

DATA SHEET

FS65HSA High Sensitivity Accelerometer

SPECIAL FEATURES

- High sensitivity
- Integrated Temperature compensation
- In series integration
- Configurable wavelengths, cable lengths and connector types



DESCRIPTION

The High Sensitivity Accelerometer is a Fiber Bragg Grating (FBG) based single-axis sensor designed to measure low frequency, small amplitude signals. It operates with two FBG for effective temperature compensation and can be inserted in series with other sensors as it is provided with two lead fibers. The FS65HSA is based on the newLight® technology developed by HBK FiberSensing. newLight sensors employ high strength fiber coatings ensuring robustness, increased sensitivity, and higher measurement accuracy. HBK FiberSensing offers innovative sensor designs compatible with standard telecommunication fibers. This eases network design and significantly

reduces installation time and cost, even when a large number of sensors are multiplexed on the same fiber, sometimes kilometers apart. The technology is completely passive - fitting explosive environments -, self referenced - providing measurement long term stability -, and compatible with most interrogators in the market. The accelerometer can be used in a large range of monitoring applications, including measuring ambient vibration of civil structures. Connect two or three accelerometers at orthogonal directions for bi- or tri-axial acceleration measurements. Contact HBK FiberSensing for additional dedicated support.

BENEFITS AND APPLICATION

Sensor design

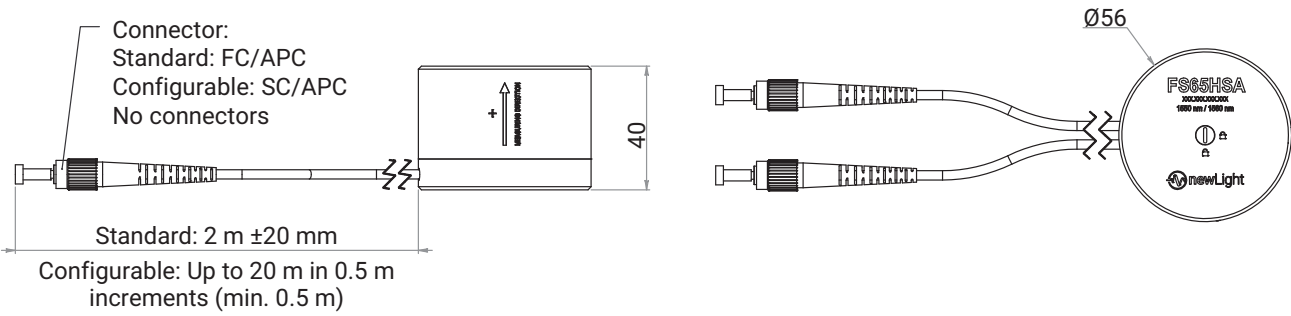
- Enhanced sensitivity for vibration monitoring of large structures
- No need for temperature compensation with external elements
- In series installation with lead in and lead out fibers and possibility to assemble with other accelerometers for bi or triaxial measurements
- Suited for outdoor applications
- Linear response at full operation range

Fiber Bragg grating technology

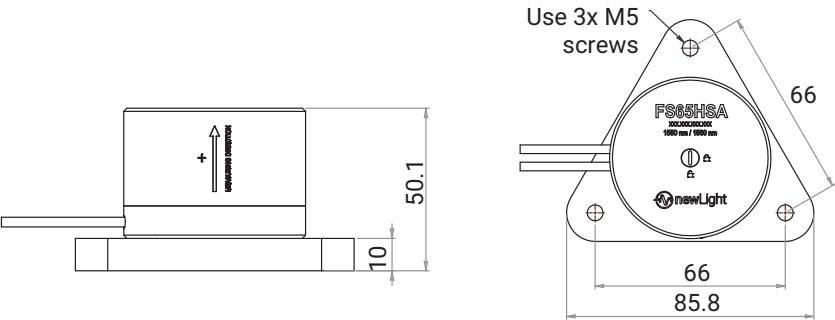
- No drift, absolute referenced measurements
- Immune to electro-magnetic and radio frequency interferences
- Passive technology fitting applications in explosive areas
- Reduced cable requirements with intrinsic multiplexing capability
- Long distances between sensors and the interrogators attainable
- Combinable with other FBG sensor types on the same fiber and same interrogator

