Installation instructions

MuST Strain Sensors

This document contains proprietary information. Please do not reveal any of its contents to anyone not directly responsible for evaluating it without first obtaining written permission from SMARTEC SA

STRAIN SENSOR – POLYIMIDE

List of Materials

Included Material
Polyimide Strain Sensor

List of Needed Equipment
Deburring Machine (optional)

List of Needed Material	
Glue	cyanoacrylate or epoxy
Paper	Sand Paper (optional)
Cleaning	Alcohol and tissues

Preparing the Surface

Figure 1

If there are protection layers, such as paint, or rust, deburr or sand the surface to remove them ensuring that it does not get too irregular.

Figure 2

Clean the surface with a tissue and alcohol.

TIP: make movements from one side to the other without changing the order.

Placing the Strain Sensor

Take the sensor out of its box.
Carefully put the glue on the surface ensuring that the opened polyimide windows are covered with glue.

TIP: FiberSensing suggests the use of cyanocrilate in gel for short term measurements and small installation periods for it cures faster, or Epoxy for long term applications despite having longer curing time.

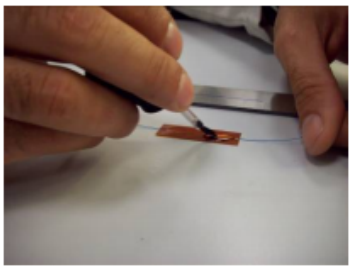

Figure 3

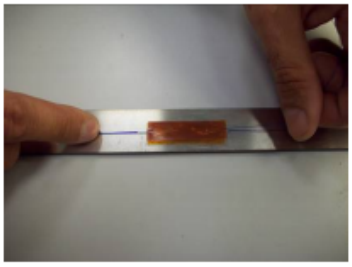

Figure 4

Place the sensor on its place, holding it by the two ends to ease aligning.

Press the sensor from the centre to the periphery ensuring that there are no air bubbles between the surface and the polyimide film. Keep doing this movement until the glue is cured.

Figure 5

STRAIN SENSOR – WELDABLE

List of Materials

Included Material
Weldable Strain Sensor

List of Needed Equipment
Spot welding Machine
Measurement Unit (or equivalent)

List of Needed Material	
Tape	Drafting tape

Preparing the Surface

Figure 6

Deburr the surface until you reach a weldable material ensuring that there are no irregularities on the surface.

Welding the Strain Sensor

Take the sensor out of its box taking care not to touch the back side of the metal part.
Align the sensor on the surface and fix it with a small piece of drafting tape across the edge of the assembly or even at the buffer.

Figure 7

Connect the sensor to the FS 4100 Portable BraggMETER Measurement Unit, or equivalent, and observe its Spectrum and Central Wavelength while welding.

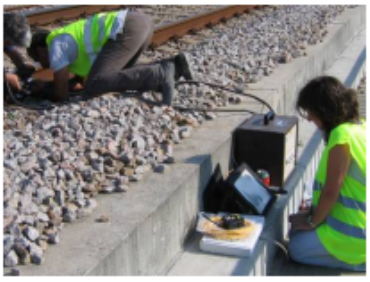

Figure 8

Give the first set of shots with the welding machine (points 1 to 1') making a triangle as shown in Figure 9.
Wait 30 s for the sensor to get cold (the welding heats the metal part).
Note that the sensor's spectrum may change Central Wavelength due to heating and its figure may deform instantly while welding.

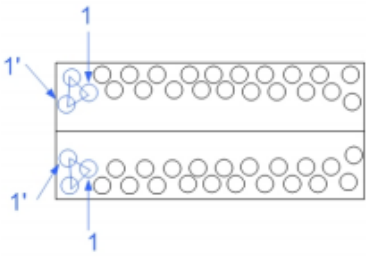

Figure 9

Extend the metal piece with your finger.
Holding it at the centre proceed with the second sets of shots as shown in Figure 10.

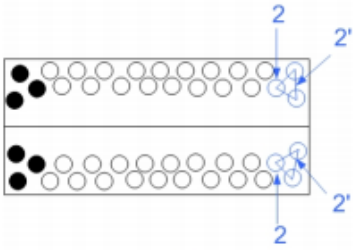

Figure 10

Wait 30 seconds for the metal piece to get colder and proceed with the 3rd set of shots (Figure 11).

