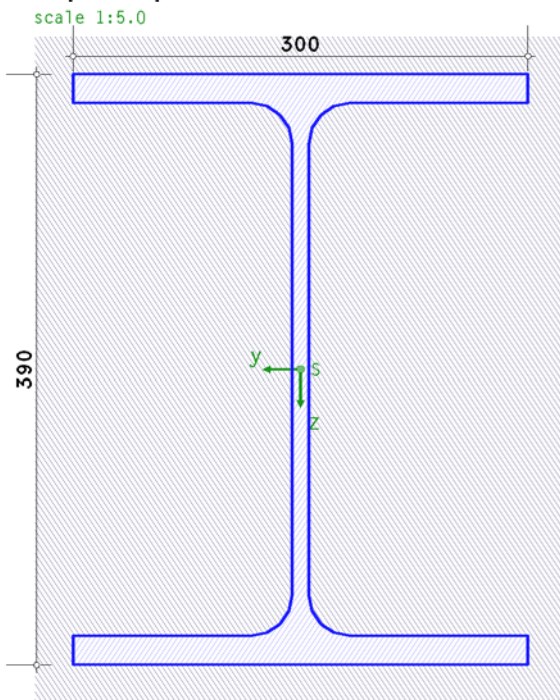


POS. 1: WAGENKNECHT 2.5.2

Welded connection EC 3-1-8 (04.25), NA: Deutschland

1. input report



material

steel grade S235

material safety factors

resistance of cross-sections $\gamma_{M0} = 1.00$

resistance of bolts, welds, plates in bearing $\gamma_{M2} = 1.25$

geometry

section HE400A

plate: thickness $t_p = 24.0$ mm

surrounding fillet weld: $a_{w,2} = 10.0$ mm, $a_{w,fu} = 10.0$ mm, $a_{w,1} = 5.0$ mm

resistance

elastic cross-sectional check

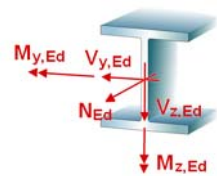
weld verification with the simplified method

resolution of shear force is conventional by taking over V_y with the horizontal welds, V_z with the vertical welds.

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

Lc 1: $N_{Ed} = -1190.00$ kN, $M_{y,Ed} = 225.00$ kNm, $V_{z,Ed} = 370.00$ kN

$M_{z,Ed} = -26.00$ kNm, $V_{y,Ed} = -180.00$ kN



2. Lc 1

2.1. verification of cross-section

elastic verification for $N = -1190.00$ kN, $M_y = 225.00$ kNm, $V_z = 370.00$ kN, $M_z = -26.00$ kNm

$V_y = -180.00$ kN

verification: $\sigma_v = 218.45$ N/mm² < $\sigma_{v,Rd} = 235.00$ N/mm² $\Rightarrow U_\sigma = 0.930 < 1$ ok

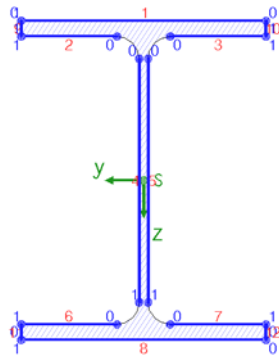
c/t-ratio (reg. section class 3):

outstand flange: utilization $U_{c/t} = 0.421 < 1$ ok

internal compression parts: utilization $U_{c/t} = 0.346 < 1$ ok

2.2. verification of welds

calculation section:



weld 1:	$a_w = 10.0 \text{ mm}$	$l_w = 300.0 \text{ mm}$
weld 2:	$a_w = 10.0 \text{ mm}$	$l_w = 117.5 \text{ mm}$
weld 3:	$a_w = 10.0 \text{ mm}$	$l_w = 117.5 \text{ mm}$
weld 4:	$a_w = 5.0 \text{ mm}$	$l_w = 298.0 \text{ mm}$
weld 5:	$a_w = 5.0 \text{ mm}$	$l_w = 298.0 \text{ mm}$
weld 6:	$a_w = 10.0 \text{ mm}$	$l_w = 117.5 \text{ mm}$
weld 7:	$a_w = 10.0 \text{ mm}$	$l_w = 117.5 \text{ mm}$
weld 8:	$a_w = 10.0 \text{ mm}$	$l_w = 300.0 \text{ mm}$
weld 9:	$a_w = 10.0 \text{ mm}$	$l_w = 19.0 \text{ mm}$
weld 10:	$a_w = 10.0 \text{ mm}$	$l_w = 19.0 \text{ mm}$
weld 11:	$a_w = 10.0 \text{ mm}$	$l_w = 19.0 \text{ mm}$
weld 12:	$a_w = 10.0 \text{ mm}$	$l_w = 19.0 \text{ mm}$

design values referring to centroid of the section:

$N_{Ed} = -1190.00 \text{ kN}$, $M_{y,Ed} = 225.00 \text{ kNm}$, $V_{z,Ed} = 370.00 \text{ kN}$, $M_{z,Ed} = -26.00 \text{ kNm}$, $V_{y,Ed} = -180.00 \text{ kN}$

cross-sectional properties referring to centroid of the line cross-section:

roots are not considered at surrounding welds.

