Mounting Instructions

English

newLight

FS64TLS

Tilt Sensor

HBM

Hottinger Baldwin Messtechnik GmbH
Im Tiefen See 45
D-64293 Darmstadt
Tel. +49 6151 803-0
Fax +49 6151 803-9100
info@hbm.com
www.hbm.com

HBM FiberSensing, S.A.
Optical Business
Rua Vasconcelos Costa, 277
4470-640 Maia
Portugal
Tel. +351 229 613 010
Fax +351 229 613 020
fibersensing@hbm.com
www.hbm.com/fs

Mat.:
DVS: A05301_01_E00_00 HBM: public
12.2018

1 General Information

The following instructions refer to the installation procedure of FS64TLS Tilt Sensors.

These sensors are delivered individually. Nevertheless, they are delivered with two fibers for easy assembly in series for example to be mounted in bi-axial configurations.

Material Numbers
K-FS64TLS
1-FS64TLS-10/2510
1-FS64TLS-10/2530
1-FS64TLS-10/2550
1-FS64TLS-10/2570

1.1 newLight Technology

The FS64TLS is based on the **newLight®** technology developed by HBM FiberSensing to combine particular advantages of the FBG overcoming technical compromises that existed so far. newLight® sensors employ **high strength fiber coatings** and **different FBG fabrication techniques** to ensure increased strain measurement ranges, enhanced fatigue resistance and higher measurement accuracy. **The low bend loss**, **telecom compatible fiber** opens the possibilities for innovative sensor designs as well as the straightforward usage of multiplexed sensors on the same fiber even if kilometers apart. The technology is completely **passive**, **self-referenced** and **compatible with most interrogators**.

2 Sensor Installation

2.1 List of materials

Included Material
Tilt Sensor
Sealant stickers (two sets)

Needed equipment
Drilling Machine (optional)

Needed material
Anchors (M6 Bolt) Suggested: HAS-R M6 5/-/- from Hilti or similar
Slotted screwdrivers (L30 D2.8 E0.7 mm and D7 E1.1 mm)
Spanner wrench (10mm)
Specifically designed Mounting brackets (optional)
Bubble level

The needed tools to install the FS64TLSTilt Sensor depend on the structure it is to be installed on. In some cases, mounting parts may need to be designed in order to adapt the sensor to the spot where it is going to be installed.

2.2 Preparation the surface

The surface where the sensor is to be installed should be vertical and regular.

Information

If the sensor wall is not vertical, it will not have the expected behavior. There is the possibility to design mounting plates to ensure the right position of the sensor.

Fig. 2.1

► Make sure of the verticality of the surface and that there are no major irregularities that could interfere with the sensor's back side (*Fig. 2.1*).

Important

If there are any bumps and/or irregularities when tightening up the sensor, its back can get deformed which will influence the sensor's behavior.

► Afterwards mark two points 20 cm apart and vertically aligned (*Fig. 2.2*).

Information

The tilt sensor has a slot to ensure that small corrections towards the vertical can be performed when the sensor is being fixed.

Fig. 2.2

Fig. 2.3

- ► Drill the holes according to the chosen M6 anchors *see section 2.1, page 5* with a minimum depth of 42 mm.
- ► Verify the screws position with a measuring tape and then anchor them definitely (*Fig. 2.3*), tightening them with a torque of 5 Nm.
- ► Remove the nut before proceeding.

2.3 Placing the sensor

- ► Carefully take the tilt sensor out of the transportation box and place it on the support (*Fig. 2.4*).

Important

The tilt sensor is a sensitive sensor. Please take extra care when handling the sensor.

Fig. 2.4 Placing the sensor on the supports

Fig. 2.5 Applying the washers and hexagon nuts

- ► Place the washer and hexagon nut on both anchors (*Fig. 2.5*).
- ► With the help of a bubble level rotate the sensor along the slot and place the sensor as close to the vertical as possible (*Fig. 2.6*). Screw the nuts loosely to allow final adjustments.

Fig. 2.6 Vertical alignment using a bubble level

2.4 Unlocking the sensor

Important

The FS64TLS is based on a pendulum mass that must be secured during sensor transportation. For correct operation of the sensor these fixations must be properly removed. The next installation steps must be followed strictly.

Throughout the next steps, it is advisable to control both FBG wavelength changes.

► Connect the sensor to an interrogator and control the Center Wavelengths of the two FBGs so that their difference is as close as possible to the value shown on the calibration sheet.

