

**Micron Optics, Inc.**  
**os3100 Style Strain Sensor**  
**Comprehensive Fatigue Test Report**

**Preliminary**

The following report provides a comprehensive summary of fatigue testing on the os3100 series strain gage. The data below includes both bending and elongation tests.

Bending Fatigue Test:

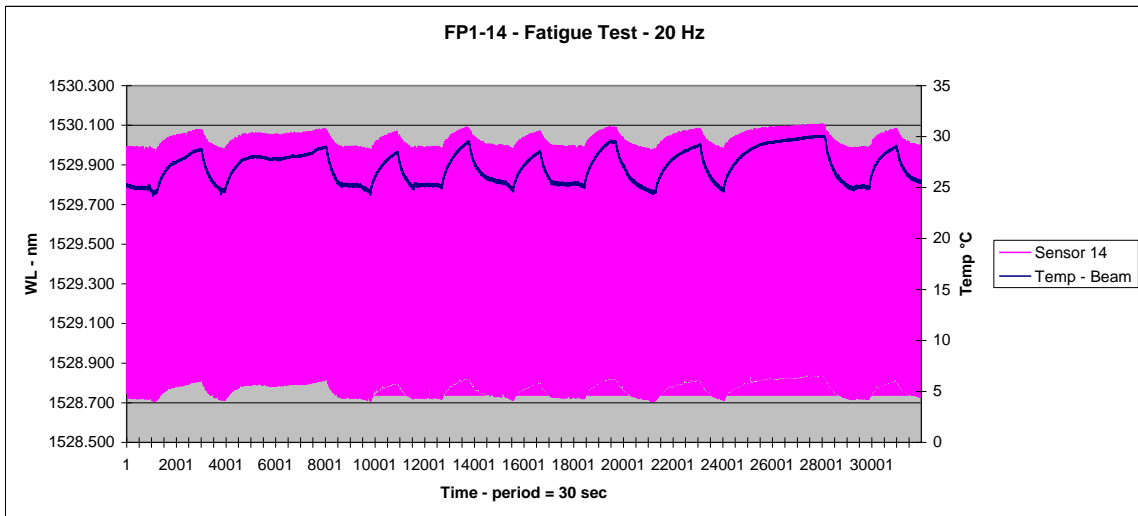
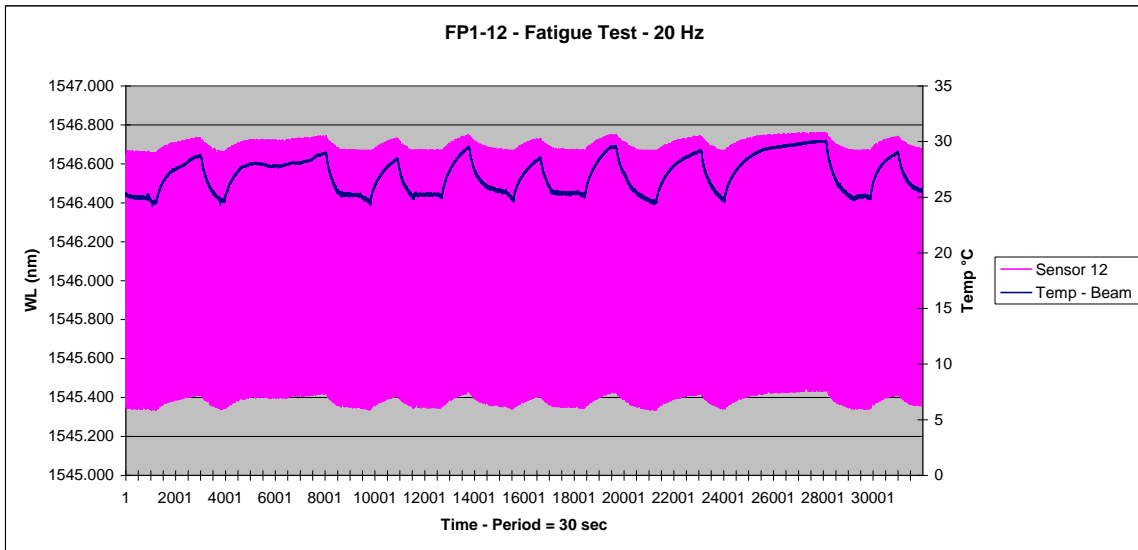
Bending fatigue was set up using a vibration fatigue testing machine model 25-HLS-T manufactured by All American Tool and MFG. Company. The unit has a frequency range of 5 to 100 Hz and maximum amplitude of 0.15 inches.



