

POSITION 48: SCHNEIDER BT 8.32

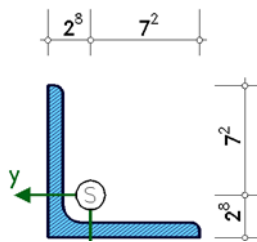
1. Input parameters

1.1. General statements

results acc. to DIN EN 1993:2010, Germany
 verification of classification of the cross-section (width to thickness ratio)
 flexural buckling by the method of fictitious bars

1.2. Cross-section

material: S235 (St37)
 section: L100X10
 section scale 1: 5



1.3. Section properties (referring to centroid S)

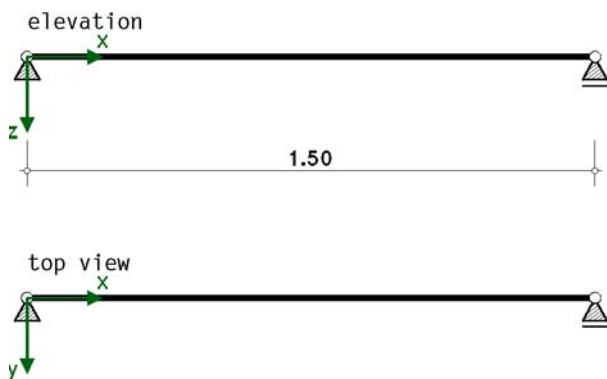
$I_y = 268 \text{ cm}^4$, $I_z = 268 \text{ cm}^4$, $I_w = 0.0 \text{ cm}^6$, $I_t = 6.33 \text{ cm}^4$
 $W_y = 39.60 \text{ cm}^3$, $W_z = 18.38 \text{ cm}^3$, $W_{p1,y} = 45.33 \text{ cm}^3$, $W_{p1,z} = 45.33 \text{ cm}^3$
 $z_{m,y} = 45 \text{ mm}$, $z_{m,z} = 45 \text{ mm}$, $A = 1920 \text{ mm}^2$, cross-section is susceptible to torsional deformations

1.4. Load application point (referring to centroid S)

$z_{load} = -22 \text{ mm}$ (centroid),

1.5. Structural system

all supports with fork conditions, beam length 1.500 [m]
 no support in z-direction, no support in y-direction



1.6. Buckling factors

about the y-axis: $\beta_z = 1.000$, about the z-axis: $\beta_y = 1.000$
 warping restraint intensity $\beta_0 = 1.000$

1.7. Combinations of design internal forces

Nr	N _d kN	A
1	250.00	

moment diagram types



2. Verifications acc. to DIN EN 1993, Germany

DIN EN 1993-1-1 (EC 3)

chapter	value	definition	
6.1(1)	permanent/transient sit.	partial factors for structural steel	
	$\gamma_{M0} = 1.00$	Cross-section failure	
	$\gamma_{M1} = 1.10$	instability	
	$\gamma_{M2} = 1.25$	fracture cross-sections in tension	
	accidental situation	partial factors for structural steel	
	$\gamma_{M0} = 1.00$	Cross-section failure	
6.3.2.2(2)	$\gamma_{M1} = 1.00$	instability	
	$\gamma_{M2} = 1.15$	fracture cross-sections in tension	
	factor f for modifying	buckling curve torsional-flexural buckling	
	of χ_{LT} : setting	general case	

2.1. Classification of cross-sections acc. to DIN EN 1993-1-1, 5.5.2

2.1.1. Load combination 1 \Rightarrow class of cross-section 3

Nr	c mm	t mm	c/t -	ϵ -	σ_1 N/mm ²	σ_2 N/mm ²	Tab 5.2	α -	ψ -	k_{σ} -	class -
1	33.0	10.0	3.30	1.000	-130.21	-130.21	ones. 1/1	---	---	---	1
2	33.0	10.0	3.30	1.000	-130.21	-130.21	ones. 1/1	---	---	---	1

verification is done in the predefined class of cross-section 3, $U = 0.236$

2.2. flexural and torsional buckling acc. to DIN EN 1993-1-1, 6.3.1

verification about the y-y and z-z - axis

$\lambda_y = 0.418 < \lambda_T = 0.580 \Rightarrow$ torsional-flexural buckling (λ_T) decisive

$\lambda_z = 0.817 > \lambda_T = 0.580 \Rightarrow$ flexural buckling (λ_z) decisive

$I_p = 353 \text{ cm}^4$, $I_T = 6 \text{ cm}^4$, $i_p^2 = 1840 \text{ mm}^2$, $c_{2y}^2 = 7598 \text{ mm}^2$, $c_{2z}^2 = 1989 \text{ mm}^2$, $i_m^2 = 1840 \text{ mm}^2$

$i_y = 38.2 \text{ mm}$, $\beta_y = 1.00$ (about the z-axis), $L_{cr,y} = 1.500 \text{ m}$, $\lambda_1 = 93.913$

$i_z = 19.5 \text{ mm}$, $\beta_z = 1.00$ (about the y-axis), $L_{cr,z} = 1.500 \text{ m}$

$\lambda_y = 0.580$, y-buckling curve b $\Rightarrow \alpha_y = 0.34$, $\lambda_z = 0.817$, z-buckling curve b $\Rightarrow \alpha_z = 0.34$

$\Phi_y = 0.733$, $\chi_y = 0.847$, $N_{by,Rd} = 347.37 \text{ kN}$, $\Phi_z = 0.939$, $\chi_z = 0.714$, $N_{bz,Rd} = 292.71 \text{ kN}$

2.2.1. Utilizations

Nr	N_d kN	U_y -	U_z -
1	250.00	0.720	0.854

max $U = 0.854 \leq 1 \Rightarrow$ verification successful!

the total utilization is: $U = 0.854$