

# Optical Sensing Interrogator | sm130

## Applications

- Measurements of fiber bragg grating (FBG) strain gages, temperature probes, accelerometers, pressure sensors and other FBG sensors.
- Simultaneous dynamic and static measurements of hundreds of sensors.
- Permanent installations for tracking the condition and performance in smart structures like bridges, dams, buildings and tunnels.
- Continuous, decades-long structural health monitoring of ships, aircraft, trains and other complex structures.

## Features

- More sensors - Wide range swept laser scanning means more sensors per channel (4x the competition).
- More channels – Dozens of channels can be realized with cascaded sm041 multiplexers.
- Fast dynamic measurements.
- Spectral Diagnostic View – Observe sensor optical characteristics during setup.
- Distance Measurement – Measure distances to all sensors during setup.
- Synchronized Measurement – Sync multiple sm130s to acquire simultaneous data for 1000s of sensors.

## Description

The sm130 Optical Sensing Interrogator provides simultaneous static and dynamic interrogation of hundreds of fiber optic sensors. The combination of high speed and repeatability allows a single module to dynamically interrogate sensors and measure static sensors with ultra-high resolution.

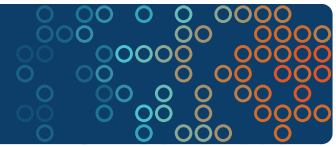
The small and economical sm130 combines an industrial PC with Micron Optics' robust, high-power, low-noise, high speed swept laser source in a single rugged package. Micron Optics interrogators are installed in hundreds of applications in harsh environments around the world from oil platforms in Brunei to marine vessels in the North Sea, to tunnels in Japan.



sm130 Field Module

ENLIGHT<sup>Pro</sup> Sensing Analysis Software is included with Micron Optics sensing interrogator systems and provides a single suite of tools for data acquisition, computation, and analysis of optical sensor networks. ENLIGHT<sup>Pro</sup> combines the useful features of traditional sensor software with the specific needs of the optical sensor system, making it easy to optimize optical properties during the design and implementation phase of an optical sensor system. Intuitive data display and additional graphing and data visualization features make ENLIGHT<sup>Pro</sup> easy to use. Learn more about ENLIGHT<sup>Pro</sup> at: [http://www.micronoptics.com/sensing\\_software.php](http://www.micronoptics.com/sensing_software.php).

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Specifications	sm130-200	sm130-500	sm130-700
<b>Optical Properties</b>			
Number of Optical Channels <sup>2</sup>	1 (up to 16)	4 (up to 16)	4 (up to 16)
Scan Frequency	100 Hz	500 Hz	1 KHz
Wavelength Range	1510-1590 nm		
Wavelength Stability <sup>3</sup>	2 pm typ, 5 pm max		
Wavelength Repeatability <sup>4</sup>	1 pm, 0.05 pm with 1,000 averages		
Dynamic Range <sup>5</sup>	25 dB with user-selectable gain		
Max FBGs per Channel	80 (up to 160 with expanded $\lambda$ range)		
Internal Peak Detection	Included	Included	Included
Spectral Diagnostic View	Optional	Included	Included
Optical Connectors	FC/APC		
FBG Requirements <sup>6</sup>	0.25 +/- 0.5nm, FWHM (-3dB point); >15dB Isolation		

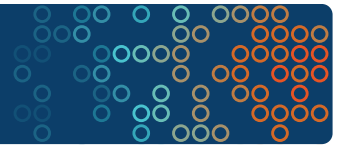
<b>Data Processing Capabilities</b>	
Interfaces	Ethernet - other interfaces available via an sp1xx Sensing Processor Module
Protocols	Custom Micron Optics protocol via Ethernet (others available)
Remote Software	Peak detection, data logger, peak tracking, and instrument control
LabVIEW™ Source Code	Allows for customization of remote software
Enhanced Data Management	ENLIGHT <sup>Pro</sup> Sensing Analysis Software

<b>Mechanical, Environmental, Electrical Properties</b>	
Dimensions; Weight	122 mm x 267 mm x 135 mm; 2.5 kg (5.5 lbs)
Operating Temperature; Humidity	0° to 50° C; 0 to 80%, non-condensing
Storage Temperature; Humidity	-20° to 70° C; 0 to 95%, non-condensing
Input Voltage	7-36 VDC; (100~240 VAC, 47~63 Hz), AC/DC converter included
Power Consumption at 12V	25 W typ, 50 Max

<b>Options</b>			
FBG Distance Measurement <sup>1,7</sup>	Optional	Optional	Included
8 or 16 Channel Expansion <sup>2</sup>	Please see our 8 or 16 channel sm041 multiplexers		
2 kHz Scan Rate <sup>1</sup>	Available with 40nm $\lambda$ range, (1525-1565nm)		
Expanded FBG Capacity <sup>1,8</sup>	$\lambda$ range of 1460 - 1620nm doubles max FBGs to 160 per channel		
1310nm $\lambda$ Range <sup>1</sup>	Available custom $\lambda$ range of 1280-1360nm		

