

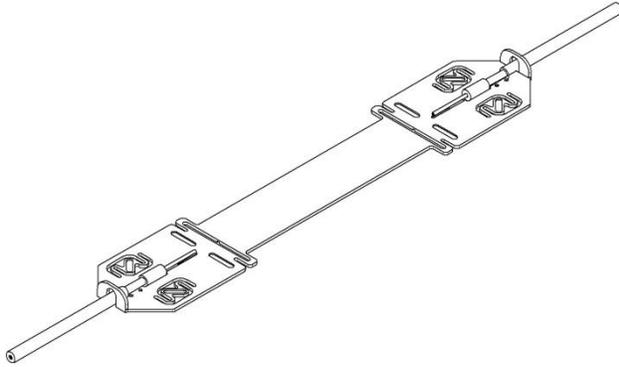
# Optical Strain Gage | **os3150 os3155**

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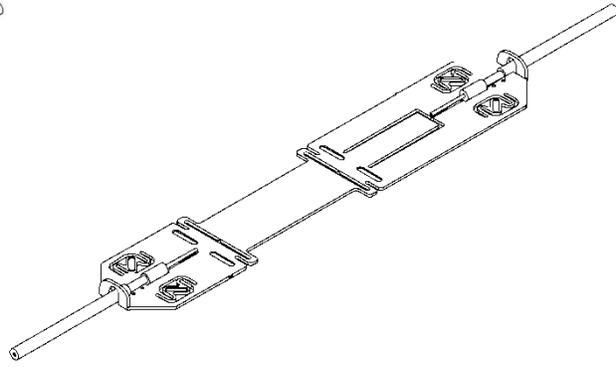


Micron Optics Inc.  
1852 Century Place NE  
Atlanta, GA 30345 USA

phone 404 325 0005  
fax 404 325 4082  
[www.micronoptics.com](http://www.micronoptics.com)



**Figure 1 – os3150 Gage**



**Figure 2 – os3155 Gage**

### Introduction:

This installation guide details the installation of both the os3150 and os3155 strain gages shown in Figures 1 and 2. These gages are similar in construction except that the os3155 includes a second FBG for temperature compensation. Also the os3150 has a 75mm gage length where the os3155 has a 50mm gage length.

These gages are designed to be spot welded to a steel specimen. A portable capacitive-discharge spot welder having 50 watt-seconds minimum energy rating is recommended for best results. The spot welder should be equipped with a small welding electrode having a spherical tip measuring approximately .030 inches [.76 mm] in diameter. It is often helpful to practice weld technique using a blank gage. Best results are usually obtained with a setting of 50 to 200 watt-seconds and firm pressure on the electrode. After making a practice weld, pull the gage off of the surface. A properly formed weld will result in a small piece of the surface or gage to break away. If needed, adjust the weld energy and electrode pressure until a satisfactory weld is obtained. (Contact Micron Optics for Welder recommendation)

Accurate strain measurement requires that the surface temperature of the specimen be measured as close to the strain gage as possible. The os3155 facilitates this by incorporating a built-in temperature compensation FBG. In addition, accurate measurement requires that the Strain gage, temperature compensator, and test specimen surface be at or near the same temperature. A layer of insulation over the sensor will help to reduce the temperature variations between these elements. A light colored or reflective surface will also help in situations where the gage will be exposed to direct sunlight.

For reliable operation it is essential that the installed gage be protected from physical damage, moisture, and corrosion. Various methods may be used to protect the installed gage depending on the application. This document outlines a typical protection method utilizing a waterproof seal and stainless steel cover.

### Surface preparation:

The surface must be properly prepared by removing all paint, rust, scale, oil, and grease. In order to achieve good adhesion of the waterproof seal and protective paint it is necessary to prepare the surface according to (SSPC-SP10 / NACE 2 Near-White Blast Cleaning) standards. The (SSPC-SP10 / NACE 2) surface finish is to coarse for the area where the sensor will be welded. It is necessary to abrade the weld area with 60 grit silicon carbide paper.

