synaptec
powered by Megger

Product manual

Photonic Strain and Temperature Sensors

Document: TD-004 Rev.02

Contents

1. General information

The following instructions refer to the installation procedure of Strain Sensors and Temperature Sensors.

2. Sensor installation

2.1 List of materials

Included material
Strain Sensor
Teflon installation aid
Teflon foil
Pressure pad
Temperature Sensor

Needed equipment
Deburring Machine (optional)

Needed material
Sandpaper / Emery paper
Surface cleaning agents
Tissues
Polyimide drafting tape Recommended: KLEBEBAND
Protection Recommended: ABM75 and AK22

2.2 Sensor installation

2.2.1 Preparation of the installation area

The surface of the measurement object must first be cleaned and flattened when installing the optical strain gauges or sensors.

If there are protection layers applied on the material, such as paint or rust, deburr (Fig. 2.1) or sand (Fig. 2.2) the surface to remove them, ensuring that the surface does not become irregular.

If the material is free of protective layers and very smooth, there is also the need to roughen the surface with the sanding paper (e.g., with 180 grain) using circular movements (Fig. 2.3).

The surface needs then to be cleaned ensuring that neither dust nor grease is present in the bonding area.

Figure 2.1

Figure 2.2

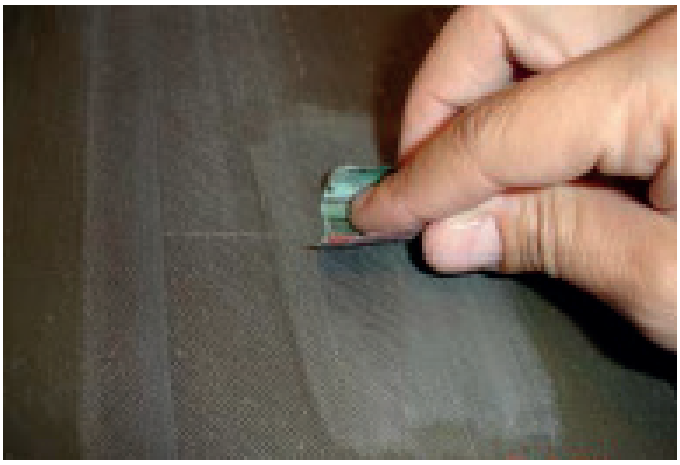
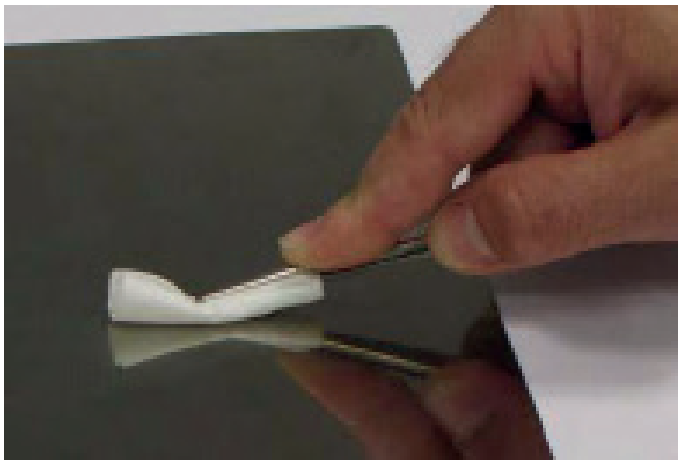


Figure 2.3: Roughening the surface of the measuring object

Clean the surface using cleaner (Fig. 2.4) and the non-woven tissues (Fig. 2.5), as recommended.

