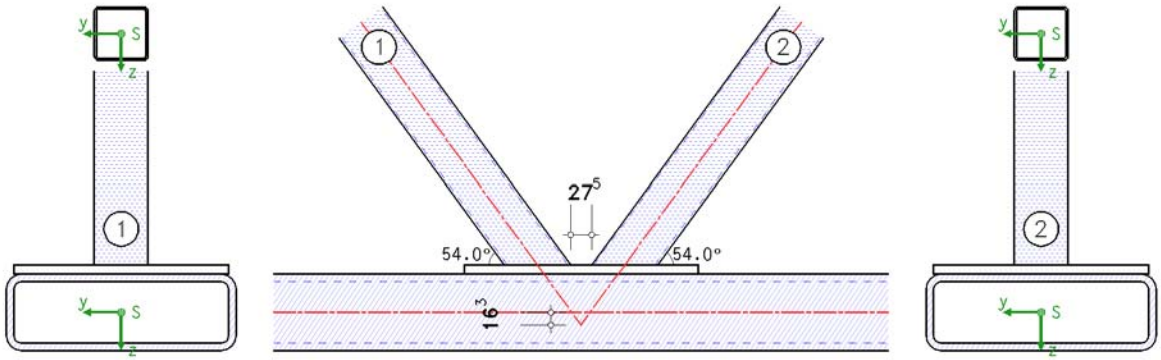
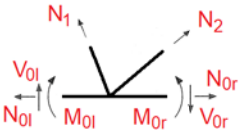
POS. 11: SK'11, 5.1.3.2 K REINFORCED, MOD.

verification of a welded hollow section joint EC 3-1-8 (12.10), NA: Deutschland 4H-EC3HK version: 5/2014-3z

1. input report



steel
steel grade S235
material safety factor
resistance of cross-sections γ_{M0} = 1.00
resistance of bolts, welds, plates in bearing γ_{M2} = 1.25
resistance of hollow section joints γ_{M5} = 1.00
geometry
K/N joint with gap g = 27.47 mm
chord: section parameters (rectangle):
overall depth h = 100.0 mm, web thickness t_w = 10.0 mm
overall width b = 300.0 mm, flange thickness t_f = 10.0 mm, cold-finished
rolled section, root radii r = 20.0 mm, r_2 = 10.0 mm
chord plate: thickness t_{pg} = 12.0 mm, width b_{pg} = 280.0 mm, length l_{pg} = 305.0 mm
brace 1: connection angle Θ = 53.95°, section parameters (rectangle):
overall depth h = 70.0 mm, web thickness t_w = 3.0 mm
overall width b = 70.0 mm, flange thickness t_f = 3.0 mm, cold-finished
rolled section, root radii r = 6.0 mm, r_2 = 3.0 mm
brace 2: connection angle Θ = 53.95°, section parameters (rectangle):
overall depth h = 70.0 mm, web thickness t_w = 3.0 mm
overall width b = 70.0 mm, flange thickness t_f = 3.0 mm, cold-finished
rolled section, root radii r = 6.0 mm, r_2 = 3.0 mm
welds
fillet weld, weld thickness a = 4.0 mm
verifications
verification of hollow section joint (chord and braces)
internal forces and moments



Lk 1: $N_{0l,Ed}$ = -599.41 kN, $N_{0r,Ed}$ = -412.31 kN, $N_{1,Ed}$ = 156.54 kN, $N_{2,Ed}$ = -151.87 kN
Lk 2: bottom flange beamwithte
$N_{0l,Ed}$ = -599.41 kN, $M_{0l,Ed}$ = -0.99 kNm, $N_{0r,Ed}$ = -412.31 kN, $N_{1,Ed}$ = 156.54 kN
$N_{2,Ed}$ = -151.87 kN
Lk 3: $N_{0l,Ed}$ = -412.31 kN, $N_{0r,Ed}$ = -599.41 kN, $M_{0r,Ed}$ = -0.99 kNm, $N_{1,Ed}$ = -151.87 kN
$N_{2,Ed}$ = 156.54 kN

notes
equilibrium is not checked.
braces are hinged to the chord (no internal moments).
welds are not verified !!
cross-section are not verified !!

check of data
brace 1: a = 4.0 mm > req a = $\beta_w \cdot 2^{1/2} \cdot f_y/f_u \cdot \gamma_{M2}/\gamma_{M0} \cdot t$ = 0.923·t_1 = 2.77 mm ok (s. EC 3-1-8, 4.9(6))
brace 2: a = 4.0 mm > req a = $\beta_w \cdot 2^{1/2} \cdot f_y/f_u \cdot \gamma_{M2}/\gamma_{M0} \cdot t$ = 0.923·t_2 = 2.77 mm ok (s. EC 3-1-8, 4.9(6))
K/N joint: joint eccentricity e = 16.34 mm
K/N joint: -0.55 ≤ e/h_0 = 16.34/100.0 = 0.163 ≤ 0.25 ok
K/N joint: gap width g = 27.47 mm > t_1+t_2 = 6.0 mm ok
brace 1: hollow section: plate thickness t_1 = 10.0 mm > 2.5 mm ok
brace 1: hollow section: plate thickness t_2 = 3.0 mm > 2.5 mm ok
brace 1: NA-DE: plate thickness t_{max} ≥ 3 mm: weld thickness a = 4.0 mm > a_{min} = $t_{max}^{1/2}$ - 0.5 = 2.66 mm ok
brace 1: weld thickness a = 4.0 mm > a_{min} = 3 mm ok
brace 2: hollow section: plate thickness t_1 = 10.0 mm > 2.5 mm ok
brace 2: hollow section: plate thickness t_2 = 3.0 mm > 2.5 mm ok

brace 2: NA-DE: plate thickness $t_{max} \geq 3$ mm: weld thickness a = 4.0 mm > $a_{min} = t_{max}^{1/2} - 0.5 = 2.66$ mm ok
brace 2: weld thickness a = 4.0 mm > a_{min} = 3 mm ok
coefficient $\beta = (b_1+b_2+h_1+h_2)/(4 \cdot b_0) = 0.233$

