

# AccuSizer® A7000 Single Particle Optical Sizing

*Accurate determination of particle size and counts at the tail end of your distributions*



## MODULAR DESIGN

The AccuSizer® product line is based on our unique single particle optical sizing (SPOS) technology. The SPOS systems can be used as liquid particle counters for contamination applications or as sophisticated particle size analyzers of suspensions.

All AccuSizer systems consist of a sensor, pulse height analyzer (counter), and fluidics to transport the sample through the sensor. Particles flowing through the sensor scatter and obscure the incident laser beam. This light interaction creates pulses that are proportion to the size of the particle. The counter converts these pulses to particle size.

## Sensors

<b>LE400</b>	Collimated beam	Scattering and extinction	0.5 – 400 µm
<b>FX</b>	Focused beam	Extinction	0.7 – 20 µm at high concentration
<b>FX NANO</b>	Focused beam	Scattering	0.15 – 10+ µm at high concentration

## Counter

The counter provides high resolution results in up to 1024 size channels.

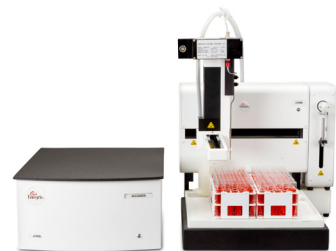
## Fluidics

The sample can be transported through the sensor either without dilution or with single and two stage autodilution samplers.

## Systems

<b>A7000 SIS</b>	USP <787>, <788>, or <789> testing of parenteral drugs or ophthalmic solutions
<b>A7000 AD</b>	Single stage autodilution for general particle size analysis applications
<b>A7000 APS</b>	Two stage autodilution for high concentration samples and USP <729> testing

*Note: All AccuSizer systems can be integrated with the Autosampler for complete automation*

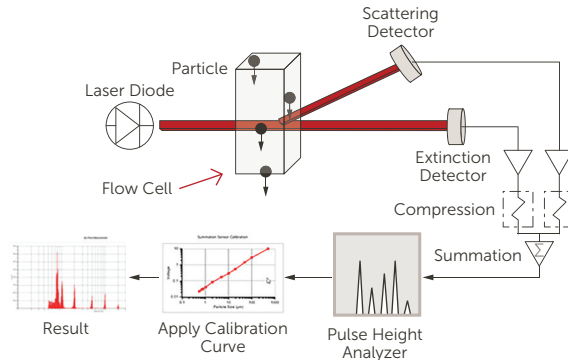


## CHOOSE THE RIGHT SENSOR FOR YOUR APPLICATION

The LE-400-05 sensor includes both extinction and scattering detectors to measure particles in liquid from 0.5 – 400  $\mu\text{m}$ . The upper concentration (coincidence) limit of the LE-400-05 sensor is 10,000 particles/mL. This sensor can be used for both contamination monitoring and for high concentration particle size analysis when coupled with one of our many auto-dilution samplers.

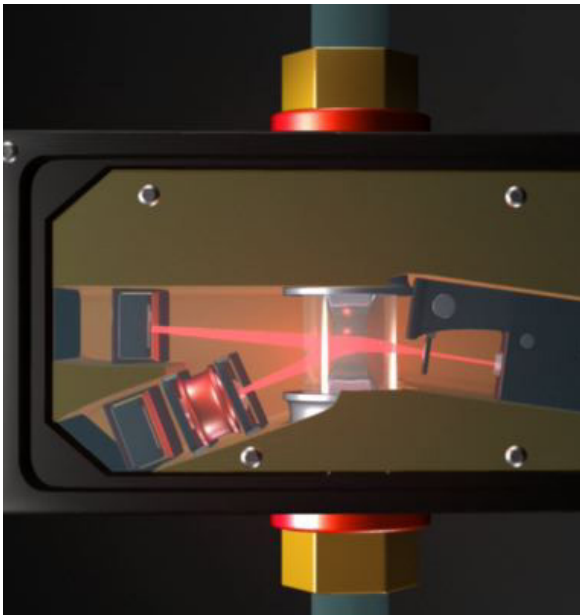
**AccuSizer FX Sensor** – uses a focused laser beam and extinction detection to reduce the inspection zone, thus greatly increasing the upper concentration limit to  $\sim 10^6$  particles/mL. This is the preferred sensor for higher concentration samples like CMP slurries.

**AccuSizer FX NANO Sensor** – uses a high power focused laser beam and scattering detection to extend the dynamic range down to 0.15  $\mu\text{m}$ . This sensor can be used stand alone or in conjunction with the LE-400-05 sensor to provide an exceptionally wide dynamic range for samples like aggregated proteins.



*The combination of extinction and scattering is used to provide this wide dynamic range for the LE sensor.*

Entegris offers a range of sensors based on single particle optical sizing (SPOS) to measure particle size and concentration.



