

SediGraph 5100

Particle Size Analyzer



THE COMPANY Behind the Product

Reputation

Micromeritics has earned a reputation for manufacturing only high-quality products in the field of particle technology and for the high level of support we provide to users of our products.

Experience and Stability

Micromeritics has been manufacturing particle technology instrumentation for over 35 years. We have grown to be one of the world's largest manufacturers dedicated exclusively to the field of particle technology instrumentation, and we continue to grow. We have a long, proud history and are well prepared for the future.

Expertise of Staff

Micromeritics employs a staff of research and applications scientists who both publish in the field of particle technology and support our users in making their own contributions. Our scientific staff includes Ph.D. and Masters level practitioners who have extensive experience in their respective fields including physical adsorption, chemical adsorption, particle sizing, and materials sciences.

Support Network

Micromeritics has a worldwide network of over fifty direct offices and distributor offices staffed with personnel trained in applications and service support. This is our "front line" of support. Behind them is the corporate staff of Micromeritics experts. Operations, applications, and service support are available by phone, fax, and e-mail, and more likely than not, in the local language.

High Quality Data

Micromeritics instruments are known for producing reliable, high-quality measurements. We stand firmly behind our published specifications and will gladly demonstrate the performance of our products by way of an evaluation analysis on the sample of your choice.

Dedication to Quality

Micromeritics is certified under the International Organization for Standardization and meets all requirements under ISO 9001 for quality management and quality assurance standards. Our instruments also meet the CE safety requirements of the European community.

Award-Winning Performance

Micromeritics is the recipient of numerous awards and recognition for product innovations. Not only do we have an impressive array of product awards, we also have been awarded recognition for industry support and for the exceptional quality of our operator manuals.

Micromeritics boasts a long track record of commitment to the development and support of high-quality, high-performance products. In December 1969 Micromeritics introduced its first particle size analyzer, the SediGraph 5000. Over the next 20 years, the SediGraph 5000 earned a reputation for accurate and reliable operation. It became a standard instrument in many materials analysis laboratories around the world. Since then, technology has advanced rapidly and today's SediGraph 5100 is a modern, fully automated particle size analyzer capable of handling the heavy work loads found in quality control laboratories. It is the analyzer chosen by companies throughout the world when accurate mass distribution by particle size analysis is crucial to their products or raw materials they purchase. The SediGraph 5100 is the instrument many quality assurance managers and materials researchers rely on day after day to provide the information needed to deliver the very best product possible.

The SediGraph 5100 determines particle size distribution using the sedimentation method. This method is firmly established as one of the most accurate and fundamental techniques for particle size analysis. The SediGraph measures particle mass directly using x-ray absorption, completing most analyses in 15 minutes or less. By measuring the rate at which particles fall under gravity, through a liquid having known properties as described by Stokes' Law, the SediGraph 5100 determines the equivalent spherical diameter of particles ranging from 300 to 0.1 micrometers. The SediGraph relies on parameters such as density and viscosity that are easy to obtain and simple to enter.



Operation

The SediGraph 5100 automatically controls the temperature of the particle and sedimentation liquid mixture with heaters located in the mixing chamber and the analysis compartment. Self-contained plumbing, circulation pumps, and a mixing chamber for moving the sample facilitate accurate temperature control of the sample and dispersion liquid. This assures that the viscosity and density of the dispersing liquid remain constant throughout the analysis cycle, resulting in greater accuracy and reproducibility of results. Most analyses are performed at or near 35°C; however, the temperature can be raised to reduce the viscosity of the dispersant to a desired level. Separate peristaltic pumps control the sample suspension and the loading and unloading of the sample cell contents.

