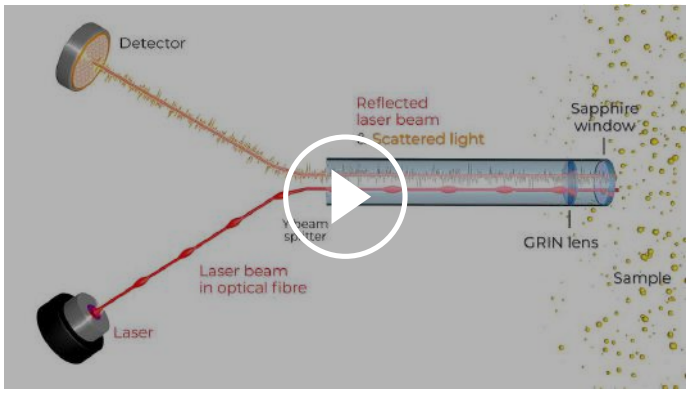
NANOPARTICLE SIZE ANALYZER

NANOTRAC FLEX

Microtrac MRB's NANOTRAC Flex is a highly flexible nanoparticle size analyzer based on Dynamic Light Scattering (DLS) which provides information on particle size, concentration, and molecular weight. It allows faster measurements with reliable technology, higher precision, and better accuracy. All of this combined into compact a DLS analyzer with a revolutionary fixed optical probe.

With the unique and flexible probe design and the use of the Laser Amplified Detection method in the NANOTRAC FLEX, the user is able to choose an appropriate vessel as a measurement cell to satisfy the needs of any application. This design also allows measurements of samples over a wide concentration range, monomodal or multimodal samples, all without prior knowledge of the particle size distribution. This is made possible through the use of the Frequency Power Spectrum (FPS) method instead of classical Photon Correlation Spectroscopy (PCS).



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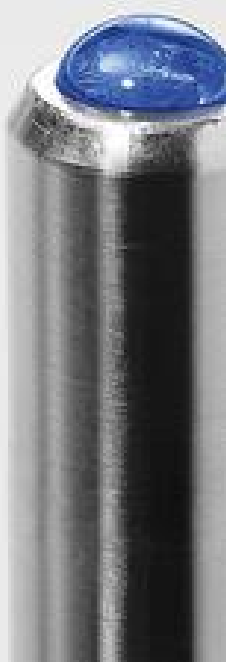
NANOPARTICLE SIZE ANALYZER NANOTRAC FLEX

- Most flexible Dynamic Light Scattering ever
- Unique external probe design
- *In situ* particle sizing and monitoring
- 180° backscatter DLS setup
- Turn any vessel into a sample cell – no consumables required
- External probe allows dip and measure
- Universal solvent compatibility
- Small footprint
- Frequency Power Spectrum calculation model instead of PCS
- Laser Amplified Detection – high signal to noise ratio



FLEXIBLE *IN SITU* MEASUREMENTS

The unique design of the NANOTRAC FLEX probe allows to measure down to only one droplet, thus requiring only a minimum sample volume. The probe also easily fits into a 1.5 ml Eppendorf Tube®. With the NANOTRAC FLEX, every vessel can be used as a measurement vessel, and there is no need for cuvettes of any kind. This makes it possible to use the probe either at line or in line for monitoring the particles' growth during a reaction.

During a reaction, the dispersion is either flowing or stirring. The dispersion motion will obscure the Brownian motion, and a Dynamic Light Scattering (DLS) measurement is normally not possible.

To measure in stirring or moving liquids, the FlowGuard can be used. This special cap for the NANOTRAC FLEX probe tip creates an enclosure around the probe, which shields the measurement surface from turbulent flow. An orifice ensures the constant exchange of the sample, while slowing down the stirring movement at the probe interface. This design ensures an accurate particle size distribution that is representative of the suspension outside the enclosure.

This probe design enables the measurement of samples over a wide concentration range, monomodal or multimodal samples, all without prior knowledge of the particle size distribution. The probe is also very easy and quick to clean between sample measurements of any kind. Additionally, the user can choose from a wide array of measurement cells to satisfy the needs of any application.

TYPICAL APPLICATIONS

Versatility is a great strength of Dynamic Light Scattering (DLS). This makes the method suitable for a variety of applications in both research and industry, such as pharmaceuticals, colloids, microemulsions, polymers, industrial minerals, inks and many more.

- pharmaceuticals
- inks
- life sciences
- ceramics
- beverages & food

- colloids
- polymers
- microemulsions
- cosmetics
- chemicals

- environment
- adhesives
- metals
- industrial minerals

... and many more!