Figure 2.4: Spraying cleaner on specimen

Figure 2.5: Cleaning with non-woven pad

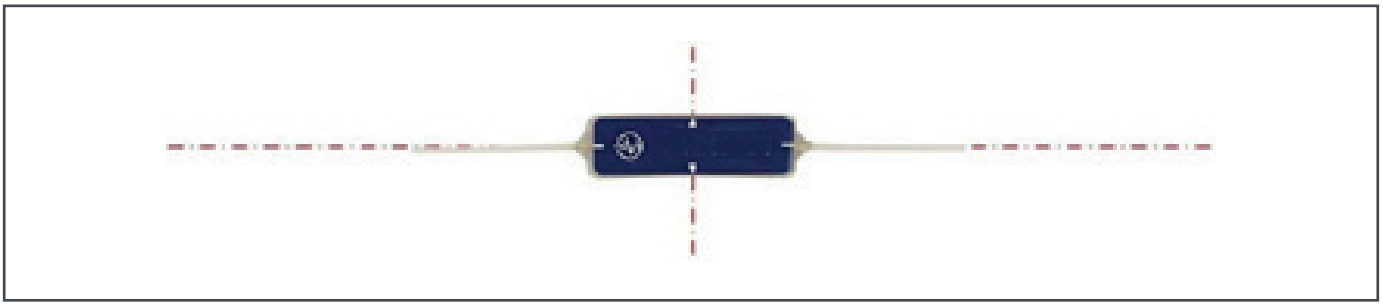


The wiping movements should always be performed in the same direction until the last tissue comes out clean.

2.2.2 Marking the measuring point

Define the alignment of the sensor considering the measurement direction and the sensor's guides.

Figure 2.6: Sensor alignment markings



In the ideal case, an empty ball point pen cartridge is recommended for marking the installation point. The length of the marking line should be approx. 60 mm in the measurement direction. A vertical marking line, approx. 40 mm long, must be drawn starting at the centre of the installation point, see Fig. 2.7.

Figure 2.7: Marking the marking lines

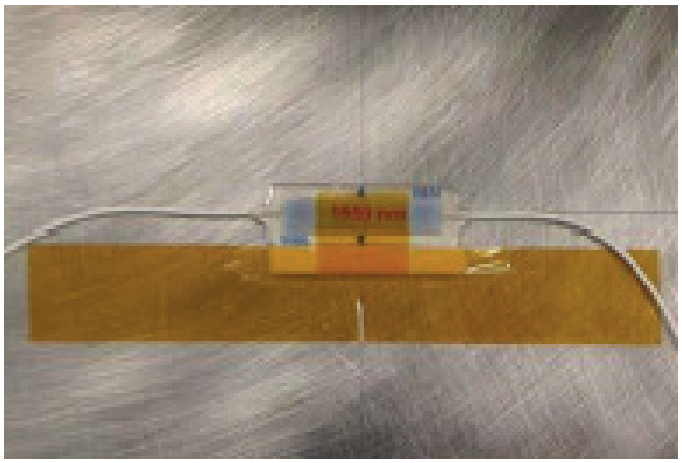
Once the area is marked out, the installation point must be cleaned very thoroughly, see Fig. 2.8. Please note that a new non-woven pad must be used each time the point is wiped. Repeat the cleaning process until no residues can be detected on the non-woven pad.

Figure 2.8: Final cleaning of the installation point

2.2.3 Positioning the sensor

Remove the optical sensor from the protective wallet in the box and peel off the Teflon protective film from the installation side of the sensor. Then transfer it with the Teflon installation aid attached to the sensor's marked measuring point. After positioning the sensor aligned with the designed cross, apply a 10 cm long polyimide adhesive tape on top of the Teflon installation aid without touching the sensor, to the measuring object (Fig. 2.9).

