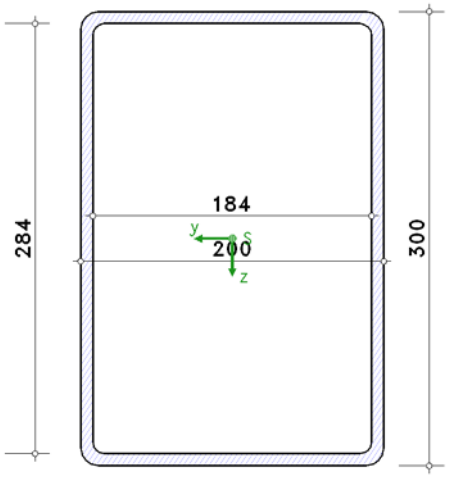
POS. 16: KINDMANN/KRÜGER 2.8.4

verification of cross-section EC 3-1-8 (12.10), NA: Deutschland

1. input report

scale 1:5.0



steel
steel grade S355
material safety factor
resistance of cross-sections γ_{M0} = 1.00
geometry
section RR 300 x 200 x 8.0(w)
resistance
elastic verification, calculation as thin-walled cross-section
valid normal, shear-, equivalent stress: $\sigma_{x,Rd}$ = 355.0 N/mm², τ_{Rd} = 205.0 N/mm², $\sigma_{v,Rd}$ = 355.0 N/mm²
internal forces and moments refering to local axes of cross-section
σ-generating forces (N, M) work at centroid, τ-generating forces (V, T_t) work at shear center
Lk 1: $M_{y,Ed}$ = -20000.00 kNcm, $V_{z,Ed}$ = 40.00 kN, $T_{t,Ed}$ = 2000.00 kNcm

notes
buckling is not investigated.

2. Lk 1

2.1. verification of cross-section

internal forces and moments: M_y = -20000.00 kNcm, V_z = 40.00 kN, T_t = 2000.00 kNcm

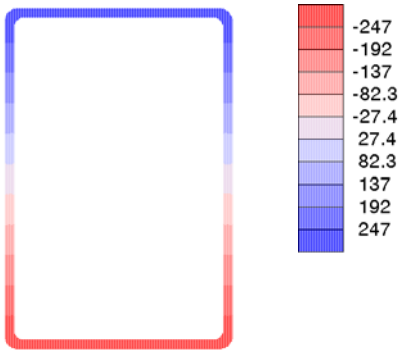
2.1.1. elastic verification

elastic verification for M_y = -200.00 kNm, V_z = 40.00 kN, T_t = 20.00 kNm
elastic stresses: max $|\sigma_x|$ = 308.74 N/mm², max τ = 33.81 N/mm², max σ_v = 312.62 N/mm²

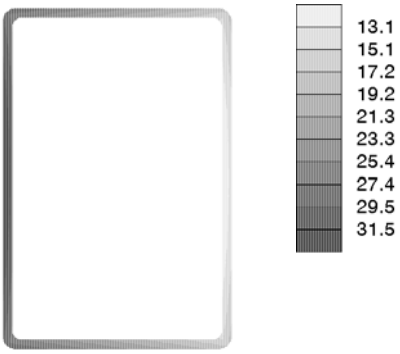
max σ_x	bei y = -80.0 mm, z = -150.0 mm:	σ_x = 308.74 N/mm², τ = 19.27 N/mm², σ_v = 310.54 N/mm²
min σ_x	bei y = 80.0 mm, z = 150.0 mm:	σ_x = -308.74 N/mm², τ = 28.36 N/mm², σ_v = 312.62 N/mm²
max τ	bei y = 100.0 mm, z = 0.0 mm:	σ_x = -0.00 N/mm², τ = 33.81 N/mm², σ_v = 58.57 N/mm²
max σ_v	bei y = 80.0 mm, z = 150.0 mm:	σ_x = -308.74 N/mm², τ = 28.36 N/mm², σ_v = 312.62 N/mm²

valid equivalent stress: $\sigma_{v,Rd}$ = 355.0 N/mm²
verification: σ_v = 312.62 N/mm² < $\sigma_{v,Rd}$ = 355.00 N/mm² ⇒ U_σ = 0.881 < 1 **ok**

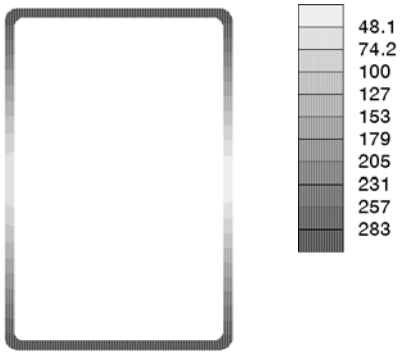
normal stresses σ_x [N/mm²]
min σ_x = -308.8, max σ_x = 308.8



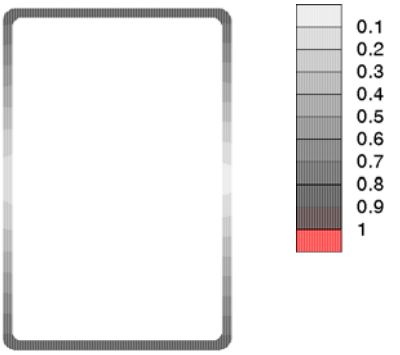
shear stresses τ [N/mm²]
max τ = 33.8



equivalent stresses σ_v [N/mm²]
max σ_v = 312.9



utilization U_σ
max U_σ = 0.881



stresses, utilizations

y mm	z mm	σ_x N/mm²	τ N/mm²	σ_v N/mm²	U_σ
-12.0	300.0	-308.80	29.03	312.87	0.881
-11.5	300.0	-308.80	29.04	312.87	0.881
-188.0	0.0	308.80	18.61	310.48	0.875
0.0	150.0	0.00	33.82	58.58	0.165

y,z: node coordinates; σ_x,τ,σ_v: stresses; U_σ: stress utilization

3. final result

maximum utilization: resistance max U = 0.881 < 1 ok

verification succeeded