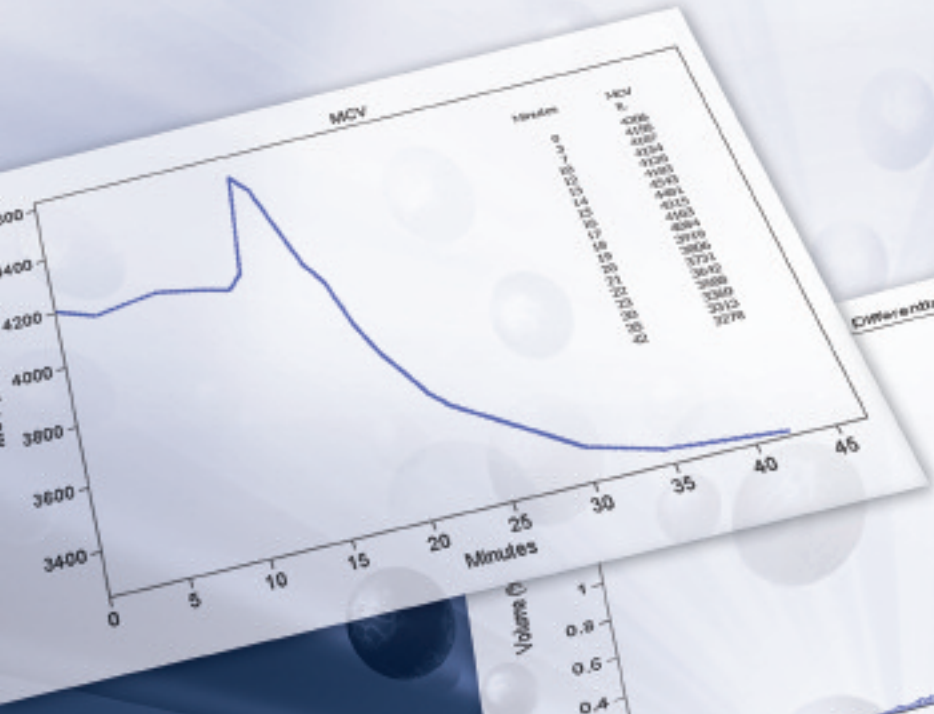
BECKMAN COULTER

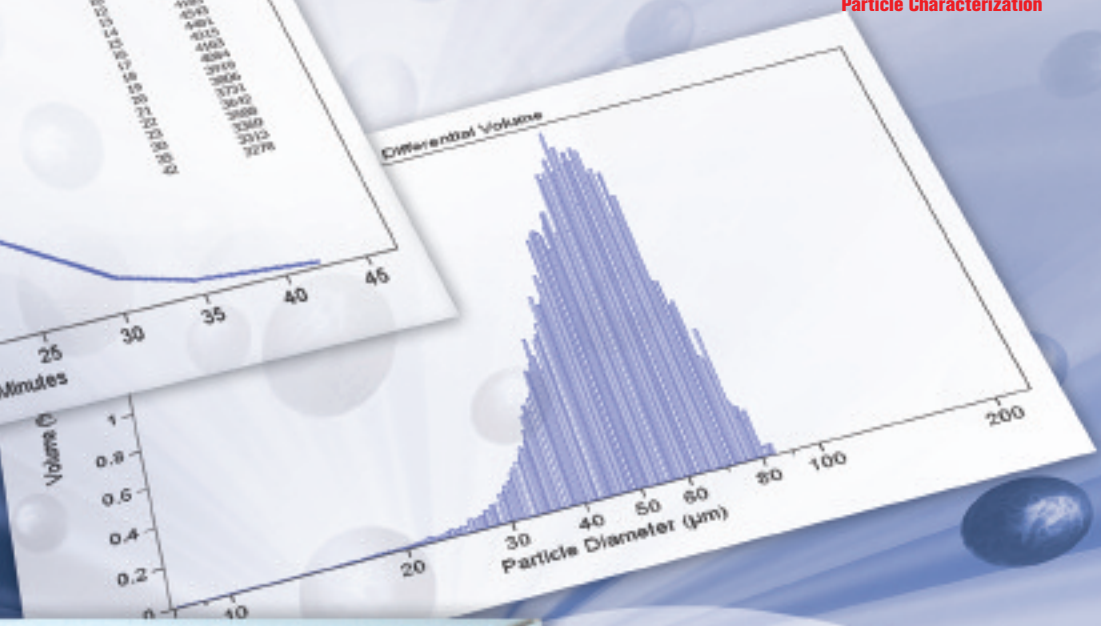
One of the highest resolutions

for particle sizing and counting.

Multisizer 3 COULTER COUNTER

Blood Banking
Capillary Electrophoresis
Cell Analysis
Centrifugation
Genomics
Lab Automation
Lab Tools
Particle Characterization





Real-Time Analysis

Digital Pulse Processor

High Resolution

Versatile and Accurate

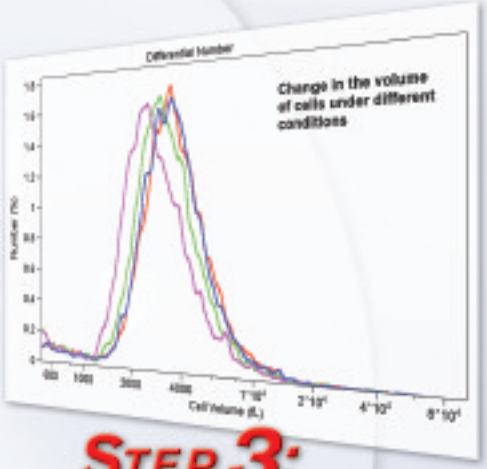
Easy to Use

BR-10052B

Introducing The Multisizer

The most versatile and accurate particle sizing and counting analyzer available today. Using the Coulter Principle, also known as ESZ (Electrical Sensing Zone), the Multisizer 3 COULTER COUNTER provides number, volume, mass and surface area size distributions in one measurement, with an overall sizing range of 0.4 µm to 1,200 µm. Its response is unaffected by particle color, shape, composition or refractive index. The Coulter Principle is the absolute leading technology in high resolution and accuracy and it is further enhanced in the Multisizer 3 by using a Digital Pulse Processor (DPP). You will get the ultra-high resolution, multiple channel analysis and accuracy not provided by any other technology. It all makes the Multisizer 3 indispensable for any industrial or life science research project involving sizing and/or counting. Equally a powerful tool for quality control, it provides the analyst with a system which is easy to use, yet so technologically advanced that it is able to solve most particle sizing problems.

