

mi M I C R O M E R I T I C S

SediGraph III *PLUS*

Particle Size Analyzer



www.micromeritics.com

IMPROVEMENTS TO A CLASSIC TECHNIQUE

SediGraph® III PLUS

Particle Size Analyzer

Proven Technique and Reliability

For over four decades, the Micromeritics SediGraph has remained the standard instrument for particle size analysis in many laboratories throughout the world. Whether in a rugged production environment or a controlled laboratory setting, the SediGraph continues to produce accurate results with superior reliability. Particle size distribution is measured using the sedimentation method. Particle mass is measured directly via X-ray absorption. By measuring the rate at which particles fall under gravity through a liquid having known properties as described by Stokes' Law, the SediGraph determines the equivalent spherical diameter of particles ranging from 300 to 0.1 micrometers.

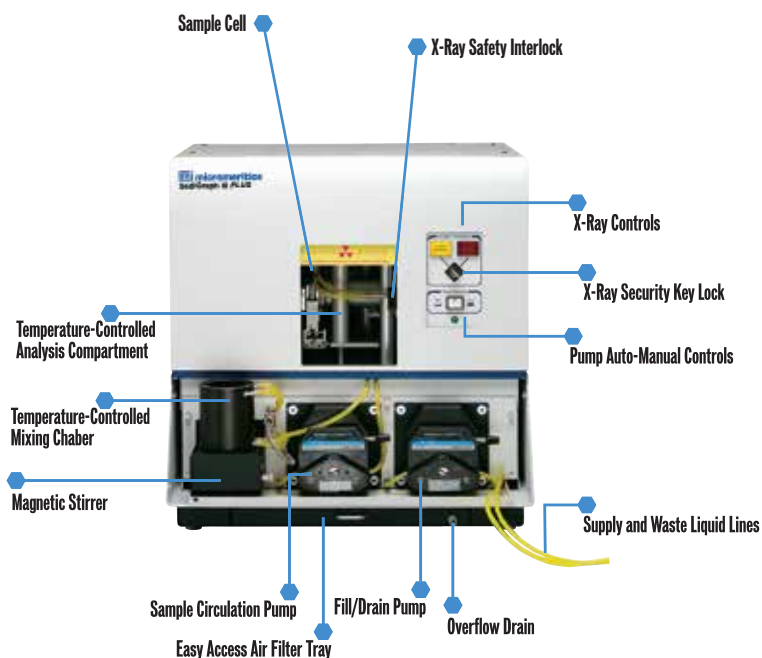
The new generation SediGraph III Plus combines this proven technique with enhanced technology to deliver reproducible and highly accurate particle size information, completing most analyses in minutes.

Intelligent Design Features

The SediGraph III Plus offers advanced instrumentation features that ensure measurements are repeatable and easy to perform. These features make it easier to operate and maintain the instrument. Results can be reliably reproduced by SediGraphs in other locations.

Design features include:

- **High-precision x-ray tube with a lifetime warranty (Seven Years)**
- Utilization of a simplified pumping system ensures fast and easy maintenance
- Low noise level makes for a quieter working environment
- A maintenance reminder, based on the number of analyses performed, alerts you when it is time for routine maintenance
- Computer-controlled mixing chamber temperature improves repeatability and reproducibility
- Windows®-operating software with Ethernet connectivity provides point-and-click selection, networking, printer selection, cut-and-paste, and much more
- A versatile reporting system provides a wide range of custom data presentation options and includes particle settling velocity and grain size in Phi units

