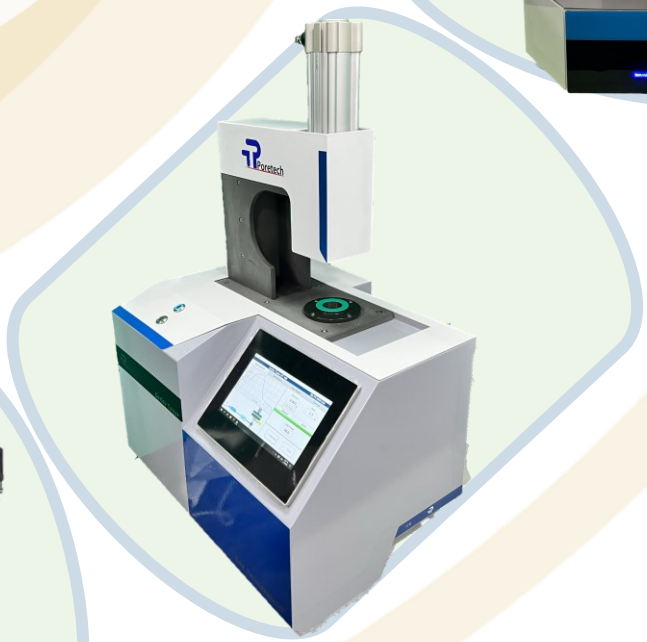
CYI
PMI



PRODUCTS CATALOGUE

Membrane Testing & Making

Air Filtration Testing

New Energy Testing

Wastewater Filtration Testing

Reaction System

Core Testing Technology

Porous Measurement Int'l Group
Poretech Instrument Inc.

Company Profile

- CYI-PMI Group comprises Chia Yun Instrument Inc., Porous Measurement Int'l Ltd., and Poretech Instrument Inc. Chia Yun Instrument Inc. was founded in 2003, followed by the establishment of Porous Measurement Int'l Ltd. in 2004.
- We are the exclusive agents for Porometer, Porosimeter, and BET instruments from PMI USA, as well as the Reaction system from ChemRe System Inc. (Korea) and Air Filter testing equipment from TTRI (Taiwan). With offices in Taiwan, China, India and Malaysia, we cater to a wide geographical market.
- As proud members of the Waterloo Filtration Institute, the Taiwan Filtration and Separation Society and the Membrane of Health and Medicine Materials Surface Engineering Industry and Technology Alliance, we are committed to advancing the field.
- Our diverse product line includes Porometer (iCFP, HLP, UNP), Porosimeter (Hydropore), Bubble Point Tester, Gas Permeameter, Liquid Permeameter, and more, serving industries such as lithium batteries, water filtration, air filtration, gas separation, and biomedical sectors.
- We boast a prestigious clientele including Volkswagen, Ecospray, Verkor SA, OXCO, 3M, Entegris, Arkema, SEMCORP, WAKO, Hana-Water, SK, Samsung, Hyundai, LG, BYD, Senior, among others.
- In line with our commitment to innovation and quality, we established a technical center in Taiwan and offer contract testing services. Moreover, we attained EN ISO 9001:2015 Certification and CE Certification in 2022, underscoring our dedication to excellence and compliance.

➢ Our Global Team:

Region	Company	E-Mail
Head office	**Chia Yun Instrument Inc.**	**info@cyi-pmi.com**
Taiwan	**Poretech Instrument Inc.**	**info@poretechinst.com**
China	**Bai Luo (Shanghai) Co., Ltd.**	**info@cyi-pmi.com**
India	**Poretech Instrument India**	**info@poretechinst.com**
USA	**Seika Machinery, Inc.**	**info@seikausa.com**
Canada	**PERM Inc.**	**info@poretechinst.com**
Europe	**3P Instruments**	**info@3P-instruments.com**
Japan	**Seika Digital Image Inc.**	**info@seika-di.com**
South Korea	**Sam Bo Scientific Co., Ltd.**	**sambosc@sambosc.com**
South-East Asia	**Porous Measurement Int'l Ltd.**	**info@cyi-pmi.com**

Certification

CEPROM
PRODUCT CERTIFICATION BODY

CEPROM ® S.A.
440240 Satu Mare, Str. Fântânele, No. 23/A, Romania
tel. +40.0361.804795; fax +40.0361.804796
www.ceprom.ro; e-mail: ceprom@ceprom.ro

CERTIFICATE OF CONFORMITY
No. 2640-CI-32022

Technical File no. *2640-CI-32022/PI-2022001-A1*

Applicant:	**Manufacturer:**
PORETECH INSTRUMENT INC. *2F., No. 12, Sec. 1, Zhongxing Rd., Wugu Dist., New Taipei City 248513, Taiwan*	*PORETECH INSTRUMENT INC.* *2F., No. 12, Sec. 1, Zhongxing Rd., Wugu Dist., New Taipei City 248513, Taiwan*

Description of product:
Machine type: *INNOVA POROMETER*
Models: *INNOVA-500, INNOVA-50, INNOVA-100, INNOVA-200*

Reference standards: *EN IEC 61326-1:2021*

Based on our assessment we confirm that the Technical File of the product is in accordance with the technical requirements of the above standard and hence fulfils the technical requirements of the

Electromagnetic Compatibility Directive 2014/30/EU

The CE mark as show joined can be used, under the responsibility of the manufacturer or the applicant, after completion of the CE Declaration of Conformity and in accordance with the above directive.

This certificate is only valid for the product and configuration described (annex), in conjunction with the detailed test data and with all applicable legal requirement for the product.
Maintaining certification is based on compliance with the requirements of certification contract.

Annex: *Product identification – 1 page*

Issuing Date: *11.10.2022*

EUROPEAN UNION
Satu Mare, Romania

GENERAL MANAGER
eng. Cristian SOPONOȘ

CEPROM–CERT Manager
eng. Vasile ZELE

Partial reproduction of this certificate is not allowed
This Certificate of Conformity is valid only if it is published on the site www.ceprom.ro

ISO 9001:2015

CE

PORETECH

EURO CERT

Certificate Number: 90.12.2247
Date of the Validity of the current Certificate: 19/08/2022
The Certificate is valid until: 18/08/2025

CERTIFICATE

EUROCERT S.A. certifies that the company

Poretech Instrument Inc.

2F., No. 12, Sec. 1, Zhongxing Rd., Wugu Dist., Taipei 248513, Taiwan

implements a Quality Management System according to the Standard:

EN ISO 9001:2015

for the following Scope of Certification:

Manufacture and sales of porous materials testing instruments

On behalf of EUROCERT S.A.,

Sifonios George
Director of International Markets

GEORGIOS SIFONIOS

Products

Innova Porometer / Porosimeter

- Capillary Flow Porometer
- Ultra Nano Porometer
- Hydro Liquid Porometer
- Liquid Liquid Porometer
- Bubble Point Tester
- Hydropore Porosimeter
- Water Intrusion Porosimeter
- Gas Permeability Tester
- Liquid Permeability Tester
- BET Sorptometer / Pycnometer

Air Filtration Testing System

- ISO 29463-4 (EN 1822-4), ISO 29463-5 (EN 1822-5): Automated scan testing of HEPA and ULPA filters
- ASHRAE 52.2 / EN 779: Testing Air Intake Filter System
- Cabin Air Filter Testing System
- Face Mask/ Filter Pressure Drop and Filter Efficiency Tester

Membrane Making Machine

- Membrane Products Manufacturing Equipment
- Hollow Fiber Spinning Machine
- Flat Sheet Membrane Making Machine
- Membrane Module and Element Fabrication
- RO/NF/UF Membrane Production Workshop

Products

➢ Core Analysis Technologies

- Steady-State Gas Permeameter
- Automated Fall-Off Gas Permeameter
- Automated Pulse-Decay Gas Permeameter
- Helium Porosimeter
- Porosity-permeameter
- Capillary Pressure Apparatus
- Fully Automated Adsorption Isotherm Apparatus
- Core Saturator
- Core Holder

➢ Reaction System

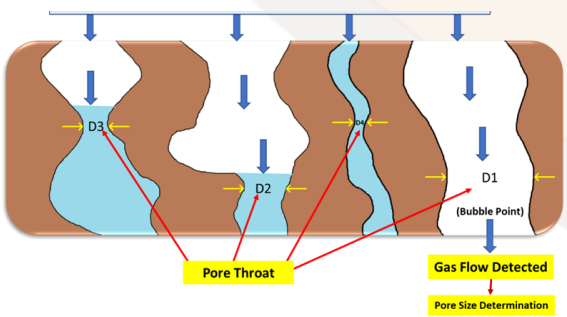
- High Pressure Reactor System
- Glass Reactor System
- Oven type Reactor System
- Catatest Reactor System
- Compact Catatest Reactor System
- Fix bed catalyst reaction system
- Supercritical Fluid Extraction System
- Supercritical water oxidation System
- Metal High Pressure Bomb

