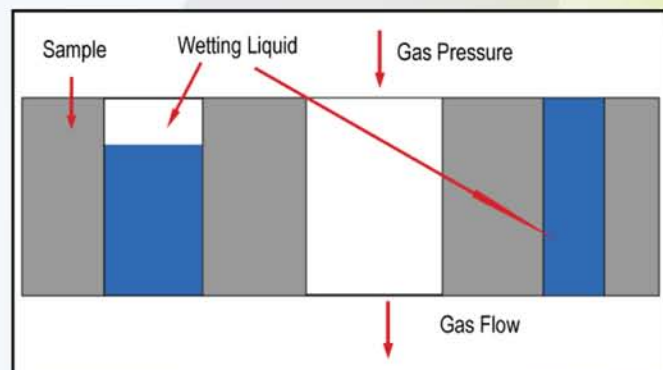
Principle

A wetting liquid is allowed to spontaneously fill the pores in the sample and a nonreacting gas is allowed to displace liquid from the pores. The gas pressure and flow rates through wet and dry samples are accurately measured.

The gas pressure required to remove liquid from the pores and cause gas to flow is given by:

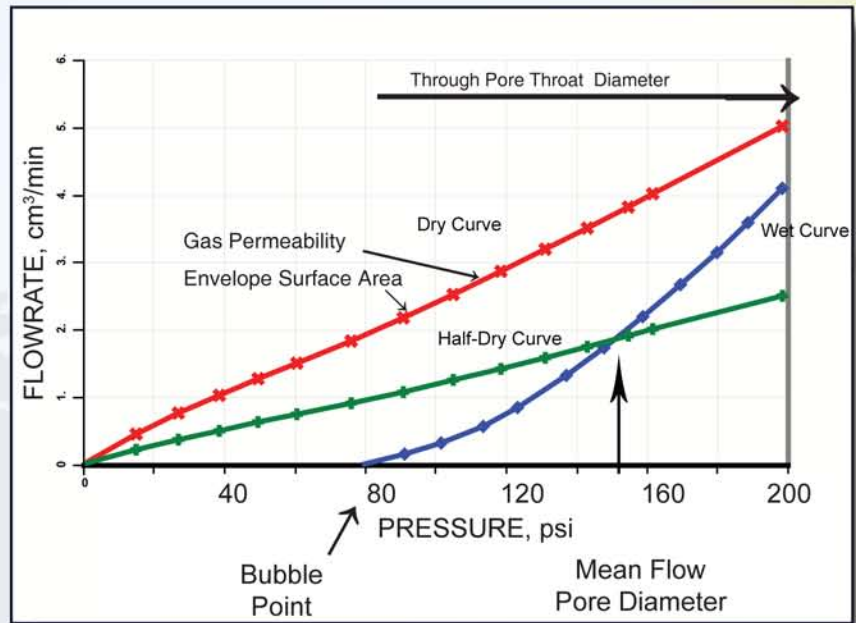
$$D = 4 \gamma \cos \theta / p$$

where D is the pore diameter, γ is the surface tension of liquid, θ is the contact angle of liquid, and p is the differential gas pressure. From measured gas pressure and flow rates, the pore throat diameters, pore size distribution, and gas permeability are calculated.



