# AUTOMATED MERCURY INTRUSION POROSIMETER
# AMP-60K-A-2

# Description

Versatile and accurate instrument used to determine properties such as pore size distribution, total pore volume, surface area, and bulk and absolute densities of solid and powder samples. Unlimited user-defined data-points, automated data collection and reduction, and the least mercury exposure of any porosimeter on the market.

# Principles of Operation

The PMI Automated Mercury Intrusion Porosimeter is a versatile and accurate instrument used to determine pore volume. The Automated Mercury Intrusion Porosimeter fills the penetrometer and sample chamber with mercury under high pressure and takes a volume reading. Gradually, increasing amounts of pressure are applied on the nonwetting liquid. For each incremental increase in pressure, the change in intrusion volume is equal to the volume of the pores whose diameters fall within an interval that corresponds to the particular pressure interval. Generates intrusion as well as extrusion curves.

The PMI Porosimeter consists of a low pressure section, a high pressure section, and penetrometers connected to the sample chambers. The low pressure section includes the mercury reservoir and the mercury trap, and can be opened to the atmosphere or evacuated. The high pressure section includes a pressure generator that uses isopropyl alcohol as the hydraulic uid to pressurize mercury. The sample is placed inside a stainless steel cell that has a hole on one of its sides for evacuation and entry of mercury into the cell.



The cell is closed with a lid and placed in the sample chamber. Intrusion volume of mercury is measured by noting changes in mercury level in the penetrometer with a magnetic sensor. Exposure to mercury is negligible due to the unique design of the instrument. The unique design also permits use of nonmercury nonwetting liquids for intrusion. Another instrument design uses water as the nonwetting liquid and uses absolutely no mercury. The instrument is known as the Aquapore.
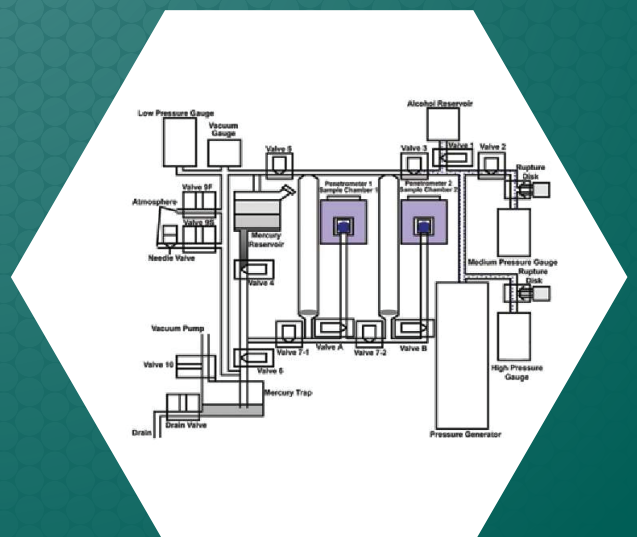
# Operating Procedure

A nonwetting liquid like mercury does not spontaneously fill pores of a sample because the sample/nonwetting liquid surface free energy is greater than the sample/gas surface free energy. However, application of pressure can force a nonwetting liquid into the pores of a sample. The differential pressure required to force the nonwetting liquid into a pore is given by:

P = - 4 g cos q / D
P = differential pressure D = pore diameter
g = surface tension of nonwetting liquid
q = contact angle of the nonwetting liquid with the sample

The pore diameter at any location in a pore is de ned such that (dS/dV) = (4/D), where (dS/dV) is the ratio of small increase in surface area due to a small increase in volume of nonwetting liquid in the pore. In this technique the pressure and
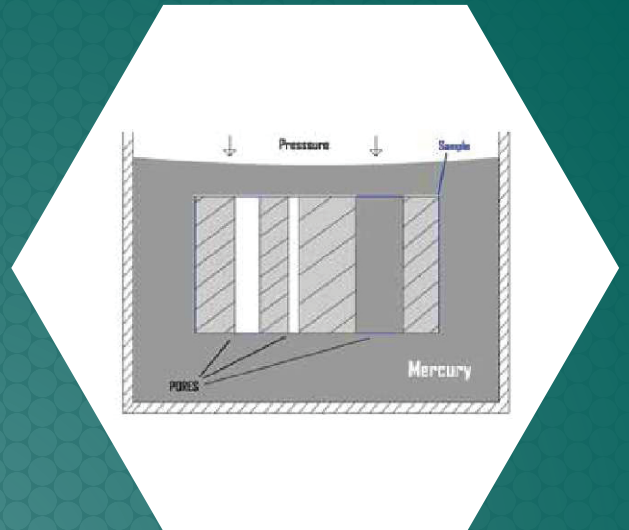


the volume of intruded nonwetting liquid are accurately measured. Combining these data with the surface tension and the contact angle of the liquid, pore diameter, pore volume, pore volume distribution and pore surface area are computed.