➢ Powder Characteristics Tester

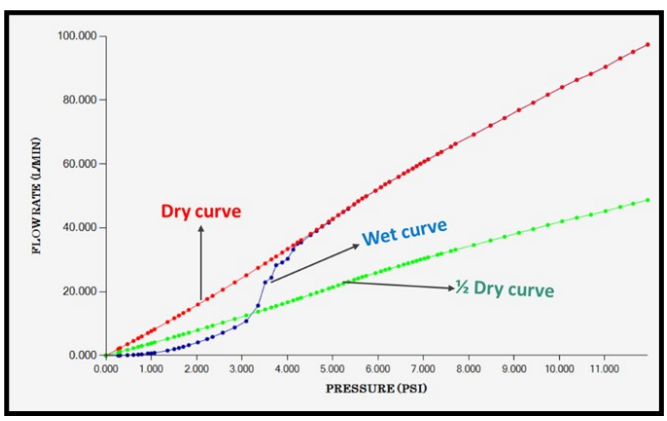
- ABD Powder Characteristics Tester
- Repose Angle Tester
- Powder Fluidity Tester
- Powder Specific Gravity Tester
- Powder Density Tester

Innova Porometer

- **Capillary Flow Porometer (CFP)**
- **Hydro Liquid Porometer (HLP)**
- **Ultra Nano Porometer (UNP)**
- **Bubble Point Tester**
- **Application:** filtration, nonwovens, pharmaceutical, biotechnology, healthcare, household, food, hygienic products, fuel cell, water purification, and battery. Samples often tested include filter media, membranes paper, powders, ceramics, battery separators and health care products.

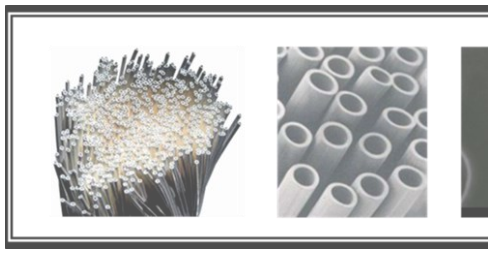


Test Results	A	A_1
Surface Tension	15.9 mN/m	15.9 mN
Bubble Point	.0235 Microns	.023 Mic
Pressure of BP	280.3633 PSI	286.449
Mean Flow Pore Diameter	.0175 Microns	.0186 M
Pressure of MFP	377.9626 PSI	355.288
Smallest Pore Size	.0155 Microns	.0173 M



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

P: Pressure
γ: Surface Tension / Interfacial Tension
cosθ: Contact Angle
D: Pore Diameter



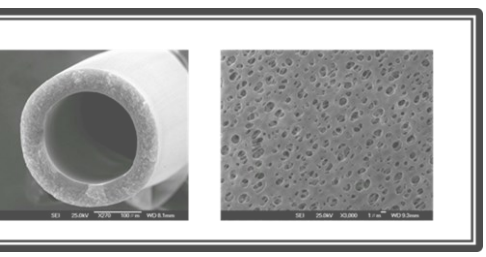
Pore Size Analysis

This technique employs a gas/liquid extrude the liquid from the pore. The pressure necessary for determining pore size varies depending on the liquid's surface tension. Presently, to measure a pore size of 2nm, a pressure of up to 500psi (approximately 35bar) is required.

This approach is particularly well-suited for analyzing pore sizes across macro, micro, ultra, and nano ranges. It finds application in various materials such as Non-woven Fabrics, Electrospinning fibers, Glass fiber, and Flat sheet membranes (including PTFE, MF, and UF membranes).

The Innova Ultra-Nano Porometer (Innova-UNP) is an instrument that combines gas-liquid and liquid-liquid testing methods and is suitable for customers to use to determine the really pore structure analysis of samples.

	TM100-galwet
/m	15.9 mN/m
rons	299.932 Microns
5 PSI	.022 PSI
icrons	103.031 Microns
3 PSI	.064 PSI
icrons	31.4215 Microns



Membrane test results by UNP machine

Innova UNP	CFP Method	HLP Method
Interfacial Tension of Test Liquid	15.9 (mN/m)	4.8 (mN/m)
Test Liquid	Galwet	Galwet - IPA
Tested Pressure	0-440psi	0-130psi
Bubble Point	0.023µm	0.0325µm
Pressure of BP	286.45psi	61.367psi
Mean Flow Pore	0.019µm	0.023µm
Pressure of MFP	355.29psi	86.704psi

Innova Porometer

➢ Product Advantages:

- ✓ Precise macropore detection (200µm to 1000µm).
- ✓ Intelligent and multi-parameter automatic testing function.
- ✓ Possessing the technology to accurately analyze micropores under high pressure testing (up to 500psi).
- ✓ Comprehensive pressure and flow regulation control capabilities.
- ✓ Combined gas-liquid test method and liquid-liquid test method testing capabilities (Innova UNP machine).

➢ Hardware Specifications:

Hardware Design	iCFP Series	HLP Series	UNP Series	Bubble Point Tester
100psi Model	v	*	*	v
200psi Model	v	*	*	v
500psi Model	v	v	v	*
<50psi Model	v	x	x	v
Pressure Gauge	Single/Dual 0.15%FS	Single/Dual 0.15%FS	Single/Dual 0.15%FS	Single 0.15%FS
Pressure Regulator	Single/Dual	Single/Dual	Single/Dual	Single
Auto switched between high and low pressure systems	v	v	v	x
Flow meter	0-200LPM Single/Dual 1%FS	0.00001cc/s to 1000sccm 0.2%FS	0-200LPM Single/Dual 1%FS	x
Mass Flow Controller	v	v	v	v
Auto switched between high and low flow systems	v	v	v	x
SUS Chamber	v	v	v	v
Clamp-on Chamber	v	x	x	v
Built-in touch Panel PC	v	v	v	v

*Need to discuss with technicians

Pore Size Analysis

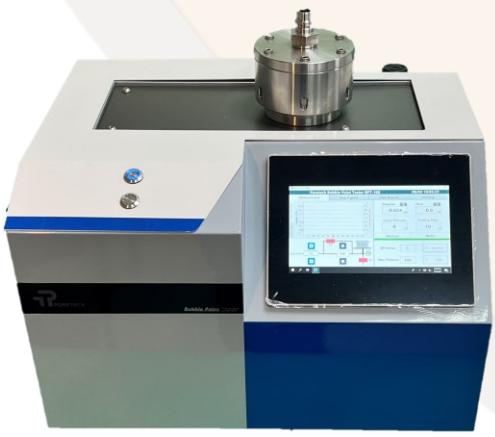
➢ Product Performance:

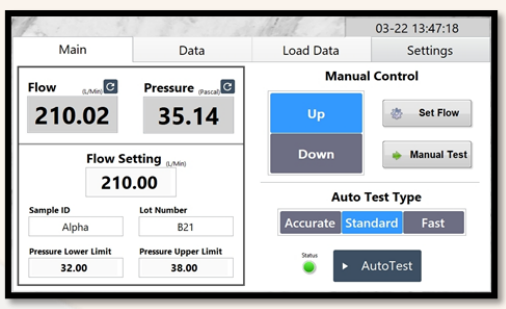
Hardware Design	iCFP Series	HLP Series	UNP Series	Bubble Point Tester
Pore size distribution	v	v	v	x
Mean flow pore size	v	v	v	x
Bubble point	v	v	v	v
Maximum Pore size	500μm*	0.2μm*	500μm	800μm*
Minimum Pore size	0.013μm	0.002μm*	0.002μm*	0.03μm*
Gas-Liquid replacement method	v	x	v	v
Liquid-Liquid replacement method	x	v	v	x
Gas Permeability	v	x	v	x
Liquid Permeability	Option	v	v	x
Visible BP testing	x	x	x	v
Through Plane testing	v	v	v	v
In-Plane testing	v	v	v	v
Flat sample testing	v	v	v	v
Hollow Fiber testing	v	v	v	v
Tubular sample testing	v	v	v	v
Cartridge testing	v	x	v	v

*Need to discuss with technicians

Innova Permeameter

- **Gas Permeability Tester**
- **Differential-pressure method Permeameter**
- **Liquid Permeability Tester**
- **Gurley Permeability Tester**
- **Frazier Permeability Tester**
- **Ultra-Low Gas Permeameter**
- **Diffusion Permeability Analyzer**





Gas / Liquid Permeability of Darcy's Law

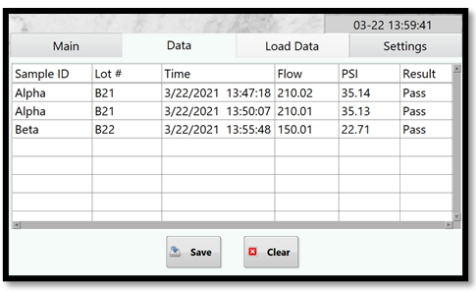
Gas (Liquid) flow through a porous medium is usually analyzed by using Darcy's law, which states that the discharge rate through a porous medium is proportional to the pressure gradient Δp and the permeability K and is inversely proportional to the coefficient of viscosity μ of gas. Darcy's law can be written as:

$$Q = -(K/\mu)\,\Delta p$$

where:

Q = flow rate K = Permeability

μ = viscosity of fluid Δp = The pressure gradient



Gurley Permeability

The Gurley method for gas permeability involves the precise measurement of the time it takes for a specific volume (100cc) of air to pass through a test specimen under a controlled air pressure of 125 mm water (equivalent to 4.921 inches of water or 0.178 psi). This method is utilized to assess the permeability characteristics of the material being tested, providing valuable data for various applications and industries.