2. Lk 1

2.1. verification of a welded hollow section joint

design values: $N_{0,Ed}$ = -599.41 kN, $N_{1,Ed}$ = 156.54 kN, $N_{2,Ed}$ = -151.87 kN
moment of eccentricity $\Delta M = [N_{1,Ed} \cdot \cos(\Theta_1) - N_{2,Ed} \cdot \cos(\Theta_2)] \cdot e = 2.97$ kNm $\Rightarrow$ $M_{0,Ed}$ = 2.97 kNm

K joint: sign requirement: model is transformed !
brace 1: connection angle Θ = 53.95°, section parameters (rectangle):
overall depth h = 70.0 mm, web thickness t_w = 3.0 mm
overall width b = 70.0 mm, flange thickness t_f = 3.0 mm, cold-finished
rolled section, root radii r = 6.0 mm, r_2 = 3.0 mm
brace 2: connection angle Θ = 53.95°, section parameters (rectangle):
overall depth h = 70.0 mm, web thickness t_w = 3.0 mm
overall width b = 70.0 mm, flange thickness t_f = 3.0 mm, cold-finished
rolled section, root radii r = 6.0 mm, r_2 = 3.0 mm
design values: $N_{0,Ed}$ = -599.41 kN, $M_{0,Ed}$ = 2.97 kNm, $N_{1,Ed}$ = -151.87 kN, $N_{2,Ed}$ = 156.54 kN

resistance (table 7.18, K/N joint with Lamellen)
brace 1:
chord plate:
min $l_p = 1.5 \cdot (h_1/\sin(\Theta_1)+h_2/\sin(\Theta_2)+g) = 300.9$ mm, min $b_p = b_0-2 \cdot t_0 = 280.0$ mm, min $t_p = \max(t_0, 2 \cdot t_1) = 10.0$ mm
l_p = 305.0 mm > min l_p = 300.9 mm
b_p = 280.0 mm $\geq$ min b_p = 280.0 mm
t_p = 12.0 mm > min t_p = 10.0 mm
chord plate $\Rightarrow$ table 7.12 with $t_0 = t_p$ = 12.0 mm
range of validity (table 7.8, K/N joint)
chord: $h_0/b_0 = 0.333 < 0.5$!!
chord: $h_0/b_0 = 0.333 < 2.0$ ok
chord: $b_0/t_0 = 25.000 < 35$ ok
chord: $h_0/t_0 = 8.333 < 35$ ok
chord: section class 1 < 2 ok
chord: $g/b_0 = 0.092 < 0.5 \cdot (1-\beta) = 0.383$!!
chord: $g/b_0 = 0.092 < 1.5 \cdot (1-\beta) = 1.150$ ok
brace 1: $b_1/b_0 = 0.233 < \max(0.35, 0.1+0.01 \cdot b_0/t_0) = 0.35$!!
brace 1: $b_1/b_0 = 0.233 < 1$ ok
brace 1: $b_1/t_1 = 23.333 < 35$ ok
brace 1: section class 1 < 2 ok
brace 1: $0.5 < h_1/b_1 = 1.000 < 2$ ok
brace 2: $b_2/b_0 = 0.233 < \max(0.35, 0.1+0.01 \cdot b_0/t_0) = 0.35$!!
brace 2: $b_2/b_0 = 0.233 < 1$ ok
brace 2: $b_2/t_2 = 23.333 < 35$ ok
brace 2: $0.5 < h_2/b_2 = 1.000 < 2$ ok
range of validity not ensured !!
resistance (table 7.12, K/N joint)
coefficient $\gamma = b_0/(2 \cdot t_0) = 12.500$
coefficient $k_n = 1.3 - 0.4 \cdot n/\beta = 0.618$ with $n = \sigma_0/(f_{y0} \cdot \gamma_{M5}) = 0.398$, $\sigma_0 = -N_0/A_0+M_0/W_{el,0} = 93.5$ N/mm²
brace 1:
chord face failure
resistance: $N_{1,Rd} = (8.9 \cdot k_n \cdot f_{y0} \cdot t_0^2 \cdot \gamma^{1/2})/\sin(\Theta_1) \cdot \beta / \gamma_{M5} = 189.81$ kN
utilisation: $U_1 = N_{1,Ed}/N_{1,Rd} = 0.800 < 1$ ok
brace failure
parameters $b_{eff} = 10/(b_0/t_0) \cdot (f_{y0} \cdot t_0)/(f_{y1} \cdot t_1) \cdot b_1 = 112.00$ mm > b_1 $\Rightarrow$ $b_{eff} = b_1 = 70.0$ mm
resistance: $N_{1,Rd} = (f_{y1} \cdot t_1) \cdot (2 \cdot h_1 - 4 \cdot t_1 + b_1 + b_{eff}) / \gamma_{M5} = 188.94$ kN
utilisation: $U_1 = N_{1,Ed}/N_{1,Rd} = 0.804 < 1$ ok
punching shear failure
parameters $b_{e,p} = 10/(b_0/t_0) \cdot b_1 = 28.00$ mm
resistance: $N_{1,Rd} = (f_{y0} \cdot t_0)/(3^{1/2} \cdot \sin(\Theta_1)) \cdot (2 \cdot h_1/\sin(\Theta_1)+b_1+b_{e,p}) / \gamma_{M5} = 546.05$ kN
utilisation: $U_1 = N_{1,Ed}/N_{1,Rd} = 0.278 < 1$ ok
without chord plate $\Rightarrow$ table 7.12 with t_0 = 10.0 mm
range of validity (table 7.8, K/N joint)
chord: $h_0/b_0 = 0.333 < 0.5$!!
chord: $h_0/b_0 = 0.333 < 2.0$ ok
chord: $b_0/t_0 = 30.000 < 35$ ok
chord: $h_0/t_0 = 10.000 < 35$ ok
chord: section class 1 < 2 ok
chord: $g/b_0 = 0.092 < 0.5 \cdot (1-\beta) = 0.383$!!
chord: $g/b_0 = 0.092 < 1.5 \cdot (1-\beta) = 1.150$ ok
brace 1: $b_1/b_0 = 0.233 < \max(0.35, 0.1+0.01 \cdot b_0/t_0) = 0.40$!!