- Clean surface with a compatible solvent to remove all oil and grease. Non-Chlorinated Brake works well and is readily available.
- Prepare a rectangular area 6 x 10 inches [150 x 250mm] to (SSPC-SP10 / NACE 2). Micron Optics recommends the use of a MONTI Bristle Blaster® for preparing surfaces in the field.

**MONTI - Werkzeuge GmbH**  
Reisertstr. 21  
53773 Hennef Germany  
<http://www.bristle-blaster.com>

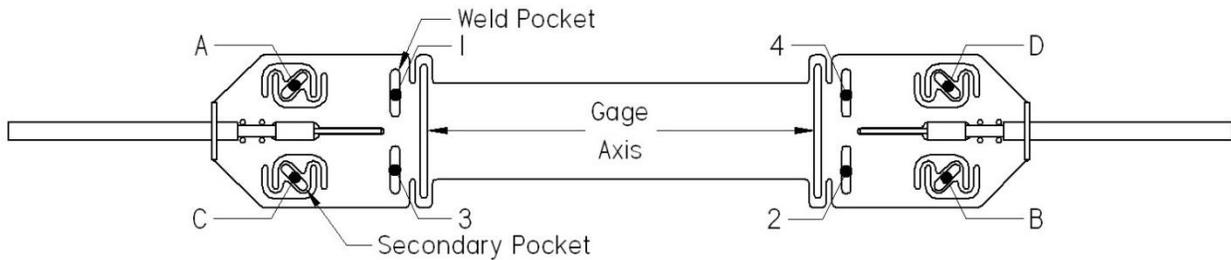
- Abrade the area immediately under where the sensor will mount 1.5 x 6 inches [38 x 150mm] with 60 grit or finer silicon carbide paper to further smooth the surface. Do not abrade the surface around the perimeter of

the sensor. The coarser surface is required for proper adhesion of the waterproof seal and protective paint topcoat. Wipe the surface clean with a compatible solvent and inspect the surface to ensure that all surface defects have been removed.

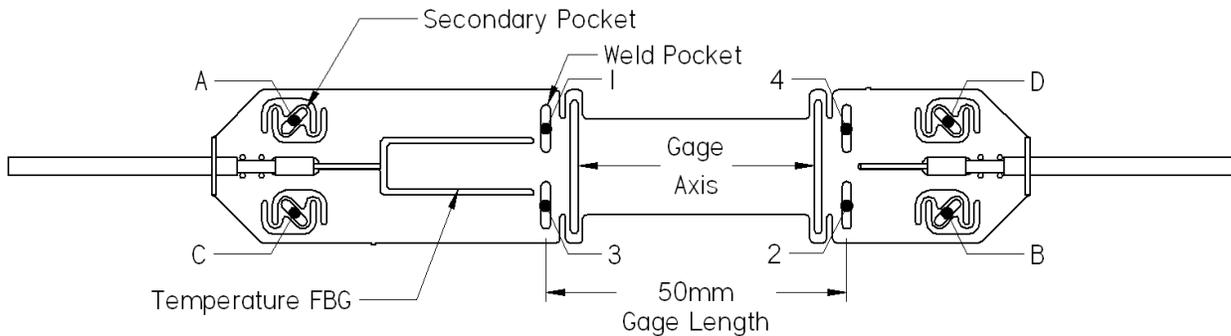
- Thoroughly clean surface using a clean cloth saturated with a compatible solvent

### Gage Installation:

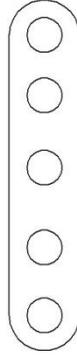
- Position the gage on the surface to be tested. Align the center axis of the gage with the strain axis to be measured. The gage may be held into position with adhesive tape. When applying tape, do not cover weld pockets. Figures 3 and 4 show the gage axis and weld sequence. The gage is welded in place at four primary weld pockets 1 thru 4. Four secondary Weld Pockets A thru D further secure the gage.
- Tack gage in place using a single spot weld in weld pocket 1.
- Perform a single weld in each of the subsequent weld pockets 2, 3, 4. These welds should be performed in the order indicated.
- Add 4 additional welds to each weld pocket. The welds should be equally spaced within the weld pocket as shown in Figure 5.
- It is important that the gage be securely welded in place with at least 5 welds per pocket. If the gage is not securely fastened to the test specimen, measurement errors will result.