Permeability Analysis

The gas/Liquid permeability tester is a crucial instrument that can measure the flow rate of fluid across a sample and the corresponding pressure drop, thereby calculating permeability using Darcy's law. Additionally, it can calculate various other valuable characteristics of porous media through analysis of gas flow rates and pressure drops. Moreover, measuring the flow rates of different gases allows for the determination of pore size. The significance of assessing the permeability of gases, vapors, and liquids lies in its pivotal role in numerous applications, as flow rates serve as key indicators of the rates of industrial processes.

Specifications:

Model	GPA-100N	GPG-1N	GPF-01N	LP-100
Test Method	Darcy Law	Gurley	Frazier	Darcy
Pressure range	0-100 psi	0-1psi	0-0.1psi	0-100psi
Permeability Range	1 x 10^{-3} - 50 Darcie	0-1000 sec	500 L/min	1x10^{-4} ～ 50 Darcy
Sample size	Dia. 10mm to 45mm Thickness upto 20mm	1inch^2 Thickness upto 20mm	Dia. 25mm ~ 113mm Thickness upto 20mm	Dia. 10mm ~ 50mm Thickness upto 10mm
Testing gas	Air, N2, CO2, O2…			Water
Data transfer	External PC or Built-in Touch Panel Computer			
Operation	Automatic test mode and manual operate mode			

➢ Frazier Permeability

Frazier permeability is defined as the flow rate of air passing perpendicularly through a known area (100cm2) of fabric, adjusted to obtain a prescribed air pressure differential between the two fabric surfaces. This permeability is expressed as the velocity of air at 23℃ and 55% RH in ft/min, creating a pressure drop of 0.5 inches of water across the sample.

Hydropore Porosimeter

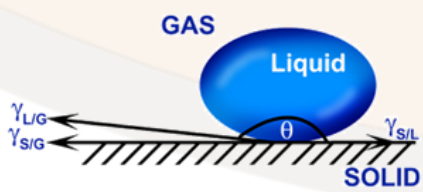
- **Hydropore Porosimeter**
- **Water Intrusion Porometry**

The Hydropore water intrusion porosimeter is specifically designed for analyzing the pore structure characteristics of hydrophobic materials. It can precisely measure parameters such as pore volume, porosity, pore size distribution, and pore volume distribution for both through-holes and blind holes. This instrument is suitable for analyzing the pore structure of polymer films, solids, and powder samples. Due to its reliance on water for analysis, it is considered the safest and most high-precision tool available.

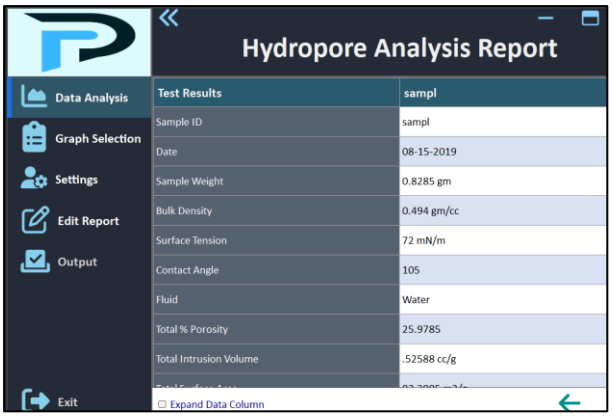
Contact Angle of Hydrophobic:

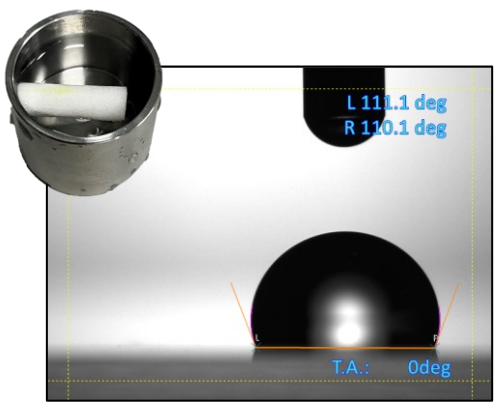
Equating sum of the components of surface tensions in the positive x-direction to zero:

$$\gamma_{s/l} - \gamma_{s/g} + \gamma_{l/g} \cos\theta = 0$$



where θ is the contact angle. For a nonwetting liquid, Ys/l > Ys/g and Yl/g has a component along Ys/g for equilibrium. Consequently, the contact angle is greater than 90 degree and cos θ is negative. The surface tensions can be expressed in terms of the contact angle.

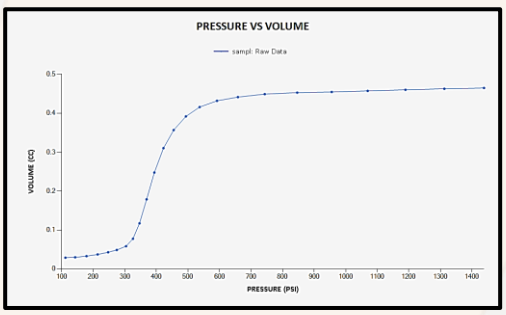


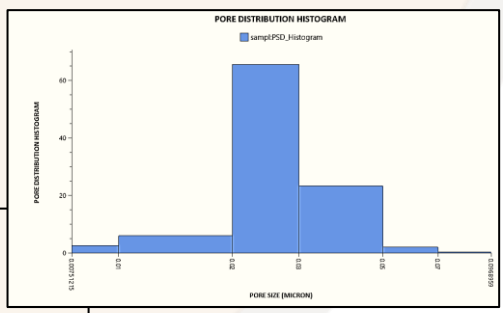


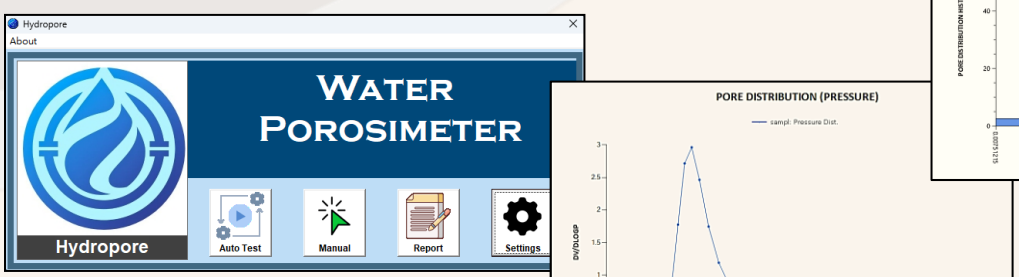
Porosity Analysis

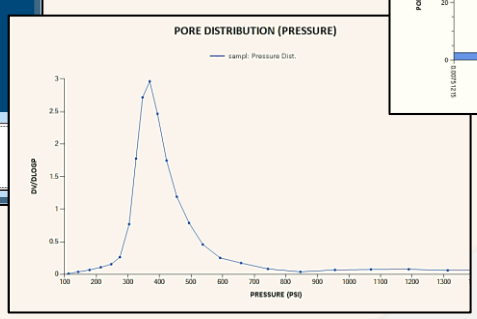
➢ Product Advantages:

- ✓ **Stainless Steel Sample Chamber Design:**
- ✓ **Fully Automatic Operation:**
- ✓ **Unlimited Data Points Definition:**
- ✓ **Mercury-Free Testing:**
- ✓ **Precision Microsensor:**
- ✓ **Reproducible Testing:**
- ✓ **Cost-Effective and Easy Maintenance:**