Achieving the highest resolution and accuracy for sizing and counting is as easy as ...



STEP 1: Prepare sample and select user defined SOP.

STEP 2: Run the sample.

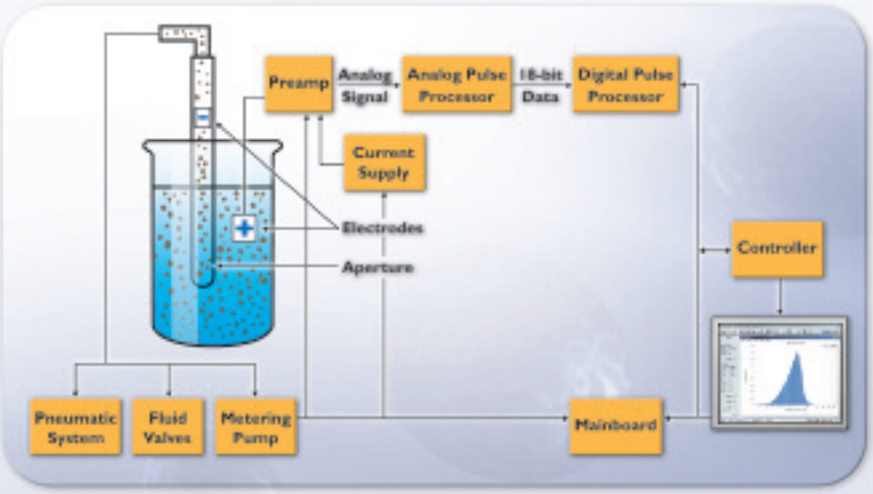
STEP 3: Review results in seconds.

Applications and Industries

Abrasives *Bacteria* *Biomedical* *Biotechnology*
Construction Industry *Cell Biology* *Ceramics*
Chromatographic Material *Clays* *Cosmetics* *Crystals*
CMP Environmental *Emulsions* *Electronic Industry*
Filtration & Filter Efficiency *Food Industry* *Fish Farming* *Fuel*
Hydraulic Fluids *Lubricants* *Metals* *Marine Biology*
Microspheres *Paints & Pigments* *Paper Industry* *Pharmaceuticals*
Petrochemical Industry *Pesticides* *Photo Industry*
Oils *Toners* *Water Contamination*

3 COULTER COUNTER

The Coulter Principle. The method was developed by Wallace Coulter to count blood cells quickly and accurately. Its acceptance in the field of hematology is evident in that presently over 90% of automated cell counters incorporate the Coulter Principle. In the past fifty years, the method has also been utilized to characterize all kind of cells from bacteria to fat cells and thousands of different industrial particulate materials as well.



Particles suspended in a weak electrolyte solution are drawn through a small aperture, separating two electrodes that have an electric current flowing between them. The voltage applied across the aperture creates a "sensing zone." As particles pass through the aperture (or "sensing zone") they displace their own volume of electrolyte, momentarily increasing the impedance of the aperture. This change in impedance produces a pulse that is digitally processed in real time. The Coulter Principle states that the pulse is directly proportional to the tri-dimensional volume of the particle that produced it. Analyzing these pulses enables a size distribution to be acquired and displayed in volume (μm^3 or fL) and diameter (μm). In addition, a metering device is used to draw a known volume of the particle suspension through the aperture; a count of the number of pulses can then yield the concentration of particles in the sample.

Proven Coulter Technology Ensures Your Results are Accurate and Reliable

- Nearly half a century of experience counting and sizing particles and cells.
- Used in approved ASTM methods.
- Technology defined by the International Standard ISO 13319.
- The highest resolution available in the industry for particle counting and size distribution. It provides a direct measurement of a real parameter of a particle: its volume.
- Capable of counting and sizing particles at concentration levels not detected by other technologies.
- Color or refractive index does not affect results.

Improved Instrument Design

- Easy to operate. Instrument completely controlled through the computer with user-friendly software.
- Digital Pulse Processor. Real-time measurements. Detection of any change in the sample over the length of the analysis. The pulse distribution offers information about the sample behavior such as cell volume, dissolution, agglomeration, etc.
- Suitable for both aqueous and organic electrolytes.
- Environmentally friendly, mercury-free metering system.
- New aperture system (no grease) makes it easy to reconfigure for a desired size range.
- Resolution can be selected from 4 to 300 channels at any selected range.

Quality Assurance Functions put You in Control of the Results

- User defined Standard Operating Procedures.
- Multiple security levels.
- Enables 21 CFR Part 11 Compliance.
- Powerful and flexible software allows the processing and presentation of data to fit all needs.
- Trending capability allows for quick and easy monitoring of any process.
- Certification Program to ensure instrument performance.
- V-Check (IQ, OQ, PQ) instrument validation.

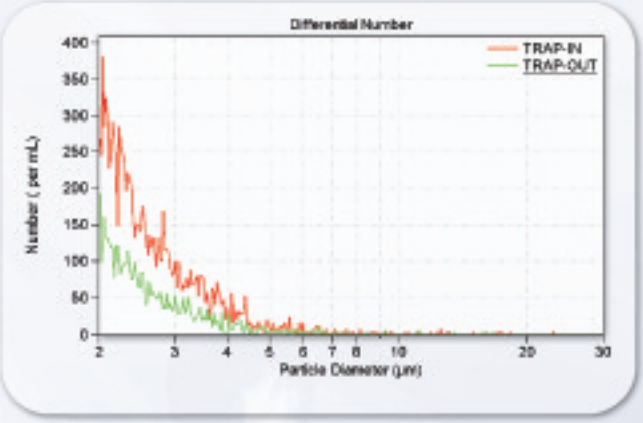
Designed With the User in

- High Sensitivity
- Overlay
- Multi-Tube Overlap
- Size Trend
- Size Interpolation
- Standard Operating Procedures
- Particle Count/ Size Distribution
- Digital Pulse Process (DPP)

Overlay and Size Interpolation

Filtration Efficiency

Using the overlay function it is possible to visualize the efficiency for filtration processes. The percentage of efficiency may be calculated for the complete range of the analysis or at different user selectable size levels by using the size interpolation feature.