$\Sigma A_w = 144.40 \text{ cm}^2$, $A_{w,y} = 107.00 \text{ cm}^2$, $A_{w,z} = 29.80 \text{ cm}^2$, $\Sigma l_w = 174.2 \text{ cm}$

$I_{w,y} = 42196.48 \text{ cm}^4$, $I_{w,z} = 10673.24 \text{ cm}^4$, $\Delta y_w = 0.0 \text{ mm}$, $\Delta z_w = 0.0 \text{ mm}$

verifications in weld edges:

weld 1,	pt. 0:	$\sigma_{w,x} = -222.93 \text{ N/mm}^2$	$\tau_{w,y} = -16.82 \text{ N/mm}^2$	$\Rightarrow U_w = 1.076 > 1$	not ok !!
	pt. 1:	$\sigma_{w,x} = -149.85 \text{ N/mm}^2$	$\tau_{w,y} = -16.82 \text{ N/mm}^2$	$\Rightarrow U_w = 0.725 < 1$	ok
weld 2,	pt. 0:	$\sigma_{w,x} = -168.34 \text{ N/mm}^2$	$\tau_{w,y} = -16.82 \text{ N/mm}^2$	$\Rightarrow U_w = 0.814 < 1$	ok
	pt. 1:	$\sigma_{w,x} = -139.72 \text{ N/mm}^2$	$\tau_{w,y} = -16.82 \text{ N/mm}^2$	$\Rightarrow U_w = 0.677 < 1$	ok
weld 3,	pt. 0:	$\sigma_{w,x} = -184.17 \text{ N/mm}^2$	$\tau_{w,y} = -16.82 \text{ N/mm}^2$	$\Rightarrow U_w = 0.890 < 1$	ok
	pt. 1:	$\sigma_{w,x} = -212.80 \text{ N/mm}^2$	$\tau_{w,y} = -16.82 \text{ N/mm}^2$	$\Rightarrow U_w = 1.027 > 1$	not ok !!
weld 4,	pt. 0:	$\sigma_{w,x} = -160.52 \text{ N/mm}^2$	$\tau_{w,z} = 124.16 \text{ N/mm}^2$	$\Rightarrow U_w = 0.976 < 1$	ok
	pt. 1:	$\sigma_{w,x} = -1.62 \text{ N/mm}^2$	$\tau_{w,z} = 124.16 \text{ N/mm}^2$	$\Rightarrow U_w = 0.597 < 1$	ok
weld 5,	pt. 0:	$\sigma_{w,x} = -163.20 \text{ N/mm}^2$	$\tau_{w,z} = 124.16 \text{ N/mm}^2$	$\Rightarrow U_w = 0.987 < 1$	ok
	pt. 1:	$\sigma_{w,x} = -4.30 \text{ N/mm}^2$	$\tau_{w,z} = 124.16 \text{ N/mm}^2$	$\Rightarrow U_w = 0.598 < 1$	ok
weld 6,	pt. 0:	$\sigma_{w,x} = 19.35 \text{ N/mm}^2$	$\tau_{w,y} = -16.82 \text{ N/mm}^2$	$\Rightarrow U_w = 0.123 < 1$	ok
	pt. 1:	$\sigma_{w,x} = 47.98 \text{ N/mm}^2$	$\tau_{w,y} = -16.82 \text{ N/mm}^2$	$\Rightarrow U_w = 0.245 < 1$	ok
weld 7,	pt. 0:	$\sigma_{w,x} = 3.52 \text{ N/mm}^2$	$\tau_{w,y} = -16.82 \text{ N/mm}^2$	$\Rightarrow U_w = 0.083 < 1$	ok
	pt. 1:	$\sigma_{w,x} = -25.10 \text{ N/mm}^2$	$\tau_{w,y} = -16.82 \text{ N/mm}^2$	$\Rightarrow U_w = 0.145 < 1$	ok
weld 8,	pt. 0:	$\sigma_{w,x} = -14.97 \text{ N/mm}^2$	$\tau_{w,y} = -16.82 \text{ N/mm}^2$	$\Rightarrow U_w = 0.108 < 1$	ok
	pt. 1:	$\sigma_{w,x} = 58.11 \text{ N/mm}^2$	$\tau_{w,y} = -16.82 \text{ N/mm}^2$	$\Rightarrow U_w = 0.291 < 1$	ok
weld 9,	pt. 0:	$\sigma_{w,x} = -149.85 \text{ N/mm}^2$		$\Rightarrow U_w = 0.721 < 1$	ok
	pt. 1:	$\sigma_{w,x} = -139.72 \text{ N/mm}^2$		$\Rightarrow U_w = 0.672 < 1$	ok
weld 10,	pt. 0:	$\sigma_{w,x} = -222.93 \text{ N/mm}^2$		$\Rightarrow U_w = 1.073 > 1$	not ok !!
	pt. 1:	$\sigma_{w,x} = -212.80 \text{ N/mm}^2$		$\Rightarrow U_w = 1.024 > 1$	not ok !!
weld 11,	pt. 0:	$\sigma_{w,x} = 58.11 \text{ N/mm}^2$		$\Rightarrow U_w = 0.280 < 1$	ok
	pt. 1:	$\sigma_{w,x} = 47.98 \text{ N/mm}^2$		$\Rightarrow U_w = 0.231 < 1$	ok
weld 12,	pt. 0:	$\sigma_{w,x} = -14.97 \text{ N/mm}^2$		$\Rightarrow U_w = 0.072 < 1$	ok
	pt. 1:	$\sigma_{w,x} = -25.10 \text{ N/mm}^2$		$\Rightarrow U_w = 0.121 < 1$	ok

Result:

weld 1, pt. 0: $\sigma_{w,x} = -222.93 \text{ N/mm}^2$ $\tau_{w,y} = -16.82 \text{ N/mm}^2$

Max: $F_{w,Ed} = 2235.62 \text{ kN/m} > F_{w,Rd} = 2078.46 \text{ kN/m} \Rightarrow U_w = 1.076 > 1$ not ok !!

3. final result

maximum utilization:

resistance max $U = 1.076 > 1$ not ok !!
c/t-ratio max $U = 0.421 < 1$ ok

resistance not ensured !!