

ThinGap Servo Application

A manufacturer of high precision wire bonding tools utilized a ThinGap® servomotor for a high precision Electrical Discharge Machining (EDM) application. In the EDM process, metal is removed by generating high frequency sparks through a small gap filled with a dielectric fluid. This technique allows machining complicated shapes in hard metals, including refractory alloys. A necessary condition for achieving a good surface finish is a precisely controlled gap between the electrode (tool) and the work piece. The sparking gap ranges from about 10 to 100 microns, respectively for finish and roughing and must be precisely controlled. The design requires controlled movement of a 25-pound spindle head with the ability to move the EDM tool, both very smoothly and very slowly during the cutting phase but to rapidly retract the spindle head after cutting was completed.

Conventional servomotors and gearboxes were unable to move smoothly during the cutting operation and could not retract rapidly to the next cutting position. The backlash in the gearbox system was impacting precision and reliability. The ThinGap servomotor was directly connected to the spindle drive screw, eliminating the gearbox from the system. The motor was equipped with a non-contact MicroE brand laser encoder with a resolution of 102,400 counts per revolution.

The motor driver/controller selected was the Agile Systems, Inc. model 2030, three-axis PWM



trapezoidal drive unit. The driver was set for brushless mode with the capability of 8 amps continuous and 15 amps intermittent current.

The lead screw in the spindle head was a precision 4.3mm pitch, re-circulating ball type with a 0.1693 inches lead per revolution. This divided by the 102,400 counts per revolution yields a linear spindle head movement of 0.00000165 inches per count. The locked rotor position shows the control system maintaining one count position variance.

The combination of equipment described above resulted in an excellent automation improvement for the EDM machining operation, improving quality, and productivity.