

APPENDIX11

calcolo dei volumi

$$\rho_{Cu} := 9.08 \cdot \frac{10^{-3} \cdot \text{kg}}{\text{cm}^3} \quad \text{valore a 0K, quello piu' grande che ho trovato}$$

$$\rho_{Ti} := 4508 \cdot \frac{\text{kg}}{\text{m}^3} \quad \text{valore a 300K non ne ho trovati altri}$$

$$\rho_{Gi} := \text{■}$$

CLE

volume tubo

$$l_{cle} := 107 \cdot \text{cm}$$

$$\phi_{ecle} := 1.75 \cdot \text{in}$$

$$\phi_{icle} := 1.625 \cdot \text{in}$$

$$s_{cle} := \frac{(\phi_{ecle} - \phi_{icle})}{2} \quad s_{cle} = 1.587 \cdot 10^{-3} \text{ m}$$

$$S_{cle} := \pi \cdot \left[\left(\frac{\phi_{ecle}}{2} \right)^2 - \left(\frac{\phi_{icle}}{2} \right)^2 \right] \quad S_{cle} = 2.138 \cdot 10^{-4} \text{ m}^2$$

$$V_{cle} := l_{cle} \cdot S_{cle} \quad V_{cle} = 2.287 \cdot 10^{-4} \text{ m}^3$$

volume di un foro

$$\phi_{fcle} := 0.316 \cdot \text{in}$$

$$S_{fcle} := \pi \cdot \left(\frac{\phi_{fcle}}{2} \right)^2 \quad S_{fcle} = 5.06 \cdot 10^{-5} \text{ m}^2$$

$$V_{fcle} := S_{fcle} \cdot s_{cle} \quad V_{fcle} = 8.032 \cdot 10^{-8} \text{ m}^3$$

$$n_{fcle} := 64 \cdot 8 \quad n_{fcle} = 512$$

$$V_{fcltot} := V_{fcle} \cdot n_{fcle} \quad V_{fcltot} = 4.113 \cdot 10^{-5} \text{ m}^3$$

$$V_{clef} := V_{cle} - V_{fcltot} \quad V_{clef} = 1.876 \cdot 10^{-4} \text{ m}^3$$

volume shaft

$$lsf1 := 2.954 \cdot \text{in}$$

$$lsf2 := 3.673 \cdot \text{in} - lsf1 \quad lsf2 = 0.018 \text{ m}$$

$$\phi_{esf1} := 1.625 \cdot \text{in}$$

$$\phi_{isf1} := 1.375 \cdot \text{in}$$

$$Ssf1 := \pi \cdot \left[\left(\frac{\phi_{esf1}}{2} \right)^2 - \left(\frac{\phi_{isf1}}{2} \right)^2 \right] \quad Ssf1 = 3.8 \cdot 10^{-4} \text{ m}^2$$

$$\phi_{esf2} := 1.75 \cdot \text{in}$$

$$\phi_{isf2} := 1.008 \cdot \text{in}$$

$$Ssf2 := \pi \cdot \left[\left(\frac{\phi_{esf2}}{2} \right)^2 - \left(\frac{\phi_{isf2}}{2} \right)^2 \right] \quad Ssf2 = 1.037 \cdot 10^{-3} \text{ m}^2$$

$$Vsf := lsf1 \cdot Ssf1 + lsf2 \cdot Ssf2 \quad Vsf = 4.745 \cdot 10^{-5} \text{ m}^3$$

Mi sa che il peso che regge questa ci finisce qui perche' i pezzi sotto ci sono premuti contro e ricadono sulla ci

$$Pcle := \rho_{Cu} \cdot (Vsf + Vclef)$$

$$Pcle = 2.134 \text{ kg}$$

CLI

volume tubo

$$l_{cli} := 108 \cdot \text{cm}$$

$$\phi_{ecli} := 0.75 \cdot \text{in}$$

$$\phi_{icli} := 0.625 \cdot \text{in}$$

$$scli := \frac{(\phi_{ecli} - \phi_{icli})}{2} \quad scli = 1.587 \cdot 10^{-3} \text{ m}$$

$$Scli := \pi \cdot \left[\left(\frac{\phi_{ecli}}{2} \right)^2 - \left(\frac{\phi_{icli}}{2} \right)^2 \right] \quad Scli = 8.709 \cdot 10^{-5} \text{ m}^2$$

$$Vcli := lcli \cdot Scli \quad Vcli = 9.406 \cdot 10^{-5} \text{ m}^3$$

volume di un foro

$$\phi_{fcli} := 0.162 \cdot \text{in}$$

$$Sfcli := \pi \cdot \left(\frac{\phi_{fcli}}{2} \right)^2 \quad Sfcli = 1.33 \cdot 10^{-5} \text{ m}^2$$

