Installation Guide | Rev. A

Long Gage Strain Sensor | os3600

MICRON OPTICS

Micron Optics Inc.
1852 Century Place NE
Atlanta, GA 30345 USA

phone 404 325 0005
fax 404 325 4082
www.micronoptics.com

Introduction:

The os3600 Long Gage Strain Sensor measures average strain over the length of the gage while providing integrated temperature compensation. It is based on fiber Bragg grating (FBG) technology. The os3600 is intended exclusively for embedding in concrete structures. Flanged ends form a solid bond to surrounding concrete or grout. The sensor is typical installed by loosely attaching the sensor to the rebar reinforcing structure prior to pouring concrete. The os3600 can also be grouted into boreholes drilled in concrete or alternatively pre-casted in a concrete briquette that is later cast into the structure. "Universal-mount" ends allow the user to employ bolt-on, weld-on, or custom end brackets for attachment to rebar or other structures before embedding.

Embedment in concrete (Floating):

The os3600 with flanged ends is designed to be embedded into concrete or reinforced concrete. The flanges at either end of the sensor lock into the concrete and allow the sensor to measure the relative motion between the flanges and measure the concrete deformation along the sensor axis. The sensor is preset near the midpoint of its strain range. Prior to embedment, the sensor will expand and contract with temperature away from the midpoint. In extreme temperature environments, take precautions to moderate the sensor temperature while pouring.

Figure 1 – Position Sensor

Position the os3600 with flanges in the desired location as shown in Figure 1. The sensor may be held in position by hanging the sensor from the rebar with soft iron tie wire or plastic cable ties. When tying the sensor in place, take precautions not to put excessive forces on the flanges at the end of the sensor. Wooden standoffs can be used if needed between the rebar and the tubular body of the sensor as shown in Figure 2. Notice the tape shown in Figure 2. A couple of wraps of rubber tape (3M Scotch® 23 Electrical Tape) will prevent the tie wire from slipping on the sensor.

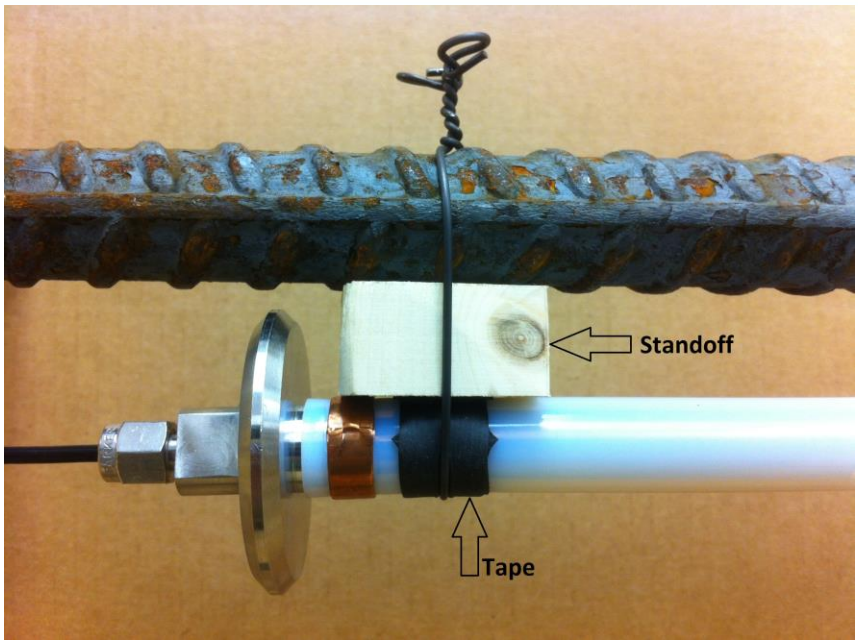

Figure 2 – Standoff & tie wire

Route cable along rebar and hold in place with cable ties. Where possible, run the cable under the rebar and reinforcing members to better protect from the poured concrete and aggregate. Allow slack in the cable along the run so that the cable will not be placed in tension as the reinforcement moves around during the pour.

Figure 3 – Cable Protection

Embedment in concrete (Fastened to rebar):

The os3600 stain sensor with "universal-mount" ends is available for users who wish to fabricate custom mounts to attach the sensor directly to the rebar. In order to accurately measure the strain in the rebar, the sensor must be rigidly attached to the rebar as shown in Figure 4.

