



OZ Optics
shop.ozoptics.com
www.ozoptics.com

219 Westbrook Road
Ottawa, ON, Canada, K0A 1L0

Toll-free: 1-800-361-5415
Telephone: 1-613-831-0981
Fax: 1-613-836-5089
sales@ozoptics.com

Fiber Optic Distributed Temperature Sensor (B-DTS)

Low-cost Brillouin BOTDA scattering version



Features:

- Real time measurement
- Uses standard telecom single mode fiber
- Good spatial resolution and long range
- Multiple channel monitoring available
- Alarm monitoring capability
- Fast Measurement and Dynamic Measurement

PERFORMANCE at a glance:

- 1 m spatial resolution
- $\pm 0.3^{\circ}\text{C}$ temperature precision
- 100 km maximum sensing range
- 5 kHz frequency uncertainty

Description:

OZ Optics' Foresight™ family of fiber optic Brillouin distributed temperature sensors (B-DTS) are sophisticated optical sensor systems employing stimulated Brillouin scattering. Distributed sensing provides a direct method of measuring the changes in temperature along the entire length of an optical fiber. Measurement is achieved by the direct placement of a singlemode fiber onto, into, or along a structure or area of interest. Low-cost standard telecom single mode fiber can be used.

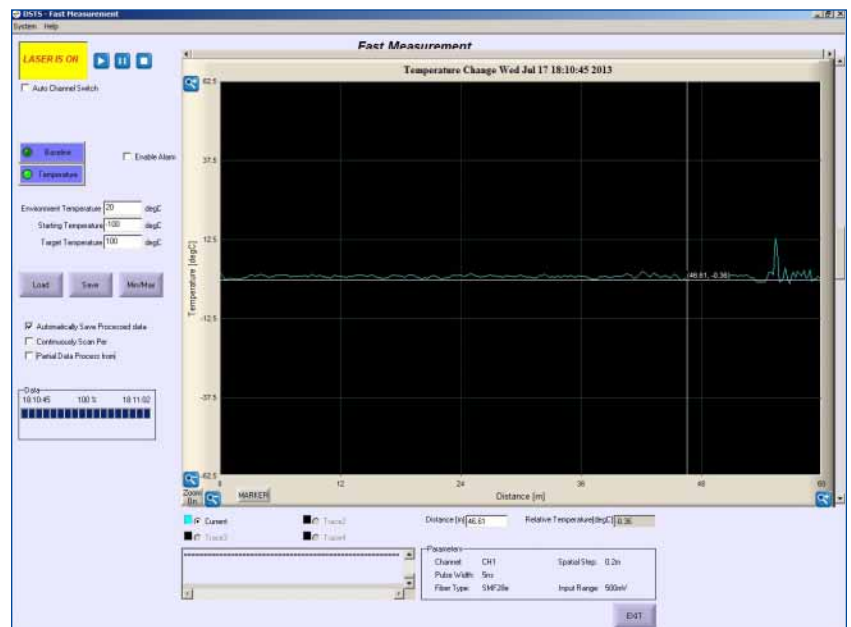
The stimulated Brillouin approach provides several levels of measurement accuracy and speed to meet application specific demands. Each DTS has the flexibility to accurately measure temperature changes, or to quickly detect the changes in temperature associated with fire or even lightning strikes. Trading off accuracy provides for 1 second measurement speed to detect large changes in temperature.

Maximum sensing length utilizing Brillouin analysis is 100 km, a significant improvement over the Raman based distributed temperature sensor. Unlike intensity based Raman systems, the stimulated Brillouin approach measures changes in frequency. This makes the Brillouin approach more immune to attenuation changes, resulting in greater range of measurement at similar spatial resolution. The Brillouin analyzer also allows for excellent spatial resolution; current designs allow for resolutions as short as 1 m for 10 km long fiber.

Internal and external optical switch are available, including fully-automated control. Utilizing an optical switch greatly reduces the costs associated with long term continuous monitoring, by allowing a single system to monitor multiple sensing fibers.

Alarm reporting of minor, major and critical events provides the means to respond appropriately to the changes being detected; furthermore, slope and span alarms provide excellent detection of localized events even as overall temperatures rise.

Spatial Resolution	Sensing Range
1 m	10 km
2 m	20 km
5 m	50 km
20 m	100 km



Fire Detection

Specialized software provides the needed speed of measurement to detect the build-up of heat or the outbreak of fire. The Foresight™ B-DTS offers greater range for sensing without reduction in spatial resolution¹. A length of fiber can be laid out in a large grid to pinpoint a fire within a couple of meters. With 2.5 meters resolution for 20 km sensing range, the temperature can be measured with an uncertainty of only ± 1.5 °C within a range of 0 °C to 100 °C, in less than 24 seconds.



