

FBT Series Cryogenic Fiber Optic Wide Range Temperature Sensors

Supported by Smart Fibres interrogators

Wide temperature range

The Lake Shore FBT Series fiber optic sensors are designed to deliver dependable temperature measurements over a full scale temperature range from -200°C to +250°C—the widest of any commercially available FBG fiber optic sensors.

Durable

The sensors are available in several rugged, hermetically sealed packages, that are highly resistant to harsh experimental and environmental conditions. Their durability and temperature range is ideal for applications ranging from base research and aerospace to extreme industrial uses.

Reliable

Developed for superior ease of use by Lake Shore Cryotronics, world leaders in precision temperature sensing technology, the sensors are supported by Smart Fibres interrogators.

When your application demands fiber optics, choose Lake Shore FBT series sensors, and work with confidence that your temperature measurements are the most accurate and reliable available.

Typical Applications

- High energy, plasma physics, and other EMI-generating materials research
- RF, microwave, and high voltage applications
- Aerospace cryogenic fuel systems and storage (LOx, LH2, etc.)
- Liquefied natural gas (LNG) storage and transport
- Materials and physical sciences research
- Superconducting research and equipment
- Microwave and RF heating/drying/processing
- Refinery, petrochemical, and other hazardous processes
- Flammable, explosive, corrosive, and other harsh environments

Benefits

- Wide 450° measurement range
- Unique, compact, rugged packages
- Dependable measurement performance



Specifications

Sensor type	Fiber Bragg grating with double-ended connections for multiplex capability	
Wavelengths available¹	1510 to 1590 nm	
Operating temperature	-200 °C to +250 °C (69 K to 525 K)	
Sensitivity	-200 °C to +30 °C	2 to 10 pm/°C
	+30 °C to +250 °C	10 to 14 pm/°C
Resolution²	±0.1 °C at 250°C; ±0.2 °C at 0 °C; ±0.5 °C at -40 °C; ±1.0 °C at -200 °C	
Calibrated accuracy³ for a typical sensor	±0.25 °C at 250 °C; ±0.3 °C at 25 °C; ±0.4 °C at -75 °C; ±0.6 °C at -125 °C; ±2 °C at -200 °C	
Stability (typical)	<0.001 °C/h at 250 °C	
Repeatability⁴	±0.5 °C over entire range	
Vibration	TBD	
Response time⁵	<2 s	
Calibration	3-point or full range calibration—curve equation provided	
Sensor packages	Au/Ni plated copper, 304L stainless steel, or all dielectric thermoplastic; hermetically-sealed, IP68-compliant sensor body	
Mounting methods⁶	Adhesive, bolt-on, clamp-on, or weld	
Dimensions⁷/ weight	Copper	4.0 mm × 10.0 mm × 20.0 mm/4.5 g
	Dielectric	4.0 mm × 10.0 mm × 20.0 mm/1.5 g
	Stainless	4.4 mm × 10.5 mm × 34.8 mm/7.5 g
Cable length	1 m ±100 mm	
Cable type	3 mm OD silicone-coated fiberglass braid with Kevlar strength member	
Fiber type	Single mode polyimide coated, bend insensitive	
Connector type	FC/PC, FC/APC, or harsh environment	
Insertion loss (typical)	0.5 dB connectorized	
Cable minimum bend radius	10 mm	
Maximum sensors that can be chained/multiplexed²	16+ sensors typical, spliced; 6 to 8 sensors, connectorized	
Sensor spacing	Up to 1000 m between sensors	
Storage temperature and humidity	-200 °C to 125 °C Up to 95%, non-condensing	

¹ Wavelength spacing required for full temperature range is approximately 4.5 nm
² Varies based on resolution and accuracy of interrogator used
³ Calibrated accuracy includes uncertainty associated with the calibration source and system
⁴ Repeatability over 10 calibration cycles; varies depending on mounting arrangement and subsequent thermal path
⁵ Based on ice water to boiling water (0 °C to 100 °C)
⁶ Sensors may be placed adjacent to each other and cable can be coiled
⁷ See model drawings; mass does not include cabling
 Patent-pending designs