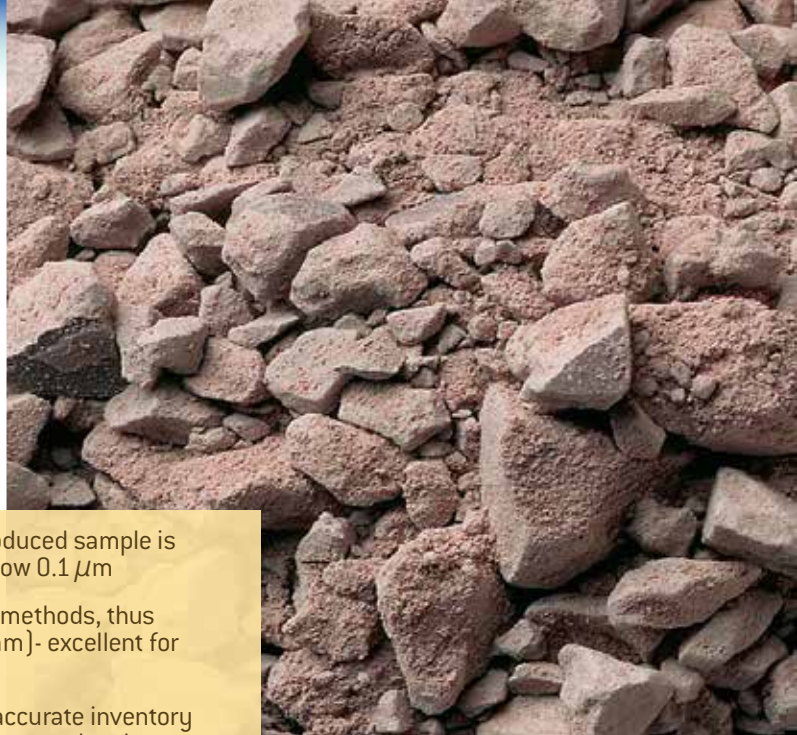


SediGraph III Plus

Particle Size Analyzer

MULTIPLE BENEFITS

- Complete particle accountability assures that all of the introduced sample is accounted for, including any fraction above 300 μm and below 0.1 μm
- Capability to merge data with that from other particle sizing methods, thus extending the range of reported data to 125,000 μm (125 mm)- excellent for geological applications
- Scanning the sedimentation cell from bottom to top allows accurate inventory of fast-settling particles while minimizing the time required to resolve the separation of fine particles
- Fully automatic operation increases sample throughput and reduces operator involvement in addition to reducing the opportunity for human error
- Temperature-controlled analyses assure that liquid properties remain constant throughout the analysis so you can be confident of accurate results
- Multiple analysis speeds allow you to choose the desired combination of speed and resolution that meets your needs
- Real-Time display allows you to monitor the cumulative mass plot of the current analysis and to make immediate procedural decisions if needed
- Statistical process control (SPC) reports track the performance of your process- es allowing immediate response to fluctuations
- Plot overlays provide a visual comparison of analysis results from one or more analyses; a reference or baseline analysis, for example, or a superposition of two different types of plots of the same analysis data
- Data comparison plots provide graphical displays of the mathematical difference between two data sets (difference from reference plot) or the extent of a data point value above or below a tolerance boundary (out of specification plot)
- Multiple analyzer control allows two SediGraphs to be operated simultaneously from a single computer, conserving valuable lab space and making data storage convenient



VERSATILE DATA PRESENTATION AND REPORTING SYSTEM

The SediGraph III Plus is equipped with a versatile, easy-to-use user interface that provides all of the convenient features you expect from a Windows-based program. These features include point-and-click menus, customizable reports with your laboratory logo graphic, editable graphs, cut-and-paste graphics and tables, data export features, and more. Custom protocols help plan, launch, and control the analysis and assure that subsequent analyses are all performed in the same manner, regardless of the skill of the operator. You can collect, organize, archive and reduce raw data, and store standardized sample information and analysis conditions for easy access during later applications. Finished reports may be generated to screen, paper, or transferred in a variety of formats to storage devices.

Data Reporting

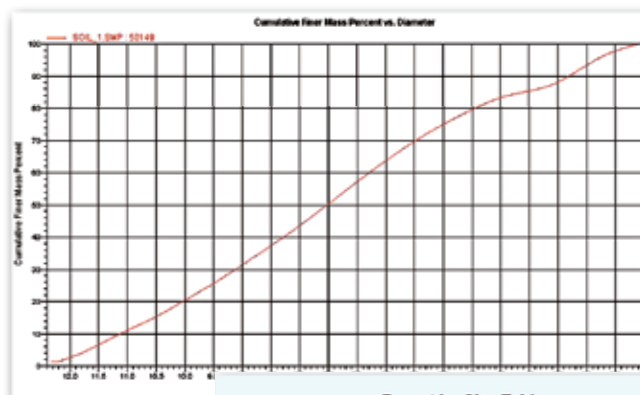
Detailed analysis data for particles ranging from 300 to 0.1 μm are provided automatically by the SediGraph III Plus. Data collected from other particle size analyses ranging from 125,000 to 300 μm can be combined with SediGraph data, enabling effective reporting for particles ranging from 125,000 to 0.1 μm .

In addition to tabular data, different graphical analysis plot types are available including:

- Cumulative Mass, Area, and Number
- Settling Velocity Distribution
- Process Control Charts
- Log Probability
- Baseline/Full Scale References
- Frequency Distribution
- Difference From Reference
- Out of Specification
- Rosin-Rammler
- Regression Analyses

Plots can be overlaid for comparing the results from different samples or for comparing different plot types from the same sample. This allows you to compare analysis results to a standard. Plots can be rescaled to give you the ability to scrutinize closely your graphical data.

