

AUTOMATIC PYCNOMETERS

THE DENSITY ANALYSIS OF POWDERS,
FOAMS AND BULK SOLIDS



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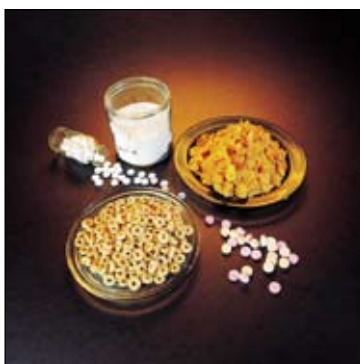
Quantachrome
INSTRUMENTS

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AUTOMATIC OPERATION SERIES

Sample Cells	Nominal Volume	Diameter	Length
Standard sample cells	135 cm ³	5.05 cm	7.55 cm
	50 cm ³	4.12 cm	3.97 cm
	10 cm ³	2.54 cm	2.41 cm
Optional Microcell	4.5 cm ³	1.66 cm	2.54 cm
Optional Mesocell	1.8 cm ³	1.66 cm	2.54 cm
Optional Nanocell	0.25 cm ³	1.66 cm	2.54 cm
Optional film/fiber winding spools	n/a	2.54 cm	2.54 cm
	n/a	1.67 cm	2.40 cm

The sample cells listed above are aluminum.
All cells are available in stainless steel for durability.
Non-elutriating cells are available for fine powders.



Foods and Pharmaceuticals



Catalysts and Ceramics



Gas Input and Vacuum Fittings

PYCNOMETRY

“Pycnometry” is derived from the Greek word pyknos, which has long been identified with volume measurements. The pycnometers from Quantachrome are specifically designed to measure the true volume of solid materials by employing Archimedes’ principle of fluid (gas) displacement and the technique of gas expansion.

Ideally, a gas is used as the displacing fluid since it penetrates the finest pores assuring maximum accuracy. For this reason helium is recommended, since its small atomic dimension enables entry into crevices and pores approaching one Angstrom (10⁻¹⁰m). Its behavior as an ideal gas is also desirable. Other gases such as nitrogen can be used, often with no measurable difference.

Applications

Quantachrome pycnometers are used for research, development and quality control in such diverse industries as carbon black, catalysts, cement, ceramics, charcoals, cosmetics, desiccants, fertilizers, fibers, fillers, insulating and structural foams, powdered foods, ion exchange resins, minerals such as alumina, silica, titania and others, nuclear fuels, petrochemicals, pharmaceuticals and powdered metals. Pycnometry can even determine the percentage of solids in a slurry.

The **PENTAPYCNOMETER** and the **ULTRAPYCNOMETER 1000** from Quantachrome are the ultimate instruments for measuring the true volume and density of powders, foams and bulk solids. A wide range of sample cell sizes are easily interchanged to accommodate many different samples. Calibration, sample conditioning, operation of valves and calculation of results are completely automatic. Samples are quickly and automatically analyzed as many times as necessary to achieve the user desired % deviation from mean at the specified number of runs. Should the deviation setting be too narrow, the analysis terminates upon reaching an operator specified maximum number of runs. The results are printed automatically, freeing the operator to perform other laboratory tasks.

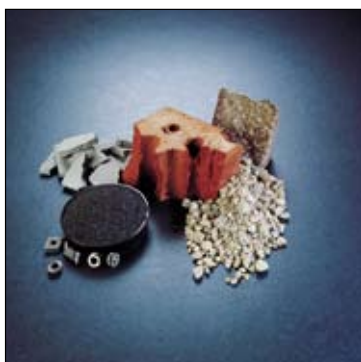
The **PENTAPYCNOMETER** permits up to five samples to be loaded and then purged simultaneously. Each of the five samples is then automatically analyzed in sequence with no operator involvement. Adjustable flow rates for each cell provide maximum flexibility of operation.

For laboratories with lower analytical throughput needs, the single sample station **ULTRAPYCNOMETER 1000** provides the same ease of operation and high performance as the **PENTAPYCNOMETER**.