File 1: TRAP-IN File 2: TRAP-OUT Size range: 2 µm to 60 µm		
Particle	File 1	File 2
Diameter	Number/mL >	Number/mL >
2 µm	11,060	4,880
3 µm	2,879	1,181
4 µm	891.7	386.7
5 m	393.9	177.3
10 µm	64	21.33
20 µm	4	0

Overlay and Size Trend

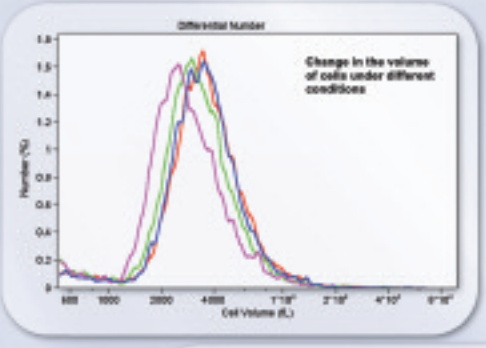
MCV (Mean Cell Volume) Changes

Change in Cell Volume is an important factor involved in many biological processes.

- Cell Growth
- Cell Cycle
- Cell Death
- Compensation for Osmotic Stress
- Pathogenesis
- Phagocytosis

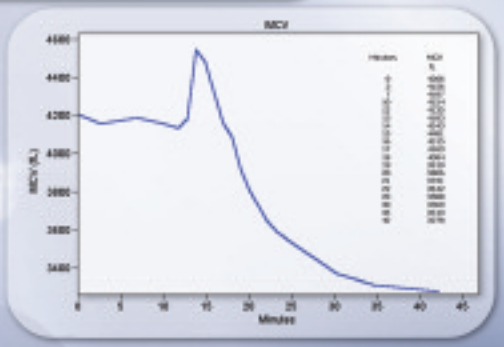
The Multisizer 3 is capable of detecting cell size and volume changes even if they happen over a few seconds or in a period of several hours.

Using the Overlay function allows for visualization and comparison of cell populations with different sizes.



Overlay

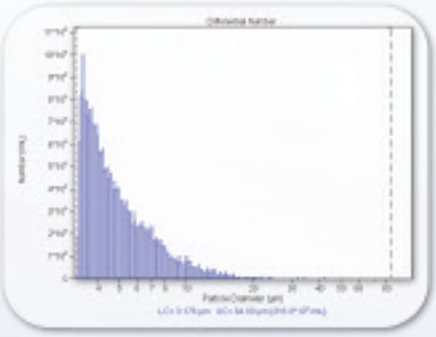
Size Trend

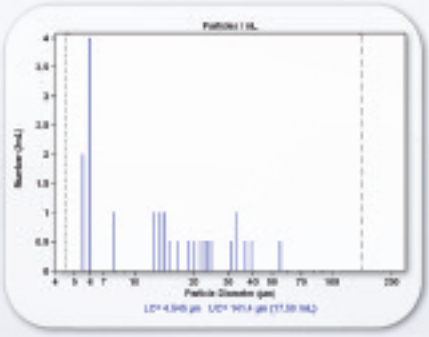


Mind

High Sensitivity

Solid Contaminants in Liquids

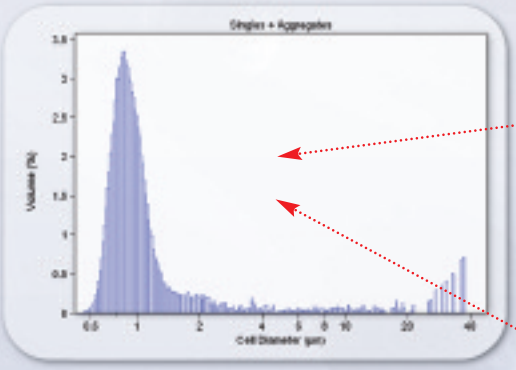


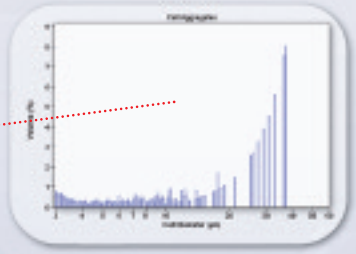


The determination of particle size and number is used to establish the level of insoluble material contaminating liquids. Usually the concentration of non-soluble contaminants is too low to be characterized with any other technology, but with the Multisizer 3 purification processes can easily be monitored.

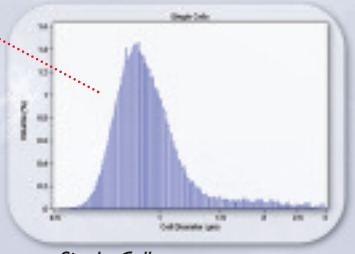
Multi-Tube Overlap

Determining Bacterial Aggregation in a Culture





Cell Aggregation

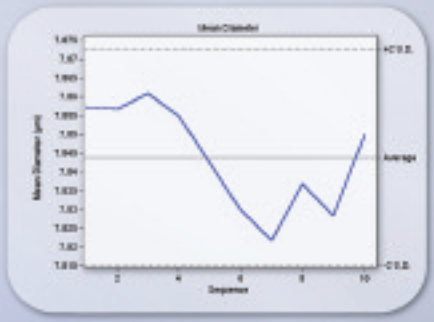


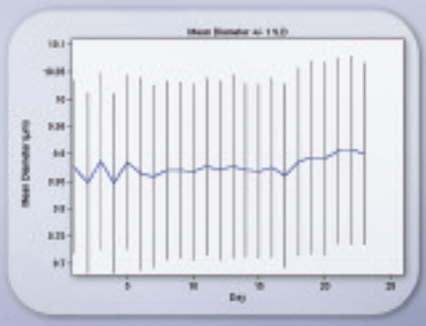
Single Cells

Bacterial aggregates can reduce the effectiveness of antimicrobial agents. A combination of detergents and filters can be used to decrease the amount of 'clumps'. The percentage of 'clumps' relative to single cells can be determined by using two different apertures. The Multi-Tube Overlap function merges the results into a single continuous distribution.