# Data Report



- Pore volume versus diameter
- Delta volume (histogram)
- Pore distribution (histogram)
- Percent total pore volume
- Pore distribution (pressure and diameter)
- Particle size distribution (histogram)
- Percent porosity and density
- Cumulative surface area
- Porosimetry text data
- Summary sheet (reporting median pore sizes based on volume and surface area along withbstandard deviations)
- Auto merging of low and high pressure data in a single graph over the entire analysis range.

## Application

Used in various industries ranging from automotive and pharmaceutical to paper, the Mercury Intrusion Porosimeter can test samples such as brake pads, catalytic converter materials, coated papers, civil or concrete field and powder precursors.

## Unique Features

- *Windows-based software handles all control, measurement, data collection, and report generation; manual control also possible.*
- *Unlimited user-defined data points based on pressure, volume, or a combination.*
- *Displays both intrusion and extrusion curve.*
- *Compatible with Windows 8 or higher version.*
- *Real-time graphical test display depicts testing status and results throughout operation.*
- *Wide range of acceptable sample sizes and types.*
- *Multiple sample chambers available.*
- *High resolution (min 0.001 cc) penetrometer of capacity up to 2 cc with unlimited refill.*
- *Low level of mercury exposure.*
- *Automatic mercury refill and clean up.*
- *Low Noise Vacuum pump (0 to 1000 Hg) included.*
- *Mean of Pore size average with mode and median, Pore size ratio and Tortuosity, total pore area and volume data, Cumulative and incremental pore area plot.*
- *Multiple data plotting routines.*
- *Volume plot or Histogram of Total pore intrusion, Cumulative intrusion, Log differential intrusion, Incremental and differential intrusion.*
- *Bulk and Apparent density.*
- *Particle size distribution (MS) and (SS) models with mean mode and median, interpolated data, tabular and graph. Material compressibility, Contact angle*

## Features

- *Windows-based software handles all control, measurement, data collection, and report generation; manual control also possible*
- *Unlimited user-defined data points based on pressure, volume, or a combination*
- *Displays both intrusion and extrusion curve*
- *Real-time graphical test display shows testing status and results throughout operation*
- *Minimal maintenance required*
- *Automatic mercury refill and clean up*
- *Pressure generator features continuous and stepwise scanning*

# Specifcations

- Pore Size Range: 0.003 to 900 microns
- Transducer Hysteresis +- 0.05% of full scale
- High Pressure Range: Atmospheric temp. to 60,000 PSI
- Low Pressure Range: Vacuum to 50 PSI
- Pressure increment mode: Step and continuous
- Accuracy: ±1% of full scale or better of intrusion volume, ±0.1mm resolution
- Pressure Range: Vacuum to 60,000 psi
- Pressure Transducer Range: 0 - 60,000 psi
- Pressure Transducer Accuracy: ±0.15%
- Transducer Hysteresis: ±0.10%
- Resolution: 1 in 60,000
- Power Requirements: 220-230 VAC, 50 Hz (Others available)
- Dimensions: 72" H x 30" W x 30" D
- Weight: 200Kg
- Sample Cell Volume: 2 ml to 15 ml (Minimum) with sample dimensions up to 25mm diameter (minimum) x 25mm length (minimum)
- Sample dimensions up to 25mm diameter (minimum) x 25mm length (minimum)
- 2 Low Pressure Ports & 2 High Pressure ports ; Low and high pressure port are combined into one.

*Optional ***
High Volume 2Inch x 2 Inch Sample Chamber ( Specially made for Concrete) :
*30,000 PSI Pressure Rating*

# Sales & Services

Our sales team is dedicated to helping our customers find which machine is right for their situation. We also offer custom machines for customers with unique needs. To find out what we can do for you, contact us. We are committed to customer support including specific service products, short response times & customer specific solutions. To quickly & flexibly meet our customer's requirement, we oller a comprehensive range of services.

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