**Figure 3 – os3150 Weld Locations**



**Figure 4 – os3155 Weld Locations**



**Figure 5 – Weld Pocket Detail**

- Add 2 or 3 welds to each of the four secondary weld pockets A thru D. These welds do not need to follow any specific sequence. These welds provide additional strain relief to prevent tension on the cable from disturbing the gage.

### Gage Protection:

To ensure reliable gage operation, the gage must be protected from physical damage, moisture, and corrosion of the substrate near the gage installation sight. As described in the *Surface Preparation* section, a rectangular area 6 x 10 inches [150 x 250mm] should be prepared to (SSPC-SP10 / NACE 2) prior to installing the gage as shown in Figure 6. It is important that this area be free from all paint, rust, scale, oil, and grease. This will allow the gage protection material to bond to bare metal and provide a robust seal against the elements.

Micron Optics recommends the following accessories for use in aboveground installations on steel structures. In many applications, additional testing may be required to determine if additional sensor protection is required.

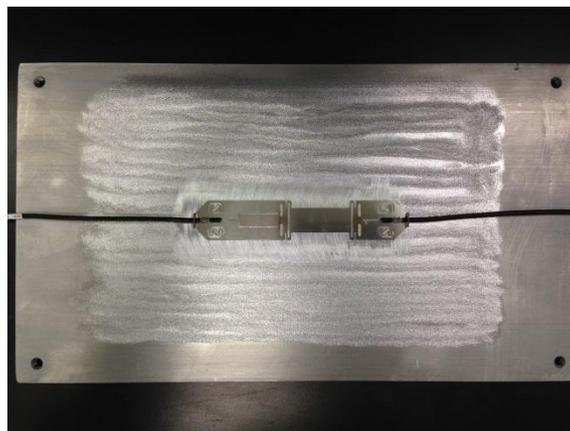
### Sensor Accessories:

os315X Weatherproofing Kit  
 os315X Protective Cover & Insulation Kit  
 Universal Connector Protection Fitting "PF" Kit

The os315X Weatherproofing Kit contains the following parts:

**STOPAQ:** WrappingBand EZ (precut 100 x 190mm patch)  
**STOPAQ:** Paste CZH  
 Kapton® Polyimide tape, 25mm wide, .09mm thick

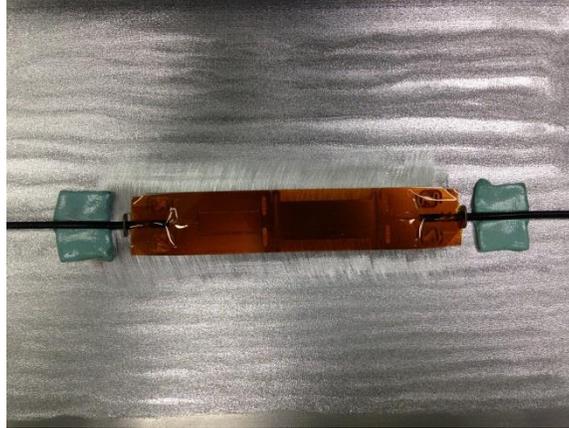
The following procedure is recommended for typical installations:





**Figure 6 – Surface Prep Area**

- Cover the sensor with a strip of Polyimide Tape as shown in Figure 7.
- Cut a piece of STOPAQ and form it into a 1/8 inch [3mm] thick sheet. Wear gloves while handling the STOPAQ material to prevent contamination from finger oils.
- Cut 2 square pieces of STOPAQ Paste 1 x 1 x 1/8 inch [25 x 25 x 3mm]. Place one piece under the cable near each end of the gage as shown in Figure 7.