This setup, pictured above, was able to provide a strain range of 1,100  $\mu$ strain from bending.

FP1-12, FP1-14

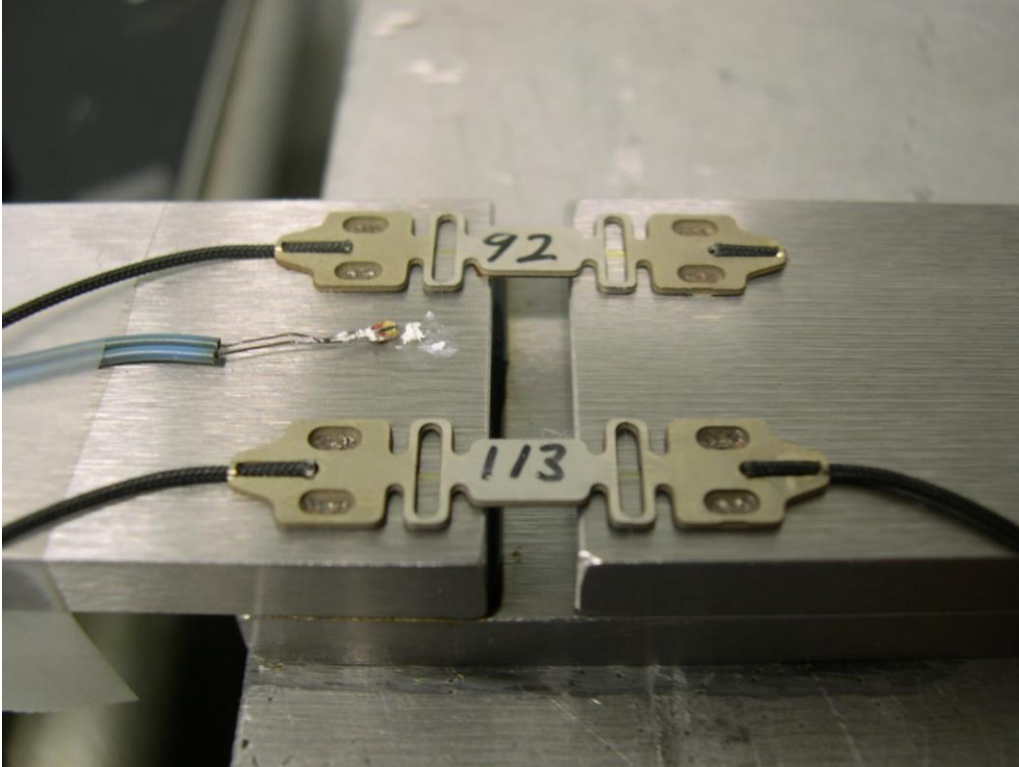
- Test Start Date - 2006-04-28 08:49:41
- Test End Date - 2006-05-09 13:52:13
- Frequency – 20 Hz
- Total No. Cycles – 13,346,780
- Strain Range – 1,100  $\mu$ strain (FP1-12 – 0 to -1,100 $\mu$ s, FP1-14 – 0 to +1,100 $\mu$ s)
- Test stopped to convert machine to high strain elongation test.
- Mounting type – Weld on



Temperature of the beam and machine varied with room temperature and followed the day/night and weekend air conditioning high/low cycle.

Elongation Fatigue Test:

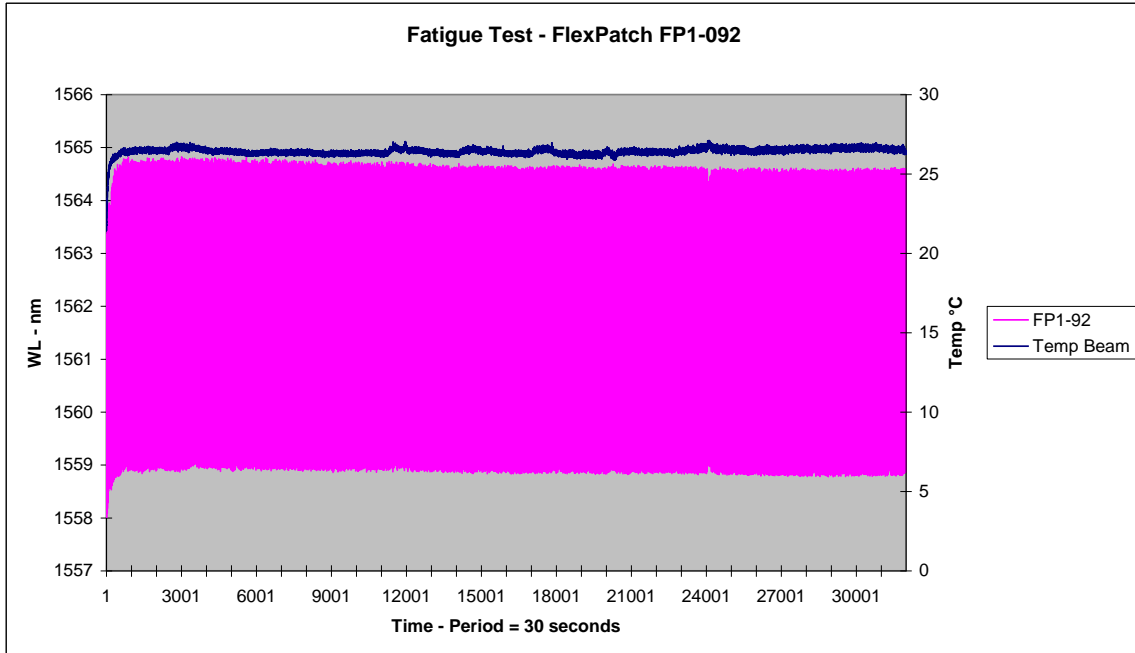
The balance of fatigue tests was performed on an elongation test configuration to apply linear strain, higher tension and higher speed. The test setup uses the same vibration fatigue testing machine but with modified tooling and is shown in the photo below:



On the above setup the beam on the left is fixed and the beam on the right moves to provide the specified elongation. Detailed test data is summarized below:

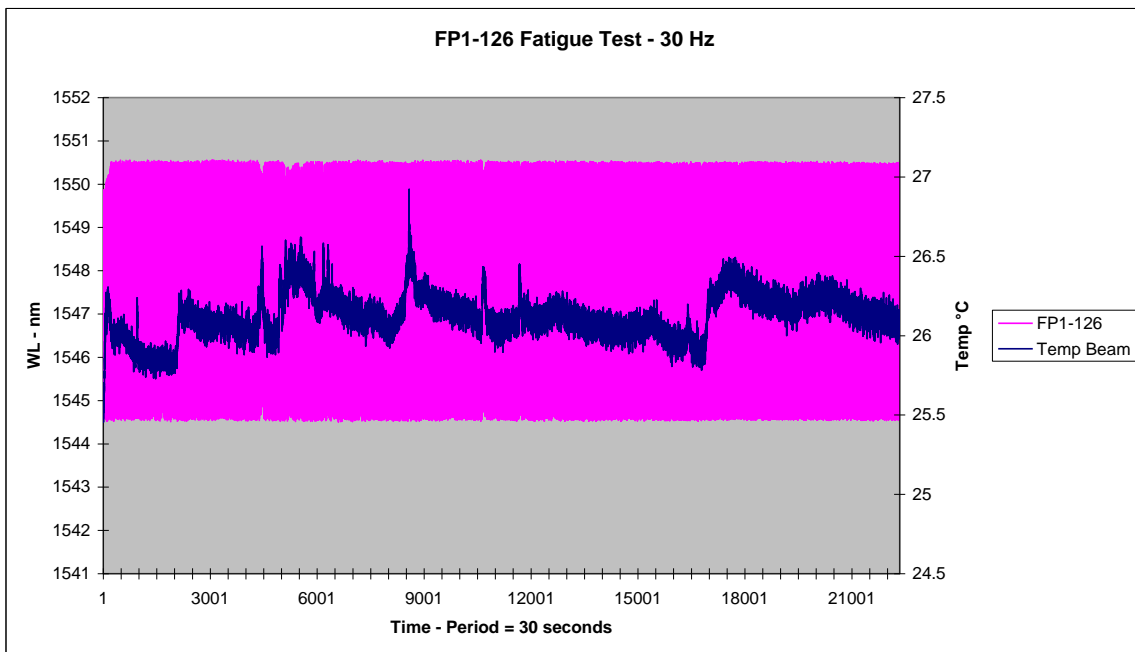
FP1-92

- Test Start Date - 2006-10-05 10:47:35
- Test End Date - 2006-10-17 11:31:59
- Frequency – 31 Hz
- Total No. Cycles – 32,223,384
- Strain Range -  $\pm 2,950$   $\mu$ strain
- Test stopped to test additional sensors.
- Mounting type – Weld on



