OZOptics
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Fiber Optic Distributed Temperature Sensors (B-DTS)

Low-cost Brillouin BOTDA scattering version

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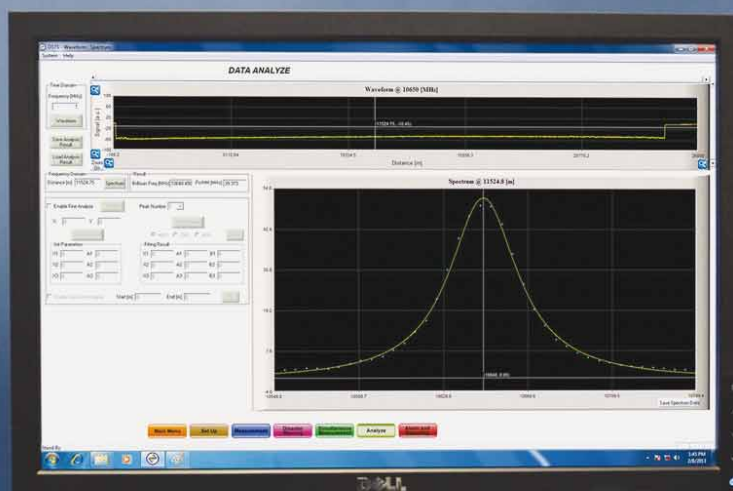

Photo: 2U+1U PC computer chassis shown.

Features
- Fast measurement and dynamic measurement
- Uses standard telecom single mode fiber
- Good spatial resolution and long range
- Immune to attenuation changes

Performance at a glance
- 1 m spatial resolution for 20 km fiber length
- ± 0.3 ºC temperature precision
- 100 km maximum sensing range

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 changes in temperature along the entire length of an optical fiber. Maximum sensing length utilizing Brillouin analysis is 100 km, a significant improvement over Raman based distributed temperature sensors.

Oil and Gas applications

Oil and Gas Pipeline Monitoring

- Pipeline leakage monitoring
- Up to 100 km sensing range per channel
- High spatial resolution supports localized measurement with long sensing range
- Short acquisition / response time

Oil and Gas Well Monitoring

- Well integrity management
- Temperature, strain and pressure monitoring with proper sensing cable and installation
- Not sensitive to hydrogen which may change the attenuation of the fiber

Refinery Efficiency Sensing

- Improve the efficiency of the refinery per distributed temperature profile
- Reduce downtime while ensuring safety levels
- Uses low cost telecom single mode fiber cable

Utility and cable applications

Overhead Power Line Monitoring

- Lightning strikes, icing and broken wires can be detected
- Up to 100 km sensing range per channel
- No additional components required along power line route
- Easy deployment

Submarine Cable Monitoring

- Ongoing quality / status monitoring throughout the life of the cable
- No additional components required along the route

Cryostat, and Fire applications

Cryostat Temperature Sensing

- Able to measure temperatures as low as 25 K
- May use low cost telecom single mode fiber
- Up to 100 km sensing range per channel
- High spatial resolution with good temperature resolution / precision

Building Fire Detection

- Fast, dynamic, and accurate temperature measurement
- Up to 100 km sensing range per channel
- May use low cost telecom single mode fiber cable

Specifications

Model	Foresight™ Series	
Performances — Number of Channels	2 to 25[1]	
Sensor Configuration	Loop fiber	
Sensing Range	60 km	100 km
Spatial Resolution	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[2]	
Temperature Accuracy (2σ)	± 0.3 °C (Whole sensing range for BOTDA)	
Dynamic Measurement	Optional	
Fast Measurement	Optional	
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 or E2000/APC[3]	
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) — 2U Chassis	390 mm x 344 mm x 85 mm (not including computer)[4]	
Dimensions (L x W x H) — 3U Chassis	390 mm x 344 mm x 133 mm (not including computer)[4]	
Weight — 2U Chassis	<8 kg (not including computer)	
Weight — 3U Chassis	<12 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] 2 channels are provided within the sensor unit. Additional channels can be added by using an external optical switch.
[2] This value is estimated/calculated from the uncertainty of laser beat frequency (5 kHz), and temperature and strain coefficients of fibers.
[3] Adaptors and patch cords are available for mating with other types of optical connectors.
[4] Dimensions do not include carrying handle or rackmount tabs. Air vents on sides of unit must not be obstructed.

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 systems and related products, please visit www.ozoptics.com.

Ordering Information

Part Number Description: **BDTS-*CT,CO,I*-*SR*-*MSR*-*AS*-BOTDA-*X***

CT = Chassis Type of DSTS opto-electronics box
2U = 2U chassis
3U = 3U chassis

CO = Computer Type
L = Laptop (requires 3U chassis)
D = Desktop
R1U = 1U computer
R6U = 6U computer
X = Customer supplier computer

I = Internal Interface between DAQ and computer
T = Thunderbolt (requires 3U chassis)
S = Standard

SR = Spatial Resolution (m)[1]
1/10
1/50

X = Connector Type
3A = FC/APC
EA = E2000/APC

AS = Acquisition Speed[3]
N = Normal
H = High Speed

MSR = Maximum Sensing Range (km)[1,2]
60
10/60
100
10/100

For a field-ready unit, replace the chassis type, computer type, and computer interface with a single letter "F." Field ready units include a built-in computer, monitor, keyboard and mouse.

Notes:

1. Each BDTS can be configured for short haul operation, long haul operation or both. The configuration must be specified at the time of purchase. The spatial resolution indicates the best resolution at the maximum sensing range. If the BDTS is configured for both short-haul and long-haul measurements then two numbers will be listed indicating the resolutions and maximum sensing range for each operating mode. For example, suppose the BDTS unit needs to achieve 1 meter resolution over a 10 km range for short-haul applications, and 50 meter resolution over a 100 km range for long-haul applications. The part number will specify the spatial resolution (SR) as 1/50, and maximum sensing range (MSR) as 10/100.

2. Maximum sensing range is 60 km or 100 km for long haul operation. Alternately, if the 1 m spatial resolution is chosen, a maximum sensing range of 10 km is displayed for that resolution (for short haul operation). Maximum sensing range is described as 60, 10/60, 100, or 10/100.

3. The acquisition speed is described as normal or high speed. N and H are used respectively. The high-speed version is typically at least a factor of two faster than the normal-speed version during the acquisition of data.
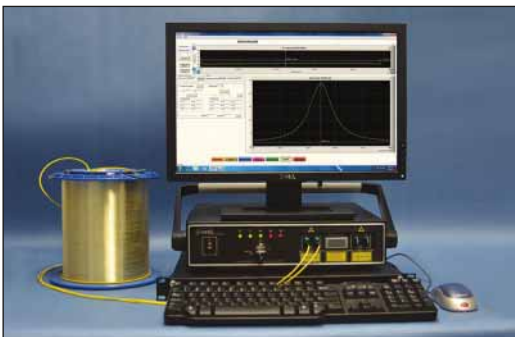
2U model with 1U computer
The 2U and 3U versions of the BDTS come with removable carrying handles that can be replaced by the user with tabs that allow the unit to be installed in a standard 19-inch rack. Monitor, keyboard, and mouse not included.

Field-ready model
A field-ready model is optional for our customers. Please contact OZ Optics for detailed information.

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 the unit be housed?

13. Any additional information?

Please email **sales@ozoptics.com** for our recommendation about your requirements.