PORETECH
INSTRUMENT

PRODUCT CATALOUGE

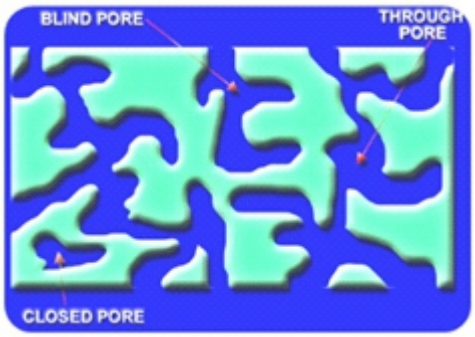
PORETECH INSTRUMENT INC.

PORE SIZE MEASUREMENT WITH EASE

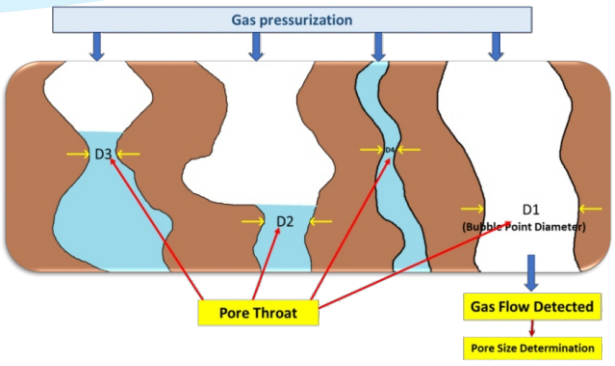
www.poretechinst.com

Introduction

Innova series Capillary Flow Porometer is a through pore size analyzer for porous materials which accurately measures the crucial microporous characteristics such as narrow pore size, maximum pore size, pore size distribution, liquid permeability, gas permeability, and external surface area. Currently, no other measuring instrument is capable to do all the measurements in a single system.The analyzer are designed to have numerous advantages: It can be operated at room temperature and under low pressure conditions. The testing time is extremely short, only single operator is required to produce accurate and repeatable data. The test pressure is from 0 to 500 psi. It can measure pore sizes ranging from 0.013 μm to 500 μm (Innova Capillary Flow Porometer Series), from 2 nm to 500 nm (Innova Ultra Nano Porometer Series).



Porous Material Properties

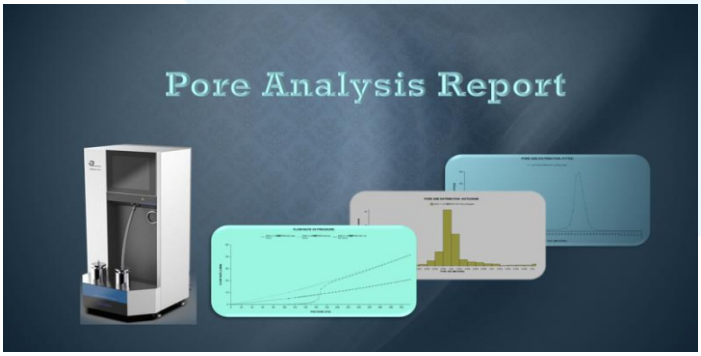


For effective filtration, the filter medium must have a variety of porous characteristics. For example, a porous material as a filter barrier must have a pore size smaller than that of the particle to be separated. The filtration rate is determined by the permeability of the liquid that passes through the filter medium. The surface area of the medium is crucial; it can control the rate of the reaction and the rate of the filtration of substances such as dust in the air. Therefore, a porous material is suitable for some special applications, as determined by its pore size, pore size distribution, maximum pore size, pore number distribution, gas permeability, liquid permeability, surface area, integrity (through medium permeation), and water pressure (pressure required to force water through the filter medium).

Testing Technique for Pore Characterization

Capillary flow pore size analyzer can measure all relevant pore properties such as narrow pore size, maximum pore size (bubble point), average pore size, throughput pore size distribution, pore number distribution, and liquid and gas permeability. This measurement method utilizes minimum time. Currently, this method is widely used in characterizing flat and hollow filtration membranes. The fundamental theories of capillary flow pore size analyzer are as follows:

a. The sample is soaked in wetting liquid, which completely fills the pores, creating a positive pressure because of the capillary phenomenon.



