

AUTOMATIC PYCNOMETERS

THE DENSITY ANALYSIS OF POWDERS,
FOAMS AND BULK SOLIDS



Quantachrome
INSTRUMENTS

QUANTACHROME

PENTAPYC 5200e

ULTRAPYC 1200e

GAS PYCNOMETRY

"Pycnometry" is derived from the Greek word puknos, 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 displacement and gas expansion (Boyle's Law).

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 0.2 nm. 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. Gas Pycnometers can even determine the percentage of solids in a slurry, or density of oil.

The PENTAPYC 5200e and the ULTRAPYC 1200e from Quantachrome are the ultimate instruments for measuring true volume and density. 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 can be printed automatically, freeing the operator to perform other laboratory tasks.

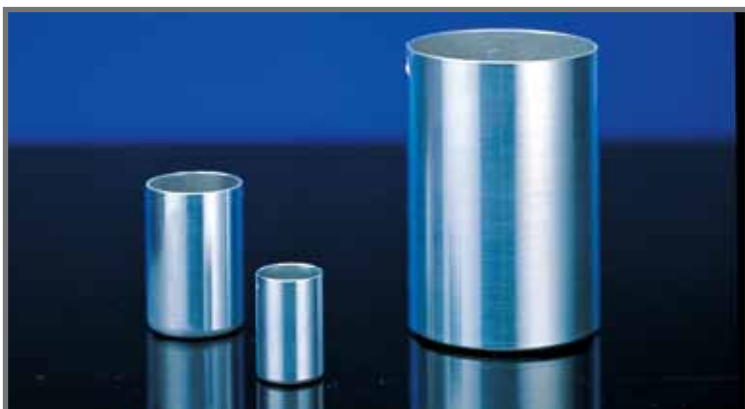
The PENTAPYC 5200e permits up to five samples to be loaded and then purged simultaneously. Each of the five samples is then automatically analyzed in sequence with no operator involvement. Adjustable flow rates for each cell provide maximum flexibility of operation.

For laboratories with lower throughput needs, the single sample station ULTRAPYC 1200e provides the same ease of operation and high performance as the PENTAPYC 5200e.

- For measurements that require a fixed, known temperature, a temperature control option (shown at left) is available for both pycnometers' - "T" version.
- For measurements in a glove box or other containment area, a remote operation ULTRAPYC 1200e is available.
- For measurement of foams, specialized versions called the ULTRAFOAM and PENTAFOAM are available for automatic measurement of open and closed cell content according to ASTM D6226 with automatic functions for the analysis of cell compressibility and cell fracture. Provided with Foam Cutting Kit (see left).
- For measurements of extremely small amounts of material, the MICRO-ULTRAPYC 1200e provides three interchangeable cell sizes of 4.5 cm³, 1.75 cm³ and 0.25 cm³ capacity.

Sample Cells	Nominal Volume	Internal Diameter	Internal Depth
Standard sample cells	135 cm ³	49 mm	75 mm
	50 cm ³	40 mm	39 mm
	10 cm ³	24 mm	23 mm
Optional Microcell	4.25 cm ³	15 mm	24 mm
Optional Mesocell	1.75 cm ³	13 mm	13 mm
Optional Nanocell	0.25 cm ³	8 mm	6.5 mm

All cells are available in stainless steel for durability (aluminum available). Non-elutriating cells are available for fine powders, and spools are available for films and fibers.



Calibration spheres



Temperature Controller

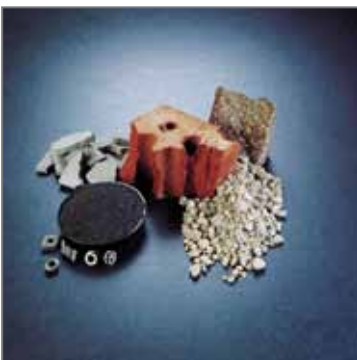


Foam Cutting Kit

Feature Benefits

- Automatic Functions -** Operating simplicity is achieved via PC and a standard web browser or via built-in keypad following prompts or instructions which are automatically presented on the alphanumeric display. Measurements and reporting of results are totally automatic. Continuous self-diagnostics monitor and signal fault conditions that may arise. The transducer is automatically reset to zero prior to each run. Front panel LEDs display the operational status at all times.
- Sample Identification -** In the analysis parameters, alphanumeric characters may be added to uniquely identify the sample, even from keypad.
- 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 2 psi. Special versions, the **ULTRAFOAM** and **PENTAFOAM** use optimum low pressure and perform 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* or, by a pulse mode suitable for powders. The **PENTAPYC 5200e** purges all five stations simultaneously, thus requiring no more time than for a single analysis. The **ULTRAPYC 1200e** 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. Greater simplicity and ease of operator is afforded when connected to a PC.
- Useful Statistics -** For three or more averaged measurements the % coefficient of variance and the standard deviation of the volume and the density are reported. 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.
- PC Connectivity -** Both Pycnometers feature USB connections to a PC and communication via a standard web browser. Analysis can be started and monitored from the PC, even remotely on a network. Reports can be accessed for analysis on the PC, or can be stored on an external USB flash / thumb drive.
- Balance Port -** Permits interface with configurable analytical balance for automatic transfer of sample weight. Eliminates risk of transcription error.

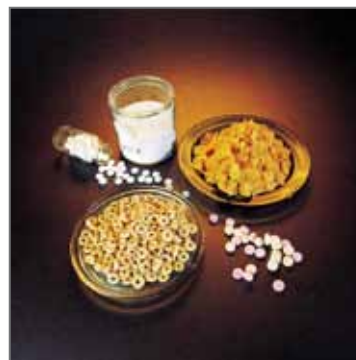
Some Applications



Powder Metals and Construction



Foams and Fibers



Foods and Pharmaceuticals



Catalysts and Ceramics



Quantachrome Instruments' corporate headquarters in Boynton Beach, Florida.

Quantachrome®

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

For over 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:

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- Surface Area Measurement
- Pore Size Distribution
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- True Solid Density
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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: LabQMC

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