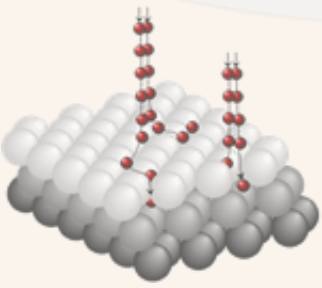
➢ *Specifications:*

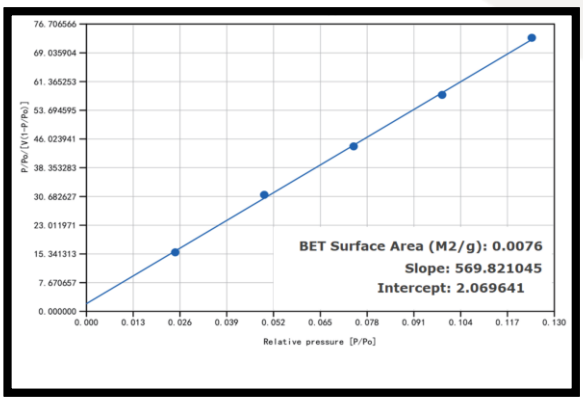
	Hydropore
Test Method	Water Intrusion
Pressure type	3000psi / 5000psi / 10000psi / 30000psi
Sample cell volume	10cc (others request available)
Channel	Single chamber
Pore size range:	0.2µm to 0.0025µm / 0.0015µm / 0.0008µm / 0.0003µm
Sample Geometry	Flat Sheets, Rods, Tubes, Hollow Fibers ….
Test fluid	Water (Other liquids can be used)
Pressure transducer	Accuracy: 0.2% (FS) ; Resolution: 1/20000
Pressurized device	Built-in high pressure generator
Sample chamber	SUS material, Single chamber (Manual Chamber)
Operation	Automatic test mode and manual operate mode
Power	AC 110V or 240V, 50/60Hz

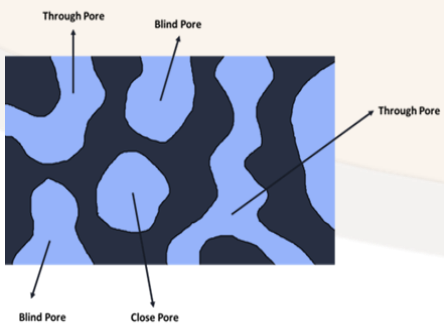
BET Sorptometer

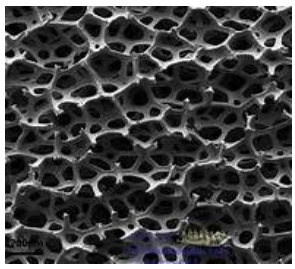
- **BET Surface Area & Pore Size Analyzer**
- **Physical adsorption**
- **Chemical adsorption**
- **Capability:**

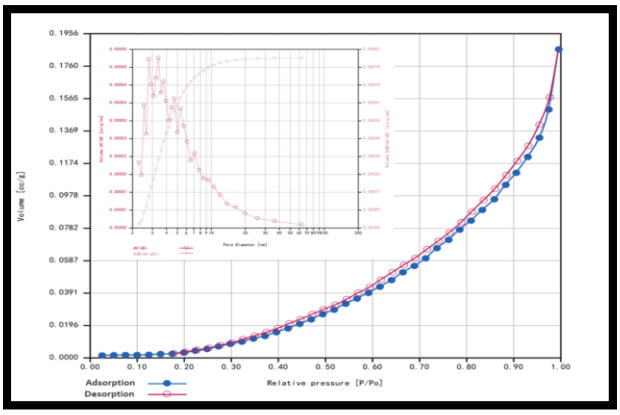
- **Analysis stations: 4-Station fully automated operate**
- **Surface Area and Pore Size by Gas Sorption**
- **Adsorption / Desorption isotherm**
- **Specific surface area: BET, Langmuir**
- **Mesopore distribution: BJH, Dollimore-Heal**
- **Micropore: Dubinin-Radushkevich, t-Plot method**
- **Micropore distribution: MP, HK, SF, DA**
- **Total pore volume and average pore width**
- **Auto Program Degassing System**









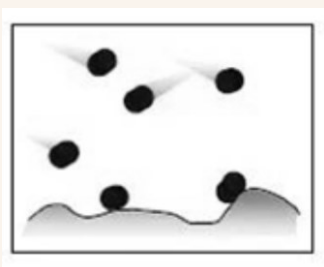


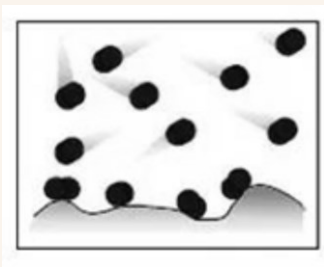
Surface Area Analysis

The Innova Sorptometer of iBET series of full-automated surface area and pore size analyzers is designed with the classic static volumetric principle, which complies with the standards of ISO15901, ASTM D3663/D4661 and ISO 9277-2010 as "Determination of the specific surface area of solids by gas adsorption - BET method".

It can analyze the specific surface area, pore size distribution and total pore volume of porous materials such as zeolite (molecular sieves), carbon materials, metal oxides, MOF, COF, and graphene.

It can be widely used for QC and R&D of ultra-low specific surface area samples such as battery materials (both positive and negative), metal powders, and pharmaceuticals (bulk drugs and their additives).





➢ *Specifications:*

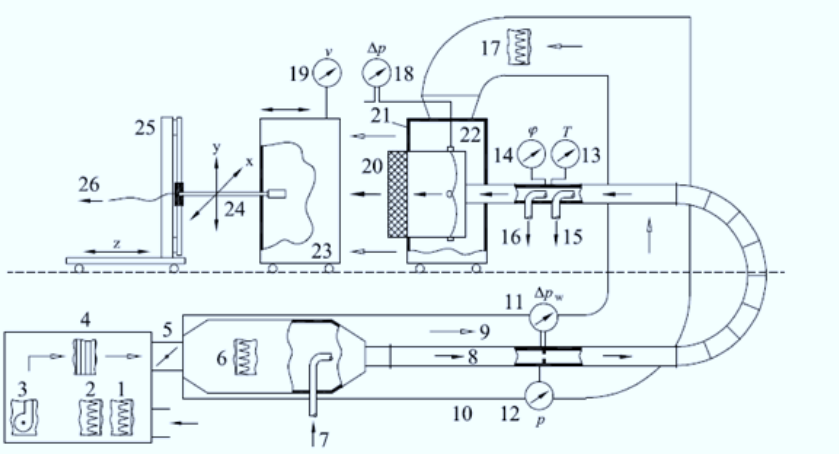
Model	iBET-204A
Analysis ports	4
1000 Torr Gauge	6
P0 Port	1
Repeatability	0.1% (Based on RM)
Surface area range	0.005m^2/g upto no upper limit
Pore size range	3.5Å ~ 4000Å
P/P0 range	$1x10^{-4}$ to 1
Minimum Pore volume	0.0001ml/g
P/P0 pressure resolution	$1x10^{-10}$
Accuracy of Transducer	±0.1%
Vacuum pump ability	Two-Stage Pump $2x10^{-3}$ Torr, Turbo Pump
Adsorbates	N2, Ar, CO2, Kr, any non-corrosive gas

Air Filtration Testing Equipment

- **EN 1822-4(ISO 29463-4), EN 1822-5(ISO 29463-5)**
  Automated scan testing of HEPA and ULPA filters
- **ASHRAE 52.2 / EN 779**
  Testing Air Intake Filter System
- **Cabin Air Filter Testing System**
- **Face Mask/ Filter Pressure Drop and**
  Filter Efficiency Tester

EN *1822* Automated scan testing of HEPA/ULPA Filter

↑ Vertical EN-1822 Test System



- **The system comprises:**
  - **Wind tunnel system**
  - **Aerosol generator system**
  - **4'x4' Filter holder**
  - **Leak scanning device**
  - **Control system**

HEPA Filter Testing

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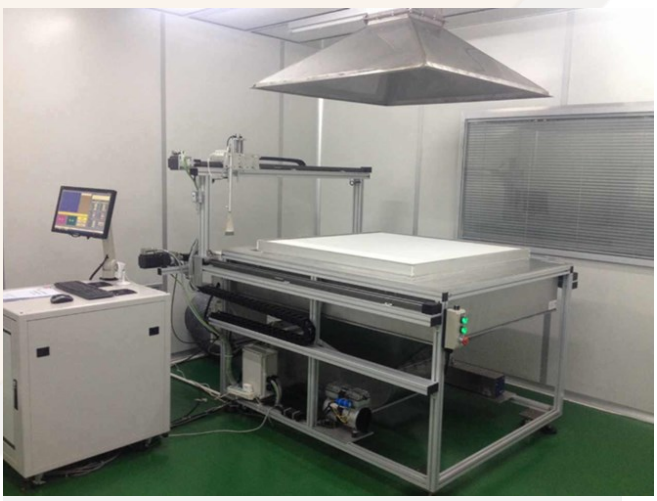
➢ *Characteristic:*

- With automatic test mode and manual operation mode.
- Two System design: **Vertical System** and **Horizontal System**.
- **System Functions：**
  - ✓ Full auto leak scanning mode and semi-auto leak scanning mode.
  - ✓ Filtration efficiency (static), dust holding capacity testing.
- Maximum filter size for testing: 1300mm x 1300mm
- Maximum filter size for installation: 1500mm x 1300mm
- Number of scanning sensor: up to 4 set

Small space requirements!!!



