



OZ Optics

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Fiber Optic Distributed Strain and Temperature Sensor (DSTS)

BOTDR Module



Features:

- Single end measurement
- Uses low-cost telecom single mode fiber
- Great spatial resolution and long range
- Multiple channel monitoring available
- BOTDA/BOTDR combo unit available

Performance at a glance:

- 1 m spatial resolution
- 70 km maximum sensing range
- ± 0.8 °C / $16\mu\epsilon$ accuracy (σ)

Description:

OZ Optics' ForeSight™ family of fiber optic Brillouin distributed strain and temperature sensors (DSTS) are sophisticated optical sensor systems employing Brillouin scattering. Distributed sensing provides a direct method of measuring the changes in strain and temperature along the entire length of an optical fiber. A new BOTDR (Brillouin Optical Time Domain Reflectometer) module based on spontaneous Brillouin scattering is now available. Even if there is a break somewhere on the fiber, this unit can still measure strain / temperature up to the point of the break.

Applications



Overhead Power Line Monitoring

- Lightning strikes, icing and broken wires can be detected
- Maximum 140 km fiber can be covered using 2 channels
- No additional components are required along power line route
- Easy deployment



Submarine Cable Monitoring

- Only one fiber required
- Ongoing quality monitoring throughout the life of the cable
- No additional components are required along the route
- Can monitor broken fibers, up to location of the break



Geohazard Monitoring

- Monitoring landslide, subsidence and deformation of levee / ground / highway
- Can monitor broken fibers, up to the location of the break
- Can monitor trends in ground movement
- Long measurement range



Structural Health Monitoring (SHM)

- Can monitor broken fibers, up to the location of the break
- Enough spatial resolution for ensemble monitoring
- Can monitor trends in degradation
- Suitable when there is limited space to loop the fiber



Oil and Gas Pipeline Monitoring

- Pipeline leakage monitoring
- Maximum 140 km fiber can be covered using 2 channels
- Can monitor broken fibers, up to the location of the break



Quality Inspection of Fiber Optic Cable

- More sensitive to strain than OTDR
- Single-end measurement, easy to use
- High level quality control based on high level technology

Specifications

	Model	Foresight™ Series BOTDR module
Performance	Number of Channels	2 to 25
	Sensor Configuration	Single end
	Sensing Range	70 km
	Spatial Resolution	1 m to 80 m
	Spatial Step	as low as 5 cm
	Dynamic Range	>15 dB
	Temperature Range	-100 °C to +500 °C ² (depending on cable material)
	Temperature Resolution	0.005 °C ¹
	Temperature Accuracy (2σ)	± 0.8 °C ³
	Strain Range	-1.4% to +1.6% ² (depending on cable material)
	Strain Resolution	0.1µε ¹
	Strain Accuracy (2σ)	± 16µε ³
Measured Variables	Strain, Temperature, Brillouin spectrum	
General	Communication & Connections	Ethernet port, USB
	Output Signals	Software alarms via TCP/IP, SPST, SSR relays (optional)
	Data Storage	Internal hard disc (128GB or more)
	Data Format	Database, text files, MS Excel, bitmap plot
	Optical Connections	FC/APC
	Operating Temperature	0 °C to 40 °C, <85% RH, Non-condensing
	Power Supply	115 or 230 VAC; 50–60Hz; max 300W
	Dimensions (L x W x H)	390 mm x 344 mm x 85 mm (Not including computer) ⁴
	Weight	8 kg (Not including computer)
Features	Measurement Modes	Manual, remote or automatic unattended measurements
	Data Analysis	Measurement analysis, multiple trace comparison with respect to selectable baseline, measurement trends, graphical zoom.
	Alarms & Warnings	Automatic alarm triggering, configurable alarm settings (gradient, threshold, etc.)
	Remote Operation	Remote control, configuration and maintenance via TCP/IP
	Watch Dog	Long term operation 24/7 guaranteed by automatic recovery and continuous self diagnostics

¹ This value is estimated/calculated from the uncertainty of laser beat frequency (5 kHz), and temperature and strain coefficients of fibers.

² -270 °C to 1500 °C and -3% to +3% is optional.

³ Measurement condition: 1km SM fibers with unstrained condition at pulse width of 10ns, average time of 60000, frequency sweep span of 300MHz with frequency step of 5 MHz, standard deviation (2σ) of 100 consecutive data on temperature/strain distribution waveform.

