

## DATA SHEET

# FS61DSP

## Displacement Sensor

### SPECIAL FEATURES

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- Temperature compensated
- Robust design
- Configurable wavelengths, cable lengths and connector types



### DESCRIPTION

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The Displacement Sensor is a Fiber Bragg Grating (FBG) based sensor designed to measure linear displacement on different types of structures. Ready to be bolted to one surface while its moving shaft is in contact with another, it is prepared to be used in a large range of monitoring applications. The sensor employs two FBG in a push-pull configuration ensuring a performing temperature compensation and impressive long-term stability.

The FS61DSP is based on the newLight® technology developed by HBK FiberSensing. newLight sensors employ high strength fiber coatings ensuring enhanced

fatigue resistance 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.

### BENEFITS AND APPLICATIONS

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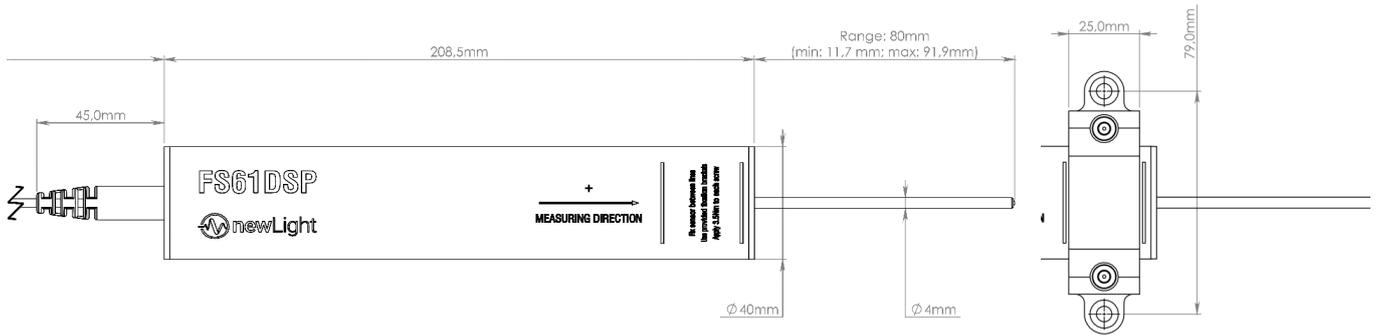
#### Sensor design

- In series installation with lead in and lead out fibers
- No need for temperature compensation with external elements
- Suited for outdoor applications
- Fitting applications like structural health monitoring of large structures across several industries (civil engineering, wind...)

#### 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



## SPECIFICATIONS

Sensor		
Sensitivity per FBG <sup>1)</sup>	pm/mm	29
Calibration factor <sup>2)</sup>	mm/nm	17.5
Resolution <sup>3)</sup>	mm	<0.02
Measurement range	mm	80
Actuation force <sup>4)</sup>	N	<30
Maximum calibration error	mm	±0.4
Insertion loss <sup>5)</sup>	dB	<0.1
Operation and storage temperature	°C	-20 ... +80
Degree of protection <sup>6)</sup>	n.a.	IP66
Temperature cross sensitivity <sup>7)</sup>	mm/°C	<0.01
Maximum temperature rate <sup>8)</sup>	°C/h	80
Sensor bend radius	n.a.	Cannot be bent
Attachment method <sup>9)</sup>	n.a.	Bolted (M5)
Operating method	n.a.	Normally opened
Dimensions	mm	266±0.5~345±0.5 x $\varnothing 40\pm 0.5$
Weight <sup>10)</sup>	g	722
Main materials <sup>11)</sup>	n.a.	Stainless steel, polyamide
Bragg wavelengths	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, 20±3 %, >10 dB

- 1) Typical wavelength variation of each FBG caused by a 1 mm displacement.
- 2) First order, typical. Detailed information provided on the calibration sheet.
- 3) Based on the  $2\sigma$  value of a measurement histogram with 60000 samples obtained using a 0.5 pm resolution equipment such as FS22SI Interrogator.
- 4) Actuation force depends on the sensor shaft displacement value, speed and direction.
- 5) Without connectors and with dual splice to standard telecom fiber (ITU-T G.652.D).
- 6) DIN EN 60529.
- 7) Temperature Cross Sensitivity (TCS) is the typical signal induced by a 1 °C change in temperature without changing displacement.
- 8) Maximum temperature changing speed for an effective temperature correction.
- 9) Includes mounting bracket for flat surfaces.
- 10) With 2 m cable each side and no connectors.

Inputs/Outputs		
Cable type <sup>11)</sup>	n.a.	Ø 3 mm armor (Hytrell, stainless steel spiral, Kevlar®, stainless steel mesh and LPDE)
Cable bend radius <sup>12)</sup>	mm	> 30
Cable length <sup>13)</sup>	m	0.5 ... 20
Connectors	n.a.	FC/APC, SC/APC or NC (No Connectors)

<sup>11)</sup> The full composition of the sensor including cable, complies with RoHS, REACH, Conflict Minerals and fire propagation prevention directives.

<sup>12)</sup> Induced loss due to one complete turn around a mandrel lower than 0.05 dB.

<sup>13)</sup> For cables longer than 2 m, a splice (Ø8x150 mm) is included at 2 from the sensor. Specified cable length is ensured on delivery. A margin of up to 10 cm can be present. Extension cables are delivered with acrylate coated fiber. For different cable lengths or splice position please contact HBK FiberSensing.

## ORDERING INFORMATION

Configurable Item K-FS61DSP		Standard item <sup>14)</sup>
<b>Options</b>		1-FS61DSP-080/2510
<b>1</b>	<b>NC</b> - No connector; <b>FC</b> - FC/APC; <b>SC</b> - SC/APC	1-FS61DSP-080/2530
<b>2</b>	0.5 m ≤ <b>Cable Length</b> ≤ 20 m @0.5 m steps	1-FS61DSP-080/2550
<b>3</b>	1510 nm ≤ <b>Wavelength</b> <sup>15)</sup> ≤ 1580 nm @10 nm steps	1-FS61DSP-080/2570
<b>4</b>	0.5 m ≤ <b>Cable Length</b> ≤ 20 m @0.5 m steps	
<b>5</b>	<b>NC</b> - No connector; <b>FC</b> - FC/APC; <b>SC</b> - SC/APC	

<sup>14)</sup> Standard Items correspond to a configuration: Armor cable, with 2 m length to each side terminated with FC/APC connectors. Wavelengths in predefined pairs of: 1510/1520; 1530/1540; 1550/1560; 1570/1580 nm.

<sup>15)</sup> Pre-defined pairs of wavelengths: 1510/1520; 1530/1540; 1550/1560; 1570/1580 nm.

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