DIMENSIONS

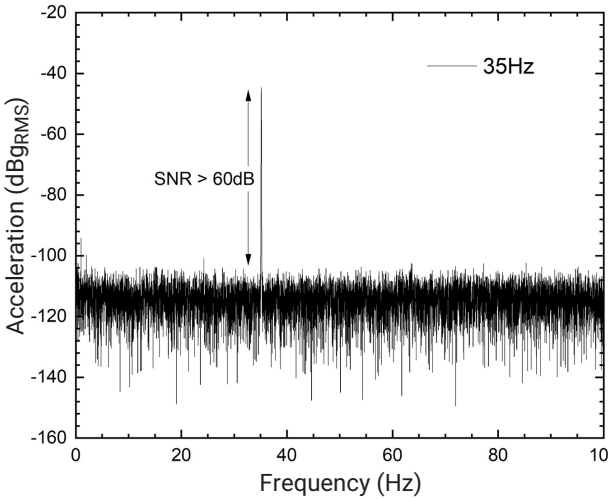
Sensor

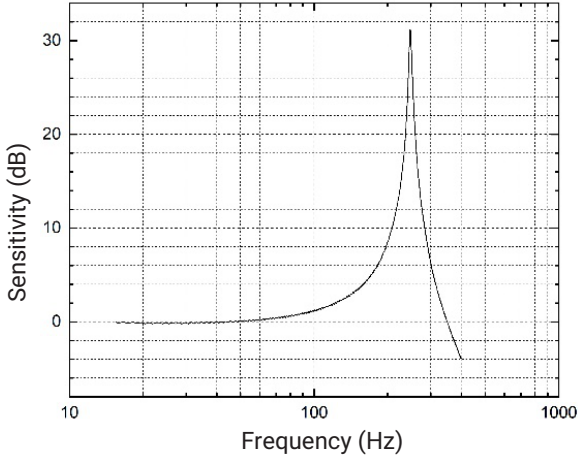


Mounting Accessory



SPECIFICATIONS

Sensor		
Sensitivity per FBG ¹⁾ combined ²⁾	pm/g	650 1300
Calibration factor ³⁾	g/nm	0.77
Resolution (unfiltered values, 1000 Hz bandwidth) Time based measurement ⁴⁾ Frequency based measurement ⁵⁾	mg	1 0.01
Signal to noise ration		
Measurement range ⁶⁾	g	± 2 or ± 5

Accuracy 0.1 – 25 Hz 0.1 – 50 Hz 0.1 – 75 Hz	%	2 3 10
Typical calibration error ⁷⁾	g	± 0.02
Impact resistance Unlocked Locked	n.a.	20 g for 6 ms in all axis 100 g for 6 ms in all axis
Long term stability	cycles	>10 ⁷ above maximum acceleration
Transverse sensitivity	%	< 0.2
Frequency range	Hz	0.1 ... 75
Sensor		
Resonance frequency ⁸⁾	Hz	240
Flatness ⁹⁾ 0.1 – 25 Hz 0.1 – 50 Hz 0.1 – 75 Hz	%	< 1.5 < 3 < 10
Typical frequency response	n.a.	
Operation temperature range ¹⁰⁾	°C	-20 ... 80
Storage temperature range	°C	-20 ... 80
Temperature cross sensitivity ¹¹⁾	mg/°C	4
Degree of protection ¹²⁾	n.a.	IP 68
Dimensions	mm	Ø56 x 40
Attachment method ¹³⁾	n.a.	Bolted (M5)
Weight ¹⁴⁾	g	610
Main Materials ¹⁵⁾ sensor body optical fiber	n.a.	Stainless steel Silica,Ormocer®
Bragg wavelengths ¹⁶⁾	nm	1500 ... 1600 (±0.5)
Fiber type	n.a.	SMF-28 compatible
Fiber cladding and coating diameter	µm	125/195
FWHM, reflectivity and side lobe suppression	n.a.	≤ 0.3 nm, 21±4 %, > 10 dB
Insertion loss	dB	< 0.5
Cables		
Cable type	n.a.	Ø 3 mm armor
Main Materials ¹³⁾	n.a.	Hytrel, stainless steel spiral, Kevlar® stainless steel mesh and LDPE
Cable length ¹⁷⁾	m	0 ... 20
Cable bend radius ¹⁸⁾	mm	> 30
Operation temperature range	°C	-20 ... 80