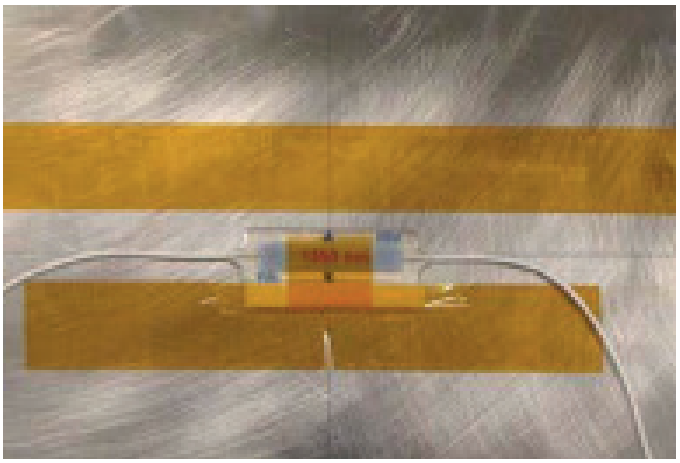
Figure 2.9: Aligning and placing the sensor



The next step is not essential, but it is recommended so that the adhesive does not leak.

Apply another 10 cm long polyimide adhesive tape on the other side of the sensor, a few millimetres away from the sensor and aligned with its longer edge (Fig. 2.10).

Figure 2.10: Applying an adhesive mask

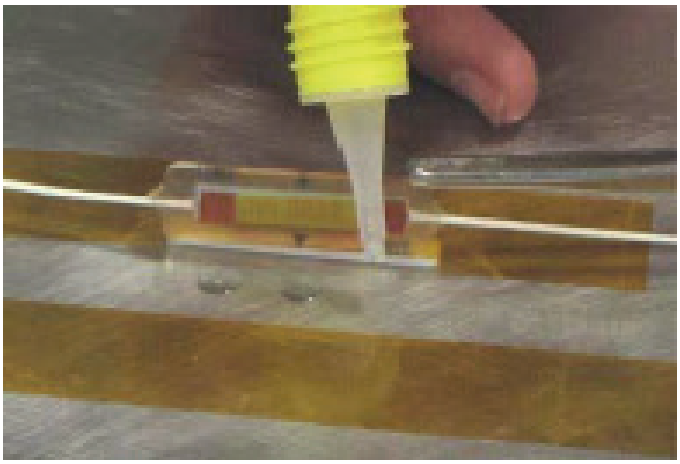


2.2.4 Gluing the strain sensor with superglue

Prepare the adhesive and the small piece of Teflon film supplied with the sensor ready at hand.

Flip the strain sensor using the Teflon installation aid as a hinge for the optical sensor as in Fig. 2.11. Place 3 drops of adhesive on the area that will receive the sensor, without allowing the bottle to touch the surface.

Figure 2.11: Folding over the strain sensor and application of adhesive

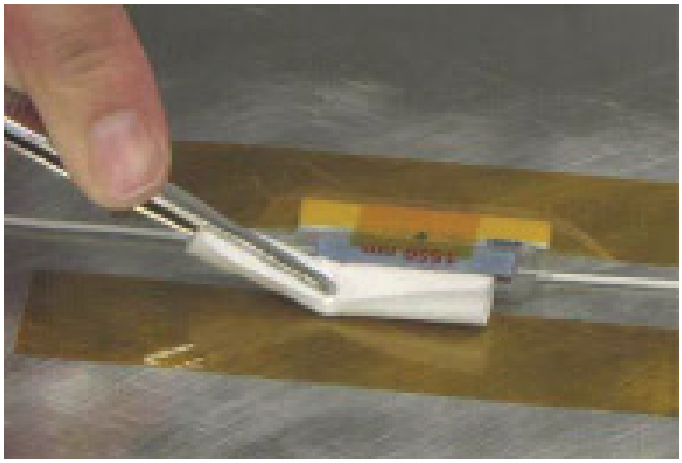


Fold the sensor quickly back down over the adhesive. Cover with the prepared Teflon foil as an intermediate layer and apply pressure to the sensor firmly and evenly for approximately two minutes. A pressing pad for pressure distribution is provided to support at this step.

Figure 2.12: Gluing on the strain sensor and hardening of the adhesive

Remove any escaping adhesive after gluing from the material surface with a non-woven pad (Fig. 2.13).