SENSORS	DESCRIPTION
<b>LE400-05</b>	Extinction + scattering, collimated Laser beam (100% inspection) Range: 0.5 – 400 $\mu\text{m}$ Concentration limit: 10,000 particles/mL Sensitivity to 10 ppt Size accuracy: 2% Count accuracy: 10% Flow rate: 60 mL/min or custom calibration
<b>AccuSizer FX</b>	Extinction only, focused laser beam Range: 0.7 – 20 $\mu\text{m}$ Concentration limit: $\sim 10^6$ particles/mL
<b>AccuSizer FX NANO</b>	Scattering only, focused laser beam Range: 0.15 – 10+ $\mu\text{m}$ Concentration limit: $\sim 10^6$ particles/mL

## ACCUSIZER SYSTEMS/FLUIDICS

The sample must be transported through the sensor at the proper flow rate and concentration. A variety of AccuSizer fluidics/samplers are used for this purpose – matched to the sample and application.

### Low Concentration

The A7000 SIS syringe pump sampler is used for low concentration samples that do not require any dilution. Volumes down to 150  $\mu\text{L}$  are drawn through the sensor and the sample is conserved for other analyses. This is the perfect system for USP <787>, <788>, and <789>.



### Concentrated

The A7000 AD is a general particle size analyzer utilizing single stage autodilution. Sample is injected into a vessel and exponential dilution then reduces the concentration to the optimum range for analysis.

### High Concentration

The A7000 APS is a two stage autodilution system that easily handles highly concentrated samples like emulsions. The APS provides exceptional count accuracy and reproducibility for samples requiring up to 2 million to 1 dilution factor.



### Automation

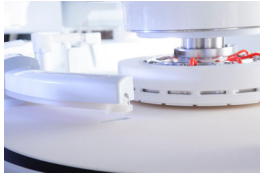
All of these sampling fluidics can be integrated with the Autosampler for high throughput sample requirements.

## SINGLE PARTICLE OPTICAL SIZING PROVEN TO IDENTIFY CRITICAL DIFFERENCES

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The AccuSizer system is used in wide variety of applications, both as a particle size analyzer and liquid particle counter. Many of these applications capitalize on the unmatched sensitivity to large particle tails.

Large particle outliers (tails) can mean the difference between good and bad product. The AccuSizer system detects tails in distributions better than any other technique.



### Chemical Mechanical Polishing (CMP) Fluids

Large particle counts (LPCs) cause defects on wafer surfaces. In both lab and process environments the AccuSizer system is the most sensitive technique for detecting LPCs.



### Parenteral Drugs

The AccuSizer system is the industry standard for many pharmaceutical procedures including USP <787>, <788>, <789>, and <729>.



### Contamination Counting

The AccuSizer system is a liquid particle counter used to measure the size and count of contamination particles in hydraulic fluids, oils, and water. Reports can quantify data according to industrial standards such as ISO 4406.



### General Particle Size Analysis

Many customers use the AccuSizer system just as a high resolution particle size analyzer for samples ranging from inkjet inks to active pharmaceutical ingredients (APIs).



### Emulsions

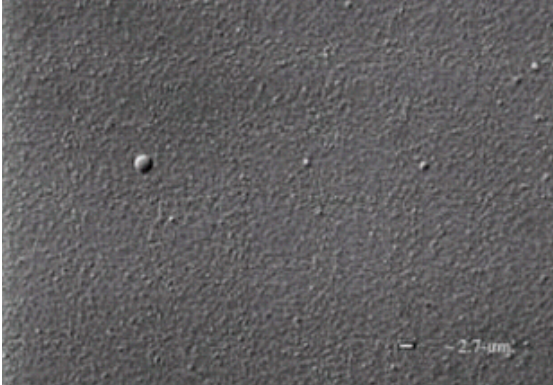

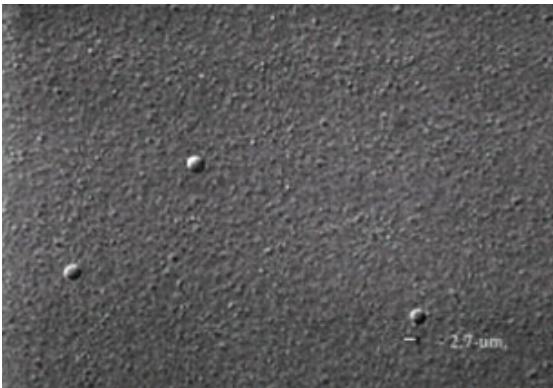
The tail of an emulsion droplet distribution is a valuable indication of stability. The AccuSizer system is used to study emulsion stability in the pharmaceutical, beverage, and chemical industries.

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## THE PROOF IS IN THE PERFORMANCE

The following photographs show two intravenous fat emulsions: one that passes USP<729> on the AccuSizer APS system and one that fails. The emulsion that passes has approximately 5 large particles in the micrograph, and can safely be infused into a patient. The emulsion

that fails has 9 large particles, and could be dangerous - or deadly - if infused. Unlike microscopic techniques the AccuSizer APS system provides the statistical accuracy to insure ultimate confidence in the results. It is the basis of the USP<729> PFAT 5 test.