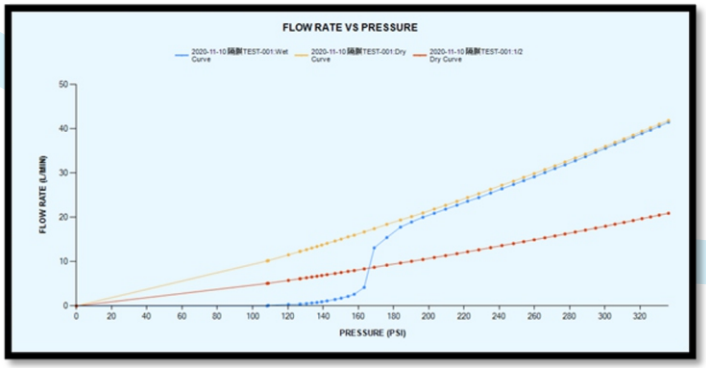
b. The sample is placed in an airtight cell and a gas is introduced into it; the gas pressure causes the liquid to be extruded from the capillary tract.

c. At this point, the liquid in a single pore is completely extruded from the capillary tract; the applied pressure and the pore diameter are related according to the Washburn equation:

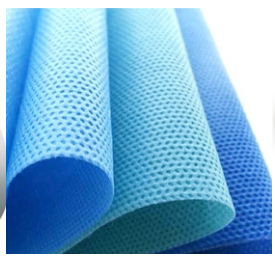
$$P = [4 \gamma \cos \theta] / D$$

P: pressure **γ:** liquid surface tension **cos θ:** contact angle **D:** pore throat diameter

d. Varying the pressure further continues to cause the liquid extrusion from the pore, leading to gas penetration rates. Then, according to changes in the pressure and flow rate, the pore size and pore size distribution are determined







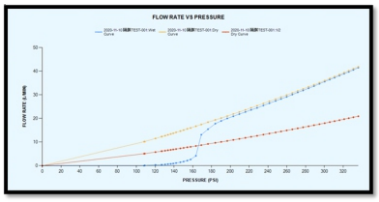
Innova Series Capillary Flow Porometer

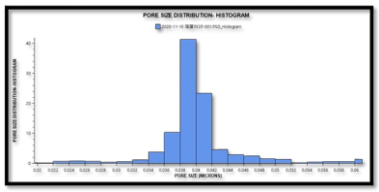
Pore size characterization instrument based on the Gas-liquid (Liquid expulsion method)

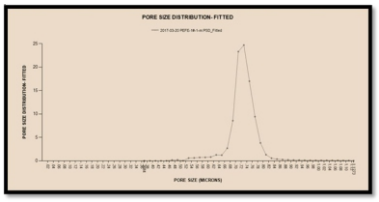
This method uses a gas to extrude the liquid from the pore. Depending on different liquid surface tensions, the pressure required to measure the pore size is also different. According to the current technology for measuring a 13 nm pore size, the required pressure is as hig as 500 psi (about 35 bar).

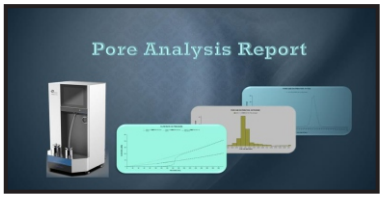
Therefore, when testing hollow fiber ultrafiltration membranes, the surface will be damaged, and the true pore size will not be obtained.

- **Mean Pore Size**
- **Pore Size Distribution**
- **Bubble Point (Largest pore)**
- **Pressure hold Test**
- **Gas Permeability**
- **Cumulative Filter Flow %**
- **Pore size from 13 µm to 500 µm**
- **Available in 4 variants 50 PSI, 100 PSI 200 PSI and 500 PSI**









CAPILLARY FLOW POROMETER

Specifications:

Model	Innova iCFP-10	Innova iCFP-50	Innova iCFP-100	Innova iCFP-200	Innova iCFP-500
Standards	ASTM E 1294-89(1999) ASTM F316-03 ASTM E1288-99 ASTM D6767-02 BS 3321:1986 BS EN240003: 1993 BS7591-4: 1993				
Measuring Principle	Gas-Liquid Expulsion				
Max Pressure Range	10 PSI	50 PSI	100 PSI	200 PSI	500 PSI
Pore Size(Min)	0.5µm	0.1µm	0.06µm	0.03µm	0.013µm
Pore Size(Max)	500µm	150µm	80µm	80µm	80µm
Extended Pore Size Range(optional)	800µm (ER Option)				
Pressure Range Accuracy	±0.1% of full scale				
Sample Size Standard	5mm to 60 mm dia upto 40 mm thick				
Customized Sample Size	Available on Request				
Sample Shapes	Membrane, Paper, Filter Wick, Nob-Woven, Nonfibre(Electrospun), Hollow Fibre, PTFE membranes, Battery Seprators, Geoxtextiles, Cartridges, Ceramics and many more				
Low Flow Rate	0-50sccm	0-50sccm	0-50sccm	0-50sccm	100sccm (Available on request)
High Flow Rate	200 SLM	200 SLM	200 SLM	200 SLM	200 SLM
Extended Flow Range	10 SLM	10 SLM	10 SLM	10 SLM	10 SLM
Flow Meter Accuracy	1% of Reading				
Flow Resolution	1 in 60,000				
Pressure Sensor	10 psi	50 psi	100 psi	200 psi	500 psi
Extended Range Pressure Transducer	1 psi, 5 psi, 10psi…(Option available)				
Pressure Regulator Switching	Auto				

