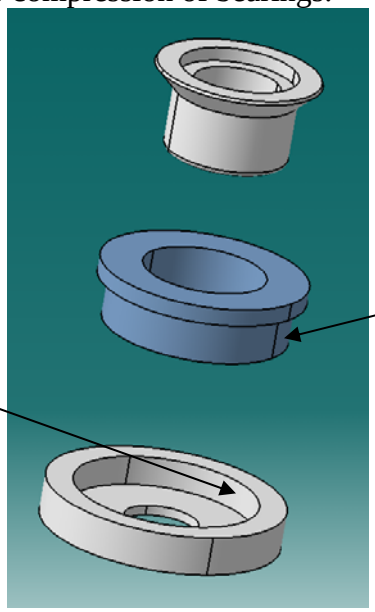
Design Analysis- Keyless Sag Saw

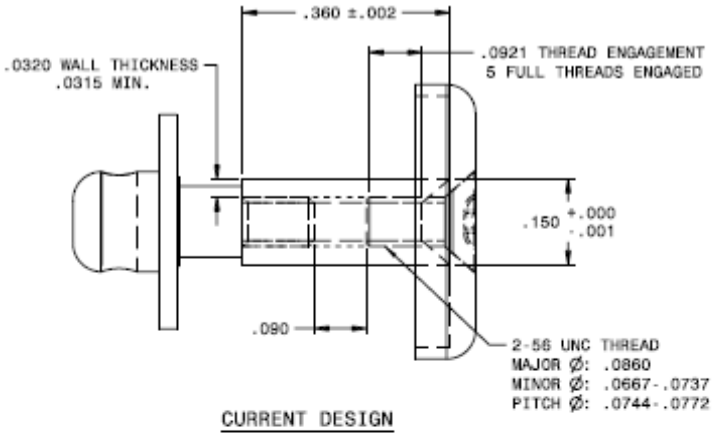
1. Press fit bearing: In the current design, the bearing is press-fitted on both inside and outside diameters, and this type of design requires extremely precise machined components and precision tooling along with the capability to heat the housing that retains the bearing and cool the bearing using liquid nitrogen during assembly process to prevent any bearing damage. In addition, lead-in chamfer is needed to prevent any bearing damage, even if current design is pursued in production. However, a design change should be considered to at least eliminate one of the press fits, otherwise, there is a high likelihood that certain percentage of bearings would be damaged during installation, and rest may have reduced life expectancy due to over compression of bearings.



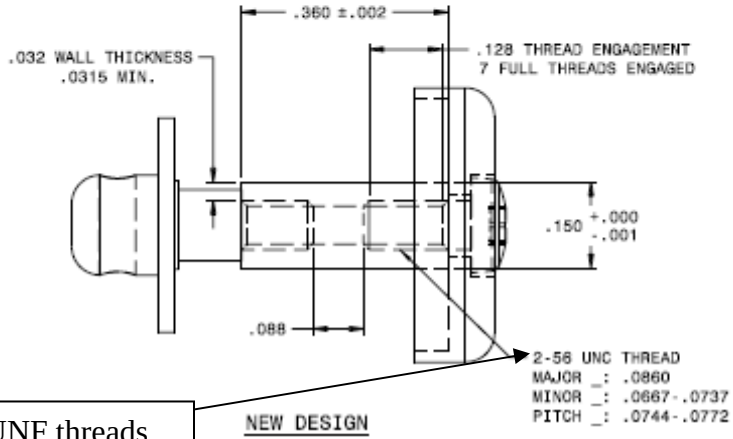
2. Screw mechanics: In the present design, 2-56 UNC[1] thread is used, which allows at maximum 5 thread engagement, and as a result of it there is a likelihood that the unit can come apart. To minimize the chances of units falling apart during usage, it is recommended that 2-72 UNF threads having a Torx driver with DLC coating be used to minimize the chances of screw coming loose. In addition, the part that retains the screw titled "lower shaft" is made out of 17-4 stainless steel, it

[1] In North America, the most common thread types used on general-purpose bolts are known as UNC or UNF. UNC threads are coarser and, thus, easier to screw in without cross-threading and to remove if corroded. UNF threads are finer and offer better torque fine-adjustment characteristics, as well as better torque-locking performance. Other common thread types include UNEF, which has extra-fine threads for special application requirements; and UNJC/UNJF, both of which have design characteristics needed on extremely high-strength bolts.

should have been made out of custom 455 stainless and vacuum heat treated prior to cutting the threads. Lastly, there is no design torque specified for the screw, however, it is recommended that the screws be tightened at least to 2.5 in-lbs.



