

$$AW1 \quad a) \quad \sigma_b = \frac{M_b}{W_b} = \frac{500.000 \text{ Nmm}}{\frac{h}{32} \cdot (50 \text{ mm})^3} = 40,744 \frac{\text{N}}{\text{mm}^2}$$

$$\tau_t = \frac{M_t}{W_t} = \frac{16 \cdot 1.000.000 \text{ Nmm}}{h \cdot (50 \text{ mm})^3} = 40,744 \frac{\text{N}}{\text{mm}^2}$$

$$\text{mit } M_{t, \text{krit}} = 1.000 \text{ Nm}$$

$$b) \quad \alpha_{ub} = 1,8 \quad ; \quad \alpha_{ut} = 1,4$$

$$\sigma_m = 0 \quad ; \quad \sigma_a = \sigma_b \quad ; \quad \tau_{tm} = \tau_{ta} = \frac{1}{2} \tau_t$$

$$\Rightarrow \sigma_{vkm} = \sqrt{3 (\alpha_{ut} \cdot \tau_{tm})^2} = 49,399 \frac{\text{N}}{\text{mm}^2}$$

$$\sigma_{vha} = \sqrt{(\alpha_{ub} \cdot \sigma_b)^2 + 3 \cdot (\alpha_{ut} \cdot \tau_{ta})^2}$$

$$= 88,425 \frac{\text{N}}{\text{mm}^2}$$

$$\sigma_{vha} \stackrel{!}{\leq} \sigma_{vhasul} = \frac{b_1 \cdot b_2 \cdot n_x \cdot \sigma_A}{S_D} = 114,547 \frac{\text{N}}{\text{mm}^2}$$

$$\text{mit } \sigma_A \approx 250 \frac{\text{N}}{\text{mm}^2}$$

$$\Rightarrow \sigma_{vha} < \sigma_{vhasul} \quad \checkmark$$

$$c) \quad A^* = \frac{\sigma_{vha}}{\sigma_{vhasul}} = 0,772 \quad \Rightarrow$$