

Laser Diffraction Model Specifications

| Model | S3500 | BLUEWAVE | TRI-BLUE |
|-------------------|----------------|-----------------------|---------------|
| Measurement Range | 0.02 to 2800µm | 0.01 to 2800µm | 0.01 to 700µm |
| Lasers | Red 780nm | Red 780nm, Blue 405nm | Blue 405nm |

| All Models | |
|-------------------|---|
| Laser Power | 3mW nominal red; 7-10 mW blue - Class 1 Laser Product per 21 CFR 1040.10 |
| Detection System | Optically fixed photo-electric detectors with logarithmically spaced segments placed at correct angles for optimal scattered light detection; 0.02 to 163° using 151 detector segments. |
| Data Handling | Volume, Number and Area distributions as well as Percentile and other summary data. Data is stored in ODBC format in encrypted Microsoft® Access® Databases to ensure compatibility with external statistical software. Data integrity may be ensured using FDA 21 CFR Part 11 compliant security features including password protection, electronic signatures and assignable permissions. |
| Analysis Time | Minimum 10 seconds |
| Electrical | AC input: 90 – 132VAC, 47 - 63Hz, single phase; 200 to 265VAC, 47 – 63Hz, single phase |
| Power Consumption | 25VA maximum |
| Environmental | Temperature: 10 to 35°C (50 to 95°F) |
| Humidity | 90% RH, non-condensing maximum |
| Storage Temp. | -10 to 50°C (14 to 122°F) - dry only |
| Pollution | Degree 2 |
| Finishes | Case material: steel and impact-resistant plastic; exterior surfaces: finished with corrosion-resistant paint or plating |
| Dimensions | 36H x 56W x 46D cm (14H x 22Wx 18D in) |
| Weight | 27kg (60 lbs.) |



Total Solutions in Particle Characterization

The Perfect Fit for Over 40 Years

Microtrac's Laser Diffraction Instrumentation Delivers Tailored Solutions by Incorporating:

- Rugged Tri-laser design
- Measure sizes from 0.01 to 2800 microns
- Specialized algorithm for precise non-spherical particle characterization
- Ability to integrate dynamic image analysis for enhanced wet dispersion measurements



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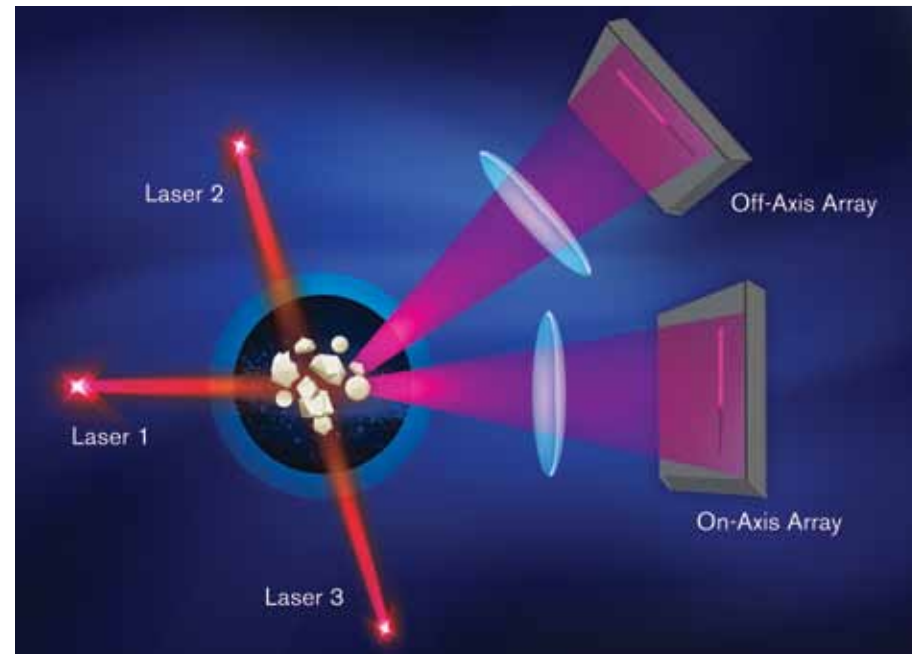


SL-PC-04 rev B



Microtrac Innovations Drive Customer Value

Microtrac was the first to use laser diffraction to measure particle size distributions with the commercial release of the model 7991 in 1974. Over the last 40 years, Microtrac has evolved the technology by introducing footprint-saving designs, elimination of moving parts, introduction of laser diodes (red and blue), advanced algorithms for non-spherical particle measurements and integration of dynamic image analysis for comprehensive particle morphology characterization.



