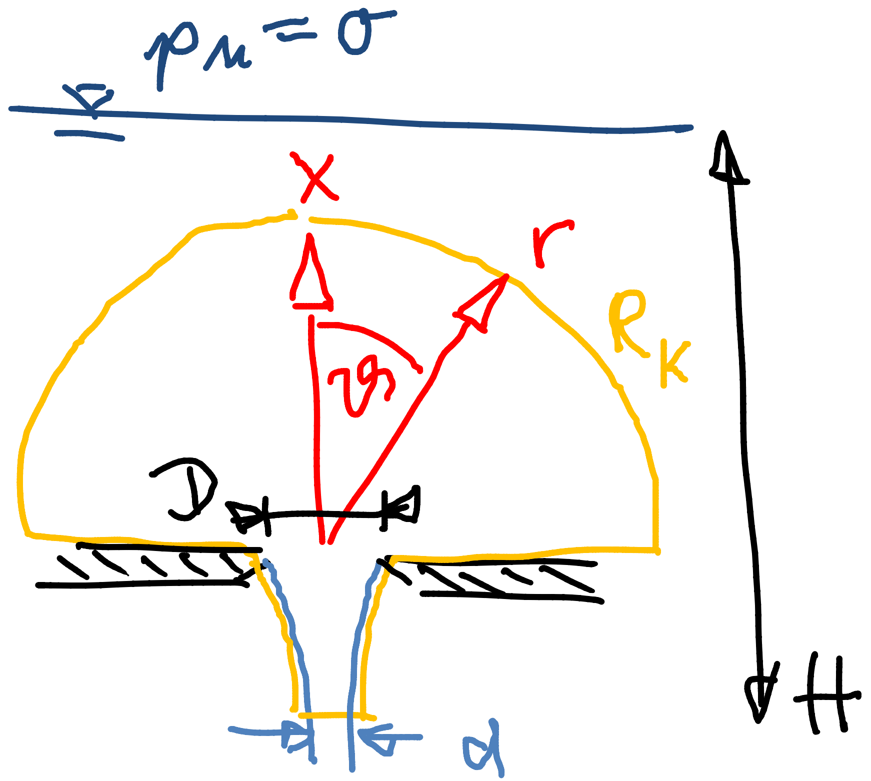
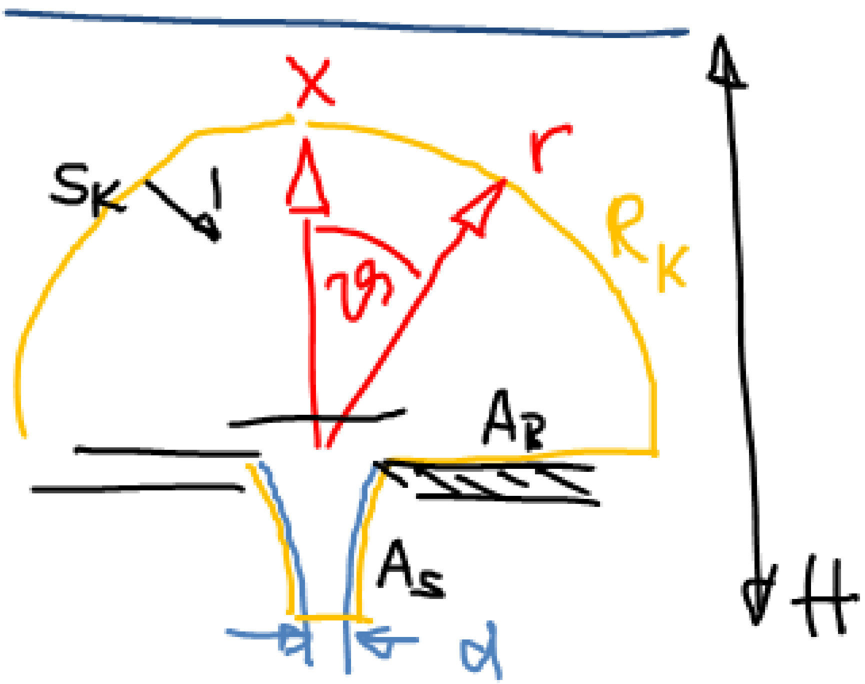
KONTRAKTIONSZIFFER α