Size Trend

Quality Control



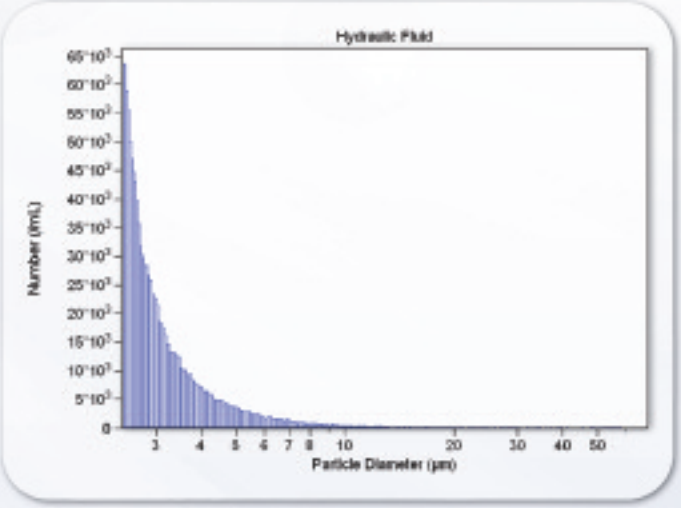


The Trend data function is used to plot statistics from a number of sample runs on one graph or report. This is useful in a process where a sample is measured at specific time intervals for example. These individual data files can then be used to create a Size Trend. These 'trend files' can be updated and added to as often as necessary.

Size Interpolation

ISO Solid Contaminant Code for Hydraulic Fluids and Lubricants

The Multisizer 3 software can be used to create sample data reports that will arrange the data to conform to a set of user defined boundaries, also called “channels”, “bins”, or “size classes” (this is similar to how particle data points are reported when different size sieves are used). The ISO Solid Contaminant Code for Hydraulic Fluids and Lubricants is based on the number of particles larger than a series of given sizes. The **Size Interpolation** function allows the arrangements of the data to classify oils and lubricants as defined by this international standard.



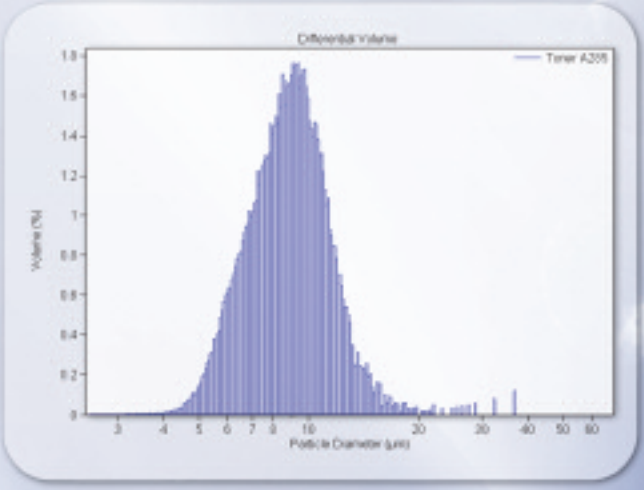
Particle Diameter (µm)	Number/mL>
5	103509
10	12333
15	3745
25	1009
50	285

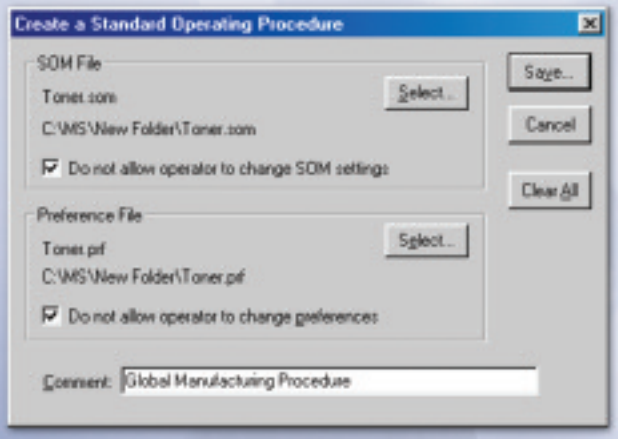
Standard Operating Procedures

Consistency and Uniformity for Analysis and Results

The easy creation of SOP’s allows the standardization of analysis methods and the reporting of results.

The use of SOP’s guarantee consistency and uniformity regardless of the number of applications, operators, instruments and locations involved.





Any number of different SOP's can be created and stored ready to be used when required.

Particle Count / Size Distribution

Control of Particle Size of Raw Material

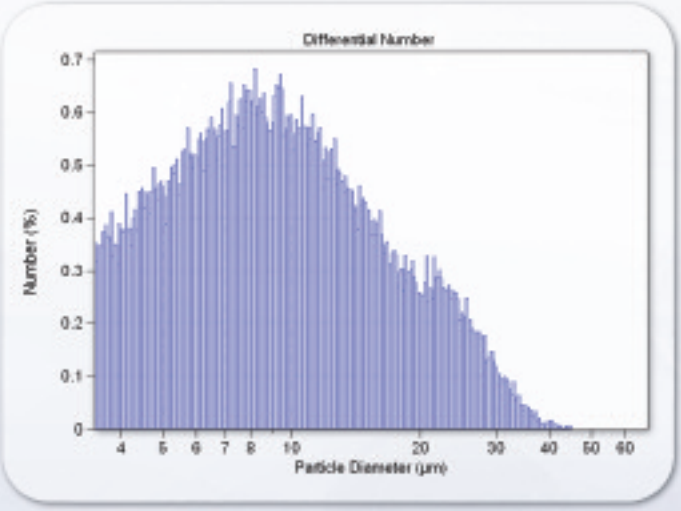


Figure 1: Differential number size distribution

Traditionally volume % size distribution is used to characterize powders because the results are comparable to sieve results, an old technology used for many years. If the size distribution is not Gaussian, the fine particles respect the main population are not shown when using volume %. If the presence of fine particles could affect the quality of a product or process, the Multisizer provides both, volume % and number % size distributions.

