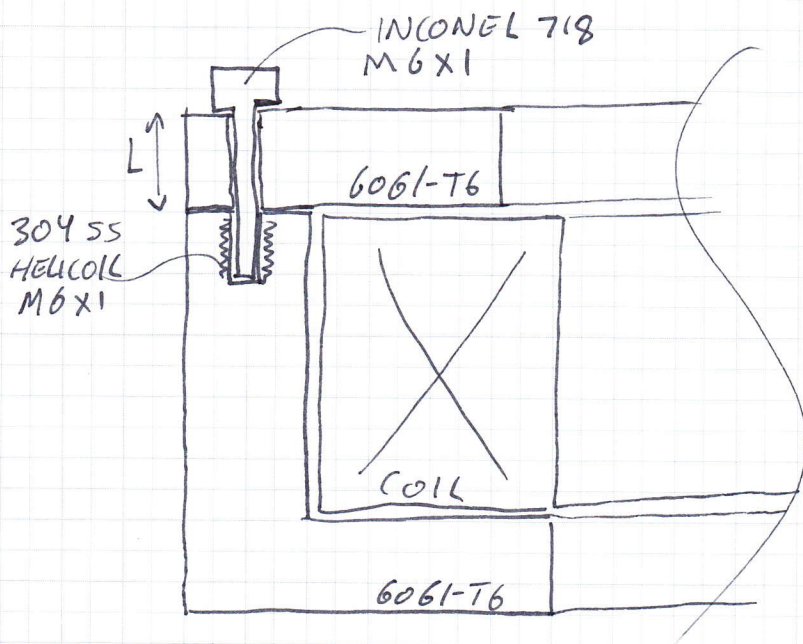


BOLTED JOINT NOTES



$$\begin{aligned}
 L &= 18 \text{ mm} & K &= .3 & \text{GUESSES} \\
 A_B &= 20.1 \text{ mm}^2 & T &= 17 \text{ Nm} \\
 E_B &= 237 \text{ GPa} \\
 E_j &= 77.8 \text{ GPa} \\
 D_\phi &= 6 \text{ mm} \\
 D_H &= 7 \text{ mm} \\
 D_{BH} &= 10 \text{ mm} \\
 \Delta L_B &= .238\% & T_i &= 293 \text{ K} \\
 \Delta L_j &= .435\% & T_F &= 3 \text{ K}
 \end{aligned}$$

$$K_B = \frac{A_B E_B}{L} = \boxed{2.65e8} \text{ N/m}$$

$$\begin{aligned}
 K_M &= \frac{\pi E_j D_H \tan(30)}{2 \ln \left[\frac{(L \tan(30) + D_{BH} - D_H)(D_{BH} + D_H)}{(L \tan(30) + D_{BH} + D_H)(D_{BH} - D_H)} \right]} \\
 &= \boxed{4.85e8} \text{ N/m}
 \end{aligned}$$

$$F_P = \frac{T}{K_D} = \boxed{9.44e3 \text{ N}} \text{ ESTIMATED PRELOAD } \pm 35\%?$$

$$F_T = \frac{K_B K_M}{(K_B + K_M)} L (\Delta L_j - \Delta L_B) = \boxed{-6.07e3 \text{ N}}$$

$$F_i = F_P + F_T = \boxed{3.38e3 \text{ N}} \text{ BOLT LOAD AFTER COOLDOWN}$$

$$F_{SEP} = \frac{F_i}{(1-C)} \quad C = \frac{K_B}{(K_M + K_B)} = .353$$

$$\boxed{F_{SEP} = 5.22e3 \text{ N}} \text{ EXTERNAL LOAD TO SEPARATE JOINT}$$