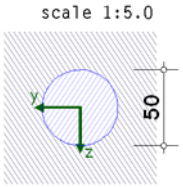
# POS. 8: ROUND STEEL, EC3, STANDARD

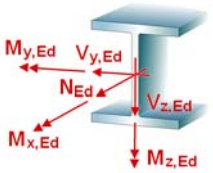
4H-EC3SA version: 10/2014-1m

## Welded connection

EC 3-1-8 (12.10), NA: Deutschland




**material**
steel grade S 235
**geometry**
section parameters (round steel):
diameter d = 50.0 mm
plate: thickness $t_p$ = 35.0 mm
surrounding fillet weld: $a_w$ = 6.0 mm
**design resistance**
elastic cross-sectional check
weld verification with the simplified method
**internal forces and moments** (sign definition of statics)
Lk 1: $N_{Ed}$ = 1.90 kN $V_{z,Ed}$ = -1.87 kN $M_{z,Ed}$ = 1.26 kNm $V_{y,Ed}$ = 2.46 kN $M_{x,Ed}$ = -2.47 kNm



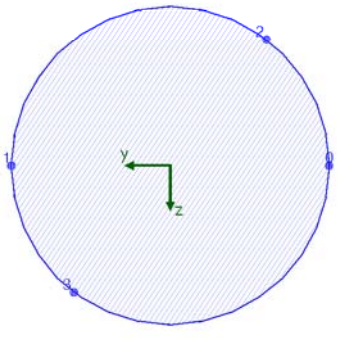

Lk 1:

## cross-sectional check

| | |
|---|---|
| design values: | $N_{Ed}$ = 1.90 kN, $V_{z,Ed}$ = -1.87 kN, $M_{z,Ed}$ = 1.26 kNm, $V_{y,Ed}$ = 2.46 kN |
| elastic stresses: | max $\sigma_x$ = 103.6 N/mm², min $\sigma_x$ = -101.7 N/mm², max $\tau$ = 2.4 N/mm², max $\sigma_v$ = 103.7 N/mm² |
| valid stresses: | $\sigma_{Rd}$ = 235.0 N/mm², $\tau_{Rd}$ = 135.7 N/mm² |
| utilizations: | design resistance $U_\sigma$ = 0.482 < 1 ok. |

## verification of welds

**calculation section:**




weld 1: $a_w$ = 6.0 mm $l_w$ = 157.1 mm

**design values:**
$N_{Ed}$ = 1.90 kN, $V_{z,Ed}$ = -1.87 kN, $M_{z,Ed}$ = 1.26 kNm, $V_{y,Ed}$ = 2.46 kN, $M_{x,Ed}$ = -2.47 kNm
**cross-sectional properties refering to centroid of the line cross section:**
$\Sigma A_w$ = 9.42 cm², $\Sigma l_w$ = 15.7 cm
$I_{w,y}$ = 29.45 cm⁴, $I_{w,z}$ = 29.45 cm⁴, $W_{w,t}$ = 23.56 cm³, $\Delta y_w$ = 0.0 mm, $\Delta z_w$ = 0.0 mm
**verification of line section:**

| | | | |
|---|---|---|---|
| pt. 0: | $\sigma_{w,x}$ = 108.97 N/mm² | $\tau_{w,t}$ = 100.86 N/mm² | $\Rightarrow$ $U_w$ = 0.714 < 1 ok. |
| pt. 1: | $\sigma_{w,x}$ = -104.94 N/mm² | $\tau_{w,t}$ = 108.80 N/mm² | $\Rightarrow$ $U_w$ = 0.727 < 1 ok. |
| pt. 2: | $\sigma_{w,x}$ = 66.74 N/mm² | $\tau_{w,t}$ = 98.27 N/mm² | $\Rightarrow$ $U_w$ = 0.572 < 1 ok. |
| pt. 3: | $\sigma_{w,x}$ = -62.71 N/mm² | $\tau_{w,t}$ = 111.39 N/mm² | $\Rightarrow$ $U_w$ = 0.615 < 1 ok. |

**Result:**

pt. 1: $\sigma_{w,x}$ = -104.94 N/mm² $\tau_{w,t}$ = 108.80 N/mm²

$F_{w,Ed}$ = 7.67 kN/cm < $F_{w,Rd}$ = 12.47 kN/cm ⇒ $U_w$ = 0.727 < 1 ok.

## Final result

**maximum utilization:** design resistance max U = 0.727 < 1 ok.

verification succeeded