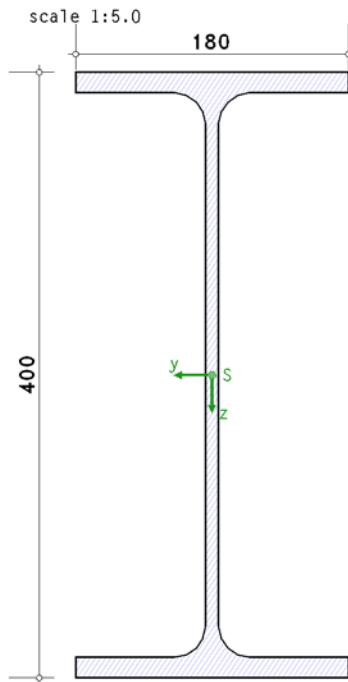


POS. 13: KINDMANN/KRÜGER 5.7.3

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 $\gamma_{M0} = 1.10$

geometry

section IPE400

resistance

plastic verification with partial internal forces and moments

internal forces and moments referring to local axes of cross-section

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: $M_{y,Ed} = 13410.00$ kNcm, $M_{z,Ed} = -2211.00$ kNcm, $B_{Ed} = 47256.00$ kNcm²

notes

buckling is not investigated.

2. Lk 1

2.1. verification of cross-section

internal forces and moments: $M_y = 13410.00$ kNcm, $M_z = -2211.00$ kNcm, $B = 47256.00$ kNcm²

2.1.1. plastic verification

plastic verification for $M_y = 134.10$ kNm, $M_z = -22.11$ kNm, $B = 4.73$ kNm²

valid normal/shear stress: $\sigma_{x,Rd} = 213.6$ N/mm², $\tau_{Rd} = 123.3$ N/mm²

top flange: flange bending $M_{\sigma,O} = -23.28$ kNm, bending stress $\sigma_O = 212.91$ N/mm² $\Rightarrow U_{\sigma,O} = 0.997$

resistance forces $N_{\max,O} = 30.28$ kN, $N_{\min,O} = -30.28$ kN

bottom flange: flange bending $M_{\sigma,U} = 1.17$ kNm, bending stress $\sigma_U = 10.71$ N/mm² $\Rightarrow U_{\sigma,U} = 0.050$

resistance forces $N_{\max,U} = 505.95$ kN, $N_{\min,U} = -505.95$ kN

web: resistance forces $N_{\max,S} = 710.11$ kN, $N_{\min,S} = -710.11$ kN

main bending: moment $M_y = 134.10$ kNm, resistance moments $M_{y,\max} = 141.45$ kNm, $M_{y,\min} = -141.45$ kNm $\Rightarrow U_{My} = 0.948$

total (possibly due to load increase): max $U = 0.997 < 1$ **ok**

3. final result

maximum utilization: resistance $\max U = 0.997 < 1$ **ok**

verification succeeded