brace 1: $b_1/b_0 = 0.233 < 1$ ok
brace 1: $b_1/t_1 = 23.333 < 35$ ok
brace 1: section class $1 < 2$ ok
brace 1: $0.5 < h_1/b_1 = 1.000 < 2$ ok
brace 2: $b_2/b_0 = 0.233 < \max(0.35, 0.1+0.01 \cdot b_0/t_0) = 0.40$!!
brace 2: $b_2/b_0 = 0.233 < 1$ ok
brace 2: $b_2/t_2 = 23.333 < 35$ ok
brace 2: $0.5 < h_2/b_2 = 1.000 < 2$ ok
range of validity not ensured !!
resistance (table 7.12, K/N joint)
coefficient $\gamma = b_0/(2 \cdot t_0) = 15.000$
coefficient $k_n = 1.3 - 0.4 \cdot n/\beta = 0.618$ with $n = \sigma_0/(f_{y0} \cdot \gamma_{M5}) = 0.398$, $\sigma_0 = -N_0/A_0+M_0/W_{el,0} = 93.5$ N/mm²
chord:
shear failure of chord
shear area $A_v = (2 \cdot h_0+\alpha \cdot b_0) \cdot t_0 = 2902.0$ mm², $\alpha = [1/(1+(4 \cdot g^2)/(3 \cdot t_0^2))]^{1/2} = 0.301$
shear force $V_{Ed} = (N_i \cdot \sin(\Theta_i))_{max} = 126.6$ kN
plastic shear resistance $V_{pl,Rd} = A_v \cdot (f_{y0}/(3^{1/2} \cdot \gamma_{M5}) = 393.7$ kN
resistance: $N_{0,Rd} = [(A_0-A_v) \cdot f_{y0}+A_v \cdot f_{y0} \cdot (1-(V_{Ed}/V_{pl,Rd})^2)^{1/2}] / \gamma_{M5} = 1689.29$ kN
utilisation: $U_0 = N_{0,Ed}/N_{0,Rd} = 0.355 < 1$ ok
brace 1:
shear failure of chord
shear area $A_v = (2 \cdot h_0+\alpha \cdot b_0) \cdot t_0 = 2902.0$ mm², $\alpha = [1/(1+(4 \cdot g^2)/(3 \cdot t_0^2))]^{1/2} = 0.301$
resistance: $N_{1,Rd} = (f_{y0} \cdot A_v)/(3^{1/2} \cdot \sin(\Theta_1)) / \gamma_{M5} = 487.00$ kN
utilisation: $U_1 = N_{1,Ed}/N_{1,Rd} = 0.312 < 1$ ok

brace 2:
chord plate:
min $l_p = 1.5 \cdot (h_2/\sin(\Theta_2)+h_1/\sin(\Theta_1)+g) = 300.9$ mm, min $b_p = b_0-2 \cdot t_0 = 280.0$ mm, min $t_p = \max(t_0, 2 \cdot t_2) = 10.0$ mm
$l_p = 305.0$ mm > min $l_p = 300.9$ mm
$b_p = 280.0$ mm ≥ min $b_p = 280.0$ mm
$t_p = 12.0$ mm > min $t_p = 10.0$ mm
chord plate ⇒ table 7.12 with $t_0 = t_p = 12.0$ mm
range of validity (table 7.8, K/N joint)
chord: $h_0/b_0 = 0.333 < 0.5$!!
chord: $h_0/b_0 = 0.333 < 2.0$ ok
chord: $b_0/t_0 = 25.000 < 35$ ok
chord: $h_0/t_0 = 8.333 < 35$ ok
chord: section class $1 < 2$ ok
chord: $g/b_0 = 0.092 < 0.5 \cdot (1-\beta) = 0.383$!!
chord: $g/b_0 = 0.092 < 1.5 \cdot (1-\beta) = 1.150$ ok
brace 1: $b_1/b_0 = 0.233 < \max(0.35, 0.1+0.01 \cdot b_0/t_0) = 0.35$!!
brace 1: $b_1/b_0 = 0.233 < 1$ ok
brace 1: $b_1/t_1 = 23.333 < 35$ ok
brace 1: section class $1 < 2$ ok
brace 1: $0.5 < h_1/b_1 = 1.000 < 2$ ok
brace 2: $b_2/b_0 = 0.233 < \max(0.35, 0.1+0.01 \cdot b_0/t_0) = 0.35$!!
brace 2: $b_2/b_0 = 0.233 < 1$ ok
brace 2: $b_2/t_2 = 23.333 < 35$ ok
brace 2: $0.5 < h_2/b_2 = 1.000 < 2$ ok
range of validity not ensured !!
resistance (table 7.12, K/N joint)
coefficient $\gamma = b_0/(2 \cdot t_0) = 12.500$
coefficient $k_n = 1.3 - 0.4 \cdot n/\beta = 0.618$ with $n = \sigma_0/(f_{y0} \cdot \gamma_{M5}) = 0.398$, $\sigma_0 = -N_0/A_0+M_0/W_{el,0} = 93.5$ N/mm²
brace 2:
chord face failure
resistance: $N_{2,Rd} = (8.9 \cdot k_n \cdot f_{y0} \cdot t_0^2 \cdot \gamma^{1/2})/\sin(\Theta_2) \cdot \beta / \gamma_{M5} = 189.81$ kN
utilisation: $U_2 = N_{2,Ed}/N_{2,Rd} = 0.825 < 1$ ok
brace failure
parameters $b_{eff} = 10/(b_0/t_0) \cdot (f_{y0} \cdot t_0)/(f_{y2} \cdot t_2) \cdot b_2 = 112.00$ mm > b_2 ⇒ $b_{eff} = b_2 = 70.0$ mm
resistance: $N_{2,Rd} = (f_{y2} \cdot t_2) \cdot (2 \cdot h_2-4 \cdot t_2+ b_2+b_{eff}) / \gamma_{M5} = 188.94$ kN
utilisation: $U_2 = N_{2,Ed}/N_{2,Rd} = 0.829 < 1$ ok
punching shear failure
parameters $b_{e,p} = 10/(b_0/t_0) \cdot b_2 = 28.00$ mm
resistance: $N_{2,Rd} = (f_{y0} \cdot t_0)/(3^{1/2} \cdot \sin(\Theta_2)) \cdot (2 \cdot h_2/\sin(\Theta_2)+b_2+b_{e,p}) / \gamma_{M5} = 546.05$ kN
utilisation: $U_2 = N_{2,Ed}/N_{2,Rd} = 0.287 < 1$ ok
without chord plate ⇒ table 7.12 with $t_0 = 10.0$ mm
range of validity (table 7.8, K/N joint)
chord: $h_0/b_0 = 0.333 < 0.5$!!
chord: $h_0/b_0 = 0.333 < 2.0$ ok
chord: $b_0/t_0 = 30.000 < 35$ ok
chord: $h_0/t_0 = 10.000 < 35$ ok
chord: section class $1 < 2$ ok

