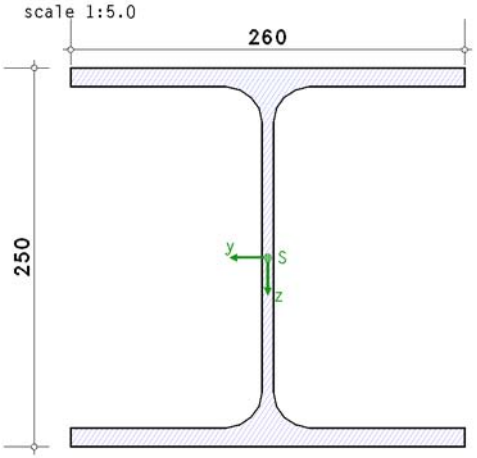
POS. 7: WAGENKNECHT 8.4.2

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

1. input report



steel
steel grade S235
material safety factor
resistance of cross-sections γ_{M0} = 1.00
geometry
section HE260A
resistance
elastic verification, calculation as thin-walled cross-section
valid normal, shear-, equivalent stress: $\sigma_{x,Rd}$ = 235.0 N/mm², τ_{Rd} = 135.7 N/mm², $\sigma_{v,Rd}$ = 235.0 N/mm²
internal forces and moments refering to main axes
σ-generating forces (N, M) work at centroid, τ-generating forces (V, T_t) work at shear center
warping forces (T_ω, B) work at shear center
Lk 1: Stelle 1
$T_{t,Ed}$ = 315.00 kNcm, $T_{\omega,Ed}$ = 135.00 kNcm
Lk 2: Stelle 2
$T_{\omega,Ed}$ = 450.00 kNcm, B_{Ed} = 68700.00 kNcm²

notes
buckling is not investigated.

2. Lk 1: Stelle 1

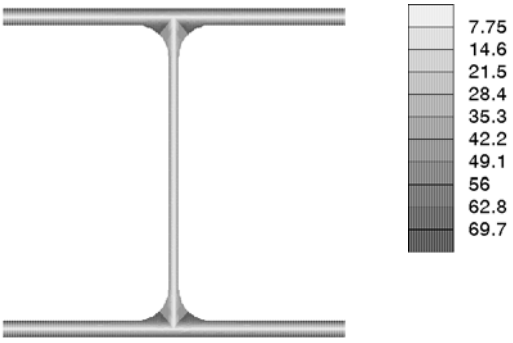
2.1. verification of cross-section

internal forces and moments: T_t = 315.00 kNcm, T_ω = 135.00 kNcm

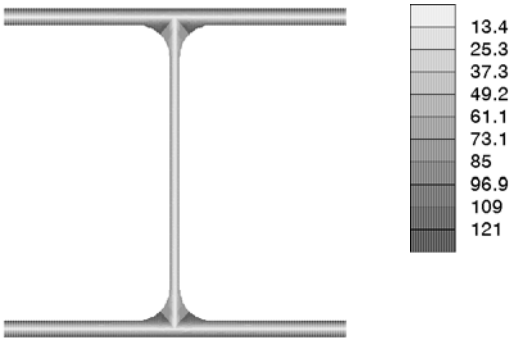
2.1.1. elastic verification

elastic verification for T_t = 3.15 kNm, T_ω = 1.35 kNm
elastic stresses: max $|\sigma_x|$ = 0.00 N/mm², max τ = 77.48 N/mm², max σ_v = 134.20 N/mm²
max σ_v bei y = 0.0 mm, z = -125.0 mm: σ_x = 0.00 N/mm², τ = -77.48 N/mm², σ_v = 134.20 N/mm²
valid equivalent stress: $\sigma_{v,Rd}$ = 235.0 N/mm²
verification: σ_v = 134.20 N/mm² < $\sigma_{v,Rd}$ = 235.00 N/mm² ⇒ U_σ = 0.571 < 1 ok