⁴ Dimensions do not include carrying handle or rackmount tabs. Air vents on sides of unit must not be obstructed.

Typical measurement results table

		Spatial Resolution						
		1 m	2.5 m	4 m	10 m	25 m	35 m	40 m
Fiber Length	1 km	± 0.8 °C / ± 16µε						
	2 km	± 1.2 °C / ± 24µε						
	5 km	± 1.5 °C / ± 30µε						
	10 km		± 1.5 °C / ± 30µε					
	20 km			± 1 °C / ± 20µε				
	30 km				± 1.5 °C / ± 30µε			
	40 km				± 1.5 °C / ± 30µε			
	50 km					± 1.75 °C / ± 35µε		
	60 km						± 1.25 °C / ± 25µε	
	70 km						± 2 °C / ± 40µε	

Results listed above are based on 100 continuous measurement using a single mode sensing fiber with zero strain. Averaging a greater number of scans can provide better precision but it will require a longer measurement time.

Optional Accessories

Bar Code	Part Number	Description
48298	DSTS-TRAVEL-CASE-1U/3U	Optional aluminum carrying case for DSTS. Includes wheels and handle. Designed for checking on airplane. Approximate dimensions: 23.75 (H) x 22.5 (W) x 15 (D). (60.3 cm x 57.2 cm x 38.1 cm).
48979	CI-1100-A2	Handheld Video Microscope kit for Fiber Optic Connector Inspection. The kit includes a 3.5" TFT LCD display with video probe. An ac power adapter with battery charger and a rechargeable battery pack. It also includes one SC/FC PC female connector, one LC/PC female connector, one Universal 2.5 mm FC/PC male connector and one Universal 1.25 mm FC/PC male connector.
48980	CI-1100-A2-PT2-FS/APC/F	Tip for SC and FC APC type female (in receptacle) connector for CI-1100-A2 handheld microscope.
36939	HUXCLEANER-2.5	Receptacle fiber cleaner for FC, SC and ST type.
5336	Fiber-Connector-Cleaner-SA	Disposable Cletop reel type A optical fiber connector cleaner.
8122	SMJ-3A3A-1300/1550-9/125-3-1	1 meter long, 3 mm OD jacketed, 1300/1550 nm 9/125 μ Corning SMF 28e fiber patchcord, terminated with angled FC/APC connectors on both ends.
11	PMPC-03	Flanged sleeve thru connector for polarization maintaining FC/PC connectors. Keyway width is 2.03/2.07 mm wide for 2.00 mm wide (Type R) key connectors.
19711	AA-200-11-9/125-3A3A	Universal connector with a male angle FC/APC connector at the input and a female angle FC/APC receptacle at the output end for SM 9/125 applications.

Related Products

Fiber Optic Sensor Probes, Components, Termination Kits, and Training

OZ Optics offers a full spectrum of fiber optic sensor probes, components, termination kits and training. OZ Optics' standard fiber optic products have been used worldwide in high performance sensor and telecommunications applications since 1985. OZ Optics also offers specialty fiber optic sensor probes and custom cabling for high temperature applications and other hostile and corrosive environments. System integrators with experience in structural and pipeline monitoring will find that OZ Optics offers a complete suite of enabling products and services for installing and maintaining fiber optic systems. If you are planning a pipeline or structural monitoring project, please contact OZ Optics to learn more about our fiber optic solutions.

For more information about our strain and temperature sensor system and related products, please visit www.ozoptics.com.

Ordering Information

Part Number Description: *DSTS-C-1/40-5/70-H-BOTDR*

Questionnaire

1. What is your application? Please describe briefly.
2. Are you looking for a BOTDA module (requires both ends of fiber to be connected to DSTS) or a BOTDR module (requires only one end of fiber to be connected to DSTS) or a COMBO unit with both BOTDA and BOTDR functions?
3. What are your resolution and precision requirements for temperature measurements?
Resolution
Precision
4. What are the highest and lowest temperatures you expect?
5. What are your resolution and precision requirements for strain measurements?
Resolution
Precision
6. What is the maximum strain to be measured?
7. What is the desired sensing range or fiber length in this application?
8. What spatial resolution do you desire?
9. Do you want to measure temperature, strain or both?
10. What is the desired data acquisition time?
11. Do you need fiber calibration / system design / project engineering service?
12. Where will unit be housed?
13. Any additional information?