Figure 2.13: Removing the excess adhesive



Remove any escaping adhesive after gluing from the material surface with a non-woven pad (Fig. 2.13).

The adhesive requires another 10 minutes to harden after gluing. If you have implemented the strain relief as described below, you can then remove the adhesive strips, otherwise wait for approx. 10 minutes more. You can then remove all adhesive strips and the installation aid. Where possible, peel the adhesive strips off at a small angle and flat to the surface (Fig. 2.14 and Fig. 2.15).

Figure 2.14: Removing the fixing adhesive strips

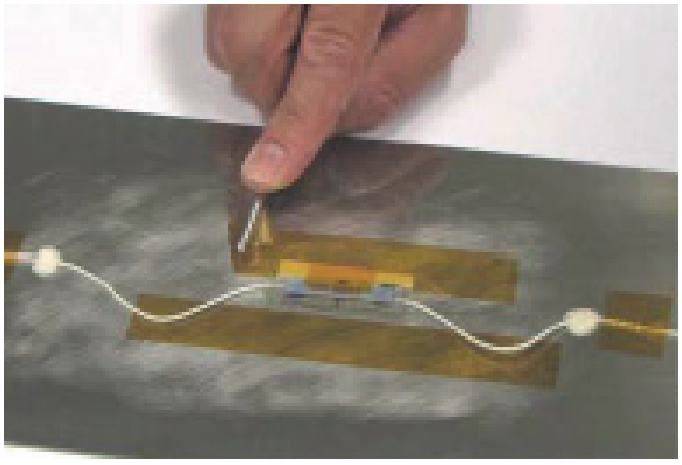
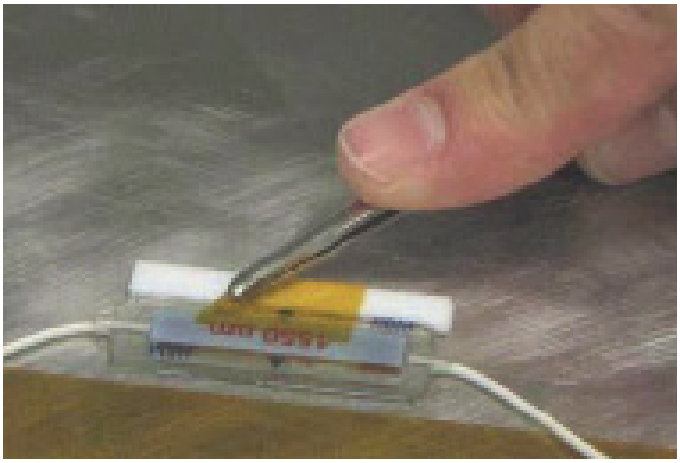
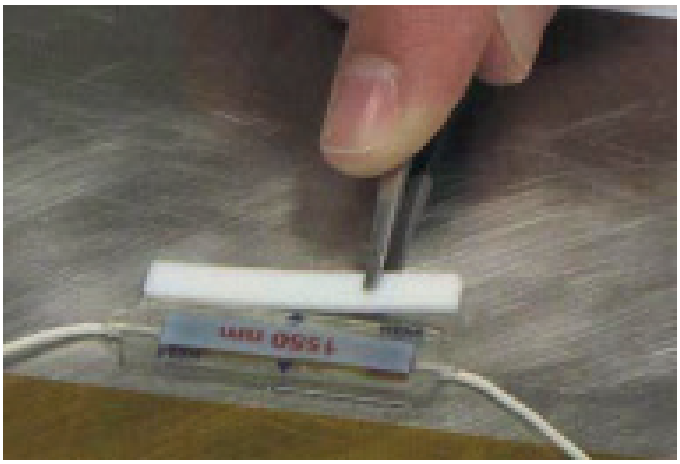