chord: $g/b_0 = 0.092 < 0.5\cdot(1-\beta) = 0.383$!!
chord: $g/b_0 = 0.092 < 1.5\cdot(1-\beta) = 1.150$ ok
brace 1: $b_1/b_0 = 0.233 < \max(0.35, 0.1+0.01\cdot b_0/t_0) = 0.40$!!
brace 1: $b_1/b_0 = 0.233 < 1$ ok
brace 1: $b_1/t_1 = 23.333 < 35$ ok
brace 1: section class $1 < 2$ ok
brace 1: $0.5 < h_1/b_1 = 1.000 < 2$ ok
brace 2: $b_2/b_0 = 0.233 < \max(0.35, 0.1+0.01\cdot b_0/t_0) = 0.40$!!
brace 2: $b_2/b_0 = 0.233 < 1$ ok
brace 2: $b_2/t_2 = 23.333 < 35$ ok
brace 2: $0.5 < h_2/b_2 = 1.000 < 2$ ok
range of validity not ensured !!
resistance (table 7.12, K/N joint)
coefficient $\gamma = b_0/(2\cdot t_0) = 15.000$
coefficient $k_n = 1.3 - 0.4\cdot n/\beta = 0.618$ with $n = \sigma_0/(f_{y0}\cdot\gamma_{M5}) = 0.398$, $\sigma_0 = -N_0/A_0+M_0/W_{el,0} = 93.5$ N/mm²
chord:
shear failure of chord
shear area $A_v = (2\cdot h_0+\alpha\cdot b_0)\cdot t_0 = 2902.0$ mm², $\alpha = [1/(1+(4\cdot g^2)/(3\cdot t_0^2)]^{1/2} = 0.301$
shear force $V_{Ed} = (N_i\cdot\sin(\Theta_i))_{max} = 126.6$ kN
plastic shear resistance $V_{pl,Rd} = A_v\cdot(f_{y0}/(3^{1/2}\cdot\gamma_{M5}) = 393.7$ kN
resistance: $N_{0,Rd} = [(A_0-A_v)\cdot f_{y0}+A_v\cdot f_{y0}\cdot(1-(V_{Ed}/V_{pl,Rd})^2)^{1/2}] / \gamma_{M5} = 1689.29$ kN
utilisation: $U_0 = N_{0,Ed}/N_{0,Rd} = 0.355 < 1$ ok
brace 2:
shear failure of chord
shear area $A_v = (2\cdot h_0+\alpha\cdot b_0)\cdot t_0 = 2902.0$ mm², $\alpha = [1/(1+(4\cdot g^2)/(3\cdot t_0^2)]^{1/2} = 0.301$
resistance: $N_{2,Rd} = (f_{y0}\cdot A_v)/(3^{1/2}\cdot\sin(\Theta_2)) / \gamma_{M5} = 487.00$ kN
utilisation: $U_2 = N_{2,Ed}/N_{2,Rd} = 0.321 < 1$ ok

K joint: sign requirement: model is reset !

total: $U_{Lk1} = 0.829 < 1$ ok

3. Lk 2: bottom flange beamwithte

3.1. verification of a welded hollow section joint

design values: $N_{0,Ed} = -599.41$ kN, $M_{0,Ed} = -0.99$ kNm, $N_{1,Ed} = 156.54$ kN, $N_{2,Ed} = -151.87$ kN
moment of eccentricity $\Delta M = [N_{1,Ed}\cdot\cos(\Theta_1)-N_{2,Ed}\cdot\cos(\Theta_2)]\cdot e = 2.97$ kNm $\Rightarrow$ $M_{0,Ed} = 1.98$ kNm

