LISST-Deep

Deep Submersible Particle Size Analyzer

Particle Size Distribution • Optical Transmission • VSF

The LISST-Deep instrument obtains *in-situ* measurements of particle size distribution, volume concentration, optical transmission, and the optical volume scattering function (VSF). Using a 670 nm diode laser and a custom silicon detector, small-angle scattering from suspended particles is sensed at 32 log-spaced angle ranges. This measurement is post-processed to obtain size, concentration, transmission, and VSF. The electronics and optical configuration in the LISST-Deep are very similar to the LISST-100X. However, because of the extreme difficulty associated with keeping alignment under high pressure, the LISST-Deep hardware design is radically different from the LISST-100X. This allows the LISST-Deep to be deployed down to 3000 m and obtain reliable measurements in waters with optical transmission up to 98.5 %.

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Tools and Research for Particle Intelligence

FEATURES

- Small angle forward scattering laser diffraction technology
- Self-contained with internal datalogger
- Externally powered
- RS232 connection to PC for programming, offloading and real-time size distribution displays
- Programmable, autonomous data collection
- Integrated depth and temperature sensor
- 32 size classes
- Optional external battery pack, rated to 3000 m depth
- Optional 80% path reduction module for higher concentrations
- Sea-Bird cable for powering from Sea-Bird CTD

SPECIFICATIONS (subject to change without notice)

Parameters Measured

- Particle size in 32 size ranges
- Depth @ 0.8 m (80 cm) resolution
- Optical transmission
- Volume concentration
- Volume scattering function (VSF)
- Temperature @ 0.01 °C resolution

Measurement Ranges

- Particle size from 1.25 µm to 250 µm OR 2.5 µm to 500 µm
- Depth from 0 m to 3,000 m
- Optical transmission from 0.3 to 0.985 (30 % to 98.5 %)
- Concentration from 1 mg·L-1 to 800 mg·L^{-1}. NOTE: Strongly grain-size dependent; see table
- Temperature from -5 °C to 45 °C

Technology

- Small-angle forward laser light scattering
- 670 nm laser diode
- 32-ring custom photodiode ring detector
- 50 mm optical path
- 10 mm optical path with optional 80 % path reduction module.

Mechanical and Electrical

- Dimensions [Ø × L]: 12.57 cm × 80.3 cm (4.95” × 31.5”)
- Weight [air / water]: 17 kg / 8 kg (38 lbs / 18 lbs)
- Depth rating: 3,000 m
- External power input: 9 VDC nominal, 6 VDC to 24VDC
- Power drain [measuring / quiescent]: 145 mA / 8 mA
- Sampling rate: Up to 1 Hz
- Memory: 1 GB (~12,500,000 size distributions)

Material	Concentration [mg/l] 98% optical transmission	Concentration [mg/l] 30% optical transmission	D10 [µm]	D50 [µm]	D90 [µm]	SMD* [µm]
ISO Fine (ISO 12103-1,A2)	1	70	1.5	7	41	3
ISO Coarse (ISO 12103-1,A4)	5	150	4	38	99	10
20-30 µm glass beads	8	445	19	24	34	24
75-125 µm sieved sand	13	810	85	122	175	112

Left: Detail of LISST-Deep optical path and laser cable

Right: LISST-Deep external battery case (optional accessory)

Sequoia Scientific, Inc.
2700 Richards Road, Suite 107, Bellevue, WA 98005 USA
Tel +1 (855) 753-3313
email info@SequoiaSci.com
www.SequoiaSci.com

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