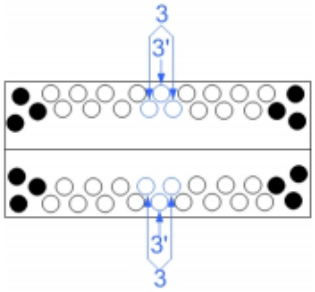

Figure 11

To minimize pre-stress losses (so that the sensor will still have the expected behaviour while compressing) FiberSensing's experience says you should weld from the centre to the periphery. You will be able to see a decrease of Wavelength as you weld the sensor. Standard sensors have 3 nm pre-stress and the welding process should decrease it in 1 nm. This value is, of course, dependant on the welding machine and the operator as well as some other external factors.
During the welding process it is advisable that you should be looking to the spectrum of the sensor and evaluate its pre-stressing losses.

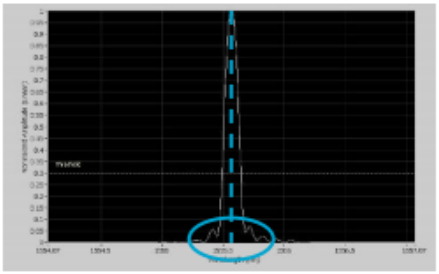

Figure 12

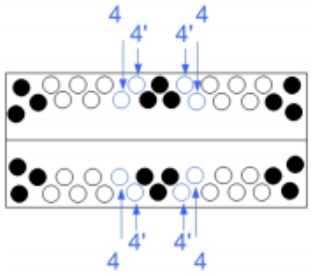

Figure 13

Proceed with the steps 4 to 4', waiting 1 minute from one shot to the other.

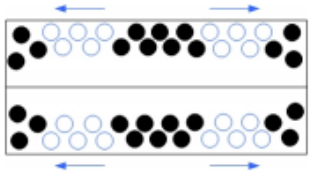

Figure 14

Repeat the 4 – 4' steps from the centre to the periphery as shown in Figure 14, alternating sides. Remember to wait 1 min between each welding shot.

STRAIN SENSOR – COMPOSITE

List of Materials

Included Material
Composite Strain Sensor

List of Needed Equipment
Deburring machine (optional)

List of Needed Material	
Glue	Cyanocrylate or epoxy
Paper	Sand Paper (optional)
Cleaning	Alcohol and tissues
Tape	Drafting tape

Preparing the Surface

Figure 15

If there are protection layers, such as paint, or rust, deburr or sand the surface to remove them ensuring that it does not get too irregular.

Figure 16

Clean the surface with a tissue and alcohol.

TIP: make movements from one side to the other without changing the order.

Gluing the Strain Sensor

Take the sensor out of its box taking care not to bend the exposed 900 µm signed out in Figure 17.

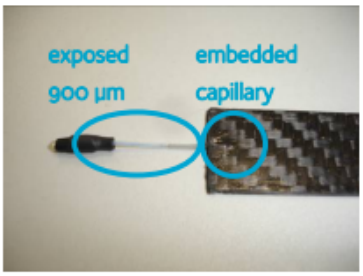

Figure 17

The two sides of the sensor have different roughness and brightness. The bondable side is less bright and rougher that the other. Align the sensor on the surface, with the bondable side facing it, and fix the sensor with two pieces of drafting tape at the buffer on each side.

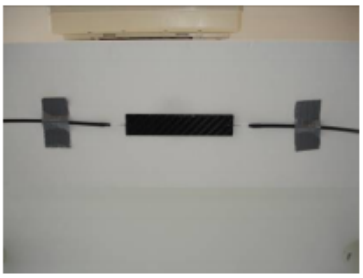

Figure 18

Attention! Never let the fibers hanging during or after installation because the exposed 900 µm will bend thus permanent losses in the signal or even breaking of the fiber may occur.

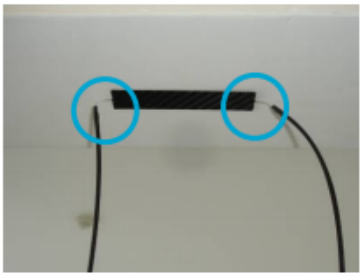

Figure 19

Spread the glue homogeneously on the sensors surface to bond.

TIP: FiberSensing suggests the use of cyanocrilate in gel for short term measurements and small installation periods for it cures faster, or Epoxy for long term applications despite having longer curing time.

Figure 20

Pressure the sensor evenly while waiting for the glue to cure.

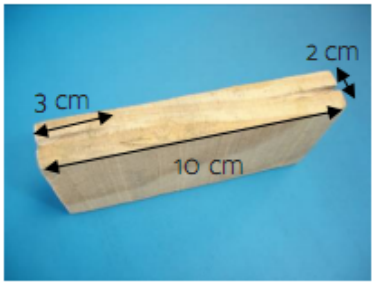

Figure 21

TIP: FiberSensing suggests that you prepare a peace of wood like the one in Figure 21 with two small cuts in the edges in order to protect the embedded capillary of the sensor (see Figure 17).

Attention! Remember not to let the fibers hanging during or after installation.