

PN3000

Static & Dynamic Laser Light Scattering Detector



Molar Mass
Molecular Size R_g
Particle Size R_h

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Specifications

Sample cell volume
10 μ L

Static and dynamic scattering volume
0,01 and 0,001 μ L

Detection principle
multi-detector, combination of static and dynamic laser light scattering: SLS and DLS

Rayleigh light scattering angles (SLS)
15° and 90°

Dynamic light scattering angle (DLS)
90°

Relative precision of MW calculation
+/- 1 %

Molar mass range
below 10^3 to 10^7 Daltons

Typical radius of gyration (R_g) range
12 nm to 150 nm (flow cell only)

Hydrodynamic radius (R_h) range
1,5 nm to 2000 nm using batch cell
1,5 nm to 300 nm using flow cell

Laser specifications
30 mW, 680 nm

Laser life time
9.000 hours at 50°C

Solvent compatibility
all common aqueous and organic solvents

Analog signal inputs
8 differential analog inputs

Digital signal inputs
8 digital TTL level inputs

Digital signal outputs
8 digital TTL outputs

Analog signal input range
-8.6 Volts to +8.6 Volts

Minimum signal resolution
10 μ Volts

Raw signal sample rate
100 per second, all channels

Selectable data sampling period
0,01 to 655 seconds

Data communications type
serial, RS232, RS485

Data communications rate
19.200 or 38.400 baud

Spike filtering
user selectable, on-board filtering

Total size
21 cm x 44 cm x 11 cm

Shipping weight
ca. 6,5 kg

Power requirement
5 VA, 100-240 V, 50-60 Hz



Postnova Analytics GmbH
Max-Planck-Str. 14
86899 Landsberg/Germany
Tel. : +49.8191.428-181
Fax : +49.8191.428-175

Postnova Analytics Inc.
230 South, 500 East, Suite # 120
84102 Salt Lake City, UT/USA
Tel. : +1.801.521-2004
Fax : +1.801.521-2884

email : info@postnova.com
web : www.postnova.com

PN3000 Light Scattering Detector

On-line Static and Dynamic Laser Light Scattering

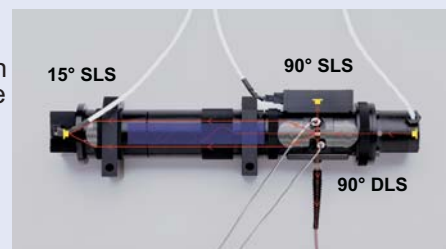
The postnova analytics PN3000 SLS/DLS Laser Light Scattering Detector series is a new type of modular detection system, which combines different physical light scattering principles at the same time. The system enables the simultaneous and independent measurement of static laser light scattering at an 15° and an 90° angle as well as the measurement of dynamic laser light scattering at an 90° angle. The detection takes place in an extremely small and sensitive light scattering cell with a total volume of only 10 μ L. Due to that possible multidimensional detection the sample can be investigated simultaneously from various viewpoints. In this way complex polymer and particle systems, where the use of only one detection technology is not sufficient, can be characterized. In the construction of the PN3000 the latest electronic components and devices as e.g. fast digital signal processors, efficient fiber optics and avalanche photodiodes were used.

Working Principle

Static and dynamic laser light scattering (SLS or DLS) has the advantage of direct determination of the characteristic properties of the polymer and particle systems under investigation without previous calibration. The molar mass, the molar mass distribution and the radius of gyration of polymers can be determined with the static laser light scattering. In static laser light scattering the molar mass of the unknown polymers can be calculated direct from the measured laser light scattering intensity at a certain angle. Only the concentration has to be determined at the same time with a RI or an UV detector. Dynamic laser light scattering makes the direct measurement of the hydrodynamic radius based on the diffusion coefficient possible. In dynamic laser light scattering the intensity fluctuations of the scattered laser light are measured at an angle of 90° and the hydrodynamic radius is calculated from the diffusion coefficient through a correlation function.

Set-up of Optical Bench

The PN3000 has an innovative optical design combined with a new type of flow cell. On the right side the optics combined with the different detectors is shown. It includes laser source (right side), 90° static LS (top), 90° dynamic LS (bottom) and 15° static LS (left side).



Sensitivity

The system achieves a very high sensitivity also for smaller polymers through the special small 10 μ L light scattering cell and the use of a laser with 30 mW power and 680 nm wavelength. The light scattering cell also facilitates the detection of small differences in the molar mass distribution, which are not detectable with common glass cells. These cells with internal volumes of 30 μ L and more often cause problems through thorough mixing of the sample. Stray light effects from particles in the solvent are minimized by the small light scattering volumes in the measurement cell (1 nL for DLS, 10 nL for SLS) and the precision optics focused exactly into the centre of the flow cell. In this way the signal quality can be improved and the measurement accuracy can be increased. The general diffuse light scattering at glass surfaces, which usually appears in flow cells completely made from glass, results in a strong signal contamination. To minimize this effect, the PN3000 cell only contains two plain glass lens surfaces and a black chemical inert teflon-coated interior.

Measurement Range

Molar masses from under 1.000 Da (with SLS 90°) up to over 100 MDa (using the patented high-performance small-angle detector, SLS 15°) and sizes from 1,5 nm up to about 2 μ m (with 90° DLS batch) can be determined reliable and fast because of the special combination of static and dynamic laser light scatter detection in one analytical detection system using only one flow cell.

Typical Application Range

Due to its great sensitivity and multidimensional detection possibilities, the PN3000 is suitable for a large number of different applications from various areas of research, development and quality assurance. The most important application fields are:

Biotechnology/Pharma: biopolymers, proteins, antibodies, micelles, virus,...
Polymer Research: plastics, rubbers, co-polymers, latex particles,...
Environmental Research: organic + inorganic particles, humic colloids,...

Available Configurations

PN3000 DLS : online Dynamic Laser Light Scattering
PN3010 SLS : online Static Laser Light Scattering 15° or 90°
PN3010 SLS/DLS : online Static and Dynamic Laser Light Scattering 15° or 90°
PN3020 SLS : online Static Laser Light Scattering 15° and 90°
PN3020 SLS/DLS : online Static and Dynamic Laser Light Scattering 15° and 90°