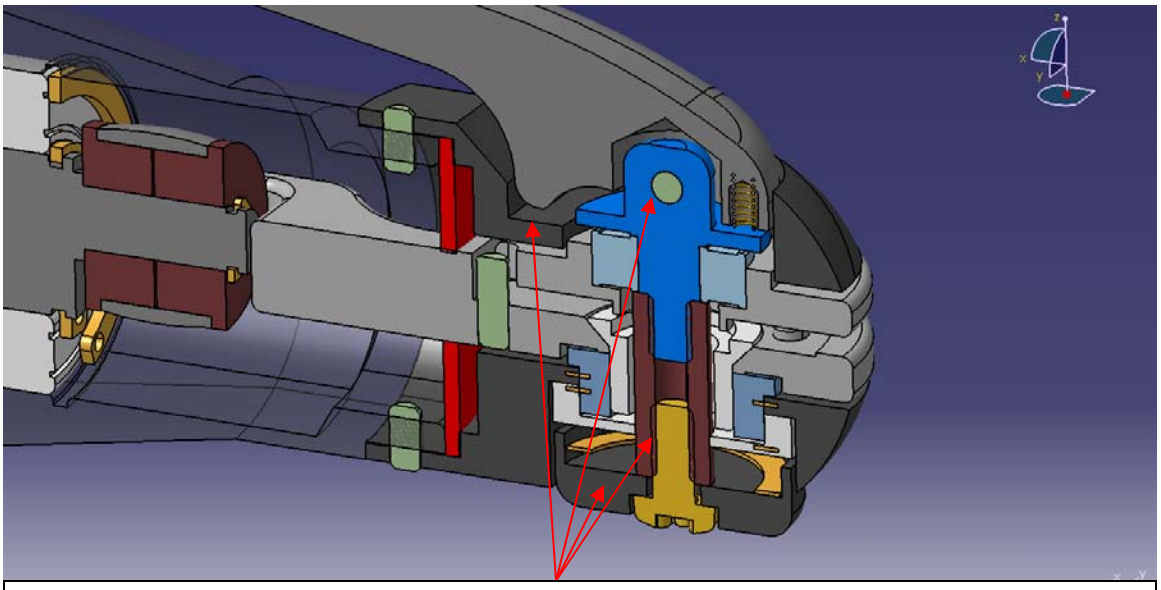
CURRENT DESIGN



NEW DESIGN

It should be 2-72 UNF threads

3. Material selection: Most of the bearing materials should be made out of vacuum heat treated custom 455 stainless steel, however, most of the components such as Sag Saw Ring (part #8170), Sag Saw Cover (part # 8173), Nose Piece (Part # 8175), Sag Saw Top Holder (part # 8165), Sag Saw Shaft (Part # 8163) and Sag Saw Sleeve (part # 8164) are made out of 17-4 stainless steel. In addition, the parts that are exposed to blood may be coated with Medcoat 2000.



Bearing surfaces should be made out of a vacuum heat treated custom 455 stainless steel and should be coated with Medcoat 2000 to prevent any chances of corrosion.

5. Press-fit dimensions: A preliminary tolerance analysis indicates that the bearings cannot be press fitted as the parts are currently designed. For instance, during the process of press fitting the bearing (part # 7542) inside the part titled Sag Saw Sleeve (part # 8164), in some cases, there will line to line fit and some cases there would be press-ft. In other words, if there were no locktite, the bearing would rotate freely.