$$\alpha = \left(\frac{d}{D}\right)^2$$

① Bestimmung aller Geschwindigkeiten und Drücke mit Hilfe Bernoulli & Konti

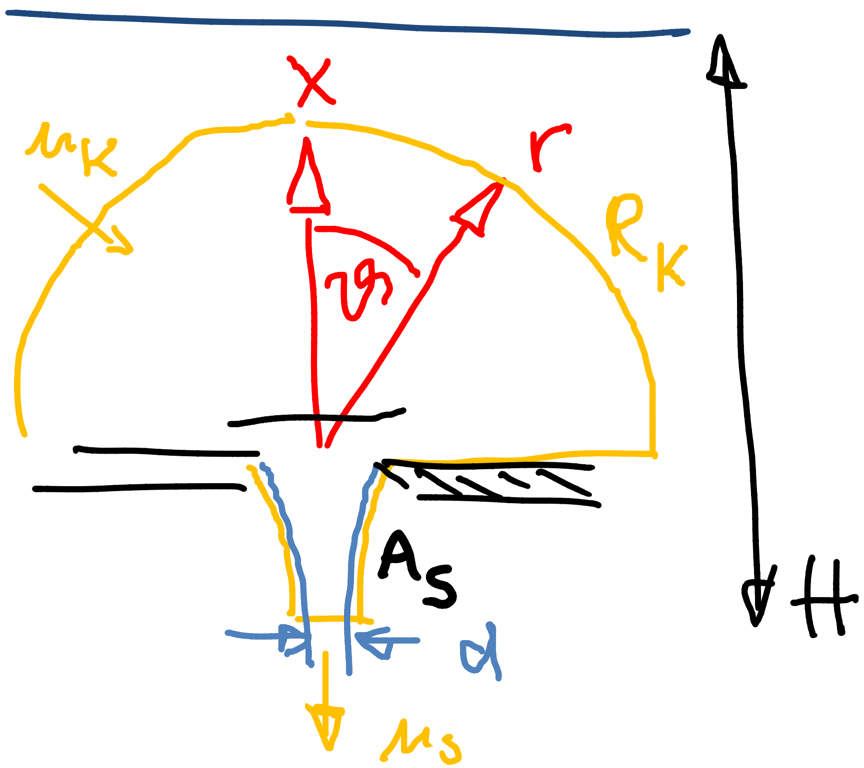
② Einsetzen in Impulssatz und Auflösen nach d



$$\vec{e}_x \cdot \iint_{A_S} \rho \vec{u}\, \vec{u}\cdot\vec{n}\, dS$$

$$= -\rho u_s u_s \frac{\pi}{4} d^2$$

$$\vec{e}_x \cdot \iint_{S_K} \rho \vec{u}\, \vec{u}\cdot\vec{n}\, dS = \int_0^{2\pi}\int_0^{\pi/2} \rho\, u_K \cos\vartheta$$



$$\vec{u}_K = -\frac{A}{R_K^2}\vec{e}_r$$

$$\vec{u}_s = \sqrt{2gH}$$

$$\vec{e}_x \cdot \iint_{A_s} \rho \vec{u}\,\vec{u}\cdot\vec{n}\,dS = -\frac{\pi}{4} d^2 u_s$$