K joint: sign requirement: model is transformed !
brace 1: connection angle $\Theta = 53.95°$, section parameters (rectangle):
overall depth $h = 70.0$ mm, web thickness $t_w = 3.0$ mm
overall width $b = 70.0$ mm, flange thickness $t_f = 3.0$ mm, cold-finished
rolled section, root radii $r = 6.0$ mm, $r_2 = 3.0$ mm
brace 2: connection angle $\Theta = 53.95°$, section parameters (rectangle):
overall depth $h = 70.0$ mm, web thickness $t_w = 3.0$ mm
overall width $b = 70.0$ mm, flange thickness $t_f = 3.0$ mm, cold-finished
rolled section, root radii $r = 6.0$ mm, $r_2 = 3.0$ mm
design values: $N_{0,Ed} = -599.41$ kN, $M_{0,Ed} = 1.98$ kNm, $N_{1,Ed} = -151.87$ kN, $N_{2,Ed} = 156.54$ kN

resistance (table 7.18, K/N joint with Lamellen)
brace 1:
chord plate:
min $l_p = 1.5\cdot(h_1/\sin(\Theta_1)+h_2/\sin(\Theta_2)+g) = 300.9$ mm, min $b_p = b_0-2\cdot t_0 = 280.0$ mm, min $t_p = \max(t_0,2\cdot t_1) = 10.0$ mm
$l_p = 305.0$ mm $>$ min $l_p = 300.9$ mm
$b_p = 280.0$ mm $\geq$ min $b_p = 280.0$ mm
$t_p = 12.0$ mm $>$ min $t_p = 10.0$ mm
chord plate $\Rightarrow$ table 7.12 with $t_0 = t_p = 12.0$ mm
range of validity (table 7.8, K/N joint)
chord: $h_0/b_0 = 0.333 < 0.5$!!
chord: $h_0/b_0 = 0.333 < 2.0$ ok
chord: $b_0/t_0 = 25.000 < 35$ ok
chord: $h_0/t_0 = 8.333 < 35$ ok
chord: section class $1 < 2$ ok
chord: $g/b_0 = 0.092 < 0.5\cdot(1-\beta) = 0.383$!!
chord: $g/b_0 = 0.092 < 1.5\cdot(1-\beta) = 1.150$ ok
brace 1: $b_1/b_0 = 0.233 < \max(0.35, 0.1+0.01\cdot b_0/t_0) = 0.35$!!
brace 1: $b_1/b_0 = 0.233 < 1$ ok
brace 1: $b_1/t_1 = 23.333 < 35$ ok
brace 1: section class $1 < 2$ ok
brace 1: $0.5 < h_1/b_1 = 1.000 < 2$ ok
brace 2: $b_2/b_0 = 0.233 < \max(0.35, 0.1+0.01\cdot b_0/t_0) = 0.35$!!
brace 2: $b_2/b_0 = 0.233 < 1$ ok
brace 2: $b_2/t_2 = 23.333 < 35$ ok

brace 2: $0.5 < h_2/b_2 = 1.000 < 2$ ok
range of validity not ensured !!
resistance (table 7.12, K/N joint)
coefficient $\gamma = b_0/(2 \cdot t_0) = 12.500$
coefficient $k_n = 1.3 - 0.4 \cdot n/\beta = 0.647$ with $n = \sigma_0/(f_{y0} \cdot \gamma_{M5}) = 0.381$, $\sigma_0 = -N_0/A_0 + M_0/W_{el,0} = 89.6$ N/mm²
brace 1:
chord face failure
resistance: $N_{1,Rd} = (8.9 \cdot k_n \cdot f_{y0} \cdot t_0^2 \cdot \gamma^{1/2})/\sin(\Theta_1) \cdot \beta / \gamma_{M5} = 198.72$ kN
utilisation: $U_1 = N_{1,Ed}/N_{1,Rd} = 0.764 < 1$ ok
brace failure
parameters $b_{eff} = 10/(b_0/t_0) \cdot (f_{y0} \cdot t_0)/(f_{y1} \cdot t_1) \cdot b_1 = 112.00$ mm $> b_1 \Rightarrow b_{eff} = b_1 = 70.0$ mm
resistance: $N_{1,Rd} = (f_{y1} \cdot t_1) \cdot (2 \cdot h_1 - 4 \cdot t_1 + b_1 + b_{eff}) / \gamma_{M5} = 188.94$ kN
utilisation: $U_1 = N_{1,Ed}/N_{1,Rd} = 0.804 < 1$ ok
punching shear failure
parameters $b_{e,p} = 10/(b_0/t_0) \cdot b_1 = 28.00$ mm
resistance: $N_{1,Rd} = (f_{y0} \cdot t_0)/(3^{1/2} \cdot \sin(\Theta_1)) \cdot (2 \cdot h_1/\sin(\Theta_1) + b_1 + b_{e,p}) / \gamma_{M5} = 546.05$ kN
utilisation: $U_1 = N_{1,Ed}/N_{1,Rd} = 0.278 < 1$ ok
without chord plate $\Rightarrow$ table 7.12 with $t_0 = 10.0$ mm
range of validity (table 7.8, K/N joint)
chord: $h_0/b_0 = 0.333 < 0.5$!!
chord: $h_0/b_0 = 0.333 < 2.0$ ok
chord: $b_0/t_0 = 30.000 < 35$ ok
chord: $h_0/t_0 = 10.000 < 35$ ok
chord: section class $1 < 2$ ok
chord: $g/b_0 = 0.092 < 0.5 \cdot (1-\beta) = 0.383$!!
chord: $g/b_0 = 0.092 < 1.5 \cdot (1-\beta) = 1.150$ ok
brace 1: $b_1/b_0 = 0.233 < \max(0.35, 0.1+0.01 \cdot b_0/t_0) = 0.40$!!
brace 1: $b_1/b_0 = 0.233 < 1$ ok
brace 1: $b_1/t_1 = 23.333 < 35$ ok
brace 1: section class $1 < 2$ ok
brace 1: $0.5 < h_1/b_1 = 1.000 < 2$ ok
brace 2: $b_2/b_0 = 0.233 < \max(0.35, 0.1+0.01 \cdot b_0/t_0) = 0.40$!!
brace 2: $b_2/b_0 = 0.233 < 1$ ok
brace 2: $b_2/t_2 = 23.333 < 35$ ok
brace 2: $0.5 < h_2/b_2 = 1.000 < 2$ ok
range of validity not ensured !!
resistance (table 7.12, K/N joint)
coefficient $\gamma = b_0/(2 \cdot t_0) = 15.000$
coefficient $k_n = 1.3 - 0.4 \cdot n/\beta = 0.647$ with $n = \sigma_0/(f_{y0} \cdot \gamma_{M5}) = 0.381$, $\sigma_0 = -N_0/A_0 + M_0/W_{el,0} = 89.6$ N/mm²
chord:
shear failure of chord
shear area $A_v = (2 \cdot h_0 + \alpha \cdot b_0) \cdot t_0 = 2902.0$ mm², $\alpha = [1/(1+(4 \cdot g^2)/(3 \cdot t_0^2))]^{1/2} = 0.301$
shear force $V_{Ed} = (N_i \cdot \sin(\Theta_i))_{max} = 126.6$ kN
plastic shear resistance $V_{pl,Rd} = A_v \cdot (f_{y0}/(3^{1/2} \cdot \gamma_{M5}) = 393.7$ kN
resistance: $N_{0,Rd} = [(A_0 - A_v) \cdot f_{y0} + A_v \cdot f_{y0} \cdot (1-(V_{Ed}/V_{pl,Rd})^2)^{1/2}] / \gamma_{M5} = 1689.29$ kN
utilisation: $U_0 = N_{0,Ed}/N_{0,Rd} = 0.355 < 1$ ok
brace 1:
shear failure of chord
shear area $A_v = (2 \cdot h_0 + \alpha \cdot b_0) \cdot t_0 = 2902.0$ mm², $\alpha = [1/(1+(4 \cdot g^2)/(3 \cdot t_0^2))]^{1/2} = 0.301$
resistance: $N_{1,Rd} = (f_{y0} \cdot A_v)/(3^{1/2} \cdot \sin(\Theta_1)) / \gamma_{M5} = 487.00$ kN
utilisation: $U_1 = N_{1,Ed}/N_{1,Rd} = 0.312 < 1$ ok