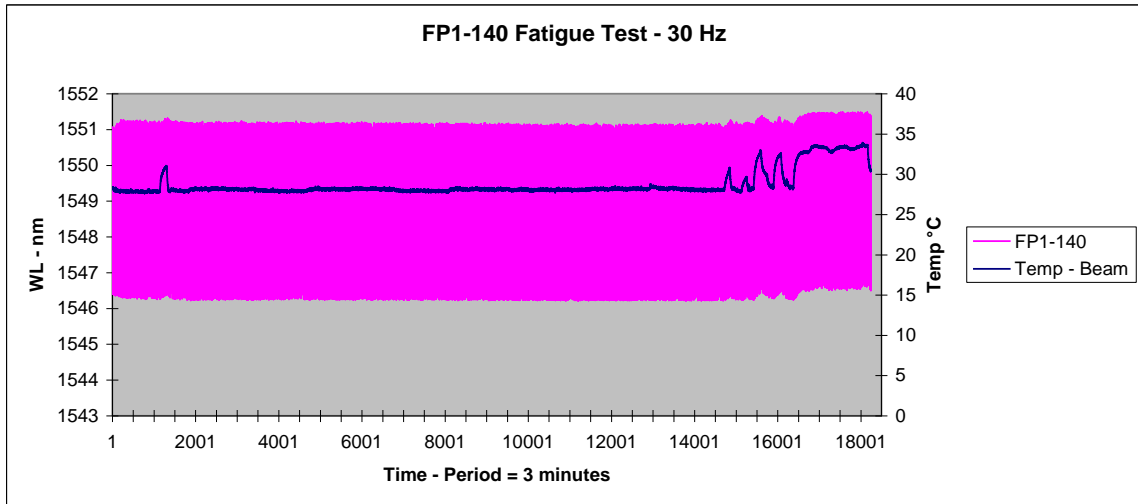
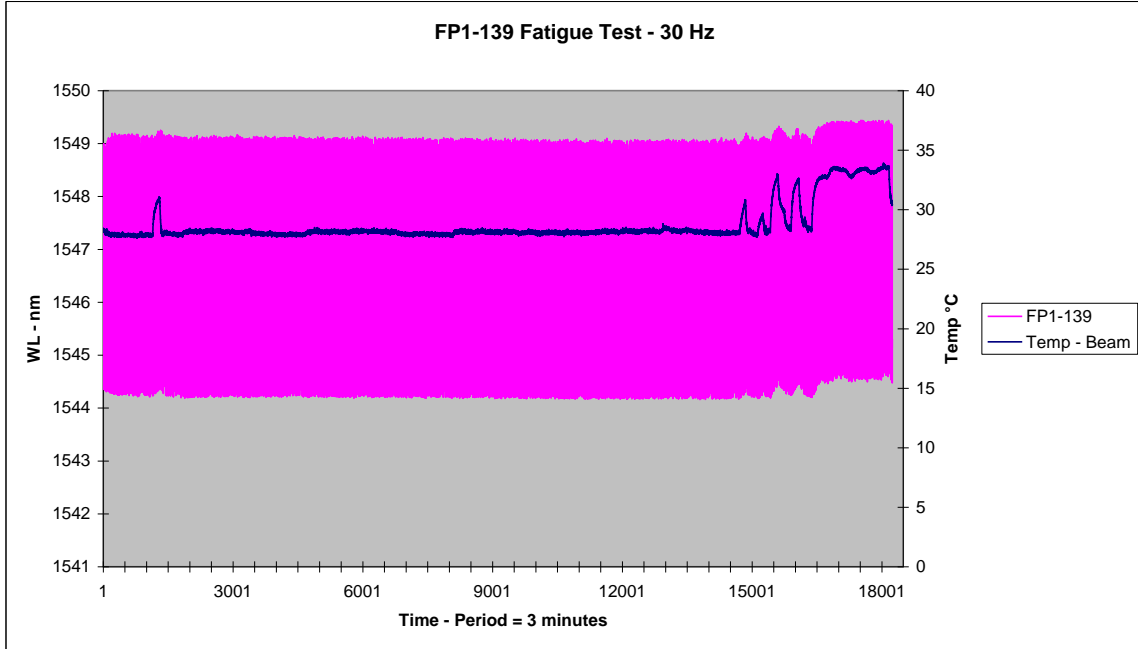
FP1-121 & FP1-126:

- Test Start Date - 2006-10-17 14:36:14
- Test End Date - 2006-10-25 15:19:03
- Frequency – 30 Hz
- Total No. Cycles – 20,813,070
- Strain Range -  $\pm 2,400$   $\mu$ strain
- Test stopped to test additional sensors.
- Mounting type – Weld on



FP1-139 & FP1-140:

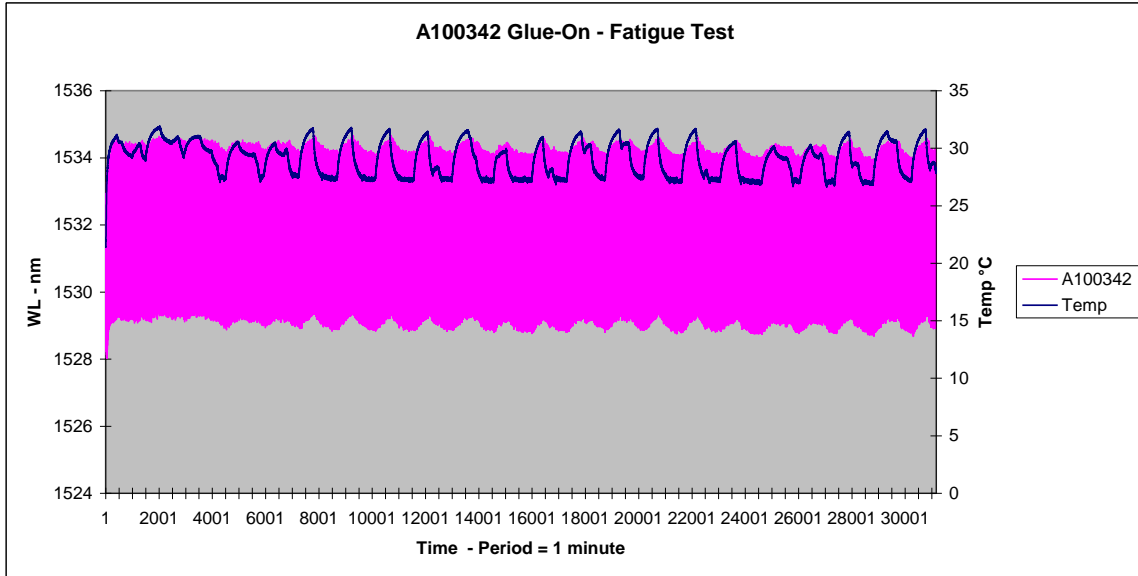
- Test Start Date - 2006-11-03 11:20:57
- Test End Date - 2006-12-11 14:25:46
- Frequency – 31 Hz
- Total No. Cycles – 102,122,959
- Strain Range -  $\pm 1,990$   $\mu$ strain
- Test stopped after 100 million cycles
- Mounting type – Weld on



A100342:

- Test Start Date - 2007-02-14 16:16:08
- Test End Date - 2007-03-08 08:49:54
- Frequency – 33 Hz
- Total No. Cycles – 61,842,858
- Strain Range -  $\pm 2,200$   $\mu$ strain

- Test stopped after 60 million cycles
- Mounting type – Glue-On using Vishay AE-10 adhesive



A100335:

- Test Start Date - 2007-05-14 07:52:12
- Test End Date - 2007-05-25 13:41:09
- Frequency – 30 Hz
- Total No. Cycles – 29,140,410
- Strain Range -  $\pm 1,900 \mu\text{strain}$
- Test stopped after 29 million cycles
- Mounting type – Glue-On using JB Weld adhesive