The Microtrac advantage:

Our approach provides users with robust instrumentation providing accurate and repeatable results for any application. See what sets us apart.

Patented Tri-laser design - unsurpassed resolution and sensitivity

By increasing the number of light sources incident on the material being measured, Microtrac's Laser Diffraction analyzers use optimal capacity of photo-detection

devices while maintaining maximum stability and alignment of the optical system...providing users with unsurpassed resolution and sensitivity.

Fixed optics/solid state laser diodes - industry-best ruggedness and reliability

Microtrac solid-state laser diodes deliver the best possible repeatability and reproducibility. They require zero stabilization time and provide a stable, long-life solution in even the harshest environments.

Non-spherical calculations - pinpoint accuracy

Microtrac laser diffraction technology uses a patented

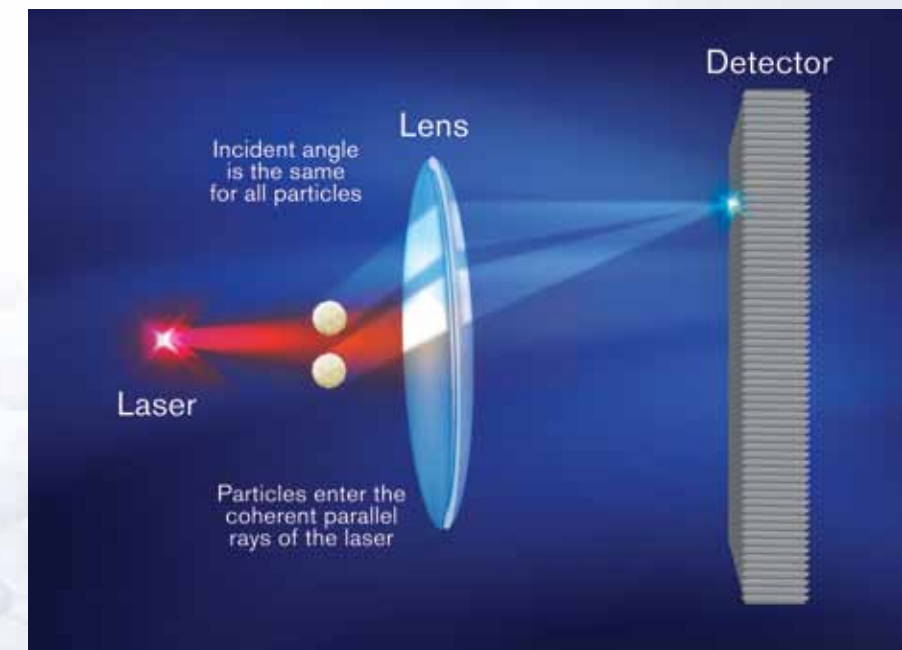
algorithm for non-spherical particles. Since 95% of particles measured are non-spherical, this algorithm helps deliver more accurate results than other, less-evolved technologies.

Fourier optical system - proven accuracy and repeatability

Microtrac's pioneering Fourier optical system delivers an optimum pattern of light by assuring the angle of incidence is constant.

Volume direct designed detectors - eliminate area conversions and errors

Unlike scanning detectors, Microtrac's "always-on" detectors enable collection of data throughout the entire measurement operation gaining a volume calculation direct from the scattering pattern.



No compromises with Fourier

If incident angle is the same, then the relative angles formed between every single detector and the incident beam would be kept constant and independent of the position of the particles when passing across the laser beam providing superior resolution compared to Reverse Fourier. Inevitably with Reverse Fourier the incident and diffraction angle is different. The image is projected to a contrasting array location requiring a special algorithm to compensate for the discrepancies before providing measurement data – this leads to poorer resolution.

Microtrac Through the Years



1970's

- First commercially available particle size analyzer



1980's

- Introduction of first PC-driven analyzer
- Bent optics reduces footprint
- All moving parts removed – laser diode
- Modified Mie



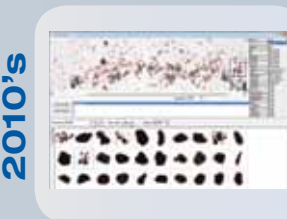
1990's

- Auto-alignment with the FRA
- Tri-laser introduction with X100



2000's

- 3500 introduction
- Bluewave introduction



2010's

- Image analysis introduction
- TRI-BLUE introduction

A Laser Diffraction Particle Size Analyzer Ideal for Your Application

S3500



Ideal for general purpose PSD

- Measures from 20nm to 2800µm
- 1-2-3 red laser configurations available
- up to 3 red 780 nm lasers
- Wet/dry capability
- Legacy calculation mode available

