$plugDiameter := 0.375 \cdot in$ $pressure := 7500 \cdot \frac{lbf}{in^2}$

$boltTensileYield := 180000 \cdot \frac{lbf}{in^2}$ $boltCompressionStrength := 180000 \cdot \frac{lbf}{in^2}$

$boltShearStrength := 180000 \cdot \frac{lbf}{in^2}$ $numBolts := 3$

$TiTensileYield := 120000 \cdot \frac{lbf}{in^2}$ $PEEKCompressionStrength := 18000 \cdot \frac{lbf}{in^2}$

$plugArea := \frac{\pi}{4} \cdot plugDiameter^2 = 0.11 \cdot in^2$ $plugForce := plugArea \cdot pressure = 828.35 \cdot lbf$

Tensile across threads

$boltTensileArea := 0.020 \cdot in^2$ From web

$boltTensileDiameter := .149 \cdot in$ $boltTensileArea := \frac{\pi}{4} \cdot boltTensileDiameter^2 = 0.017 \cdot in^2$

$boltTensileStress := \frac{plugForce}{numBolts \cdot boltTensileArea} = 1.584 \times 10^4 \cdot \frac{lbf}{in^2}$

$FOS := \frac{boltTensileYield}{boltTensileStress} = 11.367$

Bearing under bolt head

$bodyDiameter := .170 \cdot in$ $headDiameter := .281 \cdot in$

$bodyArea := \frac{\pi}{4} \cdot \left(headDiameter^2 - bodyDiameter^2 \right) = 0.039 \cdot in^2$

$bearingPressure := \frac{plugForce}{numBolts \cdot bodyArea} = 7.023 \times 10^3 \cdot \frac{lbf}{in^2}$

$FOS := \frac{boltCompressionStrength}{bearingPressure} = 25.631$

Bolt shear through head

$shearHeight := 0.073 \cdot in$ $shearArea := \pi \cdot bodyDiameter \cdot shearHeight = 0.039 \cdot in^2$

$shearStress := \frac{plugForce}{numBolts \cdot shearArea} = 7.082 \times 10^3 \cdot \frac{lbf}{in^2}$

$FOS := \frac{boltTensileYield}{shearStress} = 25.416$

Plug shear through flange

$$\text{diameter} := 0.338\cdot\text{in} \qquad \text{height} := .150\cdot\text{in} \qquad \text{shearArea} := \pi\cdot\text{diameter}\cdot\text{height} = 0.159\,\text{in}^2$$

$$\text{shearStress} := \frac{\text{plugForce}}{\text{shearArea}} = 5.201\times 10^3\,\frac{\text{lbf}}{\text{in}^2} \qquad \text{FOS} := \frac{\text{TiTensileYield}}{\text{shearStress}} = 23.074$$

Bolt shear through flange

$$\text{diameter} := 0.281\cdot\text{in} \qquad \text{height} := 0.150\cdot\text{in} \qquad \text{shearArea} := \pi\cdot\text{diameter}\cdot\text{height} = 0.132\,\text{in}^2$$

$$\text{shearStress} := \frac{\text{plugForce}}{\text{numBolts}\cdot\text{shearArea}} = 2.085\times 10^3\,\frac{\text{lbf}}{\text{in}^2} \qquad \text{FOS} := \frac{\text{TiTensileYield}}{\text{shearStress}}$$

Plug bearing on bolts

$$\text{diameter} := 0.281\cdot\text{in} \qquad \text{bearingArea} := \frac{\pi}{4}\cdot\text{diameter}^2 = 4.001\times 10^{-5}\,\text{m}^2$$

$$\text{bearingPressure} := \frac{\text{plugForce}}{\text{numBolts}\cdot\text{bearingArea}} = 4.452\times 10^3\,\frac{\text{lbf}}{\text{in}^2} \qquad \text{FOS} := \frac{\text{TiTensileYield}}{\text{bearingPressure}} = 26.952$$

Bolt shear through flange

$$\text{diameter} := .281\cdot\text{in} \qquad \text{height} := .150\cdot\text{in} \qquad \text{shearArea} := \pi\cdot\text{diameter}\cdot\text{height} = 0.132\,\text{in}^2$$