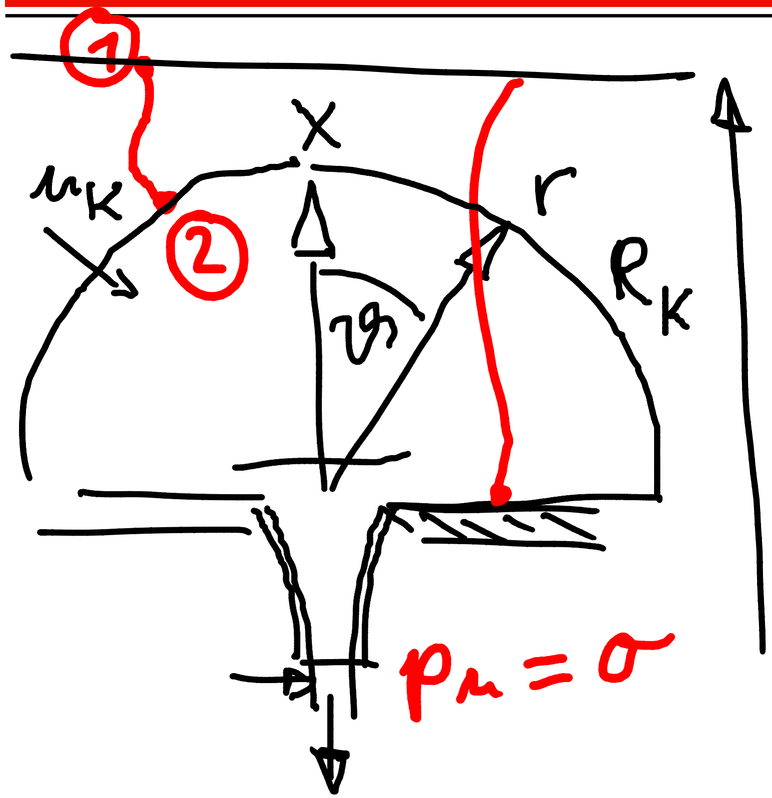
$$\vec{e}_x \cdot \iint_{S_K} \varrho \vec{u}\, \vec{u} \cdot \vec{n}\, dS =$$

$$\int_0^{2\pi} \int_0^{\pi/2} (-\varrho u_K \cos\vartheta)(-u_K) \underbrace{\sin\vartheta\, d\vartheta\, d\varphi\, R_K^2}_{dS_K}$$

$$= \int_0^{2\pi} \int_0^{\pi/2} \varrho \frac{A^2}{R_K^4} R_K^2 \underbrace{\sin\vartheta \cos\vartheta}_{\frac{1}{2}\sin 2\vartheta} d\vartheta\, d\varphi = \pi \varrho \frac{A^2}{R_K^2}$$

$$\vec{e}_x \cdot \iiint \rho \vec{k} \, dV = -\rho g V$$

$$= -\rho g \frac{2}{3} \pi R_k^3$$



$$\rho g H = \rho g R_K \cos\vartheta + p_K + \frac{\rho}{2}\frac{A^2}{R_K^4}$$

$$p_K = \rho g (H - R_K \cos\vartheta) - \frac{\rho}{2}\frac{A^2}{R_K^4}$$

$$\iint\limits_{S_K} \vec{t}\, dS \cdot \vec{e}_x = -\int_0^{2\pi}\int_0^{\pi/2} p_K \cos\vartheta \sin\vartheta\, R_K^2\, d\vartheta\, d\varphi$$

$$\varrho g H = p_B + \frac{\varrho}{2} \frac{A^2}{R_K^4}$$

$$p_B = \varrho g H - \frac{\varrho}{2} A^2 / R_K^4$$

$$\vec{e}_x \cdot \iint \vec{t} \, dS_B = \int_0^{2\pi} \int_{D/2}^{R_K} p_B \underbrace{r \, dr \, d\varphi}_{dS_B} \dots$$

$$\frac{A}{R_K^2} 2\pi R_K^2 = u_s \frac{\pi}{4} d^2 \quad \text{Konti}$$

$$A = u_s \frac{d^2}{8}$$

$$\oint\!\!\oint_S \rho \vec{u}\, \vec{u}\cdot\vec{n}\, dS = \iiint \rho \vec{k}\, dV + \oint\!\!\oint -p\vec{n}\, dS$$

$$2d^2 = D^2 + \tfrac{1}{4}\, d^4/D^2 \quad \Big|\ \frac{1}{D^2}$$

$$2\underbrace{\left(\frac{d}{D}\right)^2}_{\alpha} = 1 + \frac{1}{4}\left(\frac{d}{D}\right)^4$$

$$2\alpha = 1 + \frac{\alpha^2}{4}$$

$$\alpha = 4 \cancel{\pm} \sqrt{12} = 0.536$$