Building Fire Detection

Oil & Gas Pipeline Leakage Monitoring

Assess the integrity of pipelines with the use of the Foresight™ B-DTS. By measuring the localized changes in temperature associated with the leakage product from the pipeline, the B-DTS provides alarms and notification of events along the entire monitored area automatically. Such leaks result in cooling or heating, depending on the product in the pipeline, that is detectable using the B-DTS. Its enhanced range of performance and better immunity to hydrogen attenuation makes the B-DTS a logical choice in pipeline leakage monitoring.



Oil and Gas Well Monitoring

Oil and Gas Reservoir Monitoring

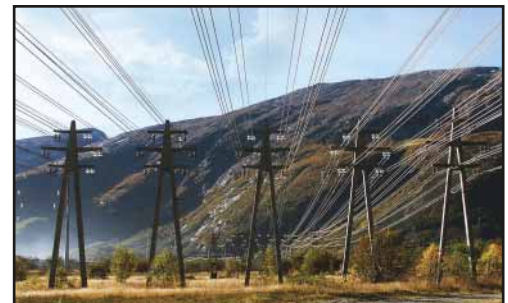
The Foresight™ B-DTS provides for real time and continuous monitoring as required for Oil & Gas reservoir management. Additionally, the Brillouin DTS offers key benefits over the widely deployed Raman DTS method. The B-DTS is a frequency based measurement; not intensity like Raman. This provides greater possibility to overcome loss and attenuation changes in the fiber. By using pure core single mode fibers, the lifespan is greatly enhanced against hydrogen darkening; this is in addition to the greater dynamic range of the Foresight™. Since single mode fibers are utilized, 5 cm spatial step and 1m spatial resolution of temperature events is easily obtained. Stable frequency measurements, greater dynamic range, longer fiber life, and better spatial resolution are key benefits that set the Foresight™ B-DTS.



Oil and Gas Pipeline Monitoring

Power Cable Monitoring

Optical sensing provides for the direct measurement of temperature in power cables. Based on these results, existing infrastructure can be operated more efficiently and carry more load safely. The Foresight™ B-DTS provides excellent range for temperature measurement: up to 100 km sensing range. As a B-DTS has two channels, each capable of monitoring 100 km of fiber, up to 200 km of fiber can be easily monitored by the same unit. Furthermore, built-in software supports external optical switches from the B-DTS as well, greatly enhancing and expanding the number of cables being monitored by a single B-DTS unit.



Power Line Monitoring

Macro Temperature Monitoring

The Foresight™ B-DTS is an excellent choice for researchers and climatologists who need to measure large areas and long lengths for subtle temperature variances. The superior range of spatial resolution and low cost of single mode fiber for sensing makes the B-DTS an ideal choice for macro measurements.

Cryostat Temperature Measurement

The B-DTS has successfully measured temperatures below 25° Kelvin. One such application was the monitoring of heat build-up in a superconductor. With rapid, continuous measurements, the B-DTS is more than just a temperature probe. It can act as an early warning and alarm system to prevent thermal runaway of the superconductor. With its excellent 1 m spatial resolution, users can manage the fiber deployment to easily obtain a very short simulated spatial resolution.



Cryostat

¹ As compared to Raman DTS.

Specifications:

	Model	Foresight™ Series				
		BDTS-C-1/10-60-N	BDTS-C-1/10-1/60-H	BDTS-C-1/50-100-N	BDTS-C-1/50-1/100-H	
Performances	Number of Channels	2 to 25				
	Sensor Configuration	Loop fiber				
	Sensing Range	60 km		100 km		
	Spatial Resolution	1 m to 10 m		1 m to 50 m		
	Spatial Step	as low as 5 cm				
	Temperature Range	-270°C to +2000°C (depending on cable material)				
	Temperature Resolution	0.005 °C ¹				
	Temperature Accuracy (2σ)	± 0.3 °C (Whole sensing range for BOTDA)				
	Dynamic Measurement	No	Yes	No	Yes	
	Fast Measurement	No	Yes	No	Yes	
	Averaging	1 to 65,000 scans				
	Measured Variables	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 (128 GB or more)				
Data Format		Database, text files, MS Excel, bitmap plot				
Optical Connections		FC/APC				
Laser Wavelength		1550 nm band				
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) ²				
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.				
	Alarm & Warnings	Automatic alarm triggering, configurable alarm settings (heat, 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 Dimensions do not include carrying handle or rackmount tabs. Air vents on sides of unit must not be obstructed.

Contact Information:

OZ Optics Limited.
 Tel. 1-613-831-0981
 Toll Free: 1-800-361-5415
 Fax: 1-613-836-5089
 Email: sales@ozoptics.com
 Website: www.ozoptics.com