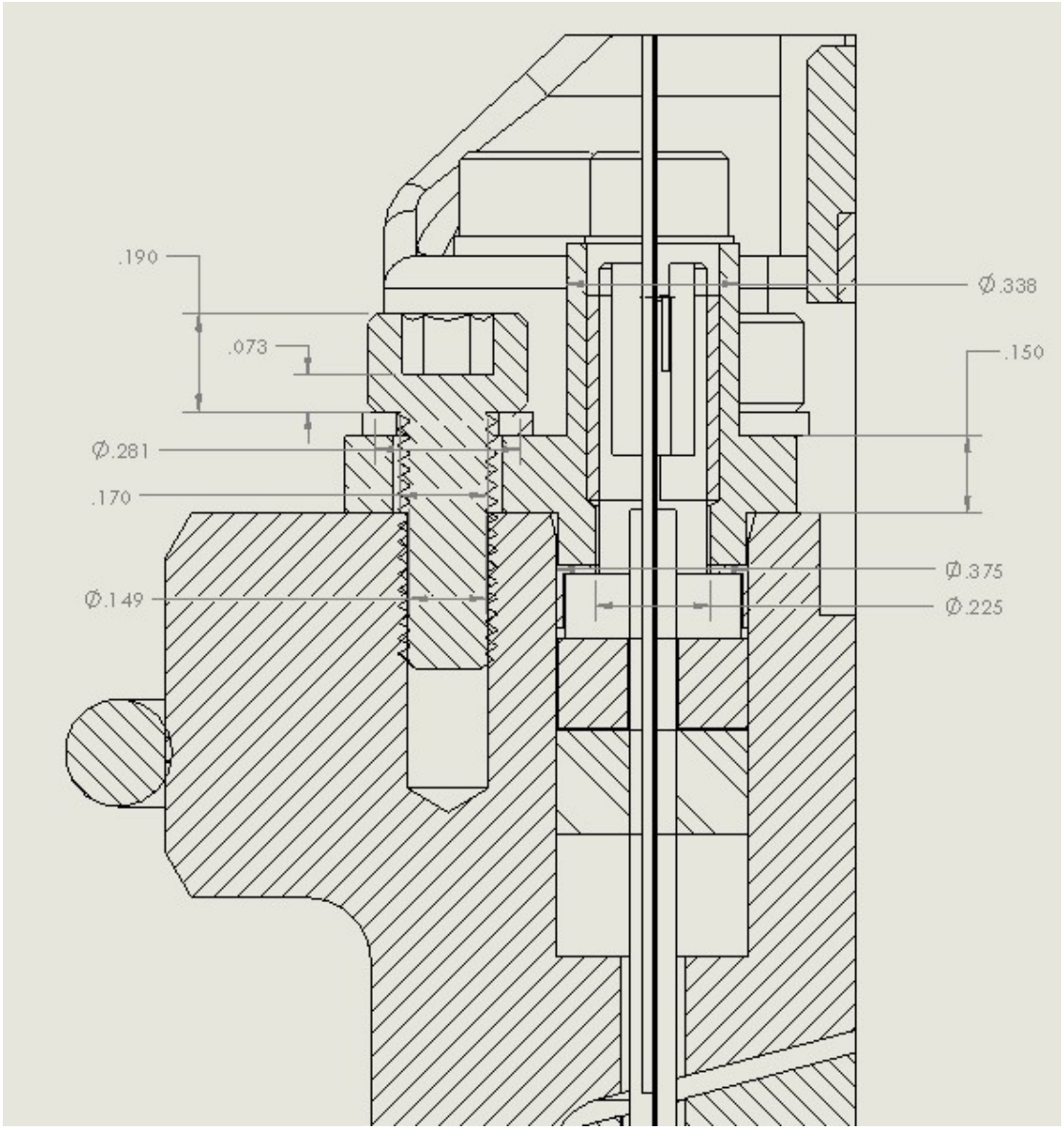
$$\text{shearStress} := \frac{\text{plugForce}}{\text{numBolts}\cdot\text{shearArea}} = 2.085\times 10^3\,\frac{\text{lbf}}{\text{in}^2} \qquad \text{FOS} := \frac{\text{TiTensileYield}}{\text{shearStress}} = 57.549$$

Plug compression on body insulating cup

$$\text{OD} := 0.375\cdot\text{in} \qquad \text{ID} := 0.225\cdot\text{in} \qquad \text{bearingArea} := \frac{\pi}{4}\cdot\left(\text{OD}^2 - \text{ID}^2\right) = 0.071\,\text{in}^2$$

$$\text{compressionStress} := \frac{\text{plugForce}}{\text{bearingArea}} = 1.172\times 10^4\,\frac{\text{lbf}}{\text{in}^2}$$

$$\text{FOS} := \frac{\text{PEEKCompressionStrength}}{\text{compressionStress}} = 1.536$$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