

## **Abstract**

Masters of Engineering Degree (Mechanical)

### **Project Title:**

ASML Small Bolt Pretensioner

### **Author:**

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### **Abstract:**

ASML is a company that specializes in lithography systems, which have low tolerance levels and require high precision. They have requested that we develop a method for tightening small bolts (M1.6-M3) that is also compatible with the clean room environment that they operate in. Torsion based methods such as wrenches and torque drivers are unacceptable due to the friction-caused surface defects and dust, and also large displacements of the clamped part. The method is to apply a known tensile load to the bolt, while also applicable to bolts that are spaced closely together (4-5.5 mm apart for M1.6 bolts, 8mm apart for M3 bolts). We have decided on a bolt tensioner with piezoelectric actuation. The basics of operation are that a piston would be screwed down onto the end of the bolt, and a piezoelectric stack actuator would push up on the bottom of the piston, applying a tensile load to the bolt, and the nut would be screwed down to the clamped part without friction. Currently analytical calculations and FEA simulations have confirmed the feasibility of this idea.