A column has been added to the tables and to the x-axis selection in the graphs that reports size in Phi units, where $\Phi = -\log_2$ [particle diameter in mm]. Also, a column selection for settling velocity (cm/s) is available for tables. The x-axis of plots can be scaled in particle size or settling velocity.



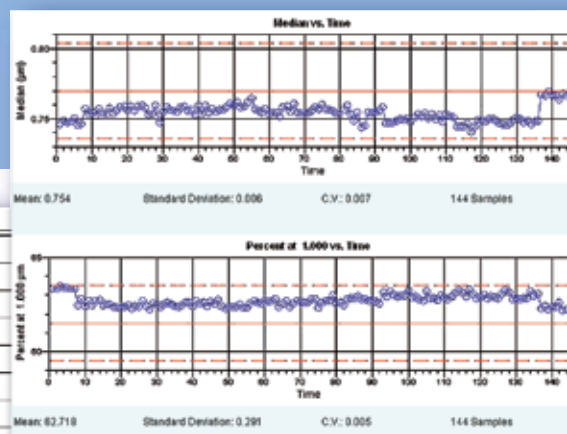
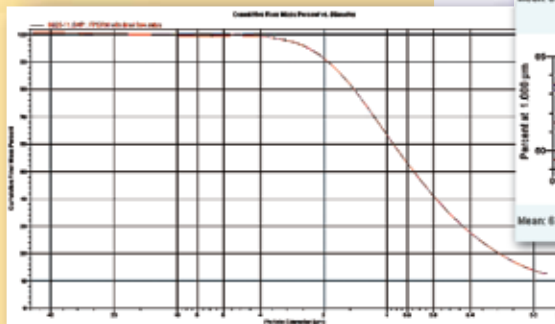
| Report by Size Table | | | | |
|----------------------|-------------------|------------------|---------------------------------|--------------------------|
| High Diameter (μm) | Low Diameter (μm) | Low Diameter (φ) | Cumulative Mass Finer (Percent) | Settling Velocity (cm/s) |
| 250.0 | 200.0 | 2.322 | 51.2 | 4.79129 |
| 200.0 | 150.0 | 2.737 | 43.3 | 2.69510 |
| 150.0 | 100.0 | 3.322 | 38.4 | 1.19782 |
| 100.0 | 80.00 | 3.644 | 33.2 | 0.76661 |
| 80.00 | 60.00 | 4.059 | 30.2 | 0.43122 |
| 60.00 | 50.00 | 4.322 | 27.9 | 0.29946 |
| 50.00 | 40.00 | 4.644 | 24.5 | 0.19165 |
| 40.00 | 30.00 | 5.059 | 19.7 | 0.10780 |
| 30.00 | 25.00 | 5.322 | 15.7 | 0.07486 |
| 25.00 | 20.00 | 5.644 | 7.3 | 0.04791 |
| 20.00 | 15.00 | 6.059 | 4.5 | 0.02695 |
| 15.00 | 10.00 | 6.644 | 3.5 | 0.01198 |
| 10.00 | 8.000 | 6.966 | 2.9 | 0.00767 |
| 8.000 | 6.000 | 7.381 | 2.2 | 0.00431 |
| 6.000 | 5.000 | 7.644 | 1.9 | 0.00299 |
| 5.000 | 4.000 | 7.966 | 1.5 | 0.00192 |
| 4.000 | 3.000 | 8.381 | 0.9 | 0.00108 |
| 3.000 | 2.000 | 8.966 | 0.0 | 0.00048 |

Tabular report and cumulative mass finer versus phi plot for soil sample

SPC Reporting and Regression Analyses

Statistical Process Control (SPC) reporting provides an easy method for continuously monitoring production processes and reducing response times to deviations from the standard. Regression analyses allow you to determine the relationship between a control parameter, for example, and a measured characteristic of the sample. Select from 26 axis variables including:

- Mean
- Mode
- Median
- Size at (percentile)
- Standard Deviation
- Coefficient of Variation
- $-N\sigma$ Size
- $+N\sigma$ Size
- Skewness
- Kurtosis
- Specific Surface Area
- Cumulative Percent at Size
- Percent Out of Specification
- Full Scale Scan Pump Speed
- MasterTech Stirrer Speed
- MasterTech Stirrer Time
- MasterTech Ultrasonic Probe Time
- Particle Density
- Liquid Viscosity
- Liquid Density
- Three User-defined (External) Parameters