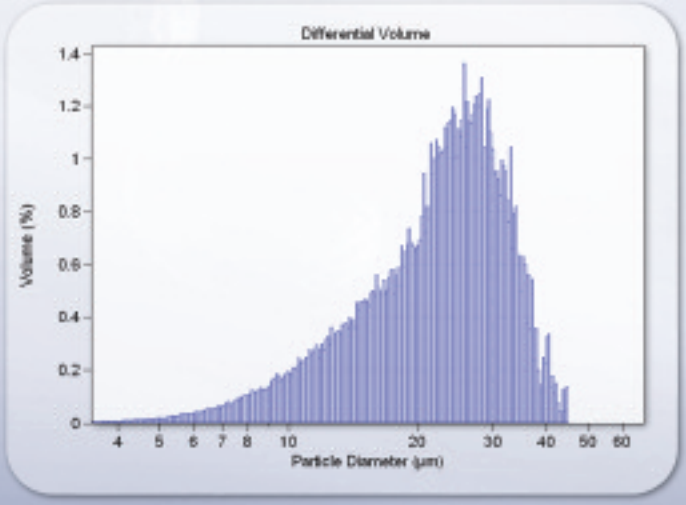
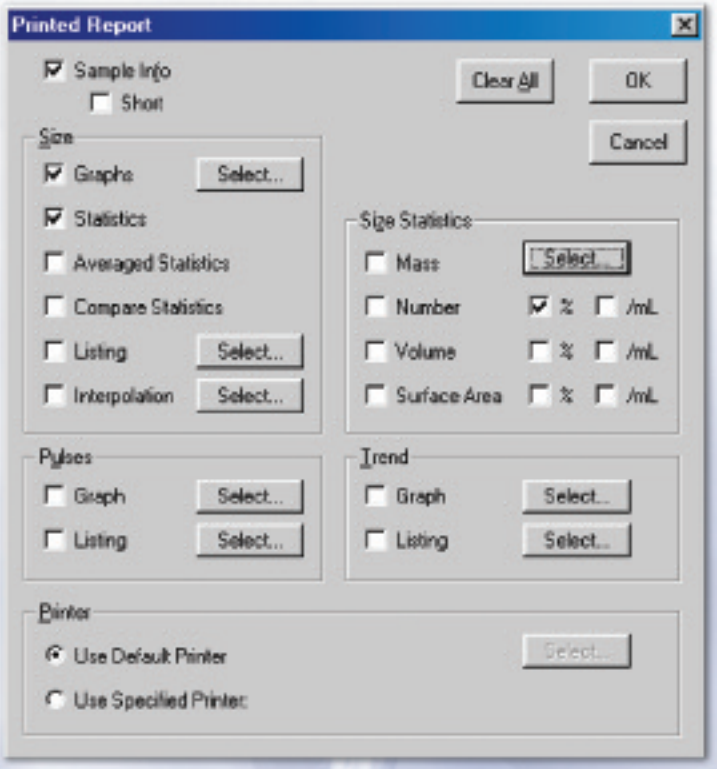


Figure 2: Differential volume size distribution

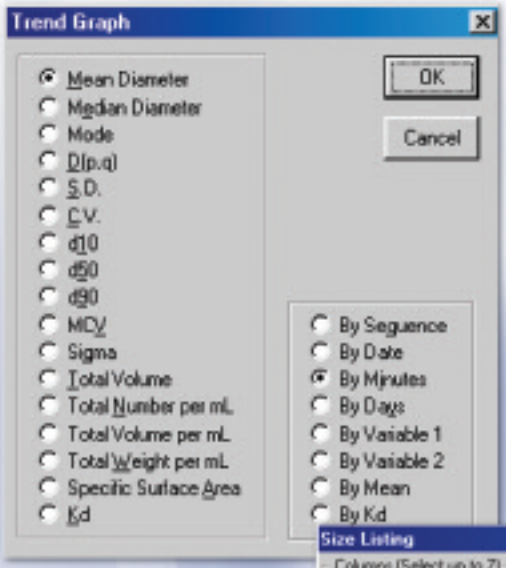
Software Power, Flexibility

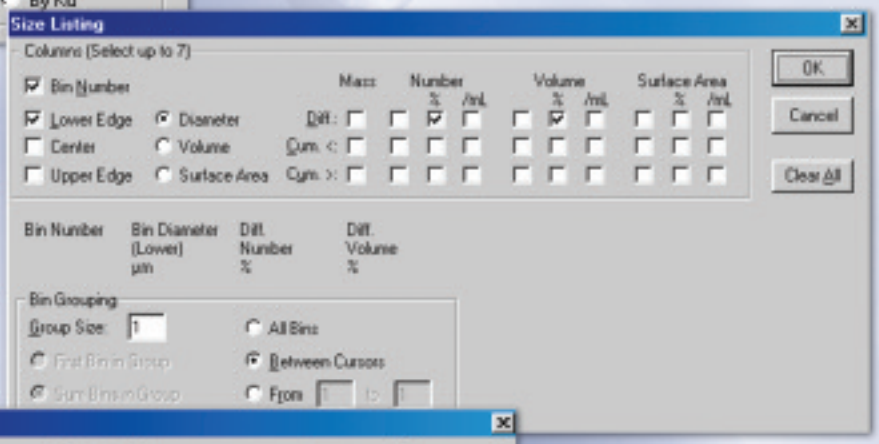
Powerful and Flexible Software

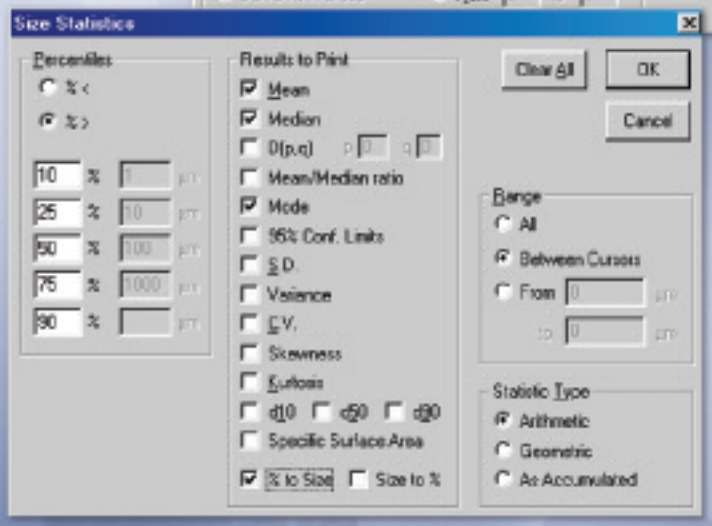
The user-friendly and flexible software that is packaged with the Multisizer 3 provides the operator with a vast array of information at the click of a mouse.