FAT EMULSION – PASSES	FAT EMULSION – FAILS
 <p data-bbox="237 936 786 1050">PFAT-5 &lt;0.01% These particles make up less than 0.01 percent of the total number of particles that are 5 microns or larger in the emulsion.</p>	 <p data-bbox="834 936 1383 1050">PFAT-5 &lt;0.10%</p>
 <p data-bbox="237 1495 786 1608">PFAT-5 &lt;0.025%</p>	 <p data-bbox="834 1495 1383 1608">PFAT-5 &lt;0.20% Over time, the fat emulsion becomes very unstable and the number of particles in the tail of the distribution exceeds 20%.</p>

## AUTOMATE YOUR PARTICLE SIZE ANALYZER

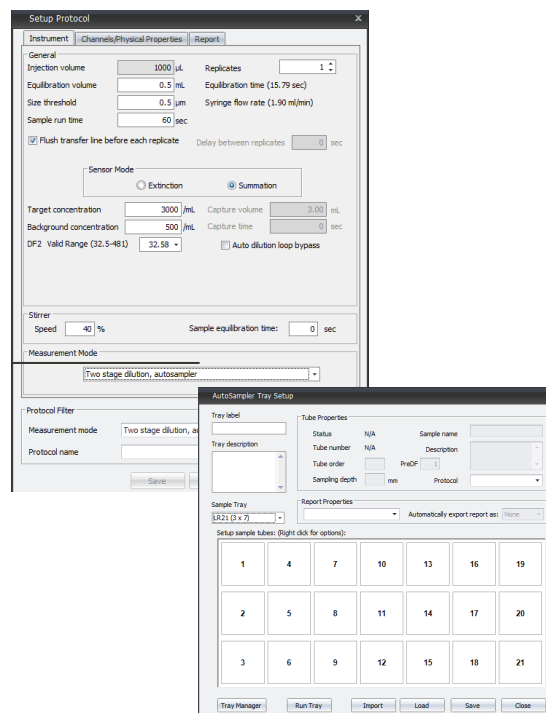
The Autosampler is designed to meet the needs of applications where higher throughput or repetitive analyses are required.

All of these systems are controlled by software packages each specifically designed to meet the rigors of the individual fluidics systems and applications that they address.



### Features

- Automated batch sample analysis
- Multiple sample trays available:
  - 3x7 samples – 30 mm tube (50 mL)
  - 4x10 samples – 20 mm tube (20 mL)
  - 5x12 samples – 16 mm tube (14 mL)
  - 6x15 samples – 13 mm tube (7 mL)
- Not all rack configurations are available for all modules.*
- Dual trays of the sample configuration are also available.
- Modular easy lock and load sample trays
- Wide dynamic range sensors:
  - 0.5 – 400  $\mu\text{m}$  (SPOS)
- Ability to pre-dilute samples such as:
  - Emulsions (food/drug)
  - Dispersions
  - Proteins/macromolecules
  - Inks/pigments/paints
  - Minerals/alumina/metals
  - Pharmaceutical powders/suspensions
- Analyzes up to 400 samples per day



## ACCUSIZER ONLINE SOLUTIONS

The AccuSizer technology is also available in a full range of online systems. AccuSizer online systems offer a range of autodilution fluidics which can be used to monitor processes such as homogenization, grinding and semiconductor CMP polishing.

**AccuSizer Mini FX System** – reduces the footprint of our lab instrument and allows for point of use monitoring with continuous data acquisition at the process line. Unlike any other instrument, the FX counts and sizes millions of particles in minutes, not hours.

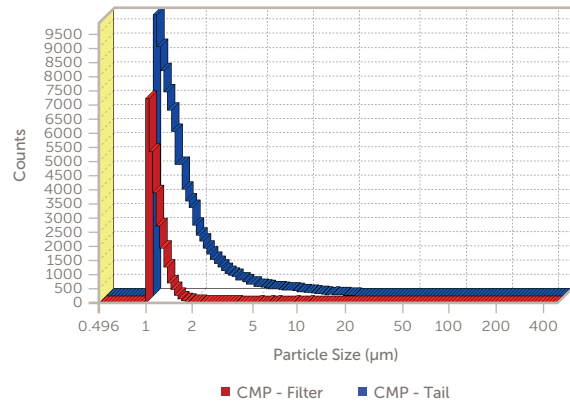


## SENSITIVITY TO TAILS OF LARGE PARTICLES

CMP slurries are typically filtered during production and use. Classical light scattering instruments fail to detect if the filtration process is working and removing the large particle tail that has been directly related to scratches.

The AccuSizer system is sensitive enough to quantify and resolve large particles in the tail of the CMP slurry (pre-and post filtration). This takes the guesswork out of monitoring filter efficiency and removal rate – while eliminating the hassle and cost of premature filter replacement.

CMP - Filter Population Differential Distribution



MB asked for this image to be replaced and added, "We should have a better general CMP image than this."

## WE ALSO OFFER DLS AND ZLS PARTICLE ANALYZERS

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**Nicomp® N3000 DLS Particle Size Analyzer** – measures nanoparticle size distribution and concentrations in complex mixtures.

**Nicomp Z3000 ZLS Zeta Potential Analyzer** – delivers reliable zeta potential measurements without sample dilution.

Unique solutions that no one else provides including:

- Autodilution
- Online
- Autosampler
- Multi-angle goniometer

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