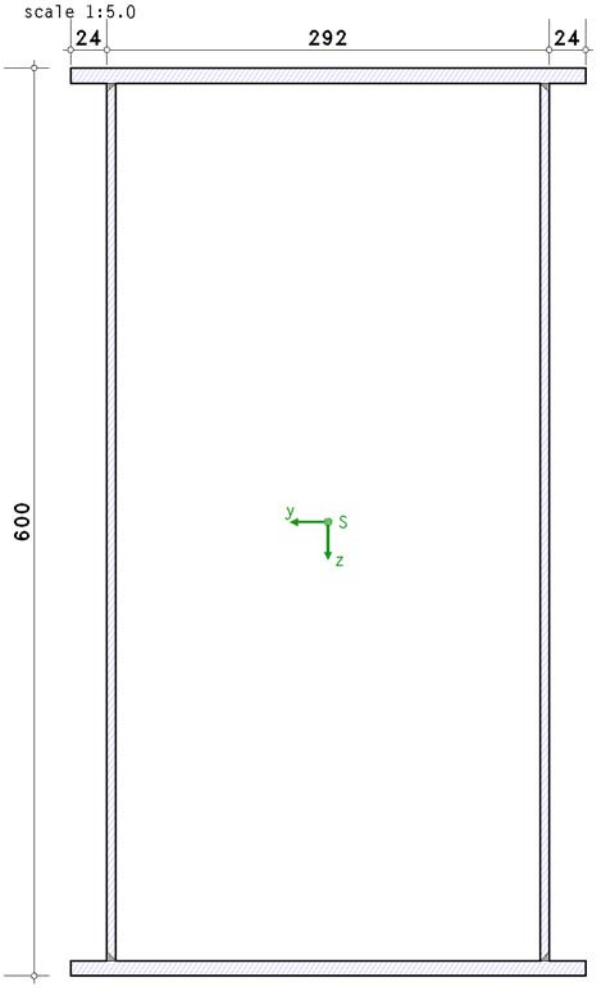
POS. 17: KINDMANN/KRÜGER 2.8.5

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

1. input report



steel
steel grade S355
material safety factor
resistance of cross-sections γ_{M0} = 1.00
geometry
section parameters (box section):
overall depth h = 600.0 mm, web thickness t_w = 6.0 mm, flange width b_f = 292.0 mm
projection $b_ü$ = 24.0 mm, flange thickness t_f = 10.0 mm
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: $M_{y,Ed}$ = 560.00 kNm, $V_{z,Ed}$ = 140.00 kN

notes
buckling is not investigated.

2. Lk 1

2.1. verification of cross-section

internal forces and moments: M_y = 560.00 kNm, V_z = 140.00 kN

2.1.1. elastic verification

elastic verification for M_y = 560.00 kNm, V_z = 140.00 kN

elastic stresses: max $|\sigma_x|$ = 213.49 N/mm², max τ = 22.32 N/mm², max σ_v = 213.87 N/mm²

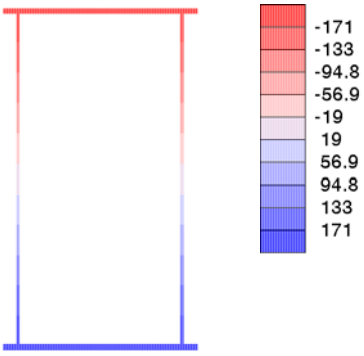
max σ_x	bei y = 170.0 mm, z = 300.0 mm:	σ_x = 213.49 N/mm², τ = 0.00 N/mm², σ_v = 213.49 N/mm²
min σ_x	bei y = 170.0 mm, z = -300.0 mm:	σ_x = -213.49 N/mm², τ = 0.00 N/mm², σ_v = 213.49 N/mm²
max τ	bei y = 143.0 mm, z = -0.0 mm:	σ_x = -0.00 N/mm², τ = 22.32 N/mm², σ_v = 38.66 N/mm²
max σ_v	bei y = 143.0 mm, z = -300.0 mm:	σ_x = -213.49 N/mm², τ = -7.41 N/mm², σ_v = 213.87 N/mm²

valid equivalent stress: $\sigma_{v,Rd}$ = 355.0 N/mm²

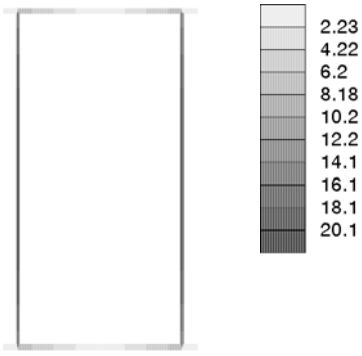
verification: σ_v = 213.87 N/mm² < $\sigma_{v,Rd}$ = 355.00 N/mm² ⇒ U_σ = 0.602 < 1 ok

c/t-ratio: outstand flange: utilization $U_{c/t}$ = 0.165 < 1 ok
internal compression parts: utilization $U_{c/t}$ = 0.733 < 1 ok
total: utilization $U_{c/t}$ = 0.733 < 1 ok

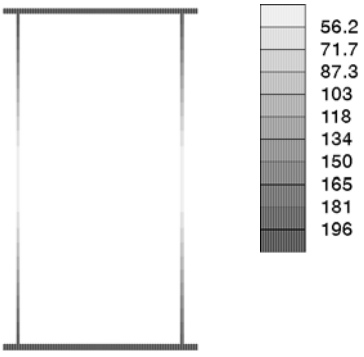
normal stresses σ_x [N/mm²]
min σ_x = -213.4, max σ_x = 213.4



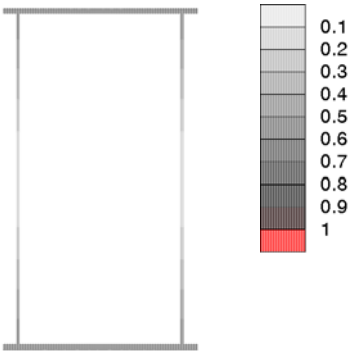
shear stresses τ [N/mm²]
max τ = 22.3



equivalent stresses σ_v [N/mm²]
max σ_v = 213.7



utilization U_σ
max U_σ = 0.602



stresses, utilizations

y mm	z mm	σ_x N/mm²	τ N/mm²	σ_v N/mm²	U_σ
0.0	0.0	-213.36	0.00	213.36	0.601
-27.0	0.0	-213.36	7.41	213.75	0.602
-313.0	0.0	-213.36	7.41	213.75	0.602

y mm	z mm	σ_x N/mm²	τ N/mm²	σ_v N/mm²	U_σ
0.0	600.0	213.36	0.00	213.36	0.601
-24.0	300.0	0.00	22.32	38.66	0.109

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

3. final result

maximum utilization:

stress	max U_σ = 0.602 < 1 ok
c/t-ratio	max $U_{c/t}$ = 0.733 < 1 ok
resistance	max U = 0.733 < 1 ok

verification succeeded