brace 2:
chord plate:
min $l_p = 1.5 \cdot (h_2/\sin(\Theta_2) + h_1/\sin(\Theta_1) + g) = 300.9$ mm, min $b_p = b_0 - 2 \cdot t_0 = 280.0$ mm, min $t_p = \max(t_0, 2 \cdot t_2) = 10.0$ mm
$l_p = 305.0$ mm $>$ min $l_p = 300.9$ mm
$b_p = 280.0$ mm $\geq$ min $b_p = 280.0$ mm
$t_p = 12.0$ mm $>$ min $t_p = 10.0$ mm
chord plate $\Rightarrow$ table 7.12 with $t_0 = t_p = 12.0$ mm
range of validity (table 7.8, K/N joint)
chord: $h_0/b_0 = 0.333 < 0.5$!!
chord: $h_0/b_0 = 0.333 < 2.0$ ok
chord: $b_0/t_0 = 25.000 < 35$ ok
chord: $h_0/t_0 = 8.333 < 35$ ok
chord: section class $1 < 2$ ok
chord: $g/b_0 = 0.092 < 0.5 \cdot (1-\beta) = 0.383$!!
chord: $g/b_0 = 0.092 < 1.5 \cdot (1-\beta) = 1.150$ ok
brace 1: $b_1/b_0 = 0.233 < \max(0.35, 0.1+0.01 \cdot b_0/t_0) = 0.35$!!
brace 1: $b_1/b_0 = 0.233 < 1$ ok
brace 1: $b_1/t_1 = 23.333 < 35$ ok
brace 1: section class $1 < 2$ ok
brace 1: $0.5 < h_1/b_1 = 1.000 < 2$ ok