**Figure 7 – STOPAQ Paste Under Cable**

- Cut 4 rectangular pieces of STOPAQ Paste 1 x 1/2 x 1/8 inch [25 x 12 x 3mm].
- Place a rectangle piece of STOPAQ Paste over each end of the gage adjacent to the cable and flush with the vertical metal tab as shown in Figure 8.



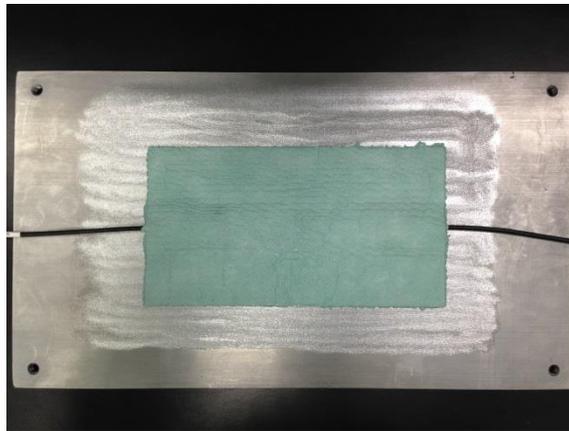
**Figure 8 – STOPAQ Paste on End of Gage**

- Cut 4 rectangular pieces of STOPAQ Paste 1/4 x 1/2 x 1/8 inch [6 x 12 x 3mm].
- Pinch and work the two STOPAQ rectangles together forming one patch at each end of the gage as shown in Figure 9.



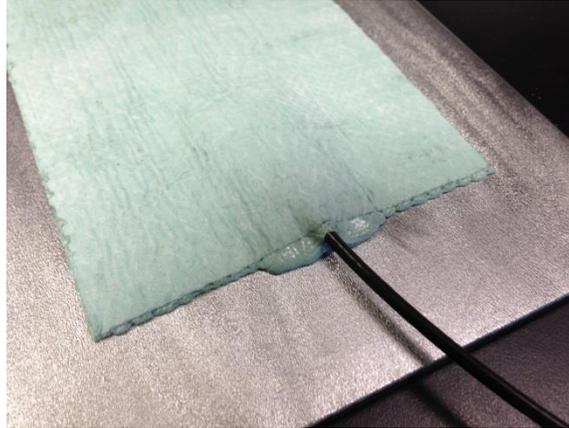
**Figure 9** – STOPAQ Paste Detail

- Cut a piece of STOPAQ WrappingBand EZ 4 x 7 ½ inch [100 x 190mm]
- Position STOPAQ over the gage and center as shown in Figure 10. Starting from the center and working toward the edges, gently press the STOPAQ in place, forcing out any air. Firmly press STOPAQ in place around the edges of gage.



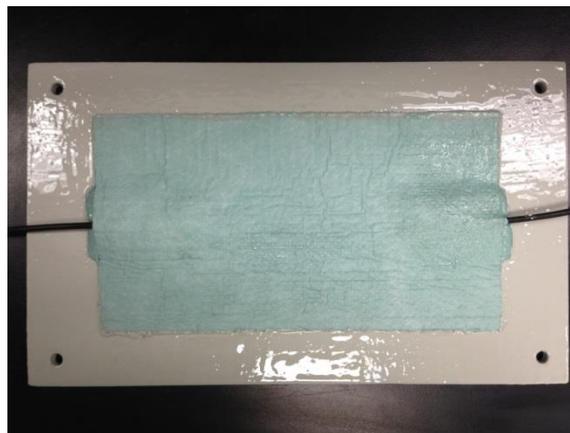
**Figure 10** – STOPAQ EZ Patch

- Firmly press and kneed the STOPAQ around the perimeter of the gage to form a tight seal with the base metal. Pay special attention to the area around the cable to ensure that it is sealed as shown in Figure 11.