↑ **Horizontal EN-1822 Test System**

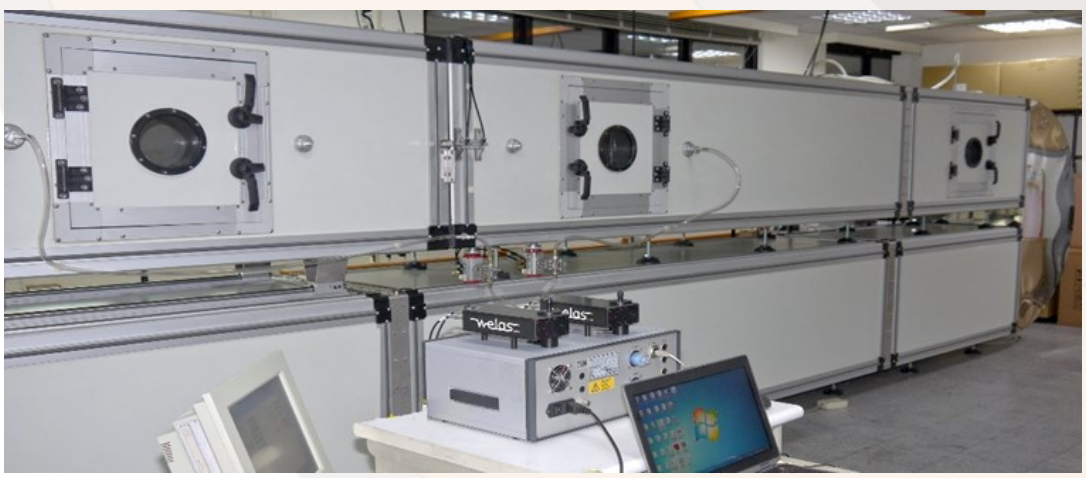
➢ *Specifications:*

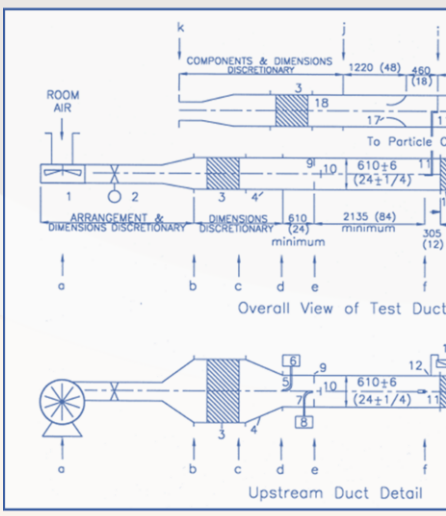
- Filter test size: 2’x 2’ to 4’x 4’ (others available)
- Test air volume range: 300 m^3/h to 3400 m^3/h
- Max. Static Pressure of Filter：
  - Vertical System 20 mmH2O
  - Horizontal System 50 mmH2O
- Test efficiency range: upto 99.99995% @0.1μm
- Vertical System Dimension: (L) 13 m x (W) 3.5 m x (H) 2.6 m
- Horizontal System Dimension: 2 m x 4.5 m

Air Filtration Testing Equipment

ASHRAE 52.2 / EN 779 Intake Air Filter Testing System

- Testing of Air Filters (ISO 16890, EN 779, ASHRAE 52.2)
- Testing of Intake Filter systems according to ISO 29461-2





Cabin Air Filter Testing System

Specifications:

- Standard for Design Reference: ISO 11155-1
- Flow rate: 150~680 CMH
- Maximum cabin filter size: 300 mmx 300 mm
- Max. Static Pressure of Filter: 450 Pa
- Aerosol generator (0.3~10μm)
- Dust feeder: Feeding speed is adjustable
- Concentration range 70~140mg/m^3
- Laser Particle Counter; Sampling flow: 5.0 lpm
- Capable: initial pressure drop, Initial efficiency, Loading Test, Weight collection rate, Particle size efficiency (0.3~10μm)

Intake Air Filter Testing

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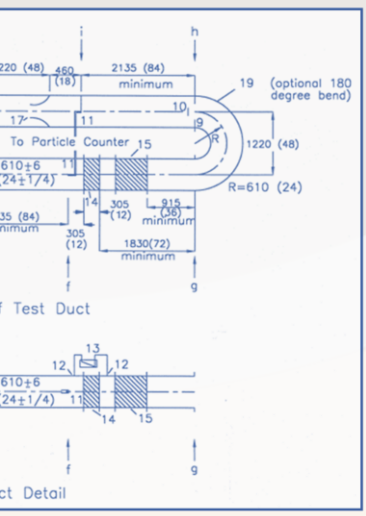
➢ *Specifications:*

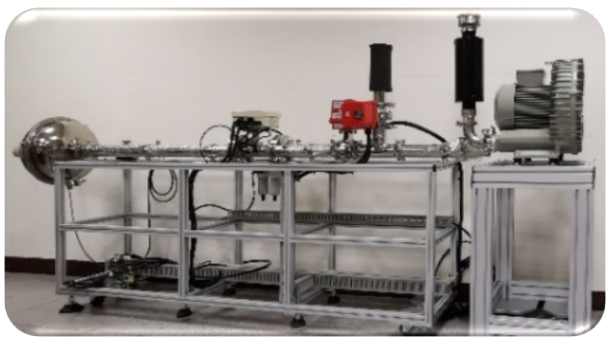
- ✓ Air flow rate: 2700/450 CFM
- ✓ Dimension of specimen: 2'x 2' (610 mm X610 mm)
- ✓ Differential pressure : 1000Pa
- ✓ Test aerosol substance: DEHS, KCl
- ✓ Air Circulation: 0-100%
- ✓ Particle Counter:
  - Range: 0.2–10μm、0.3–17μm、0.6–40μm、2–100μm.
  - Maximum concentrations up to 40,000 particles/cm3
- ✓ Dimension of Equipment Space: 13m x 2m x 2.5m (LxWxH)
- ✓ With Temperature/Humidity sensor for measure tunnel inside temperature and humidity

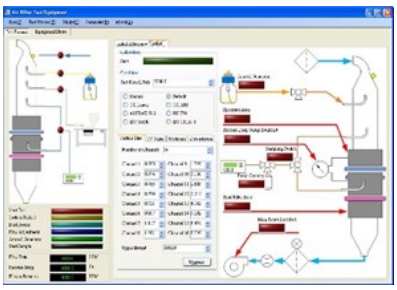


➢ High-Temp. Cleanable Filter Testing System

➢ *Specifications:*

- Maximum scanning size of filter: 1220x1220x292mm
- Max. Flow： 1500 CFM
- Max. Static pressure： 100 mmH2O
- Filter loading: Convenient, pneumatic and slide rail fixed
- Aerosol: Atmospheric dust
- Filter holder: 610x610 mm (1set)