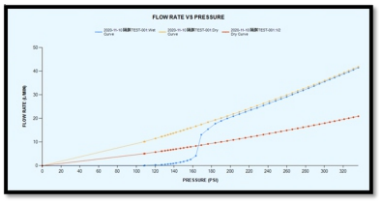
Innova Series Liquid Liquid Porometer

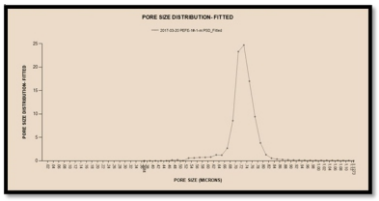
Pore size characterization instrument based on the Liquid-Liquid method

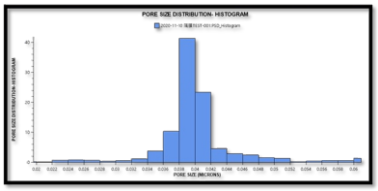
This method uses a liquid to extrude the liquid from the pore. Depending on the different characteristics of interfacial tension between liquid and liquid, the required pressure to measure the pore size is also different. For this method of measuring a 10-nm pore size, the required pressure is low-less than 100 psi .

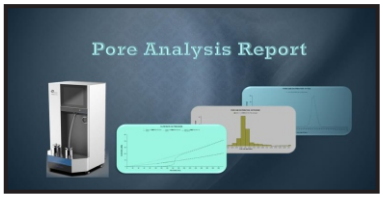
Therefore, it is suitable for applications in hollow fiber ultrafiltration membranes, and the true pore size and distribution can be obtained quickly. Internal and external pressures can also be adopted for testing hollow fiber membranes.

- **Mean Pore Size**
- **Bubble Point (largest pore)**
- **Pore Distribution**
- **Cumulative Filter Flow %**
- **Liquid Permeability**
- **Measure Through Pore from 2nm to 0.2 µm**
- **Available in 3 variants, 100 PSI, 200 PSI and 500 PSI**







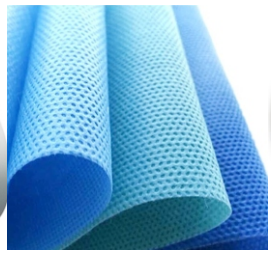


INNOVA SERIES LIQUID LIQUID POROMETER

Specifications:

Model	Innova DLLP-100	Innova DLLP-200	Innova DLLP-500
Measuring Principle	Liquid-Liquid Expulsion		
Max Pressure Range	100 PSI	200 PSI	500 PSI
Pore Size (Min)	10nm	5nm	2nm
Pore Size (Max)	0.2µm	0.2µm	0.2µm
Pressure Range Accuracy	±0.1% of full scale		
Sample Size Standard	5mm to 60 mm dia upto 40 mm thick		
Customized Sample Size	Available on Request		
Sample Shapes	Membrane, Paper, Filter Wick, Nob-Woven, Nonfibre(Electrospun), Hollow Fibre, PTFE membranes, Battery Seprators, Geoxtextiles, Cartridges, Ceramics and many more		
Flow Rate detection Range	0.00001 CC up to 10,000 SCCM		
Displacement Liquid	Galwet, Silwet, Porewet, IPA, Water, any Non-Corrosive liquid		
Pressure Sensor	100 psi	200 psi	500 psi
Pressure Regulator Switching	Auto		





