

Effect of Cross-Axis Inclination on the Scale Factor of 756-Series Mid-Range Miniature Tilt Sensors

Tech Note

Tilt sensors are calibrated by tilting them in a vertical plane and measuring their outputs at known angles. If a sensor is subsequently inclined by the cross-axis angle β (Figure 1) and again rotated in a vertical plane, its output at the same known angles will be different than in the initial calibration.

We evaluated the cross-axis performance of a Model 756-1172 Tilt Sensor by inclining and then calibrating it at cross-axis angles from -20 to +20 degrees. A signal conditioning module with analog voltage output (Applied Geomechanics Model 84828) was used in the calibrations. In each test we tilted the sensor in 0.5 degree steps over its full range of ± 10 degrees.

Calibration of this sensor yielded an obvious cosine relationship between the scale factor and the cross-axis inclination (Figure 2). The maximum scale factor occurred at a cross-axis angle of 4 degrees. The cosine relationship can be summarized with the equation:

$$y = \cos(\beta + 4^\circ)$$

where y is the normalized scale factor (degrees/Volt). The 4-degree offset is a function of the symmetry of the placement of the platinum electrodes inside the sensor and will vary slightly from sensor to sensor.

Conclusion: There is a cosine relationship between sensor output and cross-axis inclination. When necessary, this effect can be measured and compensated to improve accuracy.

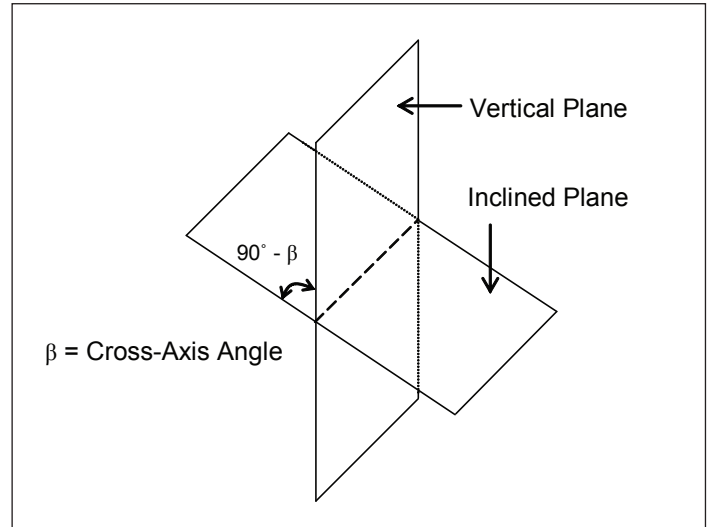


Figure 1. Cross-axis angle defined