Tip

The easiest way to perform this control is to configure the sensor so that the tilt value is measured. Nevertheless, if the available equipment does not have software to perform this automatically, it can be done manually by looking directly at the absolute wavelength values.

Fig. 2.7 Unlocking sequence

2.4.1 Mass Locking Screws

Fig. 2.8 Mass locking screws (number “1”)

The locking screws marked with “1” are physically fixing the pendulum mass for transportation.

► Start by unlocking the right (white) side slowly, using the bigger slotted screwdriver (D7 E1.1 mm), while controlling the wavelength values. Then change to the left (blue) side and repeat.

These screws should be fully removed from the sensor and stored so that they can be attached again if the sensor is to be transported.

2.4.2 Front Locking Screws

Fig. 2.9 Front locking screws (number “2”)

Marked with number “2” are the front locking screws. These screws are not removable.

► Starting again on the right (white) side, use the smaller slotted screwdriver (L30 D2.8 E0.7 mm) and turn 3 to 4 times to unfasten the screw half way. Repeat on the left (blue) side.

Tip

If wavelength values start to separate visibly switch sides more often.

► Return to the right (white) side hole and finish unlocking.

Notice

Do not force the screw. Once you feel it has hit the end stop rotating it.

► Repeat on the left (blue) side.

2.4.3 Side Locking Screws

Fig. 2.10 Side locking screws (number “3”)

Last to unfasten should be the side locking screws marked with number “3”. The process for these lockers is the same as for the previous.

► Starting on the right (white) side, use the smaller slotted screwdriver (L30 D2.8 E0.7 mm) and turn 3 to 4 times to unfasten the screw half way. Repeat on the left (blue) side.

Information

On this direction the wavelength change should be smaller. Nevertheless, if wavelength values start to separate visibly switch sides more often.

► Return to the right (white) side hole and finish unlocking.

Notice

Do not force the screw. Once you feel it has hit the end leave it.

► Repeat on the left (blue) side.

Notice

Before removing the sensor to use it in a different location the mass must be locked again. Only by doing so it is granted that no damage is done to the sensor. Please follow the instructions of chapter 2.7 on page 17.

2.5 Aligning the sensor

Now it is time to set the final alignment of the sensor.

► For the sensor to be installed vertically, ensure that the difference between the two measured wavelengths equals the wavelength difference of the two reference wavelengths as stated on the calibration sheet.

Information

If you have information on the tilt value, you should set it as close as possible to zero.

Fig. 2.11 Fastening hexagon nuts

► After ensuring that the sensor is in its vertical position, fasten the hexagon nuts (*Fig. 2.11*) with a torque of 5 Nm.

Important

Care must be taken to avoid rotating the sensor while fastening the nuts.

2.6 Protecting the sensor

Once the sensor is tightly set in place, cover the holes from the locking screws with the provided sealant stickers (Fig. 2.13).

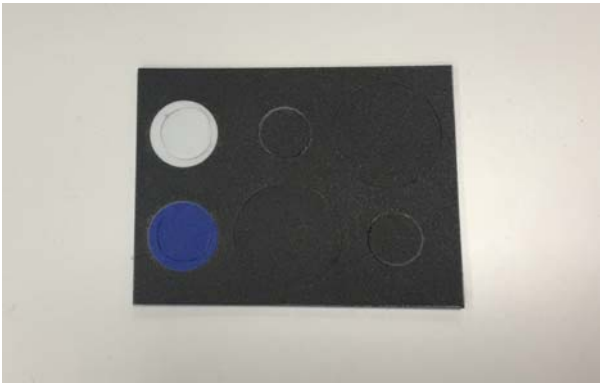

Fig. 2.12 Sealant stickers

With the sensor two complete sets for tilt protection are provided. Each is composed by four smaller stickers and two bigger stickers. Use the bigger stickers for covering holes “1” and the smaller ones for “2” and “3”, by matching the color.

If the sensor is to be placed outdoors, it should be installed inside a box with a proper IP. This box will protect the sensor from moisture, sun and the influence of the shades on the measurement. Despite being a thermally compensated sensor, the measurement can be affected if the sensor is, for example, subjected to sunlight and shade at the same time. Note that some protection boxes may require their installation on the wall previous to the sensors.

2.7 Locking the sensor for transportation

Before removing a sensor from its location it must be locked back to ensure a safe transportation. The procedure should be the inverse of the explained in *chapter 2.4 on page 10*, after removing the sealing stickers.

2.7.1 Sealant stickers

► Remove the sealant stickers from the sensor to reveal the locking screws.