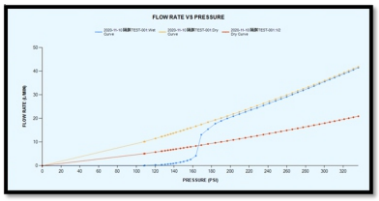
Innova Series Ultra Nano Porometer

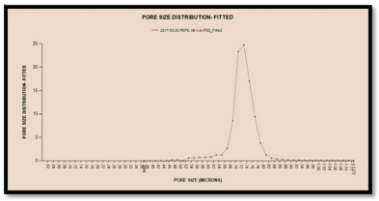
Pore size characterization instrument based on the dual test methods of gas-liquid and liquid-liquid

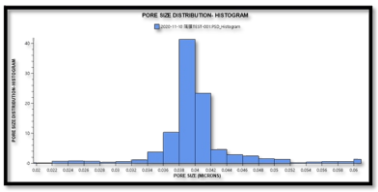
Innova Ultra-Nano Porometer (Innova-UNP) is a combination of gas-liquid and liquid-liquid methods. It is a through pore size analysis device, which includes a gas-liquid method that measure large pores of 500 µm to 0.013 µm and has liquid-liquid function to accurately measure

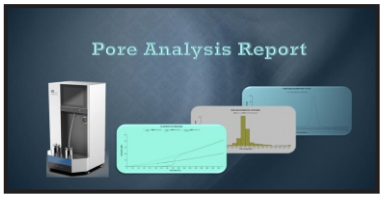
The Innova-UNP is the only commercially available pore size measurement system which can accurately measure pores from macro, micro, ultra and nano range.

- **Capillary Flow Porometer and Liquid Liquid Porometer in a single machine**
- **Measures Through Pores from 2 nm to 500 µm**
- **Mean Pore Size, Bubble Point (Largest Pore) , Pore Distribution**
- **Cumulative Filter Flow % and Liquid Permeability**
- **Available in 3 variants 100 PSI, 200 PSI and 300 PSI**









INNOVA SERIES ULTRA NANO POROMETER

Specifications:

Model	Innova UNP-100	Innova UNP-200	Innova UNP-500
Measuring Principle	Gas-Liquid Expulsion/ Liquid-Liquid Expulsion		
Max Pressure Range	100psi	200psi	500psi
Pore Size(Min)	10nm	5nm	2nm
Pore Size(Max)	500µm	500µm	500µm
Extended Pore Size Range(optional)	800µm (ER Option)		
Pressure Range Accuracy	±0.1% of full scale		
Sample Size Standard	5mm to 60 mm dia upto 40 mm thick		
Customized Sample Size	Available on Request		
Sample Shapes	Membrane, Paper, Filter Wick, Nob-Woven, Nonfibre(Electrospun), Hollow Fibre, PTFE membranes, Battery Seprators, Geoxtextiles, Cartridges, Ceramics and many more		
Low Flow Rate	50sccm	50sccm	100sccm
High Flow Rate	200 SLM	200 SLM	200 SLM
Extended Flow Range	10 SLM	10 SLM	10 SLM
Flow Meter Accuracy	1% of Reading		
Flow Resolution	1 in 60,000		
Pressure Sensor	100 psi	200 psi	500 psi
Extended Range Pressure Transducer	1 psi, 5 psi, 10psi…(Option available)		
Pressure Regulator Switching	Auto		

Additional Special Functions
(Available with Innova Porometers)

Integrity Test: For the integrity analysis of the filters

In-plane Test: Analysis of the sample pore size in the transverse plane

Microflow Test: Test of pore size in samples , such as dense materials with extremely low gas permeability

Liquid Permeability: Measurement of permeation flow rate per unit area at atmospheric or elevated pressure

Controlled Environment Pore Size test under variety of user defined test conditions including temperature , humidity and chemical environment

Clamp-on Sample Cell: Test of samples without cutting or damaging the samples

Automatic Sample Cell: Test of samples without the need for manual operations to cover the sample cell or avoiding error due to human operation

SOFTWARE FUNCTIONS IN INNOVA SERIES POROMETERS:

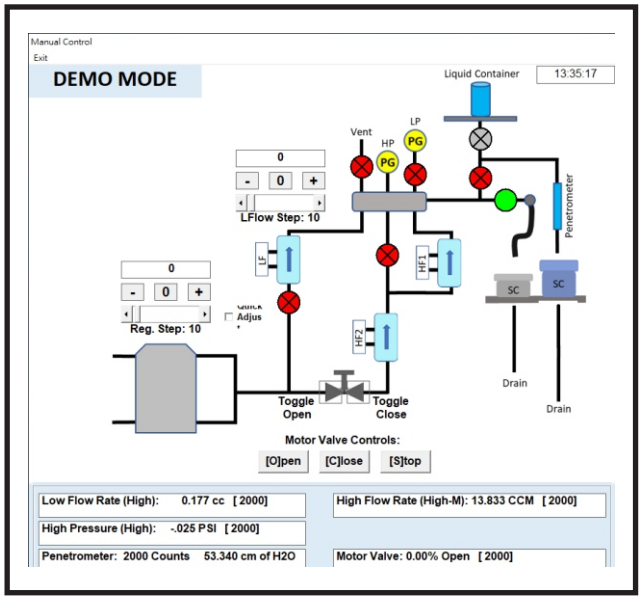
Different parameter values can be entered, depending on the pore property

Freedom to select automatic or manual mode

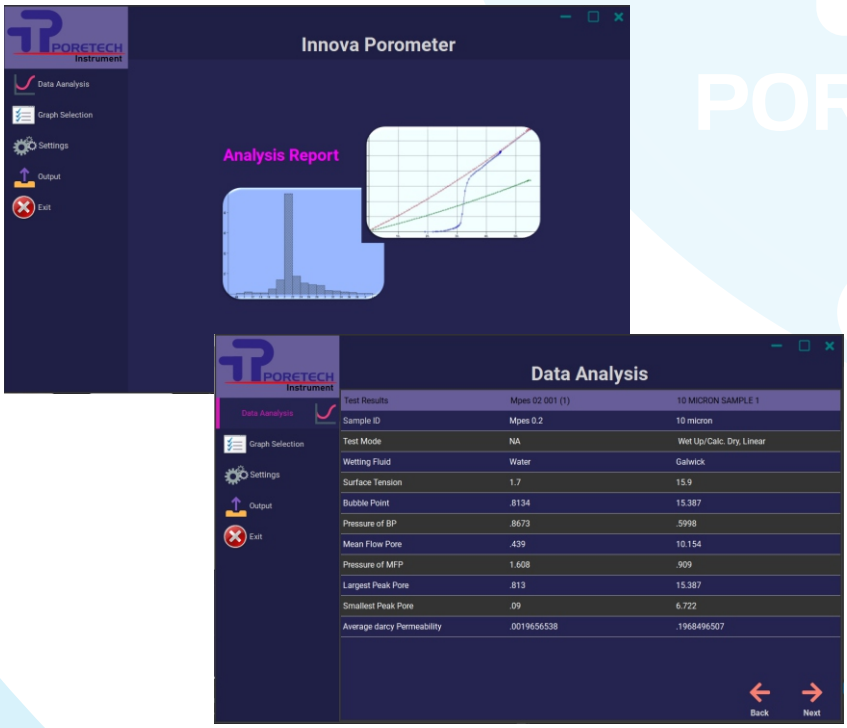
A variety of measurement functions to choose from: Complete pore size distribution test, bubble point test, gas permeability testing, pressure reserved testing

Self-internal parameter calibration (adjustment)

Analysis: pore throat diameter, bubble point diameter, mean flow pore size, pore size distribution,



distribution ratio of the number of pores, dry/wet gas flow, gas permeability, cumulative flow distribution, accumulation and differential flow distribution, pore size distribution and cumulative flow, frequency distribution and cumulative flow, simultaneous analysis of 12 or more data files, and overlay for data comparison



Reporting Functions in Innova Series Porometers: Pore throat diameter, bubble point diameter, mean flow pore size, liquid permeability, pore size distribution, number of pore proportional distribution, cumulative flow distribution, accumulative and differential flow distribution, simultaneous analysis of 12 data files, and overlay for data comparison

Contract Testing Services: We offer affordable, reliable and fast pore size testing for various parameters and materials as listed below:

- Capillary Flow Porometer (Gas-Liquid Method) for bubble point, mean flow pore size, pore distribution, gas permeability
- Liquid Liquid Porometer(Liquid-Liquid Method) for bubble point, mean flow pore size, pore distribution, liquid permeability
- Water Intrusion Porosimetry(only Hydrophobic sample) for % porosity, pore volume and pore distribution
- EUROPE: EN 14683:2019 Medical Face Masks. Requirements & Test Method
- Performance requirements for medical face masks EN 14683: 2019 Barrier Levels
- NIOSH Non-Powered Air-Purifying Particulate Respirators
- ASTM F2100 - 19 Standard Specification for Performance of Materials used in Medical Face Masks
- Performance Requirements for Medical Face Masks ASTM F2100-19

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