Sedisperse®

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

MasterTech

For completely automated SediGraph analyses add the MasterTech 051, an autosampler designed specifically for the SediGraph 5100. The MasterTech 051 holds up to eighteen samples and has a built-in ultrasonic probe and stirrer for redispersing previously dispersed samples. It automatically redisperses and moves the sample to the SediGraph as required in the analysis protocol specified by the operator. It has been found that combining the MasterTech 051 with the SediGraph 5100 actually increases the accuracy and reproducibility of results. This is due to the elimination of operator variability in preparing and delivering each sample for analysis. The MasterTech redisperses each sample just prior to analysis exactly the same way every time, assuring uniform sample delivery.

Operating Software

The SediGraph 5100 features powerful, Windows™-based operating software. It provides the convenient easy-to-use features of

Windows such as point-and-click menus, access to multiple printers and networks, multitasking capability, and much more. The Instrument Schematic Window displays the instrument's internal operations throughout the automated analysis. Manual mode allows this window to be used for easy point-and-click manual operation of the valves, pumps, sample cell, and optional MasterTech 051 Autosampler. The Analysis Status Window provides real-time display of the time remaining, cell temperature, X-ray counts, mass percent or mass fraction, and diameter so decisions about process changes can be made as soon as deviations from the standard are observed.

With the SediGraph 5100 software, the operator simply enters the sample and analysis parameters to start the analysis, the rest is performed automatically. Analysis conditions, liquid properties, and report options can all be saved as parameter files for use with future samples to make analysis preparation and start-up even faster. With the Windows software, as many as four SediGraph 5100s or other Micromeritics analyzers can be operated from a single computer and the status of all four units can be monitored on a single screen. This feature saves valuable lab space, reduces operator labor, eliminates the cost of multiple computers, and makes data consolidation simple. The number of sample files that can be stored is limited only by the amount of available disk space on the controlling computer or its network. A library of liquid properties is included in the standard program to allow greater flexibility in analysis liquid choices. Built-in help information makes learning and using the SediGraph 5100 very easy. Network access is readily available for integrating analyzers and data files into a Laboratory Information Management System (LIMS). The networking capability also makes it possible for analyses to be started and controlled from other networked computers or by using remote communications software. Data are easily exported into spreadsheet, word processing, and database programs. An analysis log is provided for monitoring the number of analyses per shift, when baselines were performed, and when reference materials were analyzed.

Data Reporting

Detailed analysis data for particles ranging from 300 to 0.1 micrometers in diameter are provided automatically by the SediGraph 5100 system. Data collected from other types of particle size analyses, in the 125,000 to 300 micrometers range, can be combined with SediGraph data enabling effective reporting for particles ranging from 125,000 to 0.1 micrometers.

B E N E F I T S

- ♦ Fully Automatic Operation increases sample throughput and reduces operator labor in addition to reducing the opportunity for human error.
- ♦ Windows Operating Software provides point-and-click selection, networking, printer selection, and much more.
- ♦ Temperature-Controlled Analysis allows you to set the temperature of the dispersing liquid and maintain that temperature throughout the analysis.
- ♦ Multiple Analysis Speeds allow you to choose the right combination of speed and resolution to meet your needs.
- ♦ Statistical Process Control (SPC) Reports allow you to track the efficiency of your processes and respond immediately to fluctuations.
- ♦ Real-Time Display allows you to monitor the cumulative mass plot of the current analysis and make immediate procedural decisions when needed.
- ♦ Plot Overlays allow you to compare analysis results directly with the results of product standards or other analysis results.
- ♦ Complete Particle Accountability improves the quality and accuracy of analysis data since all particles in the sample cell are accounted for, even the smallest.
- ♦ Multiple Analyzer Control allows you to operate up to four Micromeritics analyzers simultaneously from a single control module, conserving valuable lab space.
- ♦ CE Approved for shipments to the European community.
- ♦ Most samples can be analyzed in 15 minutes or less.



