

# Proving Theoretical Cutting Forces of Rotary Ultrasonic Machining

Industry: Manufacturing

## Summary

### Customer Need / Challenge

- Rotary ultrasonic machining is a hybrid process that combines diamond grinding with ultrasonic machining to provide fast, high-quality drilling of many ceramic and glass applications. Recently, the potential of using this new method to expand its capabilities from simply drilling holes to milling complex shapes, has been theoretically proven using computer models. However, proving this theory in the real world requires a better understanding of the forces happening during the machining process. Rotary ultrasonic machining generates forces of a very small magnitude. As a consequence, any load cell used for their measurement must be sensitive, while at the same time retaining high structural stiffness within a compact, low-profile envelope. In addition, any crosstalk in the load cell must be minimized in order to clearly identify the force of each axis.

### Interface Solution

- An Interface Model 3A120 3-Axis load cell is installed in the rotary ultrasonic machine to measure the forces being applied to a sample part. With clear signals and minimal crosstalk, the applied forces are recorded and stored using an Interface Model BSC4D.

### Results

- The 3-Axis load cell provides excellent data helping uncover the relationship between machine cutting parameters and the forces applied on the component. Using this knowledge the machining process can be reliably optimized for new materials and operations.

## Materials

### Interface Products

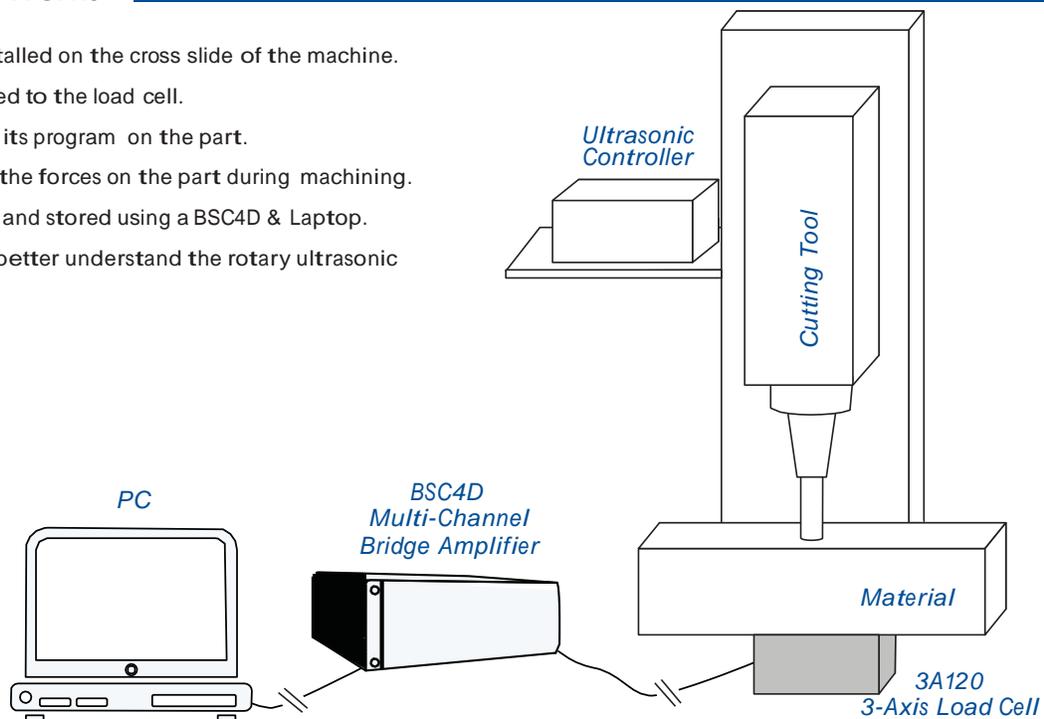
- Model 3A120 3-Axis Load Cell
- Model BSC4D Multi-Channel Bridge Amplifier & PC Interface Module
- Appropriate Cabling

### Additional Materials

- Rotary Ultrasonic Machine
- Test Material
- PC Laptop

## How It Works

- A 3-Axis load cell is installed on the cross slide of the machine.
- The test material is fixed to the load cell.
- The load machine runs its program on the part.
- The load cell reacts to the forces on the part during machining.
- The signals are logged and stored using a BSC4D & Laptop.
- The data is studied to better understand the rotary ultrasonic machining process.



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