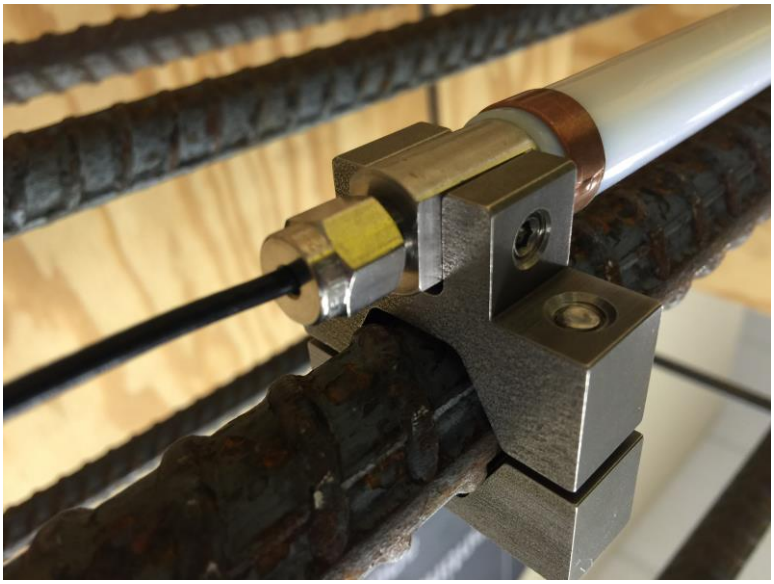

Figure 4 – Custom Mount

It is important that mounting brackets are properly spaced and axially aligned prior to attaching to rebar. If axial alignment is not maintained, the sensor may bind leading to reduced sensor accuracy. The installation jig shown in Figure 5 is available to hold the mounting brackets in alignment and properly spaced during attachment to the rebar. The installation jig has flats cut into each end that properly position the end brackets.

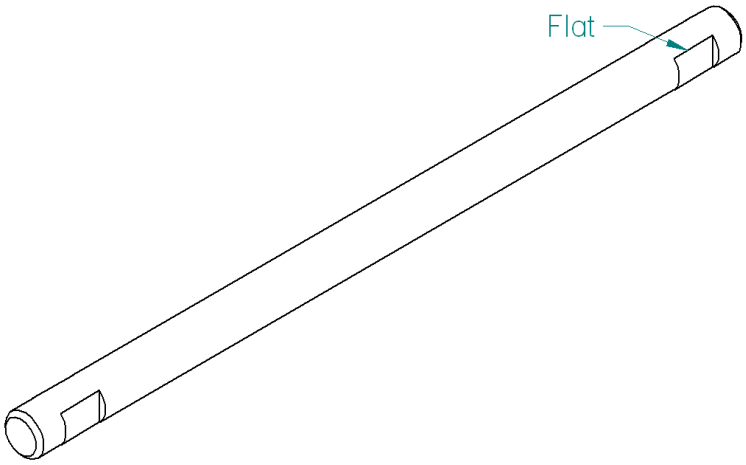

Figure 5 – Installation Jig

Typical mounting brackets are fabricated to clamp around the rebar and held in place with bolts or alternatively welded to the rebar. Once the mounting brackets are attached to the rebar, the gage may be set in place and pre-tension adjusted if necessary. The sensor is held in place using setscrews in the mounting brackets. It will be necessary to have an interrogation unit attached to the gage if pre-tension requires adjustment.

Sensor Protection:

When positioning the sensor, avoid areas where the sensor may be damaged from the concrete pour or Tremie pipe. Consider using wire mesh or rebar to build a protective barrier around the sensor. Also clearly mark the area around the sensor with paint or colored tape to identify the sensing area. Avoid the use of concrete vibrators in the area immediately around the sensor.

Route cable along rebar and hold in place with cable ties. Where possible, run the cable under the rebar and reinforcing members to better protect from the poured concrete and aggregate. Allow slack in the cable along the run so that the cable will not be placed in tension as the reinforcement moves during the pour.

Protect cable splices and connectors in closures or connector protection fittings. Take special precautions to protect cables where they exit the concrete with conduit.

Installation in Borehole:

Drill a 75mm (3”) or larger borehole. It may be helpful to drill a larger borehole to aid in packing grout around sensor. The grout must fully surround the sensor without voids to ensure accurate strain readings.

Carefully position the os3600 in the borehole. The sensor may be loosely tied to rebar or wire if needed to hold the sensor in position. If wire or rebar is used, tie the sensor cable to the rebar to help protect it from the grout flow.

Tremie grout into the hole and carefully hand pack around the sensor as the borehole is filled while avoiding damage to the sensor cable. Withdraw tremie pipe as grouting proceeds. Alternatively, attach sensor to rigid tremie pipe and leave tremie pipe in place. Be sure to maintain at least 25mm (1”) bend radius in the cable.

For deeper boreholes it may be helpful to install a vent tube alongside the sensor to the bottom of the borehole. Insert Tremie pipe and seal the top of the borehole around the Tremie and vent pipe. Tremie grout into borehole until it exits the vent tube.