- For measurements that require a fixed, known temperature, a temperature control operation is available for both the **ULTRAPYCNOMETER 1000** and the **PENTAPYCNOMETER**.
- For measurements in a hazardous environment, such as a nuclear “hot cell”, a remote operation **ULTRAPYCNOMETER 1000** is available.
- For measurement of foams, a specialized version called the **UltraFoam™** pycnometer is available. It is a system for automatic measurement of open and closed cell content with automatic functions for the analysis of cell compressibility and cell fracture according to ASTM D-2856.
- For measurements of extremely small amounts of material, the **Micro ULTRAPYCNOMETER** provides three interchangeable cell sizes of 4.5 cm³, 1.8 cm³ and 0.25 cm³.

Feature Benefits

- Automatic Functions -** Operating simplicity is achieved by user prompts or instructions which are automatically presented on the alphanumeric display. Measurements and printout of results are totally automatic. Continuous self-diagnostics monitor and signal fault conditions that may arise. The transducer is reset to zero prior to each run. Front panel LEDs display the operational status at all times.
- Sample Identification -** In the analysis parameters, alphanumerics may be added to uniquely identify the sample.
- Temperature Readout -** Sample temperature is displayed and printed to ± 0.1 °C. This feature is important for:
 (a) verifying operation at the calibration point or,
 (b) making corrections when analyzing larger quantities of materials whose density varies significantly with temperature.
- Target Pressure -** The measurement of pressure-deformable cellular foams (insulation) is made possible by this feature. A user can conveniently reduce the target pressure typically from around 18 psi to as low as 0.5 psi. A special version, the **UltraFoam™** pycnometer, automatically scans for the optimum pressure and performs calculations of open and closed cell content with or without ASTM correction for cut cells.
- Sample Purge -** Before analysis, samples are automatically conditioned to remove contaminants and trapped air. The user has a choice to purge by a *continuous flow* to prevent elutriation (blowing out) of fine particles, by a pulse mode more suitable for coarse powders or bulk solids. The **PENTAPYCNOMETER** purges all five stations simultaneously, thus requiring no more time than for a single analysis. The **ULTRAPYCNOMETER** has the added capability to purge the sample by vacuum for a “user selectable” time, (vacuum pump supplied separately).
- Repeat Run Mode -** This feature eliminates the need to reenter the same set of analysis parameters prior to each run. It allows one to quickly change sample weight and sample ID, or simply to rerun a sample by a double keystroke.
- Useful Statistics -** For three or more averaged measurements the % coefficient of variance and the standard deviation of the volume and the density are printed out. This allows a relative comparison of samples from run-to-run and a precise assessment of the absolute variation of the sample being measured.
- NIST Traceability -** Pycnometer volume calibration spheres can be provided with a formal Report of Calibration from the National Institute of Standards and Technology.
- Computer Software -** To capture printed output, automatic pycnometers are available with Windows® based PC software that provides disk storage (ASCII format) of data along with all user entered information. Archived files can be recalled for review, printing and importation to other programs.
- Balance Port -** Permits interface with configurable analytical balance for automatic transfer of sample weight. Eliminates risk of transcription error.



Powder Metals and Construction



Foams and Fibers



NIST traceable calibration spheres.



Quantachrome Instruments' corporate headquarters in Boynton Beach, Florida.

Quantachrome®

Renowned innovator of ideas for today's porous materials community.

For almost 40 years, Quantachrome's scientists and engineers have revolutionized measurement techniques and designed instrumentation to enable the accurate, precise, and reliable characterization of powdered and porous materials:

- Adsorption/Desorption Isotherms
- Surface Area Measurement
- Pore Size Distribution
- Chemisorption Studies
- Water Sorption Behavior
- Mercury Porosimetry
- True Solid Density
- Tapped Density

Not only are Quantachrome products the instruments of choice in academia, but the technology conceived and developed by our expert staff is applied in industrial laboratories worldwide, where research and engineering of new and improved porous materials is ongoing. Manufacturers also rely on porous materials characterization technology to more precisely specify bulk materials, to control quality, and to isolate the source of production problems with greater efficiency.

Quantachrome is also recognized as an excellent resource for authoritative analysis of your samples in our fully equipped, state-of-the-art powder characterization laboratory.



Quantachrome Instruments Application Laboratory.

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