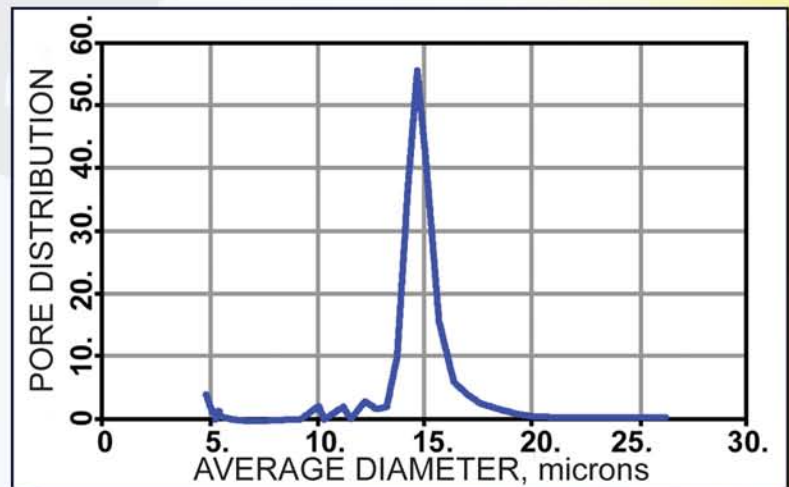
Features

- Testing of small samples as well as complete parts
- Any sample geometry (Example: sheets, rods, tubes, hollow fibers, cartridges, and powders)
- Any nonwetting liquid
- Tests in QC, research, or any number of user defined modes
- See-through sample chamber for visual observation of test available
- Real time graphic display
- Window based software for all control, measurement, data collection, data reduction, and report preparation



Special Features

- Adjustable pressure on o-rings through pneumatically controlled piston-cylinder device
- Measurement of pressure close to the sample to minimize pressure drop correction
- Straight flow path avoiding turbulence
- Versatile sample chamber for a variety of samples and test modes



Capabilities

- Diameter of the most constricted part of a through pore (pore throat)
- Bubble point (the largest through pore throat diameter)
- Mean flow pore diameter (50% of flow is through pores smaller than the mean flow pore)
- Pore diameter range
- Pore distribution

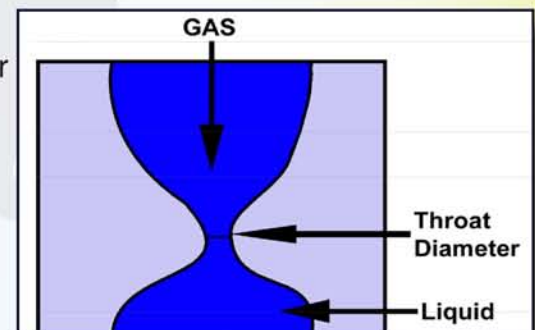
Distribution function f:

$$f = -d[(fw/fd) \times 100] / dD$$

fw = flow rate through wet sample

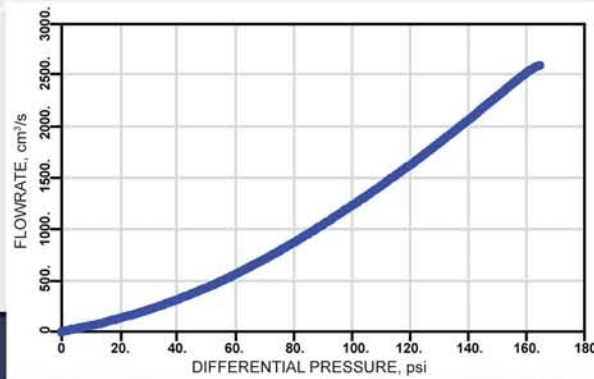
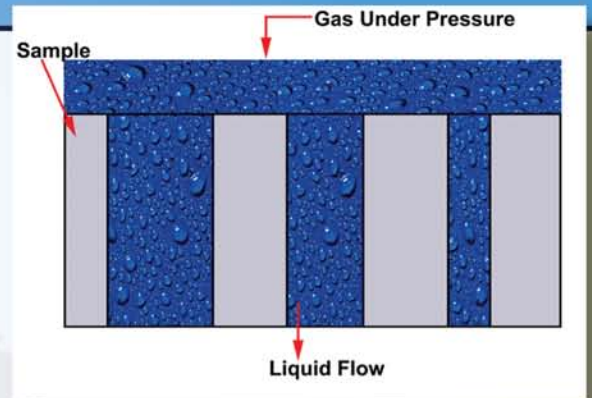
fd = flow rate through dry sample

- Gas permeability in many desired units including Frazier, Gurley, Rayle, and Darcy