Cumulative mass finer versus diameter plot and SPC control chart for fine calcium carbonate sample

The MasterTech™ 052 Autosampler

The MasterTech 052 Autosampler provides assurance that samples are prepared and analyzed exactly the same way, every time. The MasterTech is designed to increase throughput, repeatability, and reproducibility while reducing operator involvement. Up to 18 samples can be queued to run sequentially and completely unattended, including automatic stirring or sonication prior to transfer to the analysis system. The SediGraph's operating software controls the MasterTech, and information about dispersion is stored in the sample file for future reference.

The MasterTech features a powerful ultrasonic probe for sample redispersion. Power to the probe tip is adjustable and the driving circuit is self-tuning for maintaining efficient and consistent sonic energy levels. A front-panel digital readout lets you know when the desired power is reached, and that same power is applied each time the method is repeated. The SediGraph III Plus is designed to accommodate the MasterTech on top of the analytical unit, thus conserving valuable bench space.



SediSpense®

Homogeneous sample dispersion is crucial for obtaining accurate and reproducible results in any particle size study. Micromeritics produces a complete line of SediSpense dispersing liquids specifically designed to maximize particle suspension and eliminate agglomeration of particles. SediSpense liquids are available in nine variations of aqueous and organic formulations and are effective in dispersing most materials.

Applications

Ceramics: The size range of particles and the distribution of mass in each size class strongly affect the ability to sinter a ceramic powder and its forming properties as well as the pore size distribution in the finished product. Particle size distribution information helps to determine curing and bonding procedures, control pore structure, ensure adequate green body strength, and produce a final product of desired strength, texture, appearance, and density.

Metal Powders: By controlling particle size, very specific pore characteristics can be designed into a product. Porosity characteristics often are the key to product performance. Similar to ceramics, the particle size distribution is critical to green body and final product strength and density.

Geological/Soil Science: Grain Size affects the moisture-holding capacity of soil, drainage rate, and the soil's ability to hold nutrients. Grain size is directly related to transport of sediment.

Cosmetics: The appearance, application, and packaging of cosmetics are influenced by the particle size distribution of base powders, such as talc, and the pigments used for coloring.

Pigments: Particle size alone can affect the tinting strength of a color. As tinting strength goes up, the quantity of pigment needed to produce required color intensity goes down. The particle size affects the hiding power of the paints. Also the particle size distribution influences gloss, texture, color saturation and brightness.

Catalysts: Particle size affects the catalytic activity of a metal for structure-sensitive catalytic reactions.

Construction Materials: Particle size of cement affects setting time and strength characteristics of finished concrete and cement.

Minerals and Inorganic Chemicals: Reactivity of materials is dependent upon exposed surface area and thus particle size distribution.

Abrasives: A properly balanced size distribution of abrasive grains and powders is a fundamental consideration whether the material is to be used in slurries, dry blasting, or bonded abrasive tools. Uniform particle size assures precise flow rates through blast machines and is a critical determination in media management when recycling the abrasive material.



Specs

| | |
|---------------------------------|---|
| Particle Diameter Range: | 300 to 0.1 micrometers Equivalent Spherical Diameter |
| Wetted Materials: | Stainless steel, Teflon® impregnated anodized aluminum, nickel plated aluminum, nylon, polypropylene, polystyrene, Tygon® and Pharmed® tubing, tungsten carbide, Ertalite®, Viton®, Buna-n, and epoxy |
| Sample Size: | 50 mL of dispersed sample - precise concentration is not required |
| Suspending Liquids: | Any liquid compatible with sample cell materials and not highly absorptive of Xrays [typical liquids are water, glycols, mineral oils, SediSpense®, and alcohols] |
| Power Requirements: | 85 to 264 VAC, 47/63 Hz, 450 VA |
| Temperature: | Ambient +10 to 40 °C, operating; -10 to 55°C, storing or shipping |
| Humidity: | 20 to 80% (non-condensing) |
| Miscellaneous: | ISO 9001 manufacturer CE certified |
| Physical: | Height: 52 cm [20.5 in.] Width: 50.5 cm [20 in.] Depth: 58 cm [23 in.] Weight: 43 kg [95 lbs] |

To request a quote or additional product information, visit Micromeritics web site at www.micromeritics.com, contact your local Micromeritics sales representative, or contact Micromeritics Customer Service Department at (770) 662-3636.

HEADQUARTERS

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