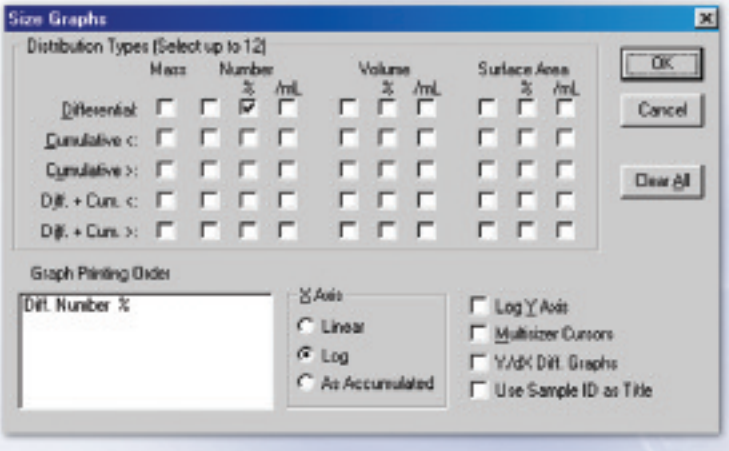
Customized Reports

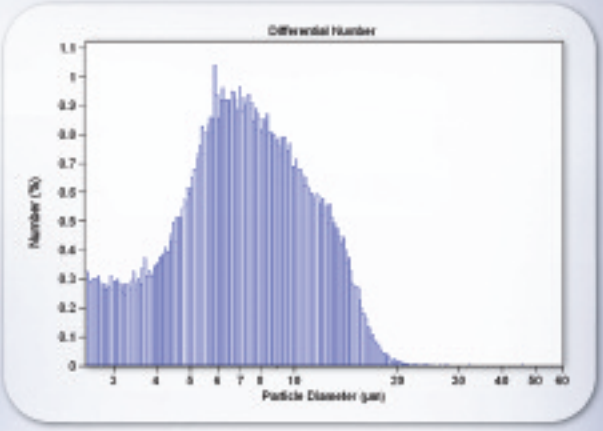




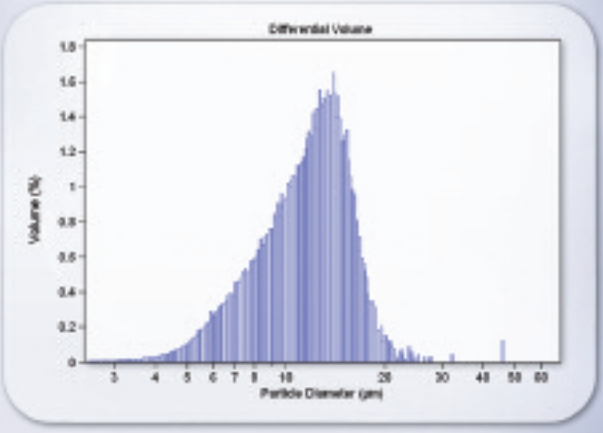


and Simplicity

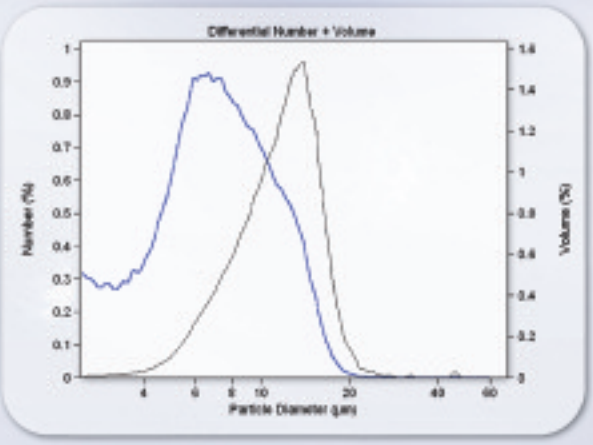




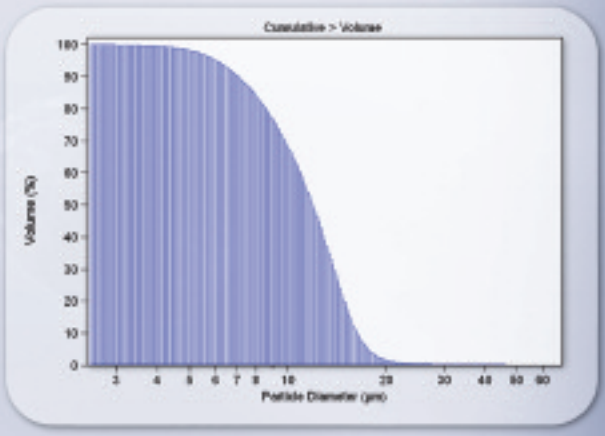
Number Size Distribution

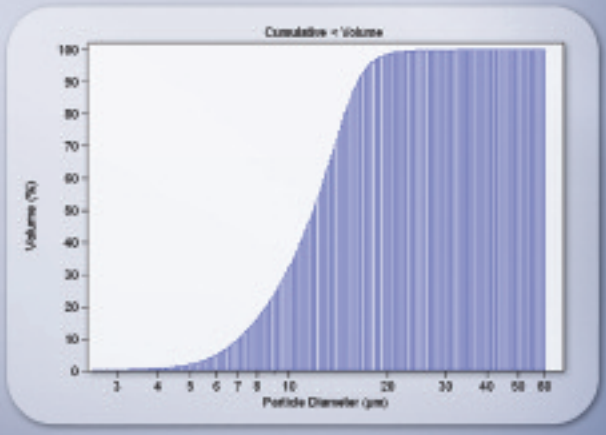


Volume Size Distribution



Number + Volume Size Distribution

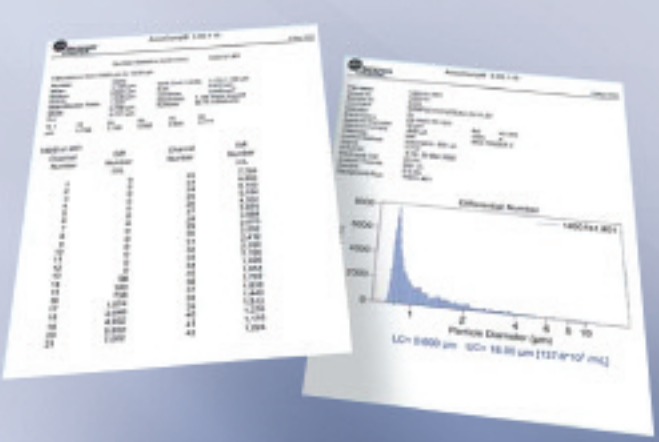




Cumulative Distribution

Efficient new data management and reporting preferences that meet all of your laboratory's requirements.

The software allows the customization of SOPs, SOM and printed reports. Whether for Biological, Industrial, Quality Control and/or Research applications, the Multisizer 3 software will satisfy any requirements for the presentation of results.

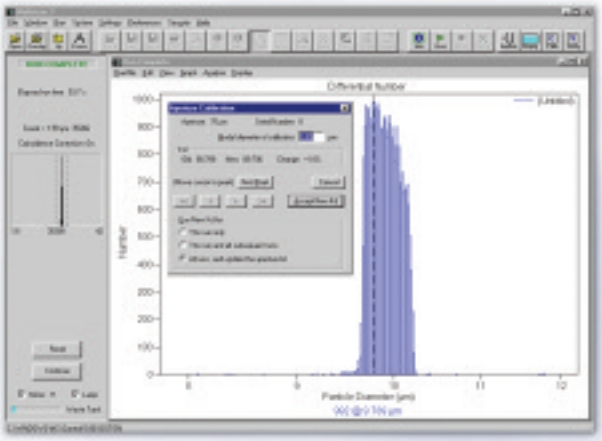


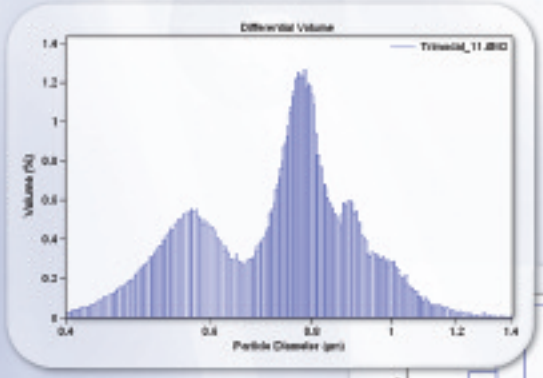
Validation Instrument Quali

Achieving Calibration and Verification of Calibration

Calibration of the Multisizer 3 is simple and quick.

The software automatically performs the calibration of the Multisizer 3. It provides consistency and confidence in the results of the analysis. In addition to the auto calibration, the software performs a verification of the calibration any time it is requested by the operator. As a result of the verification, the software will determine if the instrument is calibrated or needs to be re-calibrated.

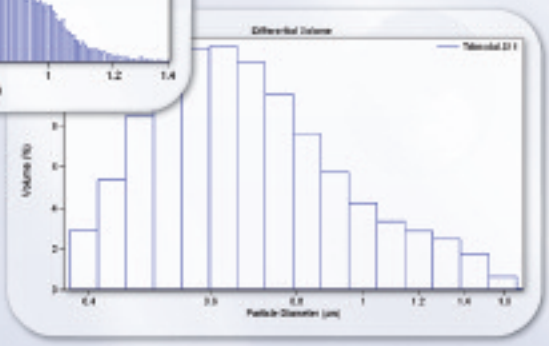




Analysis of a narrow size trimodal sample using the Multisizer 3.

Resolution

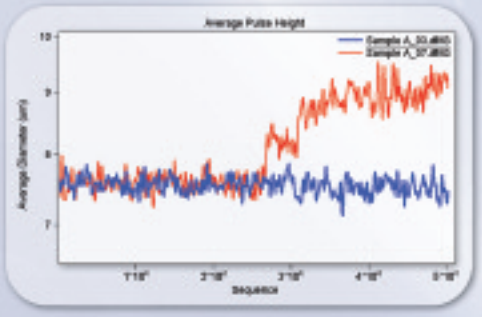