brace 2: $b_2/b_0 = 0.233 < \max(0.35,\ 0.1+0.01 \cdot b_0/t_0) = 0.35$!!
brace 2: $b_2/b_0 = 0.233 < 1$ ok
brace 2: $b_2/t_2 = 23.333 < 35$ ok
brace 2: $0.5 < h_2/b_2 = 1.000 < 2$ ok
range of validity not ensured !!
resistance (table 7.12, K/N joint)
coefficient $\gamma = b_0/(2 \cdot t_0) = 12.500$
coefficient $k_n = 1.3 - 0.4 \cdot n/\beta = 0.647$ with $n = \sigma_0/(f_{y0} \cdot \gamma_{M5}) = 0.381$, $\sigma_0 = -N_0/A_0+M_0/W_{el,0} = 89.6$ N/mm²
brace 2:
chord face failure
resistance: $N_{2,Rd} = (8.9 \cdot k_n \cdot f_{y0} \cdot t_0^2 \cdot \gamma^{1/2})/\sin(\Theta_2) \cdot \beta \ / \ \gamma_{M5} = 198.72$ kN
utilisation: $U_2 = N_{2,Ed}/N_{2,Rd} = 0.788 < 1$ ok
brace failure
parameters $b_{eff} = 10/(b_0/t_0) \cdot (f_{y0} \cdot t_0)/(f_{y2} \cdot t_2) \cdot b_2 = 112.00$ mm $> b_2 \Rightarrow b_{eff} = b_2 = 70.0$ mm
resistance: $N_{2,Rd} = (f_{y2} \cdot t_2) \cdot (2 \cdot h_2 - 4 \cdot t_2 + b_2 + b_{eff}) \ / \ \gamma_{M5} = 188.94$ kN
utilisation: $U_2 = N_{2,Ed}/N_{2,Rd} = 0.829 < 1$ ok
punching shear failure
parameters $b_{e,p} = 10/(b_0/t_0) \cdot b_2 = 28.00$ mm
resistance: $N_{2,Rd} = (f_{y0} \cdot t_0)/(3^{1/2} \cdot \sin(\Theta_2)) \cdot (2 \cdot h_2/\sin(\Theta_2) + b_2 + b_{e,p}) \ / \ \gamma_{M5} = 546.05$ kN
utilisation: $U_2 = N_{2,Ed}/N_{2,Rd} = 0.287 < 1$ ok
without chord plate $\Rightarrow$ table 7.12 with $t_0 = 10.0$ mm
range of validity (table 7.8, K/N joint)
chord: $h_0/b_0 = 0.333 < 0.5$!!
chord: $h_0/b_0 = 0.333 < 2.0$ ok
chord: $b_0/t_0 = 30.000 < 35$ ok
chord: $h_0/t_0 = 10.000 < 35$ ok
chord: section class $1 < 2$ ok
chord: $g/b_0 = 0.092 < 0.5 \cdot (1-\beta) = 0.383$!!
chord: $g/b_0 = 0.092 < 1.5 \cdot (1-\beta) = 1.150$ ok
brace 1: $b_1/b_0 = 0.233 < \max(0.35,\ 0.1+0.01 \cdot b_0/t_0) = 0.40$!!
brace 1: $b_1/b_0 = 0.233 < 1$ ok
brace 1: $b_1/t_1 = 23.333 < 35$ ok
brace 1: section class $1 < 2$ ok
brace 1: $0.5 < h_1/b_1 = 1.000 < 2$ ok
brace 2: $b_2/b_0 = 0.233 < \max(0.35,\ 0.1+0.01 \cdot b_0/t_0) = 0.40$!!
brace 2: $b_2/b_0 = 0.233 < 1$ ok
brace 2: $b_2/t_2 = 23.333 < 35$ ok
brace 2: $0.5 < h_2/b_2 = 1.000 < 2$ ok
range of validity not ensured !!
resistance (table 7.12, K/N joint)
coefficient $\gamma = b_0/(2 \cdot t_0) = 15.000$
coefficient $k_n = 1.3 - 0.4 \cdot n/\beta = 0.647$ with $n = \sigma_0/(f_{y0} \cdot \gamma_{M5}) = 0.381$, $\sigma_0 = -N_0/A_0+M_0/W_{el,0} = 89.6$ N/mm²
chord:
shear failure of chord
shear area $A_v = (2 \cdot h_0 + \alpha \cdot b_0) \cdot t_0 = 2902.0$ mm², $\alpha = [1/(1+(4 \cdot g^2)/(3 \cdot t_0^2))]^{1/2} = 0.301$
shear force $V_{Ed} = (N_i \cdot \sin(\Theta_i))_{max} = 126.6$ kN
plastic shear resistance $V_{pl,Rd} = A_v \cdot (f_{y0}/(3^{1/2} \cdot \gamma_{M5})) = 393.7$ kN
resistance: $N_{0,Rd} = [(A_0-A_v) \cdot f_{y0} + A_v \cdot f_{y0} \cdot (1-(V_{Ed}/V_{pl,Rd})^2)^{1/2}] \ / \ \gamma_{M5} = 1689.29$ kN
utilisation: $U_0 = N_{0,Ed}/N_{0,Rd} = 0.355 < 1$ ok
brace 2:
shear failure of chord
shear area $A_v = (2 \cdot h_0 + \alpha \cdot b_0) \cdot t_0 = 2902.0$ mm², $\alpha = [1/(1+(4 \cdot g^2)/(3 \cdot t_0^2))]^{1/2} = 0.301$
resistance: $N_{2,Rd} = (f_{y0} \cdot A_v)/(3^{1/2} \cdot \sin(\Theta_2)) \ / \ \gamma_{M5} = 487.00$ kN
utilisation: $U_2 = N_{2,Ed}/N_{2,Rd} = 0.321 < 1$ ok

K joint: sign requirement: model is reset !

total: $U_{Lk2} = 0.829 < 1$ ok

4. Lk 3

4.1. verification of a welded hollow section joint

design values: $N_{0,Ed} = -599.41$ kN, $M_{0,Ed} = -0.99$ kNm, $N_{1,Ed} = -151.87$ kN, $N_{2,Ed} = 156.54$ kN
moment of eccentricity $\Delta M = [N_{1,Ed} \cdot \cos(\Theta_1) - N_{2,Ed} \cdot \cos(\Theta_2)] \cdot e = -2.97$ kNm $\Rightarrow$ $M_{0,Ed} = 1.98$ kNm
resistance (table 7.18, K/N joint with Lamellen)
brace 1:
chord plate:
min $l_p = 1.5 \cdot (h_1/\sin(\Theta_1) + h_2/\sin(\Theta_2) + g) = 300.9$ mm, min $b_p = b_0 - 2 \cdot t_0 = 280.0$ mm, min $t_p = \max(t_0, 2 \cdot t_1) = 10.0$ mm
$l_p = 305.0$ mm $>$ min $l_p = 300.9$ mm
$b_p = 280.0$ mm $\geq$ min $b_p = 280.0$ mm
$t_p = 12.0$ mm $>$ min $t_p = 10.0$ mm
chord plate $\Rightarrow$ table 7.12 with $t_0 = t_p = 12.0$ mm