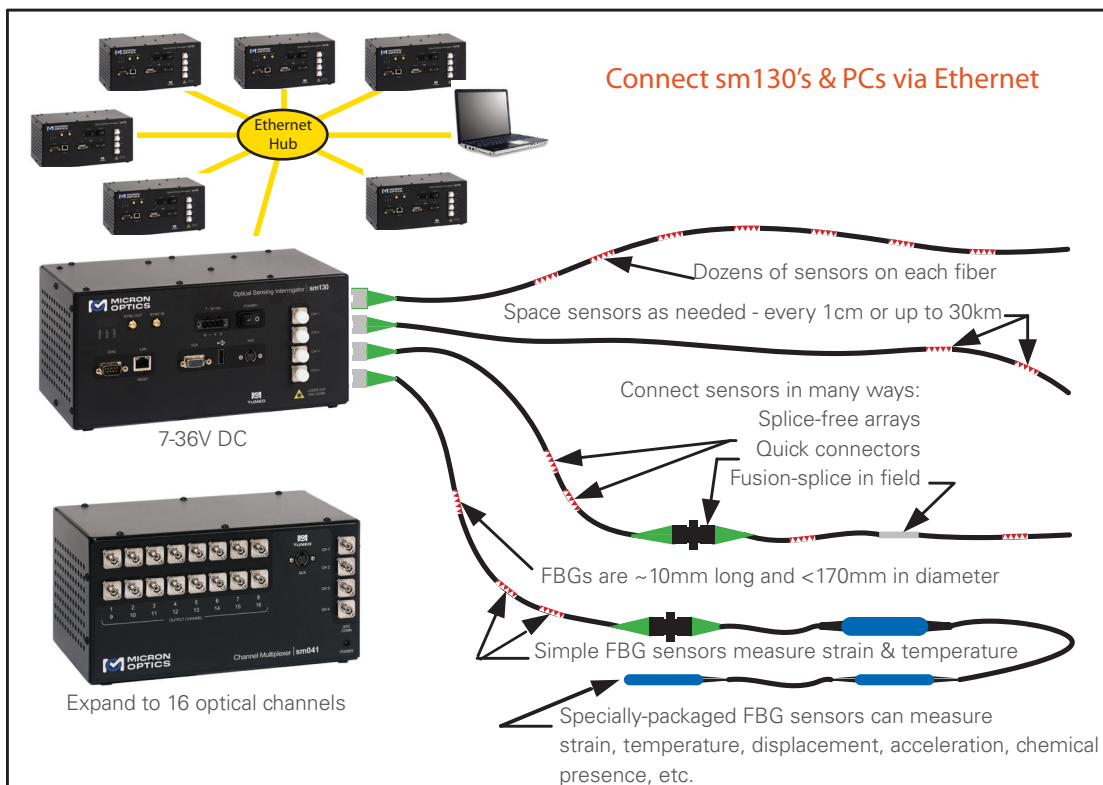
**Notes:**

- Beta product or function. For details see [www.micronoptics.com/product\\_designation.php](http://www.micronoptics.com/product_designation.php).
- Expansion requires 4 integrated optical channels and 1 KHz scan rate to operate a sm041-408 or sm041-416 switch-type multiplexer. (500Hz scan rate is sufficient with 160nm  $\lambda$  range).
- Captures effects of long-term use over full operating temperature range of the instrument. (Assumes an FBG bandwidth of 0.25nm).
- Per NIST Technical Note 1297, 1994 Edition, Section D.1.1.2, definition of "repeatability [of results of measurements]". (Assumes an FBG bandwidth of 0.25nm)
- Defined as laser launch power minus detection noise floor. Adjustable 13 dB window within total range.
- Used for performance qualification (See Notes 3 and 4). Bandwidths of 0.1 to 1.0nm may reduce performance.
- Minimum FBG  $\lambda$  spacing is 1.5nm; FBGs must be in ascending  $\lambda$  order along the fiber; distance measurement accuracy is ~2m, 1KHz/80nm max.
- Maximum scan frequency of 500Hz. Not compatible with FBG distance measurement.