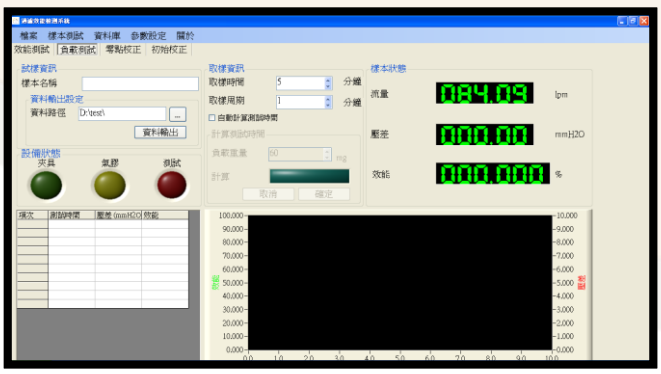


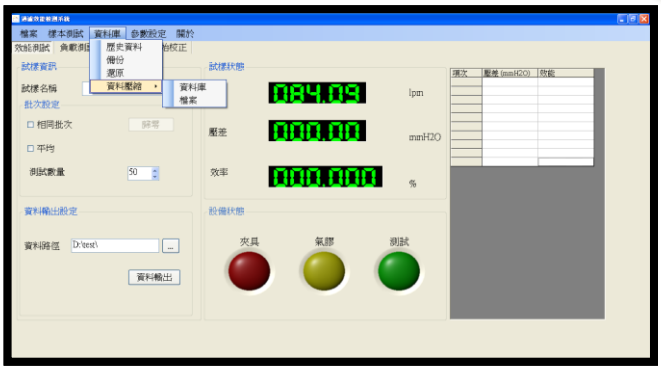
Air Filtration Testing Equipment

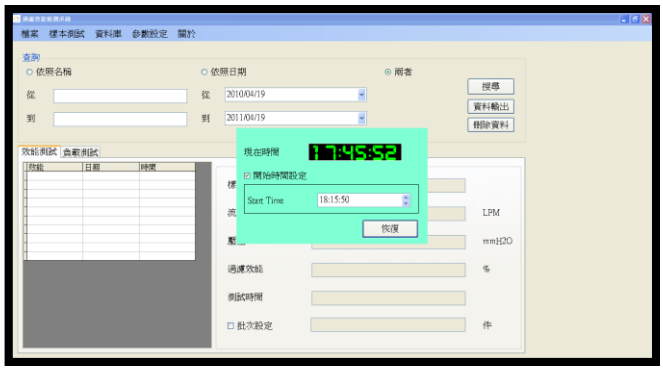
Automated Air Filter Tester

Specifications:

- Capable: Filtration efficiency (99.999%), initial pressure drop, initial efficiency, dust load.
- Differential Pressure： 100 mmH2O
- Maximum Flow： 100 LPM
- Sample Testing Area： 100 cm^2
- Particle Detector: Photometer
- Test sample type： Filter, Face mask
- Aerosol Generator: Oil Aerosol or NaCl
- Aerosol Detection: 0.1-10μm
- Static Neutralizer







Efficiency and Pressure Drop

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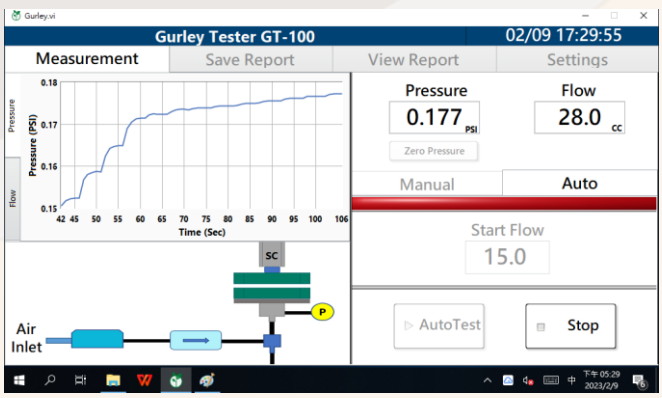
Face Mask/Filter Pressure Drop Tester

- Operation Type： Manual or Auto
- Flow adjustment range： 0 - 20 L/min
- Static pressure： 20mmH2O/cm²
- Sample Testing Area： 4.9 cm²
- Sample fixture type: Air Cylinder



Filter Pressure Drop Tester

- Operation Type： Automatic
- Flow control： Manual, Auto (Program)
- Sample Testing Area： 100 cm² or Others
- Flow control range： 0 - 100 L/min
- Static pressure： 20 mmH2O/cm²
- Flow control mode： Auto/Manual
- Sample fixture type: Air Cylinder

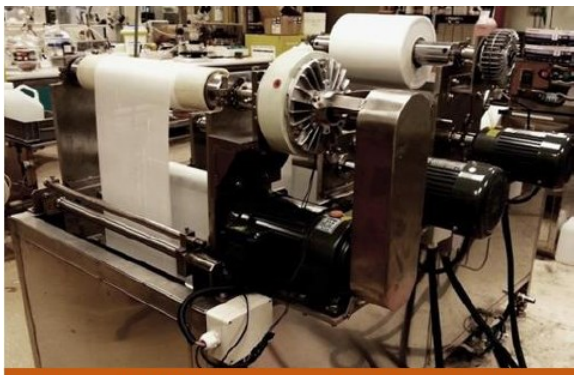
Membrane Making Equipment

Flat Sheet Membrane Making Machine

Ind-scale FS Membrane Casting Machine

Membrane Slitting Machine

Element Auto Rolling Machine



Lab-scale FS Membrane Casting Machine

Flat Membrane and Hollow Fiber

Ind-Scale FS RO Element Fabrication Workshop Overview

▶ Hollow Fiber Making Machine

Pilot-scale HF Spinning Machine

Ind.-scale HF Spinning Machine

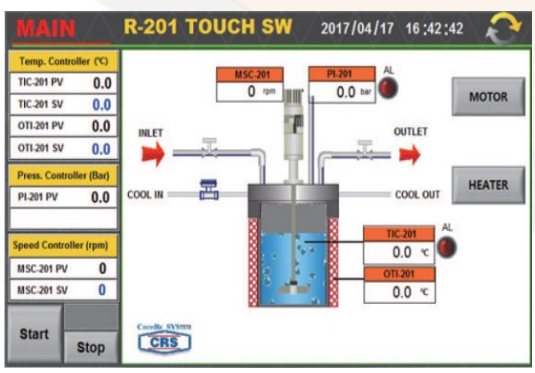
Ind-scale HF Dope Mixing Equip.

High Pressure Reactor

- **High Pressure Reactor System**
- **Glass Reactor System**
- **Oven type Reactor System**
- **Metal High Pressure Bomb**

High Pressure Reactor System (R-201):

- The vessel material is metal.
- Max. Pressure : 414 Bar (6000 psig)
- Max. Temperature : 500℃
- Capacity: 100ml~500L
- Designed with or without agitator
- Automatic programming or manual operation.
- Designed to move vessel by pressure cylinder easily.



Continuous and Batch Type

▶ Glass vessel High Pressure Reactor (R-211):

- The vessel of R-211 Series Glass Reactor is glass.
- Max. Pressure : 14 Bar (220 psig)
- Max. Temperature : -30~250℃
- Capacity: 100ml~100L
- Designed to move vessel by pressure cylinder easily.

▶ Oven type Reactor System (R-202):

✓ Features

- Easy to make temperature uniform without effect on
- Easy to open & close the cover from the vessel because of pin
- Easy to move the vessel by lifting in the oven

✓ General Specification

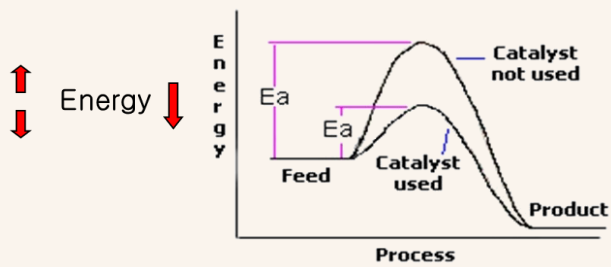
- Pressure Vessel
  - Material (316SS, Hastelloy C- 276, Ti, inconel, etc.)
  - Capacity : 100ml~2L
  - Max. temperature: 300'C
  - Max. Pressure: 5000psig
- Structure
  - Oven Type skid
  - Lifting cylinder

Catatest Reactor System

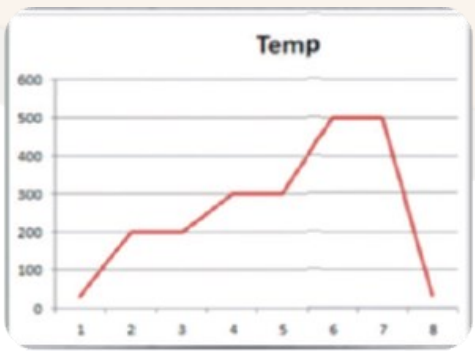
- **Catatest Reactor System**
- **Compact Catatest Reactor System**
- **Fix bed catalyst reaction system**

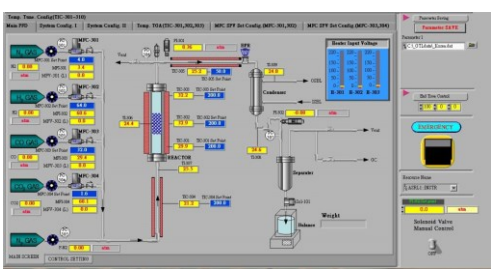
Catatest Reactor System (R-301):

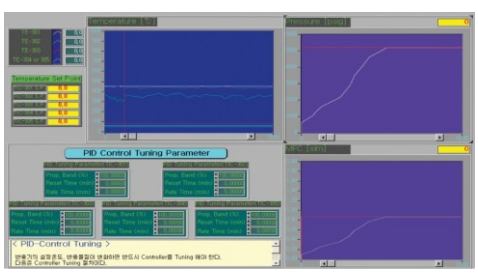
- **Use of catatest:**
  - Identify the different variables used in catalyst improvement studies, such as; reaction temperature, pressure, and feed flow, reaction temperature, pressure, feed flow, reaction kinetics, etc.
  - Test of Catalyst on Hydrogen reaction.
  - Catalyst Screen, Selectivity & Activity Test.
  - Test of Catalyst Life Span.



