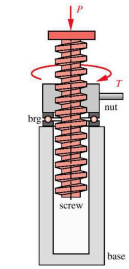
# Ex3) Self-locking or back-driving




- **For the screw jack in Ex1),**
  - **determine if is self-locking or not**
  - **compute the efficiency**
  - **Parameters from Ex1)**
    - **single-start thread,**
    - **the pitch $p = 0.2$ in,**
    - **the pitch diameter $d_p = 1.15$ in,**
    - **the collar diameter $d_c = 2$ in,**
    - **the lead screw friction $\mu = 0.15$,**
    - **the collar friction $\mu_B = 0.02$**

- **Verify that the scissor jack of ex2) is self-locking**

Screw jack:

$n_s = 1 \Rightarrow L = p = 0.2$

$\tan\lambda = \frac{L}{\pi d_p} = \frac{0.2}{\pi \cdot 1.15} = 0.055 < 0.15 = \mu \Rightarrow$ self-locking

Efficiency $\eta = \frac{1 - \mu \tan\lambda}{1 + \mu \cot\lambda} = \frac{1 - 0.15 \cdot 0.055}{1 + 0.15 \cdot \frac{1}{0.055}} = 0.2661$ (no roller friction)

With roller friction:

$\eta = \frac{PL}{2\pi T_{up}} = \frac{1000 \times 0.2}{2\pi \times 139.07} = 0.2289$

Scissor jack:

$\tan\lambda = \frac{L}{\pi d_p} = 0.0433 < \mu = 0.15$

$\Rightarrow$ self-locking

$T_{down} > 0 \iff$ self-locking