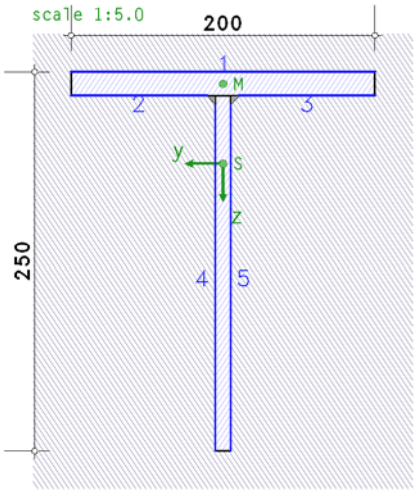
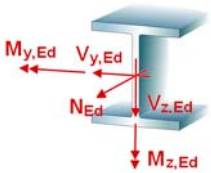
POS. 4: WAGENKNECHT 2.5.4

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 parameters (T-section):
overall depth h = 250.0 mm, web thickness t_w = 10.0 mm
flange width b_f = 200.0 mm, flange thickness t_f = 16.0 mm, fillet weld a = 4.0 mm
welded section, thickness of fillet weld a = 4.0 mm
plate: thickness t_p = 12.0 mm
welds as fillet weld (full-size):
a_{w1} = 5.0 mm, l_{w1} = 200.0 mm a_{w2} = 5.0 mm, l_{w2} = 89.3 mm a_{w3} = 5.0 mm, l_{w3} = 89.3 mm
a_{w4} = 3.0 mm, l_{w4} = 228.3 mm a_{w5} = 3.0 mm, l_{w5} = 228.3 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 refering to local axes of cross-section
Lc 1: N_{Ed} = -300.00 kN, $M_{y,Ed}$ = 28.00 kNm, $V_{z,Ed}$ = -95.00 kN

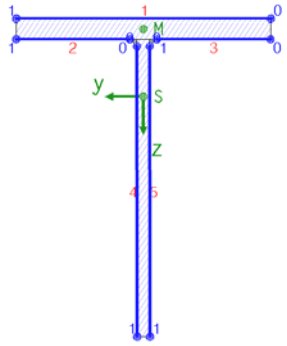


2. Lc 1

2.1. verification of cross-section

elastic verification for N = -300.00 kN, M_y = 28.00 kNm, V_z = -95.00 kN
verification: $\sigma_v = 132.16$ N/mm² < $\sigma_{v,Rd} = 235.00$ N/mm² ⇒ $U_\sigma = 0.562 < 1$ ok
c/t-ratio (reg. section class 3):
outstand flange: utilization $U_{c/t} = 0.282 < 1$ ok

2.2. verification of welds
calculation section:



weld 1:	a_w = 5.0 mm	l_w = 200.0 mm
weld 2:	a_w = 5.0 mm	l_w = 89.3 mm
weld 3:	a_w = 5.0 mm	l_w = 89.3 mm
weld 4:	a_w = 3.0 mm	l_w = 228.3 mm
weld 5:	a_w = 3.0 mm	l_w = 228.3 mm

design values refering to centroid of the section:
N_{Ed} = -300.00 kN, $M_{y,Ed}$ = 28.00 kNm, $V_{z,Ed}$ = -95.00 kN
cross-sectional properties refering to centroid of the line cross-section:

ΣA_w = 32.63 cm², $A_{w,y}$ = 18.93 cm², $A_{w,z}$ = 13.70 cm², Σl_w = 83.5 cm
$I_{w,y}$ = 1915.40 cm⁴, $I_{w,z}$ = 669.69 cm⁴, Δy_w = 0.0 mm, Δz_w = 0.6 mm

verifications in weld edges:

weld 1,	pt. 0:	$\sigma_{w,x}$ = -181.69 N/mm²		$\Rightarrow$ U_w = 0.874 < 1 ok
	pt. 1:	$\sigma_{w,x}$ = -181.69 N/mm²		$\Rightarrow$ U_w = 0.874 < 1 ok
weld 2,	pt. 0:	$\sigma_{w,x}$ = -158.30 N/mm²		$\Rightarrow$ U_w = 0.762 < 1 ok
	pt. 1:	$\sigma_{w,x}$ = -158.30 N/mm²		$\Rightarrow$ U_w = 0.762 < 1 ok
weld 3,	pt. 0:	$\sigma_{w,x}$ = -158.30 N/mm²		$\Rightarrow$ U_w = 0.762 < 1 ok
	pt. 1:	$\sigma_{w,x}$ = -158.30 N/mm²		$\Rightarrow$ U_w = 0.762 < 1 ok
weld 4,	pt. 0:	$\sigma_{w,x}$ = -150.03 N/mm²	$\tau_{w,z}$ = -69.34 N/mm²	$\Rightarrow$ U_w = 0.795 < 1 ok
	pt. 1:	$\sigma_{w,x}$ = 183.77 N/mm²	$\tau_{w,z}$ = -69.34 N/mm²	$\Rightarrow$ U_w = 0.945 < 1 ok
weld 5,	pt. 0:	$\sigma_{w,x}$ = -150.03 N/mm²	$\tau_{w,z}$ = -69.34 N/mm²	$\Rightarrow$ U_w = 0.795 < 1 ok
	pt. 1:	$\sigma_{w,x}$ = 183.77 N/mm²	$\tau_{w,z}$ = -69.34 N/mm²	$\Rightarrow$ U_w = 0.945 < 1 ok

Result:

weld 4,	pt. 1:	$\sigma_{w,x}$ = 183.77 N/mm²	$\tau_{w,z}$ = -69.34 N/mm²
Max:	$F_{w,Ed}$ = 589.25 kN/m < $F_{w,Rd}$ = 623.54 kN/m $\Rightarrow$ U_w = 0.945 < 1 ok		

3. final result

maximum utilization:	resistance	max U = 0.945 < 1 ok
	c/t-ratio	max U = 0.282 < 1 ok

verification succeeded