Resolution is the ability to differentiate between different particle sizes. Higher resolution means more detailed size information. The Multisizer 3 provides the highest resolution available for particle size distributions by measuring a real parameter of a particle: its volume. It can discriminate between two particles similar in size better than any other instrument. Particles that are distributed under different size classes by the Multisizer 3 may be viewed as one size class by other instruments or technologies. In many cases, if your particles or cells change in size, they will not be detected using an instrument other than the Multisizer 3. The Digital Pulse Processor (DPP) allows recalculation of the original data over a narrower range, thus significantly increasing the resolution of the desired range.



Analysis of a narrow size trimodal sample using a lower resolution instrument.

Pulse Distribution

The use of a Digital Pulse Processor (DPP) allows storing all the original information from the pulses generated at the moment of the analysis. High-speed digitization of the signal allows the use of pulse area analysis and other techniques for additional particle characterization. This information may be used at a later time to recalculate the size distribution for a different range, number of channels, or even to change the calibration constant, thus eliminating the need for re-analysis of the sample. In addition to the size distribution, the DPP data also calculates the pulse distribution. By looking at the pulse distribution graph, it is possible to know if the sample preparation was stable over the length of the analysis. An unevenly distributed pulse pattern is an indication of changes in the dispersed sample that otherwise would not be possible to detect with the size distribution graph.