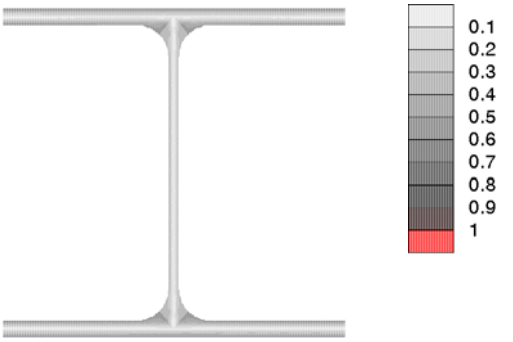
shear stresses τ [N/mm²]
max τ = 77.5



equivalent stresses σ_V [N/mm²]
max σ_V = 134.2



utilization U_σ
max U_σ = 0.571



stresses, utilizations

y	z	τ	σ_V	U_σ
mm	mm	N/mm²	N/mm²	
-130.0	0.0	77.48	134.20	0.571

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

3. Lk 2: Stelle 2

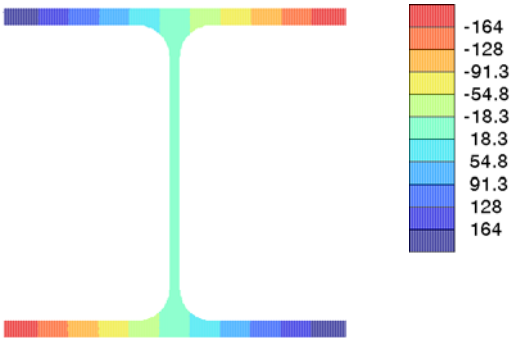
3.1. verification of cross-section

internal forces and moments: T_ω = 450.00 kNcm, B = 68700.00 kNcm²

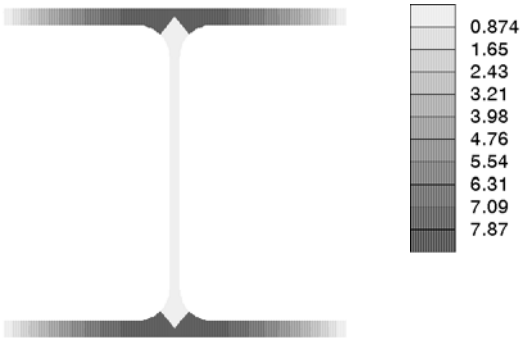
3.1.1. elastic verification

elastic verification for T_ω = 4.50 kNm, B = 6.87 kNm²
elastic stresses: max $|\sigma_x|$ = 205.37 N/mm², max τ = 8.74 N/mm², max σ_V = 205.37 N/mm²
max σ_x bei y = 130.0 mm, z = -118.8 mm: σ_x = 205.37 N/mm², τ = 0.00 N/mm², σ_V = 205.37 N/mm²
min σ_x bei y = -130.0 mm, z = -118.8 mm: σ_x = -205.37 N/mm², τ = 0.00 N/mm², σ_V = 205.37 N/mm²
max σ_V bei y = 130.0 mm, z = -118.8 mm: σ_x = 205.37 N/mm², τ = 0.00 N/mm², σ_V = 205.37 N/mm²
valid equivalent stress: $\sigma_{V,Rd}$ = 235.0 N/mm²
verification: σ_V = 205.37 N/mm² < $\sigma_{V,Rd}$ = 235.00 N/mm² ⇒ U_σ = 0.874 < 1 ok

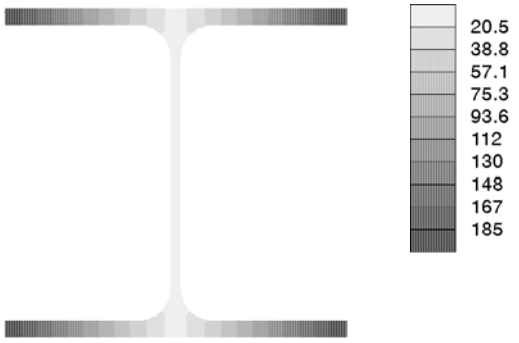
normal stresses σ_x [N/mm²]
min σ_x = -205.4, max σ_x = 205.4



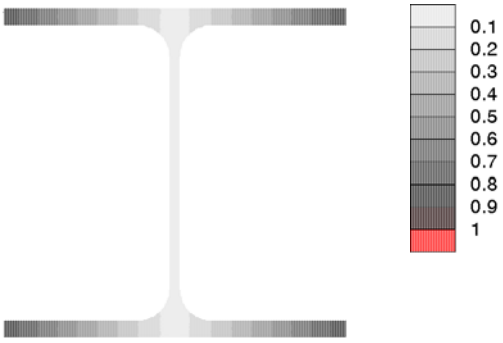
shear stresses τ [N/mm²]
max τ = 8.7



equivalent stresses σ_V [N/mm²]
max σ_V = 205.4



utilization U_σ
max U_σ = 0.874



stresses, utilizations

y mm	z mm	σ_x N/mm²	τ N/mm²	σ_v N/mm²	U_σ
0.0	12.5	205.41	0.00	205.41	0.874
0.0	6.3	205.41	0.00	205.41	0.874
0.0	0.0	205.41	0.00	205.41	0.874

y mm	z mm	σ_x N/mm²	τ N/mm²	σ_v N/mm²	U_σ
-130.0	6.3	0.00	8.74	15.14	0.064
-260.0	0.0	-205.41	0.00	205.41	0.874

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

4. final result

maximum utilization [Lk 2]: resistance max U = 0.874 < 1 ok

verification succeeded