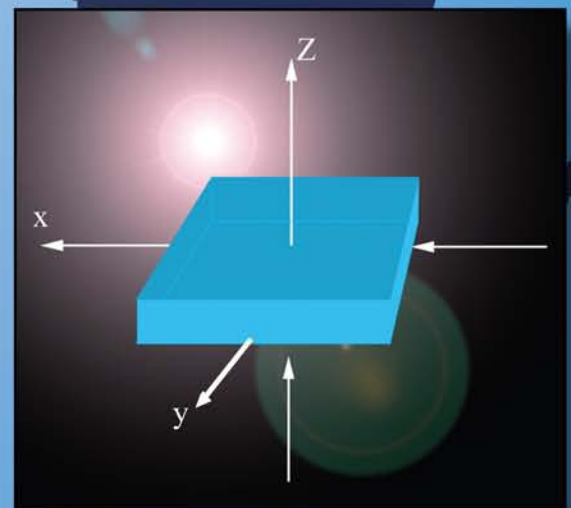
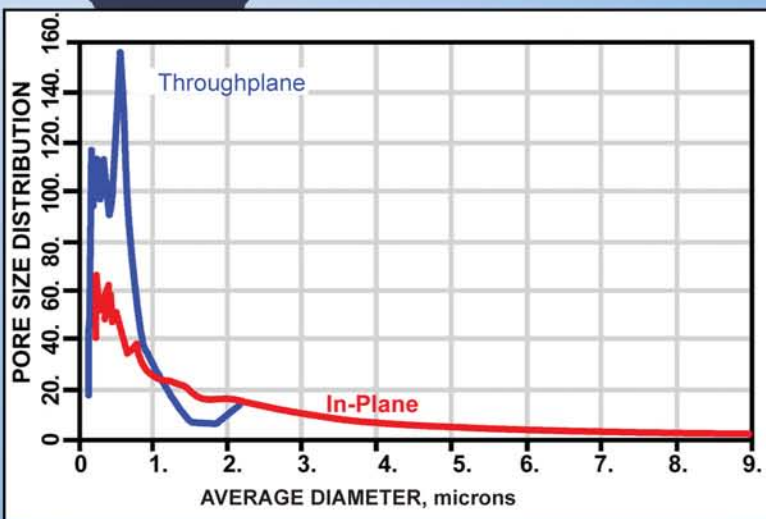
Optional Capabilities

- Liquid permeability: Measuring liquid flow rate through the sample when pressure is applied on excess liquid on the sample. Volume of liquid measured using a penetrometer.
- Pressure Hold Test
- Hydro-head (break through pressure) test
- Integrity test
- Envelope Surface Area, average particle size and average fiber diameter obtained from gas flow rate through dry sample
- Multiple sample chamber
- Multiple test mode
- Shuffled smoothness test
- Burst pressure test
- Use of desired fluid including strong chemicals
- Elevated temperature test



Multi-Mode Instruments

- Q.C., Clamp-On, In-Plane, and Compression modes may be combined
- In-Plane test permits measurement of pore in the x-y plane
- In-plane test permits insitu determination of pore diameter and structure of each layer of the multi-layer media



Specifications

Pressure Accuracy: 0.15% of reading

Test Pressure: 100, 200 and 500 psi instrument versions (700, 1400, 3500 kPa instrument versions)

Pressure and Flow Resolution:
1/60,00 of full scale (1 part in 60,000)

Maximum Pore Size Detectable: 500 μm

Minimum Pore Sizes Detectable:

Flow Rates: Up to 200 SLPM (standard liters per minute)

Sample Size:
Standard: 0.25" - 2.5" diameter (up to 1.5 " thick).
Standard: 5 mm - 60 mm diameter (up to 40 mm thick).
Others available

Sample Geometry: Sheets, Rods, Tubes, Hollow Fibers, Cartridges, Powders, etc.

Fluid	Surface Tension, dynes / cm	Diameter μm , (100 psi Porometer)	Diameter, μm , (200 psi Porometer)	Diameter, μm (500 psi Porometer)
Water	72	0.30	0.15	0.06
Mineral Oil	34.7	0.14	0.07	0.03
Petroleum Distillate	30	0.12	0.06	0.03
Denatured Alcohol	22.3	0.09	0.05	0.02
Silwick	20.1	0.08	0.04	0.02
Porewick	16	0.07	0.03	0.014
Galwick	15.9	0.07	0.03	0.014

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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