Storage temperature range	°C	-20 ... 80
Connectors		
Type	n.a.	FC/APC, SC/APC or NC (No Connectors)
Operation temperature range	°C	-20 ... 80
Storage temperature range	°C	-20 ... 80

- 1) Typical wavelength variation of each FBG caused by a 1 g acceleration.
- 2) Typical combined wavelength variation ($\lambda_2 - \lambda_1$) of the two FBG caused by a 1 g acceleration.
- 3) Typical value. Calibration factor defined as acceleration / wavelength difference ($\lambda_2 - \lambda_1$). Calibration is performed at 35 Hz.
- 4) For 1 pm resolution in wavelength measurement, as found in MXFS DI interrogator.
- 5) Dynamic signals obtained with FFT analysis using an MXFS DI interrogator for wavelength measurement using catman®. The system resolution can be calculated as 0.25 µg/√Hz considering a bandwidth of 1000 Hz.
- 6) Selectable range by part number or configurator. Measurement range directly reflects on occupied wavelength range per FBG. ±2 g option allows for the integration of two triaxial sets of accelerometers on the same line.
- 7) Calibrated at 35 Hz. Typical traceability uncertainty of 0.1 g(0-pk).
- 8) Typical value.
- 9) Relative sensitivity variation within sensors' frequency range.
- 10) Continuous operation tested at 125 °C for an equivalent time of 9600 h at 80 °C.
- 11) Typical temperature sensitivity over the full frequency range. No visible temperature effect on sensor sensitivity.
- 12) DIN EN 60529. Tested for 1m submersion for 24 h.
- 13) Anchors and screws not included. Mounting plate available as an accessory on configurable item.
- 14) With 2 m cable each side and no connectors.
- 15) The full composition of the sensor including cable, complies with RoHS, REACH, Conflict Minerals.
- 16) Standard selection of fixed pairs. For different wavelength combinations please contact HBK FiberSensing.
- 17) For cables longer than 2 m, a splice (Ø 8 x 150 mm) is included at 2 m from the sensor. Specified cable length is ensured on delivery. A margin of up to 10 cm can be present. For different cable lengths or splice position please contact HBK FiberSensing.
- 18) Induced loss due to one complete turn around a mandrel lower than 0.05 dB.

ORDER INFORMATION

Configurable Item		Standard Item ¹⁹⁾
K-FS65HSA – 1 2 3 4 5 6 7		
Options		1-FS65HSA-02/2510
1	Connector type: NC - No connector; FC - FC/APC; SC - SC/APC	1-FS65HSA-02/2525
2	0.5 m < Cable length < 20 m @0.5 m steps	1-FS65HSA-02/2540
3	Measurement range: 02 - ±2g; 05 - ±5g	1-FS65HSA-02/2555
4	1510 nm ≤ Wavelength ²⁰⁾ ≤ 1590 nm	1-FS65HSA-02/2570
5	0.5 m ≤ Cable length ≤ 20 m @0.5 m steps	1-FS65HSA-02/2585
6	Connector type: NC - No connector; FC - FC/APC; SC - SC/APC	1-FS65HSA-05/2510
7	Mounting accessory: Y – With; N – Without	1-FS65HSA-05/2530
		1-FS65HSA-05/2550
		1-FS65HSA-05/2570

- 19) Standard Items correspond to a configuration: 2 m length armor cable to each side terminated with FC/APC connectors. Wavelengths pairs starting at the defined wavelength, spaced at 5 nm for the sensor with ±2 g measurement range and spaced 10nm for the ±5 g measurement range (e.g. 1-FS65HSA-02/2570 has 1570/1575 nm).
- 20) Pre-defined pairs of wavelengths for each measurement range. For ±2 g: 1510/1515; 1525/1530; 1540/1545; 1555/1560; 1570/1575; 1585/1590 nm. For ±5 g: 1510/1520; 1530/1540; 1550/1560; 1570/1580 nm. For different wavelengths please contact HBK FiberSensing.

ACCESSORIES

Article	Description	Order Number
Mounting accessory	Stainless steel (AISI304) mounting plate for uniaxial assembly of one FS65HSA.	1-FS84-FS65HSA01

HBK FiberSensing S.A.

Via José Régio, 256 · 4485-860 Vilar do Pinheiro · Portugal

Phone: +351 229 613 010

www.hbkworld.com · info.fs@hbkworl.com

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