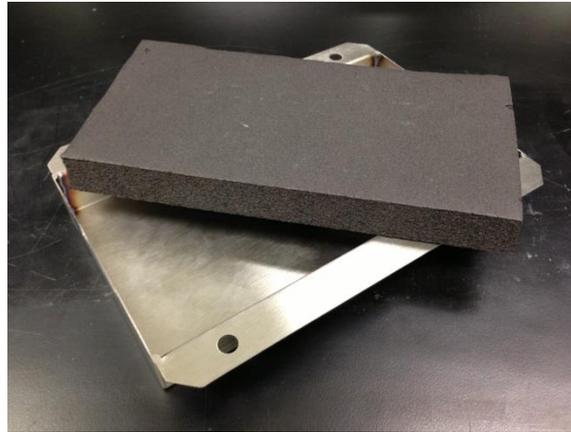
**Figure 11 – Seal around Cable**

- Paint the exposed steel surface around STOPAQ Patch with a uniform coat of a suitable primer such as Carbozinc 859 as shown in Figure 12. Paint right up to the edge of the patch to fully protect the metal, but do not paint the surface of the patch. Paint over the primer with a compatible topcoat such as Carboxane 2000.



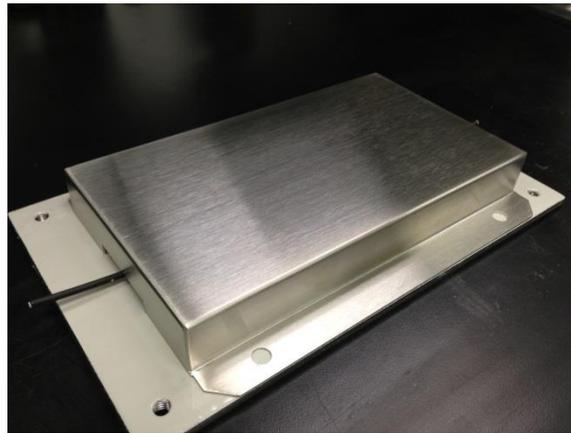
**Figure 12 – Primed and Painted**

- Accurate measurement of strain requires that the Strain gage, temperature compensator, and test specimen surface be at or near the same temperature. A layer of insulation over the sensor will help to reduce the temperature variations between these elements. A light colored or reflective surface will also help in situations where the gage will be exposed to direct sunlight. Figure 13 shows the closed cell foam Insulation and a stainless steel Cover provided in the Micron Optics os315X Protective Cover & Insulation Kit.



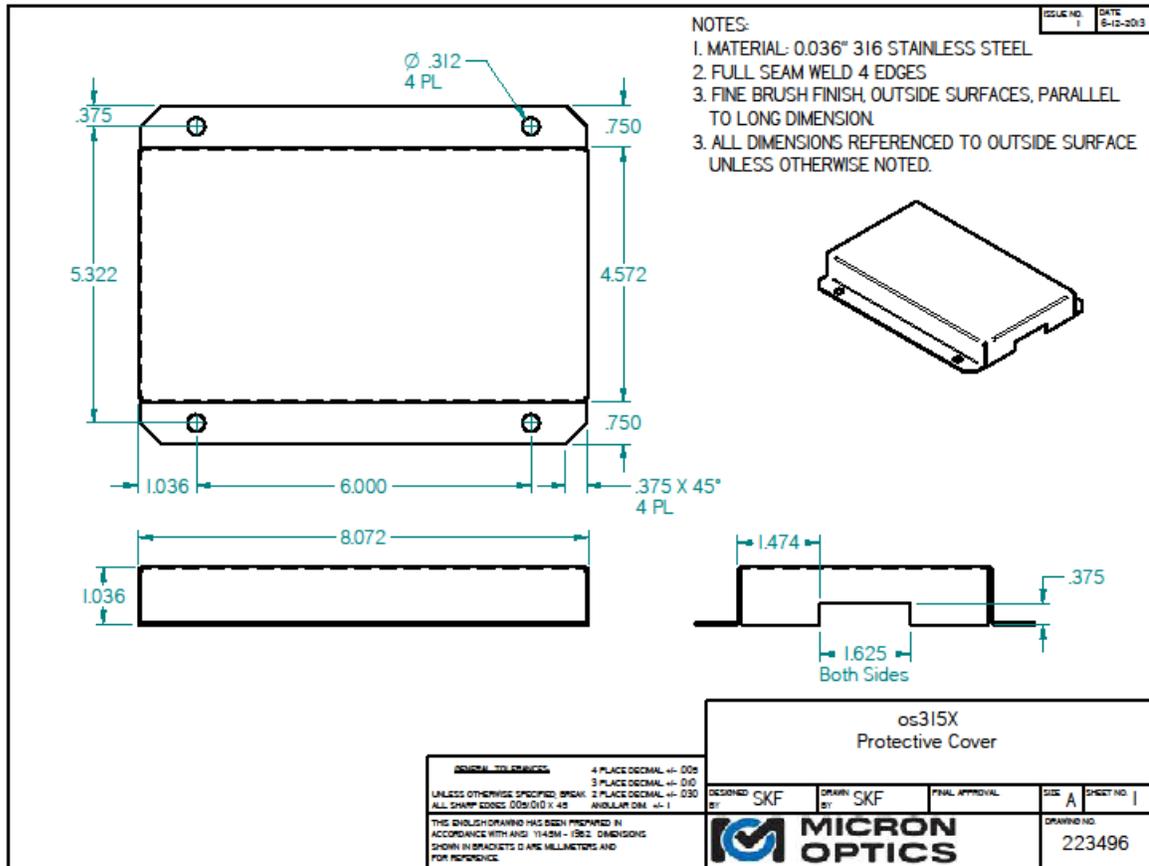
**Figure 13** – os315X Protective Cover & Insulation Kit

