

QUANTACHROME

# MANUAL PYCNOMETERS

THE DENSITY ANALYSIS OF POWDERS,  
FOAMS AND BULK SOLIDS



# Manual OPERATING SERIES

## 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 ( $10^{-10}\text{m}$ ). Its behavior as an ideal gas is also desirable. Other gases such as nitrogen can be used, often with no measurable difference.

### Applications

Pycnometers are currently used for research and quality control in such diverse industries as ceramics, catalysts, filters, nuclear fuels, petrochemicals, soils, fertilizers, carbon blacks, charcoals, fibers, minerals, pharmaceuticals, cosmetics, cement, powdered food, desiccants, powdered metals, ion exchange resins, silica, alumina, titania, rigid foams and many others.

### General Information

The **STEREOPYCNOMETER** and the **MULTIPYCNOMETER** are manually operated instruments. They are designed to measure the true volume of powders and other solid materials. From this volume, density is easily determined by dividing into the weight of the sample. All models feature a digital display and fine adjustment controls for both pressurization and venting rates. A complete density analysis can be done in as little as a minute.

An optional RS232 port and PC software provides storage of calibration data, data capture and calculation of volume and density with average and standard deviation.

## STEREOPYCNOMETER



### Stereopycnometer

The **Stereopycnometer** is the standard model of the series of manually operated pycnometers. It offers a choice of two interchangeable sample cells used in conjunction with a single reference volume.

A sample is placed in the sample cell and degassed by purging with a flow of dry gas, by vacuum, or by a series of pressurization cycles. The standard analysis is performed by pressurizing the sample cell to approximately 17 psi and recording the value. The selector valve is rotated so the gas expands into the reference or added volume and that lower pressure is recorded. From these two readings, the sample volume can be quickly and accurately calculated.

If samples are compressible foams, the cell-to-reference pressure sequence of the **Stereopycnometer** is the preferred method over that employed by the **Multipycnometer**.

### Features

- Sample size range from  $5\text{ cm}^3$  to  $135\text{ cm}^3$ .
- Two interchangeable sample cells.



NIST traceable calibration spheres.



Foods and Pharmaceuticals



Catalysts and Ceramics

## MULTIPLYCNOMETER



### Multipycnometer

The **Multipycnometer** is the most versatile model. It gains its name from its multiple volume feature that offers three sizes of interchangeable sample cells: 135 cm<sup>3</sup>, 20 cm<sup>3</sup>, 4.5 cm<sup>3</sup>. In addition, there are three different calibrated reference volumes which provide peak performance for each cell size. The operating sequence is reversed from that of the **Stereopycnometer**, that is, pressurizing the reference volume first, then expanding the gas into the sample cell. This arrangement minimizes dead volume in the sample chamber leading to increased accuracy on measurement of small samples.

The wide operating range of the **Multipycnometer** offers the greatest sample size flexibility in the series, while still maintaining its high degree of accuracy.

### Features

- Sample size range from 0.5 cm<sup>3</sup> to 135 cm<sup>3</sup>.
- Three interchangeable sample cells.
- Three matching reference volumes.



Powder Metals and Construction



Foams and Fibers

## SPECIFICATIONS

### Manually Operated Gas Pycnometers

**Gas Recommendations:** Ultrahigh purity compressed gas with outlet pressure of 20 PSIG. Helium is standard. Nitrogen or SF<sub>6</sub> are alternate gases for helium permeable materials.

**Precision:** Digital pressure display resolution of 0.001 pounds per square inch (psi).

**Accuracy:** Better than 0.2% (when properly prepared, thermally equilibrated, and sample occupies greater than 75% of nominal sample cell volume).

**Calibration:** Metal spheres provided by cell size:  
4.5 cm<sup>3</sup> Cell: 2 spheres, 1.0725 cm<sup>3</sup> each  
135 cm<sup>3</sup> Cell: 1 sphere, 56.5592 cm<sup>3</sup>

**Options:**

- N.I.S.T. certification of a sphere diameter.
- RS232 port with PC software in English and German language.
- Non-elutriating cells for fine powders.
- Stainless steel cells for durability.
- Fiber/film winding spool. Fits 20 cm<sup>3</sup> cell.

**Physical:**

Weight	10.9 kg / 24 lbs.
Width	30 cm / 11.8"
Depth	47 cm / 18.5"
Height	18 cm / 7.1"

**Power:** • 100/240 V; 50/60 Hz

Sample Cells	Volume	Diameter	Length
Standard sample cells	135 cm <sup>3</sup>	5.05 cm	7.55 cm
	20 cm <sup>3</sup>	2.54 cm	3.81 cm
Multipycnometer only	4.5 cm <sup>3</sup>	1.66 cm	2.54 cm
Optional film/fiber winding spool	n/a	2.54 cm	2.54 cm
	n/a	1.67 cm	2.40 cm

All cells are available in stainless steel for durability.  
Non-elutriating cells are available for fine powders.





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:

- 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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Quantachrome Instruments' quality management system is certified to be in accordance with ISO9001:2000.

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# Quantachrome

INSTRUMENTS

Serving Porous Materials and Powder Characterization Needs Since 1968



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