FIBER OPTIC SENSING
Our distributed sensing solutions offer high-resolution strain and temperature measurements using low-cost optical fiber as the sensor, providing unprecedented sensor density for your strain or temperature sensing application. Our systems can provide hundreds of measurement locations per meter of fiber with resolution of a few microstrain.

Distributed sensing allows customers to fully characterize their materials, offering the ability to test a structure at specific points of interest or continuously along the fiber with user-configurable sensing locations and gage lengths. In contrast to traditional discrete sensing solutions, fully distributed sensing provides a global view of the material.

Our sensing platforms provide insight into the performance, tolerances, and failure mechanisms of structures, enabling greatly reduced time, complexity, and expense of instrumentation and measurement for test applications.
With sensors suitable for surface bonding or embedding in composites, this technology can accomplish your objectives either by direct integration during manufacturing or later installation.

- Non-destructive testing
- In-situ strain and temperature monitoring
- Design verification
- Structural load & fatigue testing
- Embedded sensing
- Composite cure monitoring
- Structural health monitoring
MARKETS

With sensors suitable for surface bonding or embedding in composites, this technology can accomplish your objectives either by direct integration during manufacturing or later installation.

AEROSPACE
- Enables structural load and fatigue testing
- Finds defects and product failures
- Supplies better information while reducing SWAP (size, weight, and power)
- Offers greater insight into residual strain left by impacts on composite structures
- Detects defects during the manufacturing process

ENERGY
- Enables efficient designs for renewable energy generation
- Provides early detection of cracks, disjoins and dislocations on a wind turbine blade
- Allows for inexpensive, detailed, real-time temperature monitoring of power generators
- Monitors strain profiles of hydrogen fuel cells

COMPOSITES
- Allows one to know what is happening inside a composite structure; to see the damage even when it’s not visible
- Provides a constant picture of load distribution in a structure
- Detects defects during manufacture and fatigue cycling of composite structures

AUTOMOTIVE
- Provides more detail from the autoclave to the racetrack
- Can be used to optimize design and improve performance
- Monitors health of composite structures
- Profiles temperature in catalytic converters and batteries for electric vehicles

INDUSTRIAL
- Monitors temperature in chemical manufacturing
- Enables structural health monitoring
TECHNOLOGY COMPARISONS

<table>
<thead>
<tr>
<th>STRAIN GAGE</th>
<th>ODiSI PLATFORM</th>
</tr>
</thead>
<tbody>
<tr>
<td>- One sensing point per channel</td>
<td></td>
</tr>
<tr>
<td>- Limited sensing points</td>
<td></td>
</tr>
<tr>
<td>- Labor-intensive installation</td>
<td></td>
</tr>
<tr>
<td>vs.</td>
<td></td>
</tr>
<tr>
<td>- Thousands of sensing points per fiber</td>
<td></td>
</tr>
<tr>
<td>- Full distributed sensing with sub-cm spatial resolution</td>
<td></td>
</tr>
<tr>
<td>- Fast and efficient installation</td>
<td></td>
</tr>
</tbody>
</table>

ACCURACY RELATIVE TO COMMON STRAIN MEASUREMENT TECHNIQUES

Luna’s Rayleigh Scatter distributed sensing technique provides the ability to make numerous strain measurements at mm-length spatial resolution. Comparative measurements between fiber, foil gage, and extensometer were carried out on aluminum coupons clamped in an MTS tensile testing machine.

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Deviation from Extensometer Reading (Fiber)</th>
<th>Deviation from Foil Gage Reading (Fiber)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fiber</td>
<td>1.14%</td>
<td>0.12%</td>
</tr>
<tr>
<td>Foil Gage</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DEFYING IMPOSSIBLE.
PRODUCTS

**ODiSI-A**
Delivers fully distributed strain and temperature measurements with sub-cm spatial resolution, using optical fiber as the sensor
- Measurement ranges of -268 to 900 °C (Sensor Dependent), ± 13,000 µStrain
- Repeatability of ± 2 µStrain, ± 0.2 °C
- Down to sub cm user-controlled spatial resolution
- Maximum sensing lengths of 50 meters