- The installed cover is shown in Figure 14.



**Figure 14** –Covered Sensor

The drawing for the stainless steel cover is shown in Figure 15 for those needing to modify or provide their own covers.



FILE NAME: 223496.dft

Figure 15 –Cover Drawing



In addition to the sensor itself, the connector or splice on the end of the sensor cable also needs to be protected from the elements. If the cable end is not protected, the cable could become a path for moisture to enter the sensor. One method of protecting sensors supplied with FC/APC connectors is to use the Universal Connector Protection Fitting "PF" Kit from Micron Optics. The Kit contains everything needed to protect an FC/APC connection.

NOTE - TO INSTALL CABLE GLAND OVER EXISTING CONNECTOR, REMOVE SEAL FROM GLAND AND SLIT WITH KNIFE. INSERT CONNECTOR THROUGH COMPONENTS AND REINSTALL SEAL. BE SURE IT IS SEATED PROPERLY. REPLACE CABLE GLAND WITH PLUG FOR SINGLE END PROTECTION.

ISSUE NO. 3 DATE 4/29/13

KIT CONTENTS		
ITEM	QTY	DESCRIPTION
1	1	102 MM LONG SLEEVE
2	1	FC/APC ADAPTER - NOT SHOWN
3	2	CABLE GLAND - ACCEPTS 3 TO 7MM CABLE
4	1	PLUG - USE TO PROTECT ONE CABLE END
5	3	O-RING SEALS - NOT SHOWN

ACCEPTS CABLES FROM 3 - 7 MM

Ø 25.4

22

22

22

102

145

Ø 25.4

17.25 REF.

CABLE GLAND - 2X

COUPLER

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GENERAL TOLERANCES:  
 UNLESS OTHERWISE SPECIFIED:  
 BREAK ALL SHARP EDGES

4 PLACE DECIMAL +/- .0005  
 3 PLACE DECIMAL +/- .003  
 2 PLACE DECIMAL +/- .01  
 ANGULAR DIM. +/- 1 DEG

CONNECTOR PROTECTION FITTING KIT  
 CUSTOMER DRAWING

DESIGNED BY: DOS  
 DRAWN BY:  
 FINAL APPROVAL:  
 SIZE: A  
 SHEET NO.:

ISSUE 3 - 4/29/13 - ADDED COUPLER ID FOR REFERENCE  
 ISSUE 2 - 6/12/12 - ADDED PLUG TO KIT TO GIVE USER OPTION TO USE EITHER SINGLE OR DOUBLE ENDED.

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