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

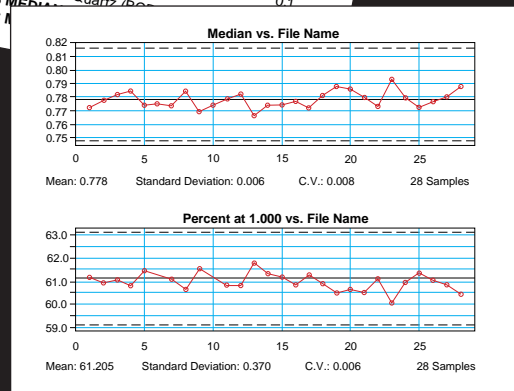
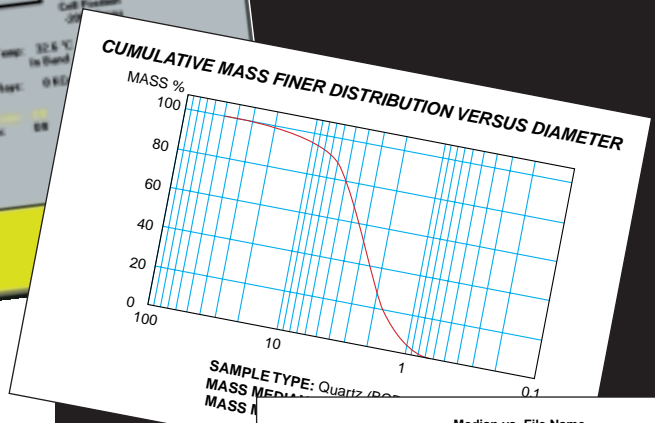
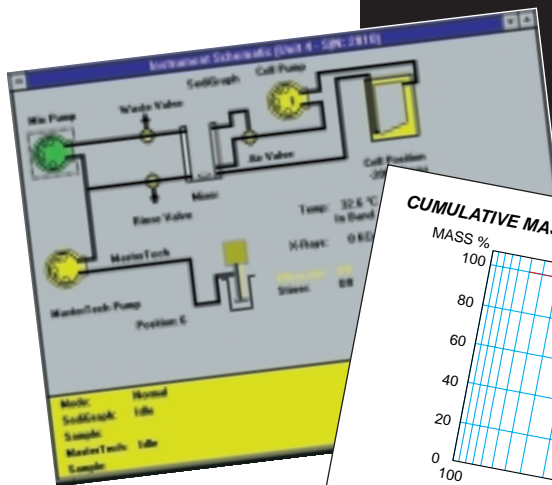
- ◆ Cumulative Percent
- ◆ Cumulative Area
- ◆ Cumulative Number
- ◆ Log Probability
- ◆ Baseline/Full scale
- ◆ Frequency
- ◆ Difference From Reference
- ◆ Out of Specification
- ◆ Rosin-Rammler

Plots can be overlaid for comparing the results from different samples or comparing different plot types from the same sample. This is especially convenient for rapidly comparing analysis results to a standard. Plots can also be rescaled when graphical data need to be more closely scrutinized.

SPC Reporting

Statistical Process Control (SPC) reporting is provided with the SediGraph 5100 operating program. SPC reports provide an easy method for continuously monitoring production processes and reducing response times to deviations from the standard. The following SPC axis variables are provided:

- ◆ Mean
- ◆ Mode
- ◆ Median
- ◆ Size at (percentile)
- ◆ Standard Deviation
- ◆ MasterTech Stirrer Speed
- ◆ Liquid Density
- ◆ Coefficient of Variation
- ◆ -N σ Size
- ◆ +N σ Size
- ◆ Skewness
- ◆ Kurtosis
- ◆ Specific Surface Area
- ◆ Cumulative Percent at Size
- ◆ Parameter n
- ◆ Max. Scale Pump Speed
- ◆ MasterTech Stirrer Time
- ◆ Particle Density
- ◆ Liquid Viscosity
- ◆ Percent out of Specification
- ◆ Plus three user-specified parameters



With the SPC program, quality control managers can continuously monitor production processes over time and make process or material changes based on the results.

so the dispersant viscosity remains constant at the desired level.

ose outside the analysis range.

able lab space and making data storage very convenient.

The 5100 has a Windows interface that makes it possible to achieve accurate results with informative and easy-to-understand graphics.

