EFFECT OF CROSS-AXIS INCLINATION ON THE SCALE FACTOR OF 756-SERIES MID-RANGE MINIATURE TILT SENSORS

MAKING SENSE OUT OF MOTION

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°. A signal conditioning module with analog voltage output (Jewell Instruments Model 84828) was used in the calibrations. In each test, we tilted the sensor in 0.5° steps over its full range of ±10°.

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°. The cosine relationship can be summarized with the equation: $y = \cos(\beta + 4°)$ where y is the normalized scale factor (°/Volt).

The 4° offset is a function of the asymmetrical platinum electrode placement within the electrolytic 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.
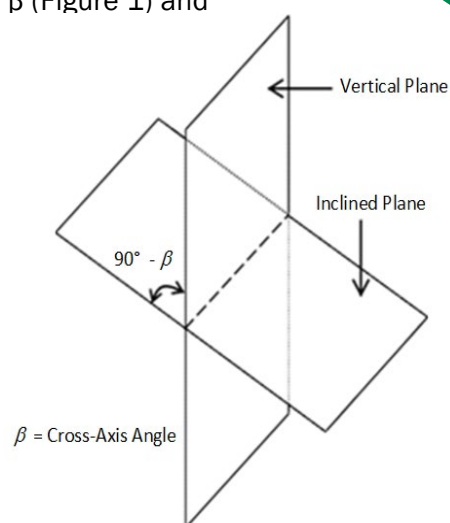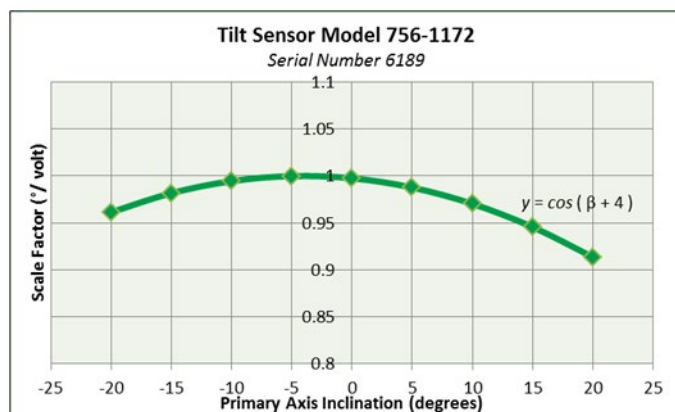

Figure 1

Figure 2