Figure 2.15: Removing the adhesive tape on the Teflon installation aid



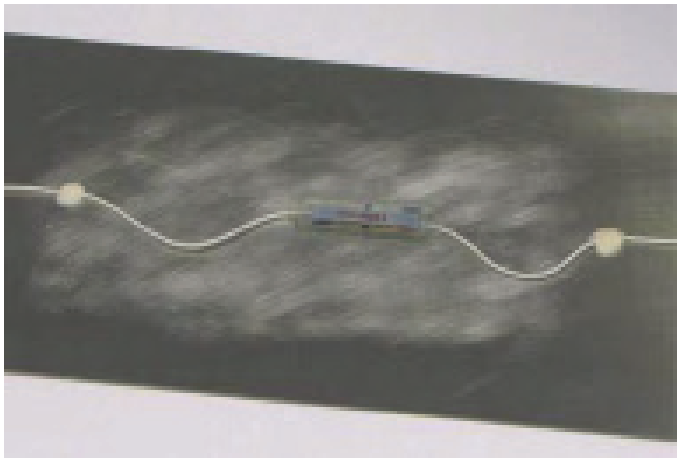
Then carefully remove the Teflon installation aid with tweezers (Fig. 2.16).

Figure 2.16: Removing the Teflon installation aid



In this last step, remove any remaining adhesive residues located under the Teflon installation aid, using a non-woven pad.

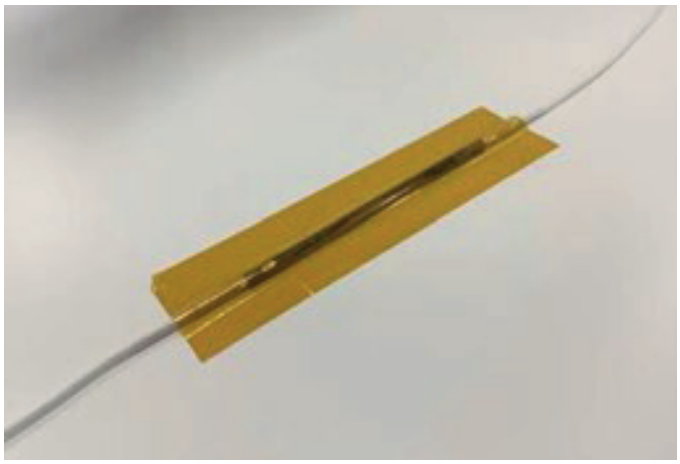
Figure 2.17: Completed installation of the optical SG



2.2.5 Fixing the temperature sensor

The temperature sensor needs to be fixed with any method that allows a thermal contact between the specimen to measure and the sensor. The easiest way to fix the sensor is to use tape on top of it, for example, polyimide adhesive tape (KLEBEBAND), or to use covering agents ABM75 or AK22.

Figure 2.18: Fixing the temperature sensor with polyimide tape.

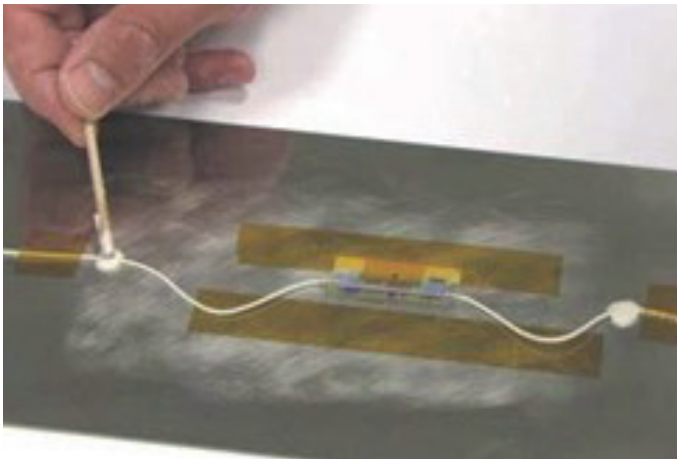


2.3 Routing and protecting the cables

Sensor cable should be routed ensuring that cables are not hanging and curvatures are kept within the limits for the used cable.