To find the best solution for your particle characterization needs, visit our application database

TECHNICAL DATA

Method	Backscattered laser-amplified scattering reference method
Calculation model	FFT power spectrum
Measurement angle	180°
Measuring range	0.3 nm - 10 µm
Sample cell	External probe (in situ)
Zeta potential analysis	no
Molecular weight measurement	yes
Molecular weight range	<300 Da -> 20 x 10^6 Da
Temperature range	+4°C - +90°C
Temperature accuracy	± 0.1°C
At line / in line measurement	yes
Reproducibility (size)	=< 1
Sample volume size measurement	one drop - 8
Concentration measurement	yes
Sample concentration	up to 40 % (sample dependent)
Carrier fluids	Water, polar and unpolar organic solvents, acid and base
Laser	780 nm, 3 mW
Humidity	90 % non-condensing

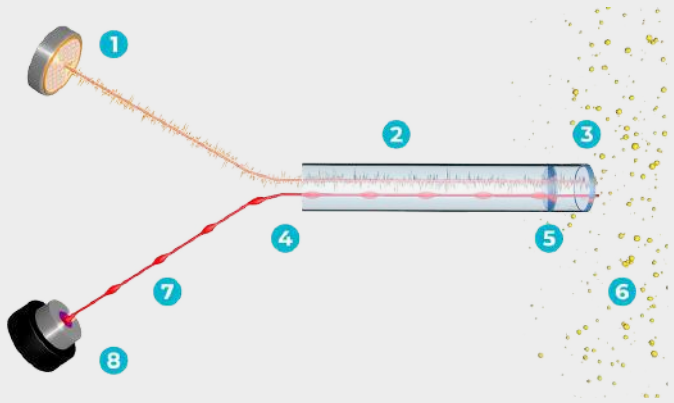
FUNCTIONAL PRINCIPLE

The optical bench of the nanoparticle size analyzer NANOTRAC FLEX is a probe containing an optical fiber coupled with a Y splitter. Laser light is focused on a volume of sample at the interface of the probe window and the dispersion. The high reflectivity sapphire window reflects a portion of the laser beam back to a photodiode detector. The laser light also penetrates the dispersion and the particle's scattered light reflects at 180 degrees back to the same detector.

The scattered light from the sample has a low optical signal relative to the reflected laser beam. The reflected laser beam mixes with the scattered light from the sample, adding the high amplitude of the laser beam to the low amplitude of the raw scatter signal. This Laser Amplified Detection method provides up to 10^6 of times the signal to noise ratio of other DLS methods like Photon Correlation Spectroscopy (PCS) and NanoTracking (NT).

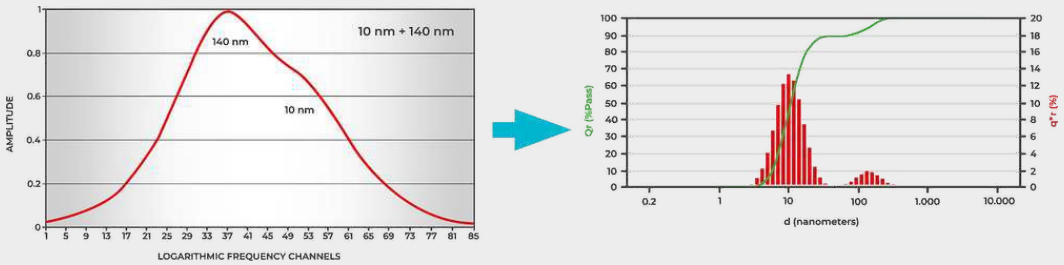
A Fast Fourier Transform (FFT) of the Laser Amplified Detection signal results in a linear frequency power spectrum which is then transformed into logarithmic space and deconvoluted to give the resulting particle size distribution. Combined with Laser Amplified Detection, this frequency power spectrum calculation provides robust calculation of all types of particle size distributions – narrow, broad, mono- or multi-modal – with no need for a priori information for algorithm fitting as it is for PCS.

Microtrac's Laser Amplified Detection method is unaffected by signal aberrations due to contaminants in the sample. Classical PCS instruments need to either filter the sample or create complicated measurement methods to eliminate these signal aberrations.



1. Detector | 2. Reflected laser beam & scattered light | 3. Sapphire window | 4. Y-beam splitter | 5. GRIN lens | 6. Sample | 7. Laser beam in optical fiber | 8. Laser

ITERATIVE PARTICLE SIZE CALCULATION FROM POWER SPECTRUM



1. Estimate size distribution | 2. Calculate estimated particle size | 3. Calculate error in particle size | 4. Correct estimated distribution | 5. Repeat 1-4 until error is minimized | 6. Minimum error distribution is best fit

www.microtrac.com/nanotrac-flex