Bluewave



Ideal for PSD analysis where enhanced sub-micron resolution is required

- Measures from 10nm to 2800µm
- 1 red 780nm laser, 2 blue 405nm lasers
- Wet/dry capability
- Legacy calculation mode available

TRI-BLUE



Ideal for PSD analysis where optimal accuracy and precision is needed in the sub-micron range

- Measures from 10nm to 700µm
- 3 blue 405nm lasers
- Wet only
- Tuning function to adjust precision/repeatability

Integrated Particle Size and Shape

PartAn SI



Seamlessly integrates with laser diffraction analyzers providing visual validation of wet dispersions

- Size range from 5 to 1500 microns
- Measures 25 morphological parameters
- Scatter plots and advanced filtering functions allow a user to quickly identify problem areas
- High-speed, high-resolution camera captures 100 images per second



Visual validation of agglomeration



Turbotrac



SDC

Accessories

Turbotrac – dry powder dispersion device

- Variable flow settings for fragile/difficult to disperse samples
- Compressed air and vacuum ensure homogenous mixing and transport of sample
- Auto-cleaning reduces measurement turn around time
- Handles small or large sample volumes
- Stainless steel and Teflon components allow full chemical acceptance
- Design virtually eliminates cross-contamination, ensuring a greater percentage of sample is measured – better than any dry powder feeder on the market

SDC – Wet dispersion circulation device with built-in sonication

- Variable speed and intensity sonication
- Innovative split flow return design prevents settling and ensures homogenized sample flows to the cell prevents settling (all particles are transported to analyzer)
- Aqueous and organic solvent compatibility without changing parts
- Self-cleaning mechanism
- 200ml sample volume for representative sample

Also available: USVR ultra small volume recirculator.