In addition to the standard variables, SPC reporting permits up to three user-specified parameters such as mill time and mill speed.

Applications

Since its introduction in 1969, the SediGraph has been used to analyze thousands of different types of samples. Even under the most demanding conditions, the SediGraph 5100 has established a reputation for reliable and accurate operation. The following is a sample of the more common applications for the SediGraph 5100:

Abrasives

Aluminum Oxide
Emery
Flint
Garnet
Iron Oxide
Silicon Carbide
Titanium Carbide

Pigments

Barium Sulfate
Cobalt Aluminate
Copper Hydroxides
Calcium Carbonate

Chromium Oxides
Kaolin
Lead Oxides
Nickel Titanium
Titanium Dioxide

Metal Powders

Aluminum
Copper
Gold
Iron
Molybdenum
Palladium
Platinum

Ruthenium
Silver
Stainless Steel
Tantalum
Tungsten

Metal Oxides

Copper Oxides
Manganese Oxide
Magnesium Oxide
Iron Oxide
Nickel Oxide
Ruthenium Dioxide
Uranium Dioxide
Vanadium Oxide
Zinc Oxide
Zirconium Oxide

Minerals

Andalusite
Barite
Bauxite
Borax

Clays
Dolomite
Fluorspar
Galena
Gypsum
Hydroxyapatite
Kaolin
Kyanite
Limestone
Marble
Mica
Potash
Pyrite
Shale
Silica
Soils
Sulfur
Talc
Uraninite
Wollastonite
Zircon

Serviceability

A variety of service tests are included in the operating program. A Micromeritics service technician can guide you through performing these tests. If you have a modem, the service technician

can communicate directly with the instrument by telephone. The tests include: photomultiplier system linearity tests, x-ray scan tests, temperature profile tests, and slit profile tests.

S P E C I F I C A T I O N S

Particle Diameter Range

300 to 0.10 micrometers equivalent spherical diameter

Resolution

The sedimenting sample is scanned in a narrow beam of less than 0.2% of the total distance scanned, permitting high resolution.

Wetted Materials

Stainless steel, Teflon® impregnated alumina/aluminum, polypropylene, polystyrene, Tygon® tubing, or PharMed™

Sample Size

80 ml of dispersed sample; precise concentration is not required

Suspending Liquids

Any liquid compatible with sample cell materials and not highly absorptive of x-rays (typical liquids are water, glycols, mineral oils, alcohols, and Sedisperse)

Humidity

Up to 90% relative (non-condensing); 20 to 80% for control module and components

Electrical

Voltage: 85 to 264 VAC
Frequency: 47 to 63 Hz
Power: 450 VA

Physical

Height: 43.2 cm (17 in.)
Width: 40.0 cm (15¾ in.)
Depth: 49.5 cm (19½ in.)
Weight: 32.7 kg (72 lbs)

In keeping with a policy of ongoing product improvement, specifications are subject to change without notice.

Teflon is a registered trademark of E.I. DuPont deNemours and Co., Inc.
Tygon is a registered trademark and PharMed is a trademark of Norton Co.
Sedisperse is a registered trademark of Micromeritics Inst. Corp.
Windows is a trademark of Microsoft Corp.

MICROMERITICS. SETTING THE PACE WORLDWIDE

Micromeritics has more than a quarter-century of experience in providing innovative products to the particle technology marketplace.

Instrumentation developed by Micromeritics has received awards for design excellence on numerous occasions. Our instruments are chosen as the standard of performance by many multi-national corporations. As a result of this, Micromeritics is pleased to provide products and product support to customers around the globe. The driving force of our Company is to develop and support high-quality, high-performance instrumentation of unmatched accuracy and utility, never losing sight of the primary importance of satisfying the needs of our customers.

Micromeritics maintains a high level of interest in the needs of the many industries it serves and aggressively responds to these needs. It is this response that firmly establishes Micromeritics as one of the world's leading suppliers of particle technology instruments.

 **micromeritics®**

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