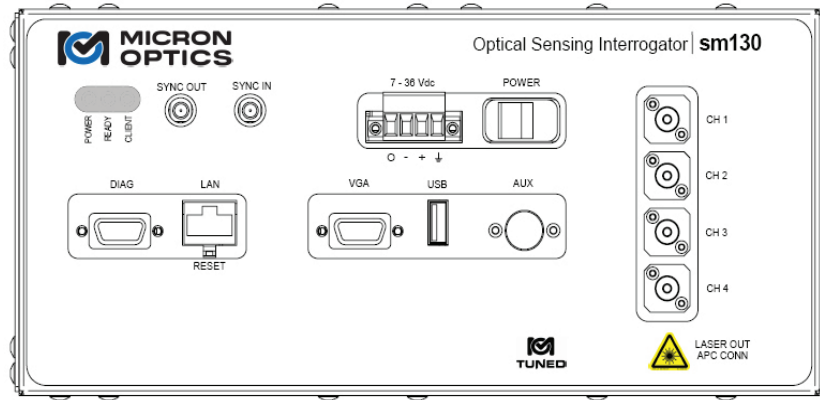
## Benefits

- No Calibration - The sm130 never needs calibrating. Wavelength is calibrated automatically on every scan.
- Robust Operation - The sm130 survives harsh environments. Tests at professional facilities, meticulous customer evaluations and tests at Micron Optics headquarters prove how well Micron Optics products are designed and built.
- Huge FBG Sensor Capacity - The sm130 can monitor a huge number of multiplexed fiber Bragg grating sensors. With expanded sensor capacity (i.e. wavelength range) and several channel expansion options, users of the system have great flexibility in designing their sensing system to maximize the number of sensors per interrogator, and to minimize total solution costs.
- Fast Peak Detection - FBG peak reflections provide the information needed to relate wavelength to strain, temperature or other measurands. The sm130's internal peak detection circuitry delivers fast, repeatable peak detection. The user can optimize peak detection thresholds by channel to meet each particular application.
- Advanced Diagnostics - Spectral Diagnostic View provides insight into spectral shapes for sensor array configuration, setup and diagnostics.
- Compact Size - The sm130 is lightweight and is smaller than a shoebox. All ports are accessible from one side allowing integration into existing control panels.
- Verifiable Performance - The performance we quote is the performance you will get. Some manufacturers boast fantastic numbers for accuracy, resolution and repeatability, but how will they perform in your application?
- Modular Design - The sm130 is offered in a variety of standard models. Custom configurations allow optimization of unit costs and feature sets for volume customers. sm130 instruments use Ethernet to network to external PCs for data analysis.
- Evolving Capabilities - The sm130 performance features are expanding: Enhancements for sensor capacity (i.e., doubling the  $\lambda$  range), speed (i.e., doubling the top scan rate) and different  $\lambda$  regimes.
- Expanded Range - The internal booster option increases effective laser power to reach more distant sensors and/or allow use of more switches and couplers in applications requiring many sensors.



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## Connections

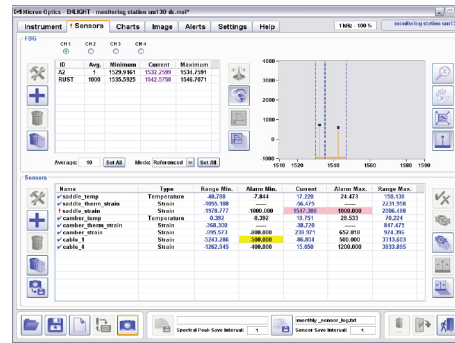


## ENLIGHT<sup>Pro</sup> Sensing Analysis Software (Please see ENLIGHT<sup>Pro</sup> datasheet for more details.)



### Image Tab Example:

- Import image for each application.
- Choose from 3 types of transducer status indicators.
- Position indicators directly on any image.
- Receive fast visual updates on transducer status.
- Maximize display to full screen.



### Sensors Tab Example:

- Set wavelength bins for sensors.
- Define sensor locations.
- Define transducer types (Strain, Temperature Displacement, Pressure or Custom) based on one or more sensor inputs.
- Set warning and alarm limits.

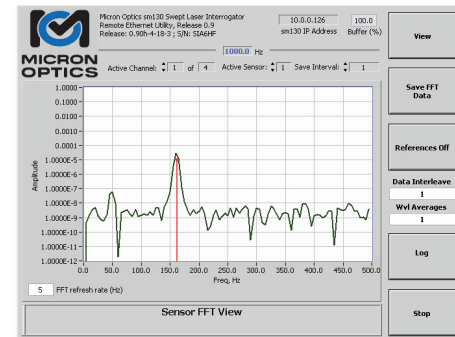
## Data Analysis Using LabVIEW<sup>TM</sup> Remote Utility

The LabVIEW Remote Utility interface displays a table of sensor readings for four channels. The table includes columns for TimeStamp, Channel 1, Channel 2, Channel 3, and Channel 4.

TimeStamp	Channel 1	Channel 2	Channel 3	Channel 4
1 1171936550.117209	1546.037017	1519.227999	1556.134722	1538.875869
2 0.000000	0.000000	1569.025013	0.000000	0.000000
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### Table View Example:

- Shows dozens of sensor readings simultaneously.



### FFT View Example:

- Fast Fourier Transform (FFT) View shows frequency content for individual sensors.