



Fiber Bragg Grating-based Temperature-compensated Accelerometer Sensors

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FBG Accelerometer Sensor

The strain effect of a FBG can be functionalized for strain measurements. Depending upon the packaged FBG strain status, external strain could increase or decrease strain so that the amount of the wavelength change can be converted to strain change. Depending upon temperature range, the fiber package could use polymeric or metal materials for $T < 300^{\circ}\text{C}$ application. However, a FBG may respond to both thermal and strain variation in real environment. At constant temperature environment, a standard strain sensor may not need temperature compensation. If this is not the case, the measured strain response amplitude may also include temperature variation amount. To substrate temperature effect second FBG, acting as a temperature sensor, is also packaged inside the strain sensor to form an athermal sensor package. Since second FBG measured temperature can be used to deduct first FBG sensor thermal response amplitude, the vibration frequency from real power spectral will be determined by Fast Fourier Transform (FFT) algorithm:

$$f(t) = FFT[\Delta\lambda(t)]$$

where $\Delta\lambda(t)$ is relative wavelength amplitude variation at time t .

Depending upon different applications the accelerometer sensor may need to respond to fast structural instability or change from a specific event. An accelerometer sensor design has considered such potential bandwidth requirement that the existing accelerometer sensors can be divided into quasi-dynamic and dynamic sensors. For quasi-dynamic accelerometer sensor it has high-vibrational amplitude range, but it is more suitable for low-frequency measurement. On the contrary, the dynamic accelerometer sensor may have low-vibrational amplitude measurement range but it could respond to transient vibration variation. If such a dynamic variation has a

dominated power spectra that could give vibration frequency signature by fast Fourier transform method.

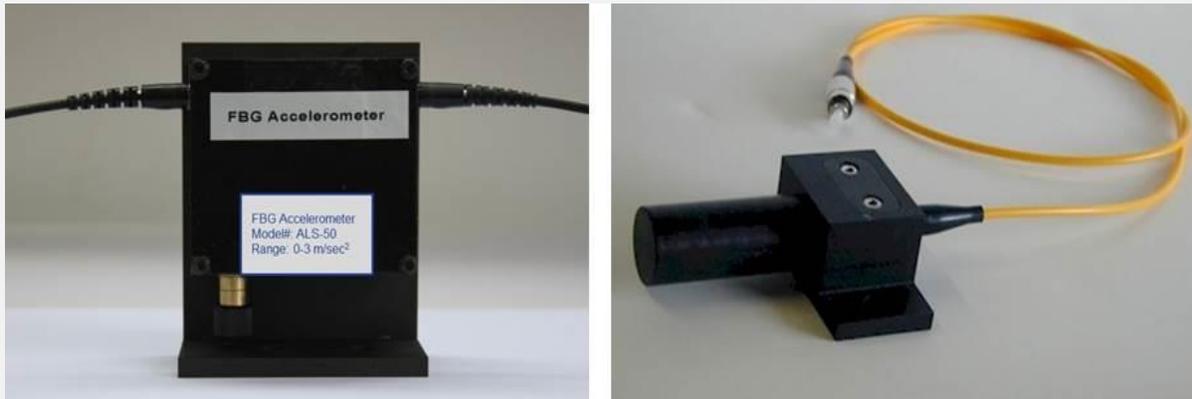
Boston Instruments provide following FBG Accelerometer Sensors:

Model: EAS80-50 (Standard, freq. band 50Hz, 80C)

Model: EAS80-300 (Prototype, freq. band 300 Hz, 80C)

FBG Accelerometer EAS80-50

FBG accelerometer EAS80-50 is designed for buildings and civil infrastructures. The accelerometer has a high sensitivity in low frequency range to cover the most important frequency components of the structural response, typically from 1 Hz to 50Hz.



Specifications

Parameter	Unit	Value	Remark
Center Wavelength	nm	1510-1590	
Range	ms ⁻²	0~3	Customized
Accuracy		1‰ F.S	
Sensitivity	pm/ ms ⁻²	250~500	customized
Frequency Response	Hz	1-50	
Operating Temperature	°C	-20~80	
Dimension	mm	80×40×100	Installation Plate Included
Connector	--	FC/APC	customized
Pigtail		ø3mm armored cable	