

DISTRIBUTED SENSING SYSTEM (DSS)TM

Luna Technologies' Distributed Sensing SystemTM (DSS) is a fiber-optic sensing tool for making distributed measurements of temperature and strain. The DSS uses swept-wavelength interferometry to simultaneously interrogate thousands of sensors integrated in a single fiber. These sensors consist of discrete Fiber Bragg Grating (FBG) point sensors which can each reflect the same nominal wavelength. As such, the sensors can be fabricated on the draw tower, eliminating the need for individual grating fabrication. The DSS combined with Luna's sensing fiber provides a tool for distributed sensing with up to 1 cm spatial resolution along the length of the fiber.



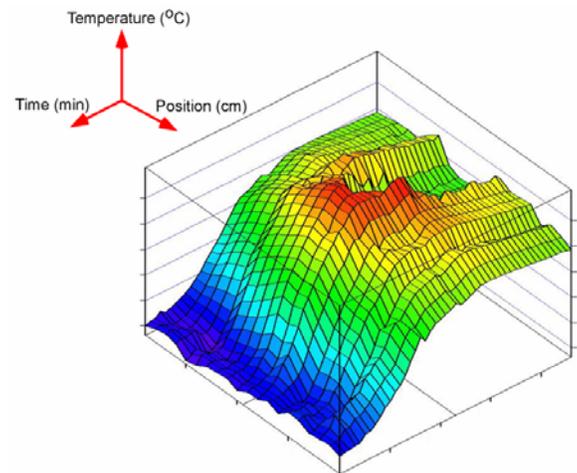
MEASUREMENT PERFORMANCE HIGHLIGHTS

- $\pm 3 \mu\text{Strain}$ resolution
- $\pm 0.5 \text{ C}$ resolution
- 1 cm spatial resolution up to 70 meters
- Measure thousands of sensors in a single fiber

The Luna DSSTM is a sensing solution providing highly distributed fiber sensing for temperature and strain.

APPLICATIONS

- Structural health monitoring for naval, aerospace and civil structures
- Conformal deformation and shape sensing
- Composite damage assessment
- Temperature profile characterization
- Industrial chemical process monitoring
- Condition-based maintenance



Luna's sensing fiber is fabricated on a draw tower. Gratings are written in the fiber at up to 1 cm spatial resolution with no need for strip and re-coat procedures.

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Parameter	Specification	Units
Maximum Sensing length:	10 30 70	meters
Sensor Spatial Resolution¹:	1.0	cm
Strain:		
Resolution ² :	± 3	µStrain
Range ³ :	± 30,000 ⁴ ± 15,000 ± 7,000	µStrain
Temperature:		
Resolution ² :	± 0.5	C
Range ⁵ :	-50 to 300	C
Wavelength range⁶:	1525 -1605	nm
Wavelength:		
Resolution	0.02	pm
Accuracy ⁷	± 1.5	pm
Measurement Rate:	3	Hz

- 1- Typical parameter for sensing fiber fabrication
- 2- Temperature and strain accuracies are calculated from spectral shift of FBGs using 1 GHz ≈ 0.8 C ≈ 4 µstrain [see A. Othonos and K. Kalli, *Fiber Bragg Gratings* (Actech House, Boston, 1999)].
- 3- Based on available wavelength scan range and calibration coefficients for SMF-28 type fiber
- 4- With FBG wavelength in center of laser range
- 5- Based on material properties of polyamide-coated SMF-28 type fiber.
- 6- Range is nominal.
- 7- Accuracy maintained by an internal NIST-traceable HCN gas cell.