$$Vfcli := Sfcli \cdot scli \quad Vfcli = 2.111 \cdot 10^{-8} \text{ m}^3$$

$$nfcli := 126 \cdot 6 \quad nfcli = 756$$

$$Vfclitot := Vfcli \cdot nfcli \quad Vfclitot = 1.596 \cdot 10^{-5} \text{ m}^3$$

$$Vclif := Vcli - Vfclitot \quad Vclif = 7.81 \cdot 10^{-5} \text{ m}^3$$

volume shaft

$$lsft := 6.196 \cdot \text{in} - 0.31 \cdot \text{in} \quad lsft = 0.15 \text{ m}$$

$$\phi_{esft} := 0.82 \cdot \text{in}$$

$$\phi_{isft} := 0.444 \cdot \text{in}$$

$$Ssft := \pi \cdot \left[\left(\frac{\phi_{esft}}{2} \right)^2 - \left(\frac{\phi_{isft}}{2} \right)^2 \right] \quad Ssft = 2.408 \cdot 10^{-4} \text{ m}^2$$

$$Vsft := lsft \cdot Ssft \quad Vsft = 3.6 \cdot 10^{-5} \text{ m}^3$$

volume ring basso

$$lr := 1.725 \cdot \text{in} - 0.124 \cdot \text{in} \quad lr = 0.041 \text{ m}$$

$$\phi_{er} := 1.234 \cdot \text{in}$$

$$\phi_{ir} := 0.444 \cdot \text{in}$$

$$Sr := \pi \cdot \left[\left(\frac{\phi_{er}}{2} \right)^2 - \left(\frac{\phi_{ir}}{2} \right)^2 \right] \quad Sr = 6.717 \cdot 10^{-4} \text{ m}^2$$

$$Vr := lr \cdot Sr \quad Vr = 2.732 \cdot 10^{-5} \text{ m}^3$$

volume ring alto

$$lr1 := 2.673 \cdot \text{in} - 0.9 \cdot \text{in} \quad lr1 = 0.045 \text{ m}$$

$$lr2 := 0.9 \cdot \text{in} - 0.422 \cdot \text{in} \quad lr2 = 0.012 \text{ m}$$

$$\phi_{er1} := 1.21 \cdot \text{in}$$

$$\phi_{ir1} := 1.005 \cdot \text{in}$$

$$Sr1 := \pi \cdot \left[\left(\frac{\phi_{er1}}{2} \right)^2 - \left(\frac{\phi_{ir1}}{2} \right)^2 \right] \quad Sr1 = 2.301 \cdot 10^{-4} \text{ m}^2$$

$$Vr1 := Sr1 \cdot lr1 \quad Vr1 = 1.036 \cdot 10^{-5} \text{ m}^3$$

$$\phi_{er2} := 1.829 \cdot \text{in}$$

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$$\phi_{ir2} := 1.21 \cdot \text{in}$$

$$\phi_{iir2} := 1.005 \cdot \text{in}$$

$$V_{r2} := \frac{1}{3} \cdot \pi \cdot l_{r2} \cdot \left[\left(\frac{\phi_{er2}}{2} \right)^2 + \left(\frac{\phi_{ir2}}{2} \right)^2 + \frac{\phi_{ir2}}{2} \cdot \frac{\phi_{er2}}{2} \right] - \pi \cdot l_{r2} \cdot \left(\frac{\phi_{iir2}}{2} \right)^2 \quad V_{r2} = 8.187 \cdot 10^{-6} \text{ m}^3$$

$$V_{rtot} := V_{r1} + V_{r2} \quad V_{rtot} = 1.855 \cdot 10^{-5} \text{ m}^3$$

volume barrel

$$l_{br} := 1.25 \cdot \text{in}$$

$$\phi_{eb} := 1.26 \cdot \text{in}$$

$$\phi_{ib} := 1.1 \cdot \text{in}$$

$$S_b := \pi \cdot \left[\left(\frac{\phi_{eb}}{2} \right)^2 - \left(\frac{\phi_{ib}}{2} \right)^2 \right] \quad S_b = 1.913 \cdot 10^{-4} \text{ m}^2$$

$$V_b := S_b \cdot l_{br} \quad V_b = 6.075 \cdot 10^{-6} \text{ m}^3$$

anello giten

$$l_g := 0.208 \cdot \text{in}$$

$$\phi_{eg} := 1.8 \cdot \text{in}$$

$$\phi_{ig} := 0.563 \cdot \text{in}$$

$$S_g := \pi \cdot \left[\left(\frac{\phi_{eg}}{2} \right)^2 - \left(\frac{\phi_{ig}}{2} \right)^2 \right] \quad S_g = 1.481 \cdot 10^{-3} \text{ m}^2$$

$$V_g := S_g \cdot l_g \quad V_g = 7.825 \cdot 10^{-6} \text{ m}^3$$

$$P_{cli} := \rho_{Ti} \cdot V_b + \rho_{Cu} \cdot (V_r + V_{rtot} + V_{sft} + V_{clif})$$

$$P_{cli} = 1.48 \text{ kg}$$