We recommend that strain relief is provided for the optical fibre. Lay down the protruding fibres with gentle curves and fix them with polyimide adhesive tape, then glue the optical fibres on both sides of the sensor with adhesive to the surface (Fig. 2.19). The adhesive must harden for at least 10 minutes.

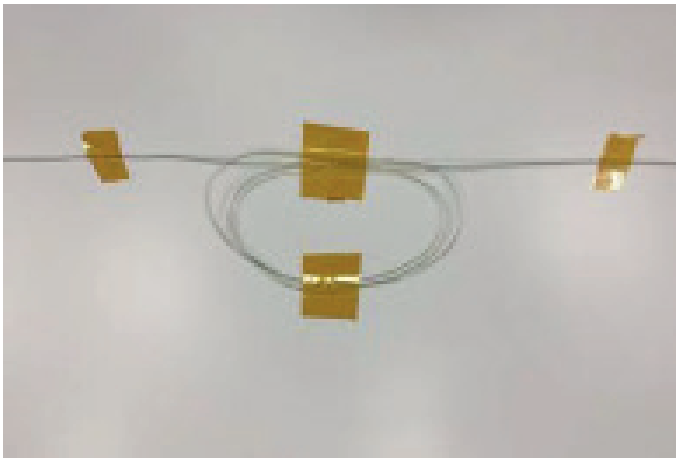
Figure 2.19: Strain relief for the optical fibres using adhesive



Sensor cable should be routed ensuring that cables are not hanging and curvatures are kept within the limits for the used cable.

In case there are splice protections, ensure that the splice is also well fixed.

Figure 2.20: Braided cable routing



Information

The braided cable is suited for laboratory installations in controlled environments. It can withstand an extended temperature range but is not fully protected for mechanical damage. In case the sensors are used in harsh environments, further protection of the cables (using plastic tubes, conduits or covering the cables with protecting material) is recommended.

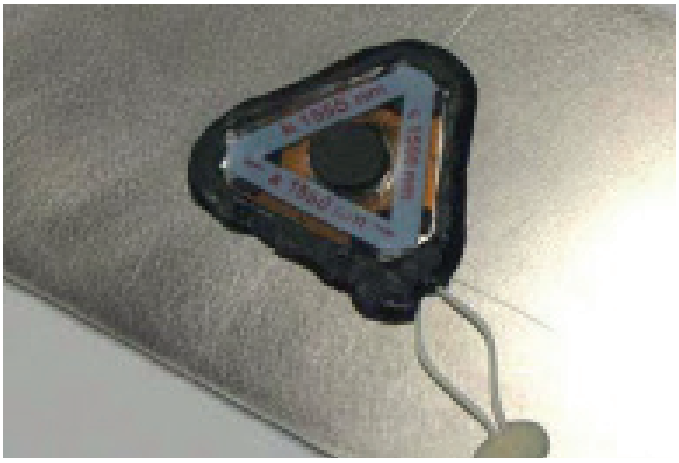
2.4 Protecting the sensors

The sensors designed for laboratory applications. Nevertheless, they can be used in other environments if correctly protected.

Sensors should be protected against humidity effects with the covering agents AK22 and ABM75.

First cover all the adhesive residues, left over from gluing, generously with the covering putty. Carefully press the putty towards the sensor from all sides (Fig. 2.21).

Figure 2.21: Covering the sensors edges with AK22



Cut a piece of the covering foil ABM75, large enough to cover the sensor area and place it over it.

Cut out a piece of the covering foil ABM75, large enough to cover the entire measuring point, and place it over the optical rosette. Press the covering foil, starting from the centre, onto the measurement object. Use e.g., a wooden stick, to press the foil down tightly onto the surface of the measurement object (Fig. 2.22).

Figure 2.22: Applying and pressing down the covering foil ABM75

Figure 2.23: Completely covered measuring point