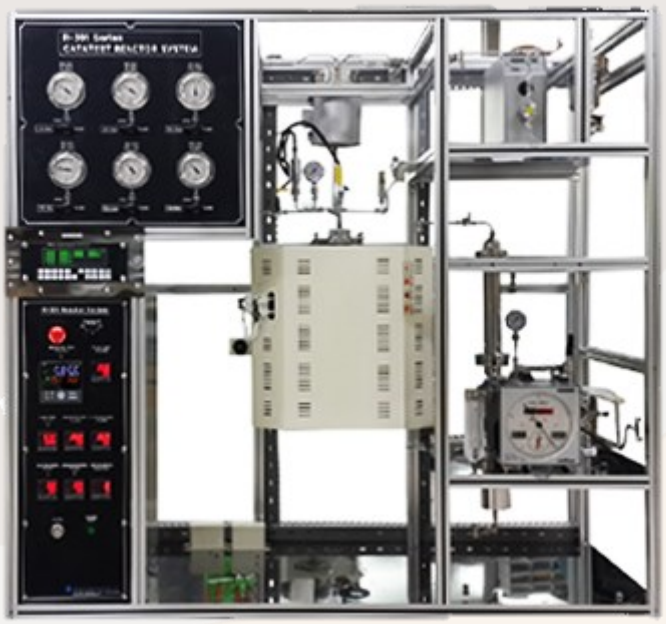
- **General Specifications:**
  - Catalyst volume (5mL~2L) : 316SS & Hastelloy C276
  - Reactor Design Pressure : 1,000psig~6,000psig
  - Reactor Design Temperature : 800℃
  - Operating Temperature : 650℃
  - Operating Pressure : 1200psig
  - Liquide Flow rang : 20mL/min~100L/min
  - Gas flow range:
    - ⇒ H2 gas : 50mL/min~3L/min
    - ⇒ O2 gas : 50mL/min~3L/min
    - ⇒ N2 gas : 50mL/min~500mL/min
    - ⇒ Feed&Spare gas : 50mL/min~500mL/min







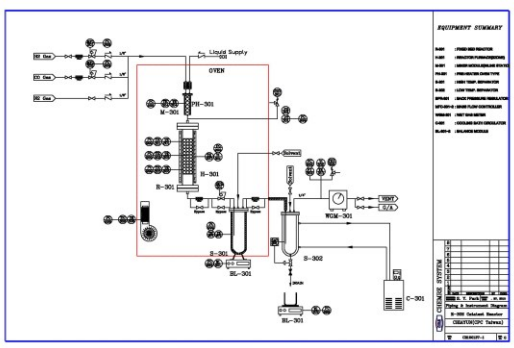
Fix bed catalyst reaction



▶ Compact Catatest Reactor System (R-302):

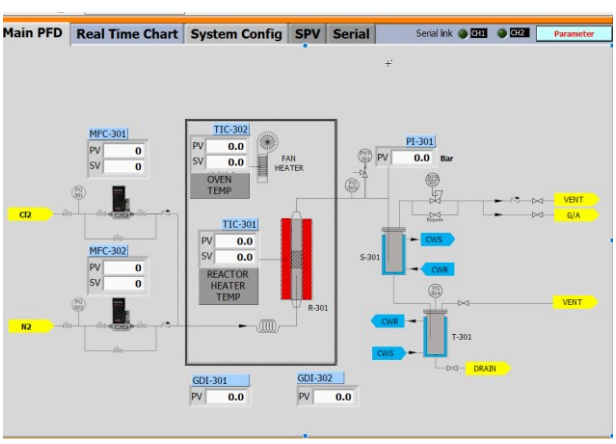
✓ Features:

- Compact design of the complete system for easy installation and also easy transport by wheel.
- Oven type Skid: Oven system surround reaction zone can keep the even test without any effect from any change of circumstance. Also, it can of reactor can keep even temperature of oven circumstance.



✓ General Specification:

- REACTOR : 5 ~ 500mL
- MAX TEMP. : 800℃
- MAX PRESS. : 6000PSIG
- Material: INCONEL, HASTELLOY, ETC Structure
- System designed with BPR, MFC, Separator, Condenser…



Supercritical Fluid Extraction System

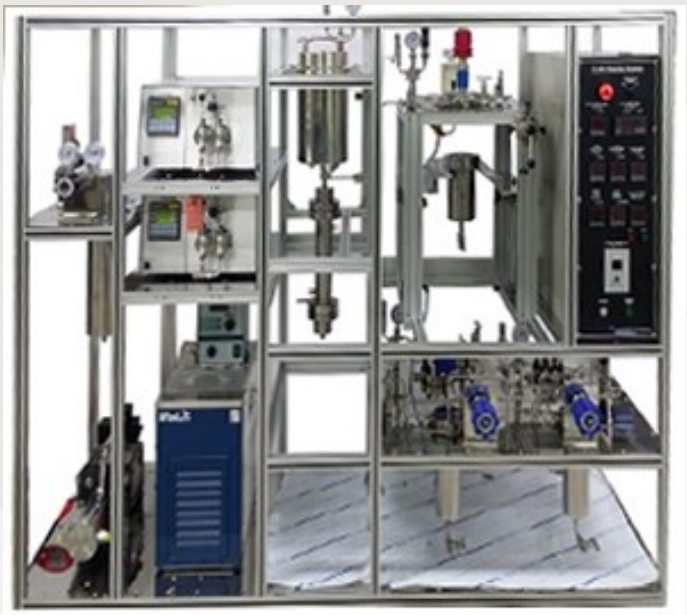
- **Supercritical Fluid Extraction System**
- **Supercritical Water Oxidation System**
- **Compact Supercritical Fluid Extractor System**

▶ Supercritical Fluid Extraction System (R-401, R-402):

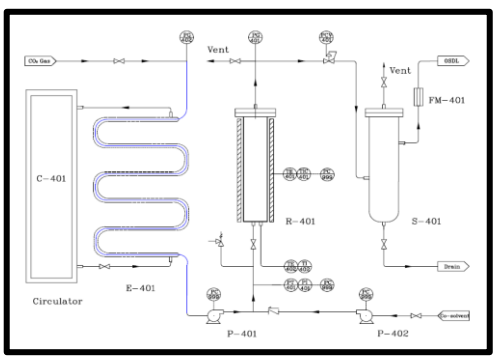
- **Feature:**
  - SFE&SCWO can be selected.
  - Supercritical Fluid Extractions and Reaction' Capacity, Pressure. Temperature, etc., are all optional selections available.
  - As for Capacity, it is standard from 20mL up to 2L, and when it should be an optional selections available.
  - Vessel capacity from 20ml up to 500ml for 10000psi model, 1Liter and 2Liters vessel for 5000psi model.

- **General Specifications:**
  - Capacity : 50mL~10L
  - Design Pressure : 10,000psig
  - Design Temperature : 0~500℃
  - Materials : 316SS, Hastelloy C-276

CO2 / Water Oxidation



▶ Supercritical Fluid Dryer System (R-403):



✓ **Applications:**

- Aerogel Drying
- Wafer Drying
- Optical Lens
- Green Decontamination Process

✓ **General Specification:**

- Extractor:
  - Material : 316SS, Hastelloy C-276, Ti ,Inconel, Quartz, etc.
  - Capacity : 5ml~ 50L
  - Design Max. temperature : -35 to 350℃
  - Design Max. pressure : 413bar
- System include Extractor, Receiver tank, Condenser, Separator, Heater, Chiller, Pressure Pump…

Core Analysis Technologies

- **Steady-State Gas Permeameter**
- **Pulse-Decay Gas Permeameter**
- **Fall-Off Gas Permeameter**
- **Fully-Auto Adsorption Isotherm Apparatus**
- **Helium Porosimeter**
- **Porosity-permeameter**
- **Capillary Pressure Apparatus**
- **Core Saturator**
- **Core Holder**

Gas Permeameter

- A gas permeameter is a device used to measure the permeability of porous materials to the flow of gases. The basic principle of a gas permeameter involves applying a known pressure difference across a porous sample and measuring the resulting flow rate of gas through the sample. The permeability of the sample is then calculated using principles of fluid dynamics, such as Darcy's law, which relates flow rate, pressure difference, and material properties.
- This measurement are capable of steady-state, fall-off, pulse-decay, or combined permeability measurement methods.

