

Geo Tech Note:

Impulse Response Of 900-Series Biaxial Clinometers With Viscous And Non-Viscous Sensors



The following graphs show the response of [900-Series Biaxial Clinometers](#) to a sudden impulse. The impulse was generated by rotating the clinometer through an angle of 3.4 degrees by pulling a gage block out from under one end of a Tiltmeter Calibration Plate. The test was reproduced at three different temperatures using clinometers with undamped (non-viscous liquid) and critically damped (viscous liquid) sensors.

The results are shown below in Figures 1, 2 and 3, which are for impulse tests performed at -22°C , $+20^{\circ}\text{C}$, and $+8^{\circ}\text{C}$, respectively. Each graph contains two traces, one for the non-viscous sensor, the other for the viscous sensor. The scale factor of the clinometer output, 10 degrees/Volt, is the same in every case. The vertical and horizontal scales are also the same for the three graphs.

The non-viscous sensor shows a damped sinusoidal resonance at all temperatures. This effect is absent from the viscous sensor at -22°C and nearly absent at the two higher temperatures. For both sensor types the amplitude of the first half cycle increases with increasing temperature. The initial tilt overshoot, lasting about 50 milliseconds, results from the inertia of the sensor liquid, which at first tries to remain stationary as the sensor housing begins to move.

The non-viscous sensor exhibits a damped resonance after a sudden impulse. There is no resonance when the viscous sensor is used. We recommend upgrading to the viscous sensor if you will make your measurements in a high-vibration environment. Under static conditions the lower-cost, non-viscous sensor (standard in all 900-Series Biaxial Clinometers) will give good results. To upgrade to the viscous sensor, see the 'Ordering Code/How to order' section of datasheet when you place your order for further details.