**ODiSI-B**
Delivers high speed, fully distributed strain and temperature measurements with up to 1.28mm spatial resolution, using optical fiber as the sensor
- 250 Hz acquisition over entire 2 meter fiber
- 30 Hz active display over 1 meter
- Maximum sensing lengths of 20 meters
- Measurement ranges of -268 to 900 °C(Sensor Dependent), ± 10,000 µStrain
- Repeatability of ± 0.4 °C, ± 5 µStrain
- 1.28mm spatial resolution

**OBR 4600**
A high-resolution reflectometer designed for component and short-run network testing and troubleshooting, with an option for integrated temperature and strain sensing
- Measurement ranges of -268 to 900 °C(Sensor Dependent), ± 26,000 µStrain
- ± 0.1 °C resolution
- ± 1 µStrain resolution
- Down to sub cm user-controlled spatial resolution
- Continuously measure a 1m segment at up to 3 Hz
- Maximum standard sensing length of 70m
- Extended range option for limited sensing capability up to 2 km
- Acquires spectrum and position of FBG sensors along fiber length; compatible with low reflectivity semi-continuous FBG arrays

**Fiber Optic Sensors**
Distributed strain and temperature sensors are made from unaltered telecom grade optic fiber
- Polyimide coated, low bend loss fiber
- 155um outer diameter
- LC/APC Connector
- Low reflectivity termination
- Temperature operating range of -50 to 300°C for strain sensors and -50 to 200°C for temperature sensors
FIBER OPTIC SENSING

Directly compares the capabilities and intended uses of the various instruments that comprise Luna’s fiber optic sensing platform.

- Included
- Optional
- Not Available

<table>
<thead>
<tr>
<th>Feature</th>
<th>OBR 4600 with Temperature &amp; Strain Option</th>
<th>ODiSI A</th>
<th>ODiSI B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fiber Type</td>
<td>Any</td>
<td>Luna Rayleigh</td>
<td>Luna Rayleigh</td>
</tr>
<tr>
<td>Reflectometer Capability</td>
<td>●</td>
<td>⊗</td>
<td>⊗</td>
</tr>
<tr>
<td># Channels</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Mux compatible</td>
<td>⊗</td>
<td>⊗</td>
<td>⊗</td>
</tr>
<tr>
<td>Minimum Gage Length</td>
<td>1 mm</td>
<td>1 mm</td>
<td>1.28 mm</td>
</tr>
<tr>
<td>Adjustable Gage Length</td>
<td>●</td>
<td>●</td>
<td>⊗</td>
</tr>
<tr>
<td>ODiSI Sensing GUI</td>
<td>⊗</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Distributed Sensing</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Point Sensors</td>
<td>Manually</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>FBG Sensors</td>
<td>Manually</td>
<td>⊗</td>
<td>⊗</td>
</tr>
<tr>
<td>Maximum Sensing Range</td>
<td>70 m (2 km optional)</td>
<td>10 m / 50 m</td>
<td>20 m</td>
</tr>
<tr>
<td>Stand-off Distance</td>
<td>0</td>
<td>10 m</td>
<td>50 m</td>
</tr>
<tr>
<td>Maximum Acquisition Rate</td>
<td>0.3 Hz</td>
<td>5 Hz / 2.5 Hz</td>
<td>250 Hz</td>
</tr>
<tr>
<td>Data Logging</td>
<td>⊗</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Scheduled Logging</td>
<td>⊗</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>
Since 1990, we have a proven track record of leveraging our world class R&D division to identify, develop, and commercialize disruptive technologies. We are innovators, engineers, researchers and developers of technology, driving breakthroughs in fields as diverse as healthcare, telecommunications, energy, and defense.

Our leadership in distributed fiber sensing is evident through the proprietary advanced sensing systems we have brought to market that improve manufacturing and testing of structures and materials.

Our innovation begins with excellence in research and develops into technologies that can be effectively commercialized. With more than 100 patents, our technologists push innovation to the edge of imagination and are recognized as leaders in transforming science into solutions.

CONTACT US

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Email: solutions@lunainc.com

To find a sales contact in your area, please visit our website at [www.lunainc.com/sales-map](http://www.lunainc.com/sales-map).

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