

Force Sensing Forceps

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Problem Statement: Our objective is to design a training and research device that will interface with a standard surgical forceps. It must measure and provide quantifiable, electrical output of clamping forces applied to tissue, without obstructing proper forceps holding technique.

Client requirements:

- Provide quantifiable electrical output of measurements
- Measure clamping forces while avoiding crosstalk
- Permits proper forceps holding technique

Design requirements:

1. Physical and Operational Characteristics

- Performance requirements*
 - Audio or visual output
 - Repetitive long term use
- Safety:*
 - Must be able to be sanitized by standard, FDA approved procedures
 - Cannot obstruct surgeon's grip
 - Disallowance of excessive force
- Accuracy and Reliability*
 - Measurements must remain accurate and account for changing conditions
 - Temperature
 - Crosstalk
 - Able to be calibrated
- Life in Service*
- Shelf Life*
- Operating Environment*
 - Used by surgeons
 - Used during surgical procedures
 - Exposed to bodily fluids
- Ergonomics*
 - Maintain balance of forceps
 - Cannot interfere with grip or tips of forceps

- h. *Size*
 - i. Compatible with a standard size of surgical forceps
- i. *Weight*
 - i. Cannot significantly affect feel/balance of the forceps
- j. *Materials*
 - i. Compatible with stainless steel forceps
- k. *Aesthetics, Appearance, and Finish*
 - i. Generally aesthetically pleasing

2. Production Characteristics

- a. Quantity
 - i. Production of one initial working prototype
- b. Target Product Cost
 - i. Less than \$1000

3. Miscellaneous

- a. *Standards and Specifications*
 - i. Must meet medical device requirements
- b. *Customer*: specific information on customer likes, dislikes, preferences, and prejudices should be understood and written down.
 - i. *Preferences*:
 - *Wireless*
 - *Digital display*
 - *Use of underside of forceps for sensor attachment*
 - Axial and torsional measurements
- c. *Patient-related concerns*
 - i. Ripping of the tissue to be avoided
- d. *Competition*
 - i. Laparoscopic force measuring tool