• General Specifications:

- Permeability range: 10 nD - 20 D
- Confining pressure: up to 10,000 psi
- Core holder diameter: 1.0" or 1.5"
- Core holder length: up to 4.0"
- Pore pressure: up to 500 psi
- Flow range: 0-20, 0-500, and 0-10,000 SCCM
- Air-driven pump for confining pressure
- Steady-state and unsteady-state technique
- Gas type: Nitrogen

Gas Permeameter

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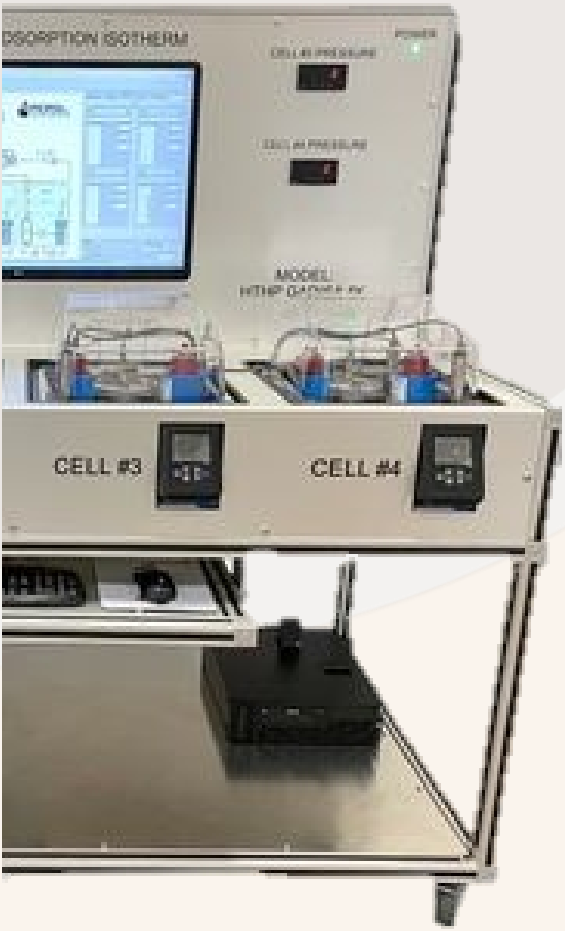

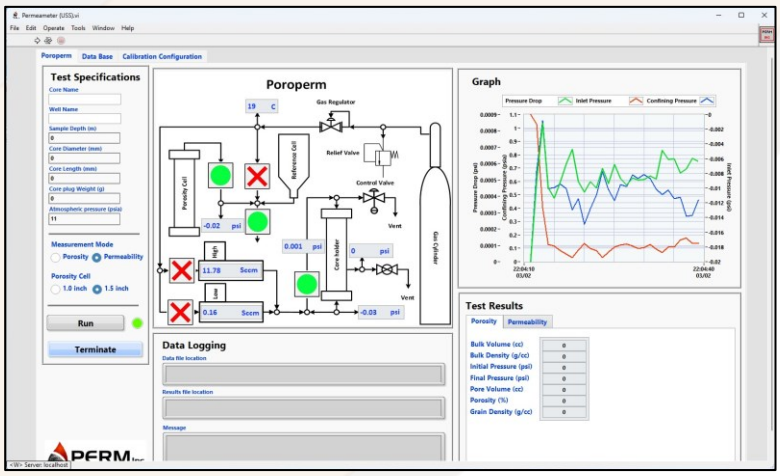

▶ Poropermeameter

- A poropermeameter is a laboratory instrument used to measure both the porosity and permeability of porous materials, such as rocks, soils, and sediments. It combines the capabilities of measuring porosity, the volume fraction of void spaces within the material, and permeability, the ability of the material to transmit fluids through its pore spaces.
- This measurement are capable of steady-state, fall-off, pulse-decay, or combined permeability measurement methods.

✓ General Specification:

- Permeability range: 10 nd - 1 mD
- Confining pressure: up to 10,000 psi
- Core holder diameter: 1.0" or 1.5"
- Core holder length: up to 4.0"
- Pore pressure: up to 500 psi
- Porosity range: 0.1%-60%
- Porosity measurement under confining pressure
- Unsteady-State Technique
- Gas type: Nitrogen and Helium

Core Analysis Technologies

Helium Porosimeter

- A helium porosimeter is a specialized instrument used to measure the effective pore volume and grain volume of porous materials, particularly those with very small pores, such as fine-grained soils, rocks, ceramics, and powders. This instrument operates on the principle of gas displacement, specifically using helium as the displacing gas.
- Other gases are available upon request.

✓ General Specifications:

- Core holder diameter: 1.0 or 1.5"
- Core holder length: up to 4.0"
- Pressure rating: up to 500 psi
- Gas type: Helium
- Air-driven pump
- Porosity range: 0.1%-60%
- Porosity measurement technique: gas expansion

Fully Automated Adsorption Isotherm Apparatus

- An adsorption isotherms apparatus is a laboratory instrument used to measure the adsorption isotherms of gases or vapors onto solid surfaces or porous materials. Adsorption isotherms describe the relationship between the amount of adsorbate (gas or vapor) adsorbed onto a surface and the equilibrium partial pressure of the adsorbate in the surrounding gas or vapor phase at a constant temperature.

✓ General Specification:

- Maximum pressure: 5000 psi
- Maximum temperature: 80ºC
- Various gas inlet ports
- Sample cell size: ~100 cc
- Reference cell size: ~250 cc
- Adsorption technique: volumetric

Porosity / Adsorption Isotherm

PERM Inc
TIPM LABORATORY

Capillary Pressure Apparatus

- A capillary pressure apparatus is a laboratory instrument used to measure capillary pressure, which is the pressure difference across the interface between two immiscible fluids in a porous medium, such as water and air or oil and water. Capillary pressure plays a significant role in various natural and engineered processes, including oil recovery, soil moisture retention, and fluid flow in porous materials.
- This measurement can be designed with both low- and high-pressure modes, enabling more accurate measurements tailored to the pore-size distribution

✓ General Specification:

- Maximum inlet pressure: 500 psi
- Operating pressure: 0-200 psi
- Minimum desaturation pressure: 0.1 psi
- Core holder diameter: 12.0"
- Core holder height: 5.0"
- Porous plate threshold pressure: 218 psi
- Gas phase type: any type of non-corrosive gas
- Liquid phase: deionized water

Core Saturator

- A core saturator is a piece of laboratory equipment used in the field of petroleum engineering and geology to saturate core samples with fluids, typically oil or water, to mimic subsurface conditions. These samples are analyzed in the laboratory to determine properties such as porosity, permeability, and fluid saturation, which are essential for assessing the reservoir's potential productivity.

✓ General Specification:

- Core holder diameter: 1.0" or 1.5"
- Core holder length: up to 4.0"
- Pressure rating: up to 2,500 psi
- Fluids: water, light oil, brine, solvents, and others
- High-performance vacuum and liquid pump

Powder Characteristics Tester

Powder Characteristics Tester

- Multifunctional measuring instrument
- Repose-Angle Tester
- Powder Flowability Tester JIS Z-2502
- Tapping Type Powder Density Tester
- Vibrating Type Powder Density Tester
- Flowing Surface Angle
- Dispersion Analyzer

Testing Services

➢ 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 Test Method) for bubble point, mean flow pore size, pore distribution, gas permeability.
- ✓ Hydro- Liquid Porometer (Liquid-Liquid Test Method) for bubble point, mean flow pore size, pore distribution, liquid permeability.
- ✓ Hydropore Porosimeter (Water Intrusion Porosimeter for Hydrophobic sample) for porosity%, pore volume and pore size distribution.
- ✓ EUROPE: EN 14683:2019 Medical Face Masks. Requirement & 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.

Test Service Item	Testing Method (Standard)
Porous Materials: • Filter Membrane • Hollow Fiber • Ceramic • Li-Ion Separator • Powder • Activated carbon • Non-Woven	**Bubble Point, Mean Flow Pore Size (ASTM F316-08)**
	Gas Permeability (Darcy, Gurley, Frazier, C-522)
	Liquid-Liquid Displace Testing Method (ASTM F316-08)
	BET, Adsorption & Desorption, Pore size, Pore Volume, Porosity
	Micro Flow Permeability Testing: N2, O2, CO2, He
	Pycnometer, Ture Density, Bulk Density, Porosity, Pore volume

PORETECH
Instrument

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