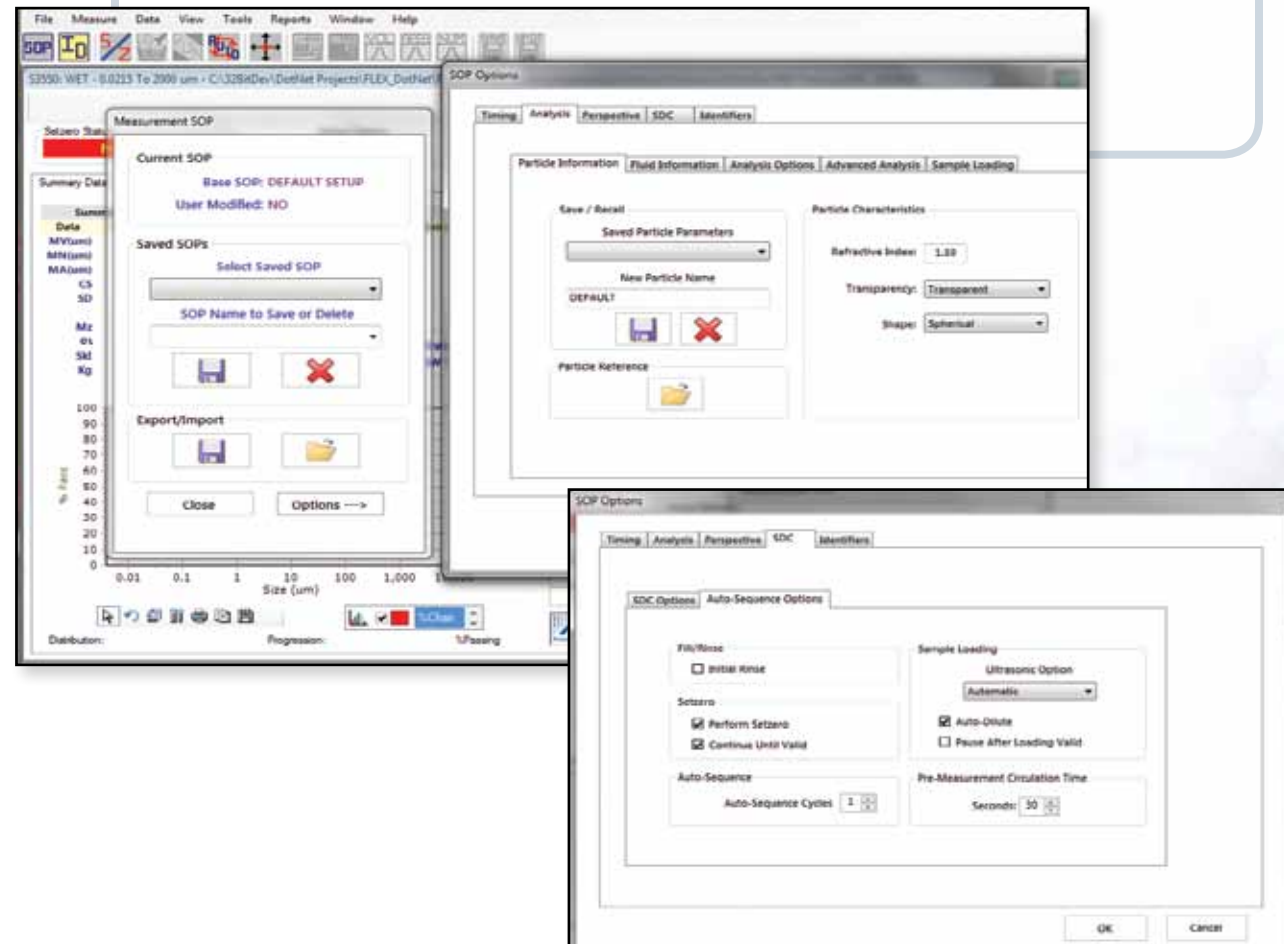
Powerful FLEX Software

It only seemed appropriate that Microtrac named our powerful, flexible, easy-to-use software FLEX. Designed with the end-user in mind, FLEX allows the operators to measure, recall, validate, export and print their analysis effortlessly.

Easy as 1, 2, 3!

01

Set-up - FLEX software takes all the guesswork out of the analysis. Simply load your material, establish your measurement SOP and the Microtrac Auto Sequence feature takes care of the rest. Users can also set up SOP libraries that save important information such as material, refractive index, fluids, dispersion settings and pump speed that can be recalled at any time, saving users from tedious data entry.



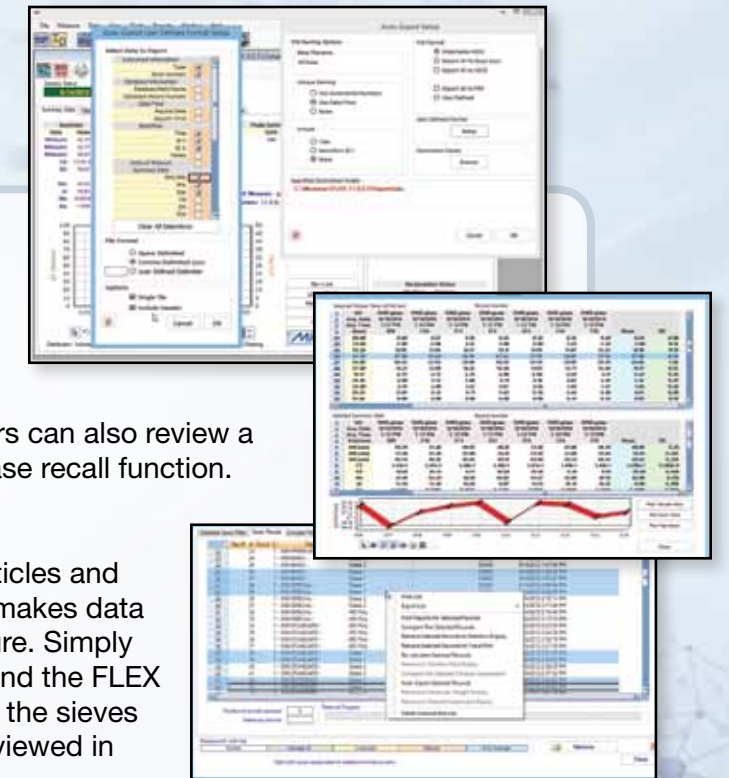
02

Database – Like taking a deeper dive into your data? FLEX gives you options: either export your data to your preferred statistical

analysis package or use ours. Operators can also review a previous measurement with our database recall function.

Integrating sieve data

Using sieves for measuring “large” particles and diffraction for the “small” stuff? FLEX makes data blending easy with the sediments feature. Simply enter the sieve data into the software and the FLEX software produces summary data from the sieves and diffraction instrument that can be viewed in either microns or mesh.



03

FLEX also performs the following functions...

- **Data Tolerance** - Set Pass/Fail alerts when your material deviates from upper and lower size limits, ideal for quality control applications.
- **Trending** – Ability to trend individual size parameters over a specific time period or material type.
- **Tailored Reports** – Use customizable reports to present your data the way you want to see it.
- **Data Protection** – FLEX lets you control usage by utilizing password access and electronic signature allocation.
- **Compliance** – FLEX is fully compliant per FDA 21 CFR Part 11 guidelines.
- **Security**: Easy to set up and administer password protected security settings.