2.7.2 Side Locking Screws

► Start by fastening the left (blue) side locking screw, marked with number 3 on the label, half way (3 to 4 screwdriver turns). Repeat on the right (white) side. Alternate sides until screws are fully fastened.

2.7.3 Front Locking Screws

► Repeat the process on the front screws marked with number 2.

2.7.4 Mass Locking Screws

► Collect the previously stored mass screws and attach them to the sensor, on the holes marked as 1 on the labels, alternating sides and starting on the left (blue) side.

2.8 Routing and protecting the cables

Sensor cable should be routed without being left hanging. The cable should be fixed by means of plastic clamps, for example (*Fig. 2.13*).

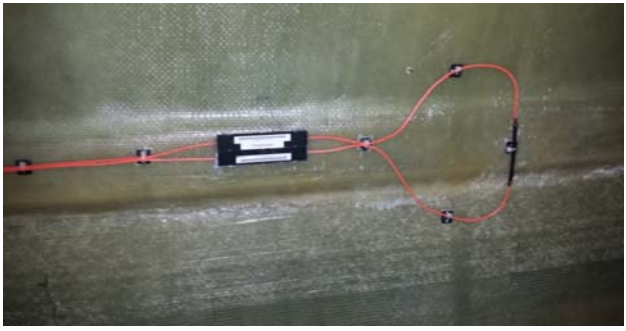

Fig. 2.13 Cable fixed with plastic clamps

Plastic corrugated tubes can also help routing the longer lead cables that will connect to the interrogator (*Fig. 2.14*).

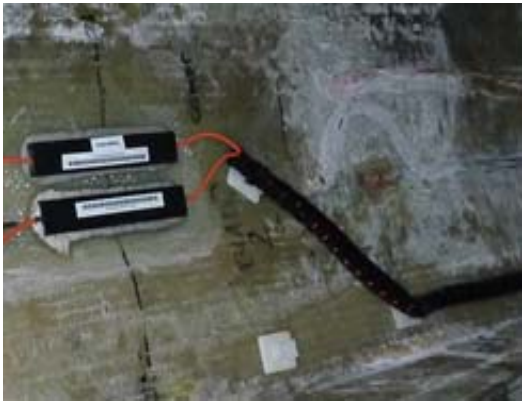

Fig. 2.14 Cable protected with corrugated tubes

Excess cable should be coiled and stored in a suitable IP case, so it can be used in case of network refurbishment (*Fig. 2.15*).

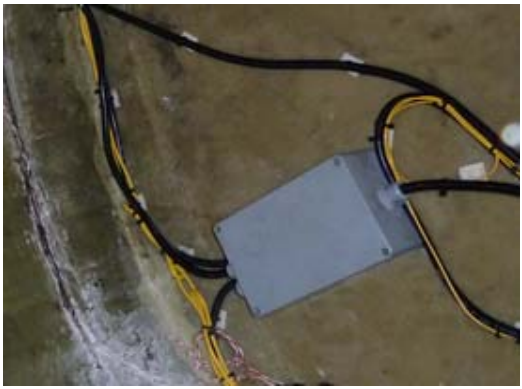

Fig. 2.15 Protection boxes for extra cable and connections

3 Sensor Configuration

3.1 Sensors documentation

Calibrated HBM FiberSensing Sensors are delivered with a Calibration Sheet.

Within the sensor's packing this installation instructions document is delivered in a printed version. Installation instructions can also be downloaded from HBM website (www.hbm.com).

3.2 Measurement computation

The FS64TLS Tilt Sensor is a single axis measurement sensor that uses two fiber Bragg gratings in a push-pull configuration for effective thermal compensation of the measurement.

3.2.1 Tilt towards the vertical

The calculations that should be performed for converting two wavelength measurements from FBG 1 and FBG2 into tilt are the shown in *Fig. 3.1*.

$$\theta = S \times \left[(\lambda - \lambda_0)_{FBG2} - (\lambda - \lambda_0)_{FBG1}\right]$$

Fig. 3.1

Where

- θ is the measured Tilt in deg
- λ is the measured Bragg wavelength of the FBG1 and FBG2 sensors in nm
- λ_0 is the Bragg wavelength of the of the FBG1 and FBG2 sensors at the vertical (0 deg) in nm
- S is the calibration factor as delivered by the calibration sheet in g/nm

www.hbm.com

HBM Test and Measurement
Tel. +49 6151 803-0
Fax +49 6151 803-9100
info@hbm.com

measure and predict with confidence

A05301_01_E00_00 HBM: public