

Using the Accumeasure 9000 Capacitance Transducer Amplifier to Measure Position and Vibration Displacement of Small Targets

Introduction

Advances in nearly all fields of science, technology, and manufacturing has brought with it the need to measure the position and/or vibration displacement of very small mechanical parts and assemblies.

The Problem

Since these devices often operate at high speed and with relatively small movements, it usually dictates the use of noncontact sensors to insure that the natural movements are not compromised by the sensor itself as may happen when using contacting sensors. In addition, the noncontact sensor must be very small and have an even smaller spatial sensing capability.

One such recent application required measurement of the position and vibration displacement amplitude of taut wires .002" to .005" (50 to 125 microns) in diameter.

The Solution

After several unsuccessful attempts at making this measurement using a variety of conventional noncontact sensors employing magnetics, optical, and capacitance technology, the customer turned to MTI Instruments for a solution to the problem.

Fortunately, MTI Instruments had recently completed the development and market introduction of the AccumeasureT 9000 Capacitance Transducer Amplifier, which can operate with up to 100X smaller capacitance sensing area than most previous capacitance sensors, while still maintaining acceptable levels of standoff distance and sensing range.

This permitted MTI Instruments engineers to design a capacitance sensor with a sensing electrode only .005" wide x .050" long, which when operated with the Accumeasure 9000 amplifier at full sensitivity could give a sensing range of up to .008", as required by the application. The .005" wide dimension of the sensing element is aligned with the .003" diameter of the wire target and the .050" length dimension of the sensing element is aligned with the axial length of the wire target. Most previous capacitance transducer amplifiers could only give about .0005" (500 micro inches) range with this size sensor, which would be far short of the customer's requirement.



MTI Instruments, Inc.

325 Washington Avenue Extension
Albany, NY 12205
PH: +1-518-218-2550
OR USA TOLL FREE: 1-800-342-2203
FX: +1-518-218-2506
sales@mtiinstruments.com
www.mtiinstruments.com

The Results

Figure 1 shows the dimensions of the face of the sensor; Figure 2 shows the gap response, and Figure 3 shows the lateral sensitivity when operating at a standoff distance of .005". Figure 4 shows a sketch of the electric field lines from the sensing electrode to the wire.

This is only one example of the unique capabilities of the Accumeasure 9000 amplifier, which has permitted MTI Instruments engineers to solve different and demanding applications for customers in a wide variety of research, engineering and manufacturing fields.

