



Installation Guide | Revision 1

Embeddable Strain Sensor | os3500



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## 1. INTRODUCTION

The os3500 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 os3500 is intended exclusively for embedding in concrete structures. Flanged ends form a solid bond to surrounding concrete or grout. The sensor is typically installed by loosely attaching the sensor to the rebar reinforcing structure prior to pouring concrete. The os3500 can also be grouted into boreholes drilled in concrete or alternatively pre-casted in a concrete briquette that is later cast into the structure.

## 2. Embedment in concrete (Floating):

The os3500 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 the os3500 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. 3 mm holes are provided in the flanges on each end of the sensor to aid in hanging the sensor. When tying the sensor in place, take precautions not to put excessive forces on the flanges at the end of the sensor. Thread wire tie through hole in sensor flange and wrap loosely around rebar as shown in Figure 2.



**Figure 2**

Route cable along rebar and hold in place with cable ties as shown in Figure 3. 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**

### 3. 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.



#### 4. 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 os3500 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.