Press & Shrink Fits

1) Select amount of interference.
   - See tables (ANSI/ASME) for class FN1 (light) to FN5 (Heavy-drive) fits.
   - They give interference in 0.001" on diameter for a range of diameters
   - Ex: FN4 for 0.95 to 1.19" diameter, interference = 1 to 2.3 mils on diameter.

2) Compute the pressure at the mating surface.
   - If same materials, use Eqn. 10.52

\[
p = \frac{E \delta_r}{R} \left[ \frac{\left( r_o^2 - R^2 \right) \left( R^2 - r_i^2 \right)}{2R^2 \left( r_o^2 - r_i^2 \right)} \right]
\]

and if shaft is solid \((r_i = 0)\):

\[
p = \frac{E \delta_r}{2R} \left[ 1 - \frac{R^2}{r_o^2} \right]
\]

   - If different materials, use Eqn. 10.51 (flipped)

\[
p = \frac{\delta_r}{R} \left( \frac{r_o^2 + R^2}{r_o^2 - R^2} + \nu_o \right) + \frac{R}{E_i} \left( \frac{R^2 + r_i^2}{R^2 - r_i^2} - \nu_i \right)
\]

3) Compute the tensile hoop stress in the outer piece. Eqn. 10.45

\[
\sigma_{o_t} = p \frac{r_o^2 + R^2}{r_o^2 - R^2}
\]

4) Compute compressive tangential (hoop) stresses in the inner piece. Eqn. 10.49

\[
\sigma_{i_t} = -p \frac{R^2 + r_i^2}{R^2 - r_i^2}
\]

5) Compute the increase in Inner Radius of the outer member from the hoop stress. Eqn. 10.46

\[
\delta_o = \frac{pR}{E_o} \left( \frac{r_o^2 + R^2}{r_o^2 - R^2} + \nu_o \right)
\]

6) Compute the decrease in Outer Radius of the inner member from the tangential compression. Eqn. 10.50

\[
\delta_i = -\frac{pR}{E_i} \left( \frac{R^2 + r_i^2}{R^2 - r_i^2} - \nu_i \right)
\]

7) As a check, ensure that:

\[
|\delta_i| + |\delta_o| = \delta_r
\]