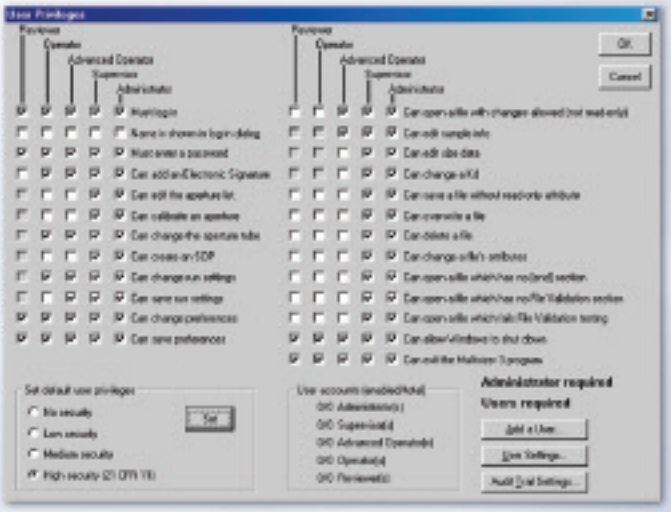


The graph distribution of the average Max High of Pulses can be used to detect changes in the sample over the length of the analysis. The figure shows two analyses of the same sample. The red curve indicates sample change during the run due to agglomeration. The blue curve corresponds to a sample that remained dispersed and stable over the length of the run.

fication Process

Data Integrity and Quality Assurance

Regulatory Compliance 21 CFR Part 11



The Electronic Records and Electronic Signatures Rule (21 CFR Part 11) was established by the FDA to define the requirements for submitting documentation in electronic form and the criteria for approved electronic signatures. This rule, which has been in effect since August 20, 1997, does not stand in isolation; it defines the standards by which an organization can use electronic records to meet its record-keeping requirements. Organizations that choose to use electronic records must comply with 21 CFR Part 11. It is intended to improve an organization's quality control while preserving the FDA's charter to protect the public. Since analytical instrument systems such as the Multisizer 3 generate electronic records, these systems must comply with the Electronic Records Rule. By selecting the 21 CFR Part 11 option in the software, the system automatically reconfigures to comply with these regulations. In addition to 21 CFR Part 11, the software offers other security levels that may be customized by the user.

V-Check Program

Beckman Coulter Inc. is regulated by the United States Food and Drug Administration (FDA) for compliance with current Good Manufacturing Practices (cGMP's) for medical devices. This gives Beckman Coulter a unique understanding of the strict requirements that users in regulated industries are subjected to. As a result, Beckman Coulter has established a comprehensive program to address all aspects of the instrument validation.

The V-Check program is a comprehensive package that addresses all appropriate aspects of a product's life cycle, from instrument development to ongoing performance verification (SQ, DQ, IQ, OQ, PQ). The V-Check program contains all the necessary documentation for instrument validation. This documentation is required to show auditors and investigators proof of proper instrument validation. It consists of a number of functional inter-linked components, which have been designed to give the user assurance that the product is fit for the purpose that it has been designed for and will perform on a consistent basis for these tasks. Where other instrument manufacturers leave off, Beckman Coulter and its V-Check program assist with ongoing quality checks of the instrument (PQ). This proves that it is important to consider products from a manufacturer who not only understands your needs, but is also willing to develop a partnership for the future.

Technical Specifications

Overall Analysis Range.....0.4 µm to 1200 µm diameter 0.0336 to 904.8 × 106 fL or µm³ volume

Dynamic Range of Aperture.....30 : 1 by diameter 27,000 : 1 by volume

Resolution.....User selectable

Number of Channels.....Pulse data is digitized and can be processed to achieve up to 300 size channels for any selected range

Linearity.....Linear response ±1% of pulse height over selected range

Interface.....TCP/IP connection from analyzer to IBM compatible PC, running Windows 95, 98, 2000, NT 4.0

Dimensions (H × W × D).....45 cm (17 3/4 in.) × 43 cm (17 in.) × 63.5 cm (25 in.)

Weight.....34 kg (75 lb)

Power Requirements.....100 - 120V AC ± 10% 50/60 Hz
220 -240V AC ± 10% 50/60 Hz

Power Consumption.....Less than 250W

Orifice Tube Sizes.....

(Aperture µm / Range µm)	(Aperture µm / Range µm)	(Aperture µm / Range µm)	(Aperture µm / Range µm)
20 / 0.4 - 12	30 / 0.6 - 18	50 / 1.0 - 30	70 / 1.4 - 42
100 / 2.0 - 60	140 / 2.8 - 84	200 / 4.0 - 120	280 / 5.6 - 168
400 / 8.0 - 240	560 / 11.2 - 336	1000 / 20 - 600	2000 / 40 - 1200

ASTM Approved Methods

C-690-86 (1997)	**Particle Size Distribution of Alumina or Quartz by Electronic Counting**
E-1772-95 (1995)	**Particle Size Distribution of Chromatography** Media by Electric Sensing Zone Technique
F-577-83 (2002)	**Particle Size Measurement of Dry Toners**
D-4438-85 (1997)	**Particle Size Distribution of Catalytic Material by Electronic Counting**
D-3451-92 (1992)	**Testing Polymeric Powders and Powder Coatings**
C757-90 (1996)	**Nuclear Grade Plutonium Dioxide Powder, Sinterable**
F-660-83 (1993)	**Comparing Particle Size in the Use of Alternative Types of Particle Counters**
F-662-86 (1992)	**Measurement of Particle Count and Size Distribution in Batch Samples for Filter Evaluation Using an Electrical Resistance Particle Counter**
F-2149-01	**Standard Test Method for Automated Analyses of Cells** – the Electrical Sensing Zone Method of Enumerating and Sizing Single Cell Suspensions

International Standard ISO 13319

Determination of Particle Size Distributions – Electrical Sensing Zone Method

Ordering Information

Part Number	Description
6605697	**Multisizer 3 Coulter Counter** *Note: Multisizer 3 Starter Kit (P/N 8321471) necessary for setup and installation. On the Multisizer 3 Coulter Counter Consumables Page, see Reagents and Controls for additional information.*

For more information on our Particle Characterization products, please visit us at www.CoulterCounter.com

Visit our online store at:
www.beckmancoulter.com/eStore

USA, Brea, CA (1) 800 352 3433, (1) 714 993 5321 **Miami, FL** (1) 305 380 3907 **Email** pc-sales@coulter.com
For all other countries and specific phone numbers for your local distributor, please visit: **www.CoulterCounter.com/contact**

B2009-10339 www.CoulterCounter.com PAR-PRINTED IN U.S.A.

BECKMAN COULTER
We're better together