os3500 Temperature Cycle Summary

Test Date: June 10, 2015
Test Date: July 21, 2015

Sensors tested: DEV009
DEV010
DEV011
DEV012

Test Equipment: Chamber: Espec SH-240
Interrogator: sm125 SIAB8T

Test Description:

Each of the 4 sensors was mounted with Bolt-on Brackets to an AISI 1018 Steel Plate measuring 8”x2”x3/8”. The sensors were placed in Espec chamber which was programmed to ramp from -40°C to 80°C at a rate of 1°C/minute with a 15 minute dwell at -40°C and 80°C. A total of 200 cycles were performed.

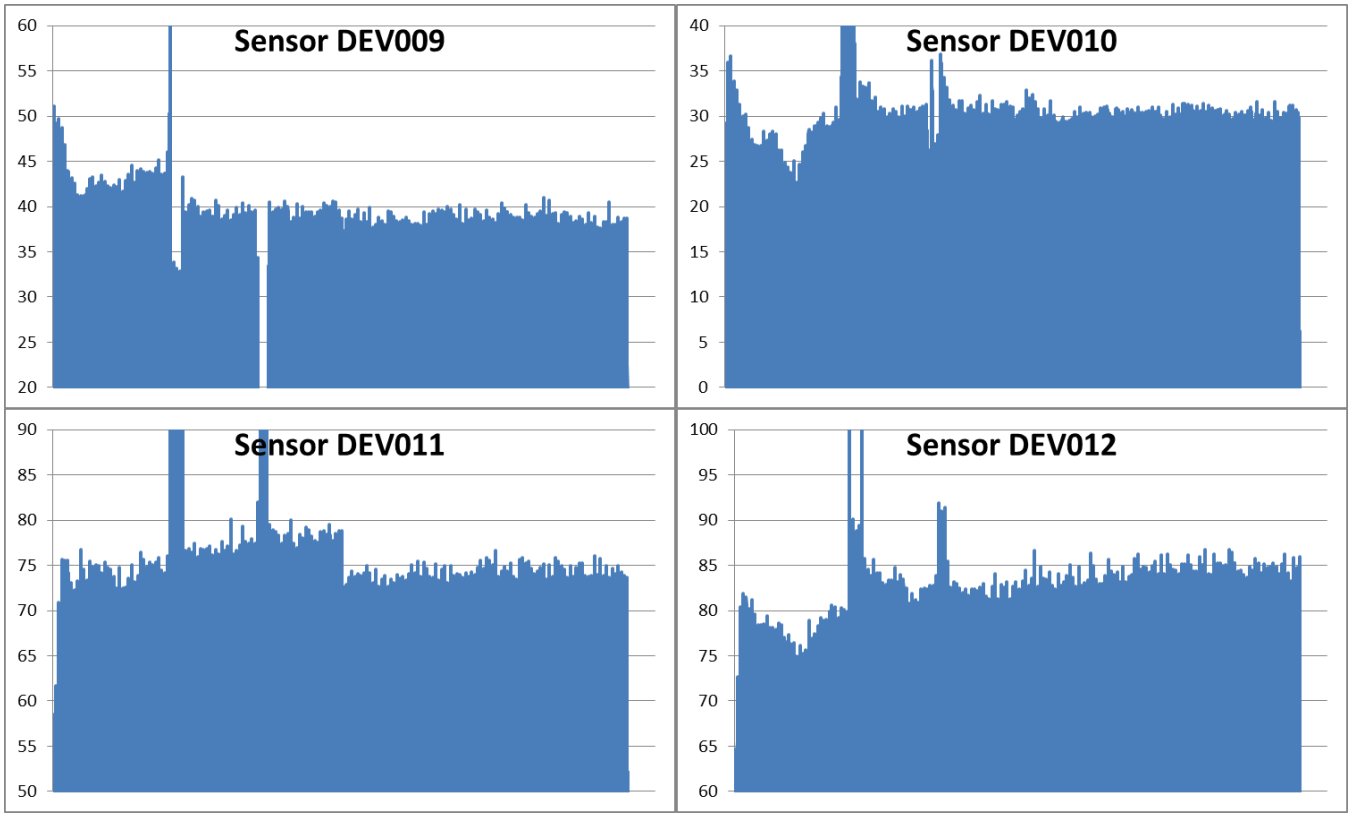
Using the following equation to calculate mechanical strain:

$$\varepsilon_{Mech} = 10^6 \left[\frac{(\Delta\lambda/\lambda_0)_S - (\Delta\lambda/\lambda_0)_T}{F_G} \right] + \frac{(\Delta\lambda/\lambda_0)_T}{S_T} (CTE_T - CTE_S)$$

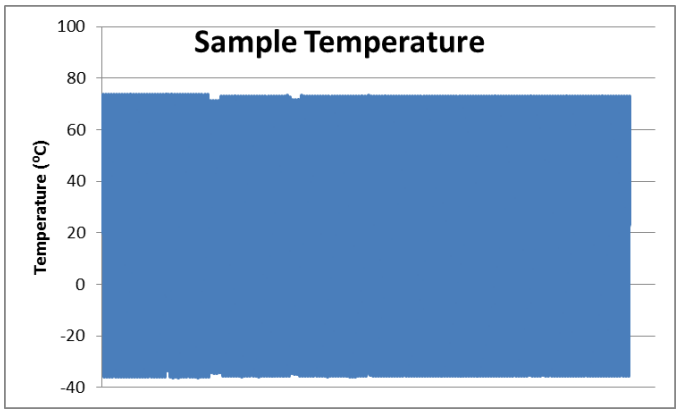
Where:

$(\Delta\lambda/\lambda_0)_S$: Strain FBG response
$(\Delta\lambda/\lambda_0)_T$: Temperature FBG response
F_G: .81
S_T: 0.0000135
CTE_T: 11
CTE_S: 13.1

The mechanical strain response of each sensor over time is plotted below:



Some of the noise in the early part of the run is due to fluctuations in the chamber cycle as can be seen below:



Test Summary:

In this test, the chamber is quickly cycled while recording temperature compensated mechanical strain. Because of the rapidly changing temperature, accurate temperature compensation is not of primary importance. In the graphs above, we zoom into the top of the strain response and focus on how it changes over the duration of the test. In this case all 4 sensors did not shift significantly during the test.