range of validity (table 7.8, K/N joint)
chord: $h_0/b_0 = 0.333 < 0.5$!!
chord: $h_0/b_0 = 0.333 < 2.0$ ok
chord: $b_0/t_0 = 25.000 < 35$ ok
chord: $h_0/t_0 = 8.333 < 35$ ok
chord: section class $1 < 2$ ok
chord: $g/b_0 = 0.092 < 0.5\cdot(1-\beta) = 0.383$!!
chord: $g/b_0 = 0.092 < 1.5\cdot(1-\beta) = 1.150$ ok
brace 1: $b_1/b_0 = 0.233 < \max(0.35, 0.1+0.01\cdot b_0/t_0) = 0.35$!!
brace 1: $b_1/b_0 = 0.233 < 1$ ok
brace 1: $b_1/t_1 = 23.333 < 35$ ok
brace 1: section class $1 < 2$ ok
brace 1: $0.5 < h_1/b_1 = 1.000 < 2$ ok
brace 2: $b_2/b_0 = 0.233 < \max(0.35, 0.1+0.01\cdot b_0/t_0) = 0.35$!!
brace 2: $b_2/b_0 = 0.233 < 1$ ok
brace 2: $b_2/t_2 = 23.333 < 35$ ok
brace 2: $0.5 < h_2/b_2 = 1.000 < 2$ ok
range of validity not ensured !!
resistance (table 7.12, K/N joint)
coefficient $\gamma = b_0/(2\cdot t_0) = 12.500$
coefficient $k_n = 1.3 - 0.4\cdot n/\beta = 0.647$ with $n = \sigma_0/(f_{y0}\cdot\gamma_{M5}) = 0.381$, $\sigma_0 = -N_0/A_0+M_0/W_{el,0} = 89.6$ N/mm²
brace 1:
chord face failure
resistance: $N_{1,Rd} = (8.9\cdot k_n\cdot f_{y0}\cdot t_0^2\cdot\gamma^{1/2})/\sin(\Theta_1)\cdot\beta / \gamma_{M5} = 198.72$ kN
utilisation: $U_1 = N_{1,Ed}/N_{1,Rd} = 0.764 < 1$ ok
brace failure
parameters $b_{eff} = 10/(b_0/t_0)\cdot(f_{y0}\cdot t_0)/(f_{y1}\cdot t_1)\cdot b_1 = 112.00$ mm $> b_1 \Rightarrow b_{eff} = b_1 = 70.0$ mm
resistance: $N_{1,Rd} = (f_{y1}\cdot t_1)\cdot(2\cdot h_1-4\cdot t_1+ b_1+b_{eff}) / \gamma_{M5} = 188.94$ kN
utilisation: $U_1 = N_{1,Ed}/N_{1,Rd} = 0.804 < 1$ ok
punching shear failure
parameters $b_{e,p} = 10/(b_0/t_0)\cdot b_1 = 28.00$ mm
resistance: $N_{1,Rd} = (f_{y0}\cdot t_0)/(3^{1/2}\cdot\sin(\Theta_1))\cdot(2\cdot h_1/\sin(\Theta_1)+b_1+b_{e,p}) / \gamma_{M5} = 546.05$ kN
utilisation: $U_1 = N_{1,Ed}/N_{1,Rd} = 0.278 < 1$ ok
without chord plate $\Rightarrow$ table 7.12 with $t_0 = 10.0$ mm
range of validity (table 7.8, K/N joint)
chord: $h_0/b_0 = 0.333 < 0.5$!!
chord: $h_0/b_0 = 0.333 < 2.0$ ok
chord: $b_0/t_0 = 30.000 < 35$ ok
chord: $h_0/t_0 = 10.000 < 35$ ok
chord: section class $1 < 2$ ok
chord: $g/b_0 = 0.092 < 0.5\cdot(1-\beta) = 0.383$!!
chord: $g/b_0 = 0.092 < 1.5\cdot(1-\beta) = 1.150$ ok
brace 1: $b_1/b_0 = 0.233 < \max(0.35, 0.1+0.01\cdot b_0/t_0) = 0.40$!!
brace 1: $b_1/b_0 = 0.233 < 1$ ok
brace 1: $b_1/t_1 = 23.333 < 35$ ok
brace 1: section class $1 < 2$ ok
brace 1: $0.5 < h_1/b_1 = 1.000 < 2$ ok
brace 2: $b_2/b_0 = 0.233 < \max(0.35, 0.1+0.01\cdot b_0/t_0) = 0.40$!!
brace 2: $b_2/b_0 = 0.233 < 1$ ok
brace 2: $b_2/t_2 = 23.333 < 35$ ok
brace 2: $0.5 < h_2/b_2 = 1.000 < 2$ ok
range of validity not ensured !!
resistance (table 7.12, K/N joint)
coefficient $\gamma = b_0/(2\cdot t_0) = 15.000$
coefficient $k_n = 1.3 - 0.4\cdot n/\beta = 0.647$ with $n = \sigma_0/(f_{y0}\cdot\gamma_{M5}) = 0.381$, $\sigma_0 = -N_0/A_0+M_0/W_{el,0} = 89.6$ N/mm²
chord:
shear failure of chord
shear area $A_v = (2\cdot h_0+\alpha\cdot b_0)\cdot t_0 = 2902.0$ mm², $\alpha = [1/(1+(4\cdot g^2)/(3\cdot t_0^2)]^{1/2} = 0.301$
shear force $V_{Ed} = (N_i\cdot\sin(\Theta_i))_{max} = 126.6$ kN
plastic shear resistance $V_{pl,Rd} = A_v\cdot(f_{y0}/(3^{1/2}\cdot\gamma_{M5}) = 393.7$ kN
resistance: $N_{0,Rd} = [(A_0-A_v)\cdot f_{y0}+A_v\cdot f_{y0}\cdot(1-(V_{Ed}/V_{pl,Rd})^2)^{1/2}] / \gamma_{M5} = 1689.29$ kN
utilisation: $U_0 = N_{0,Ed}/N_{0,Rd} = 0.355 < 1$ ok
brace 1:
shear failure of chord
shear area $A_v = (2\cdot h_0+\alpha\cdot b_0)\cdot t_0 = 2902.0$ mm², $\alpha = [1/(1+(4\cdot g^2)/(3\cdot t_0^2)]^{1/2} = 0.301$
resistance: $N_{1,Rd} = (f_{y0}\cdot A_v)/(3^{1/2}\cdot\sin(\Theta_1)) / \gamma_{M5} = 487.00$ kN
utilisation: $U_1 = N_{1,Ed}/N_{1,Rd} = 0.312 < 1$ ok

brace 2:
chord plate:
min $l_p = 1.5\cdot(h_2/\sin(\Theta_2)+h_1/\sin(\Theta_1)+g) = 300.9$ mm, min $b_p = b_0-2\cdot t_0 = 280.0$ mm, min $t_p = \max(t_0,2\cdot t_2) = 10.0$ mm
$l_p = 305.0$ mm $>$ min $l_p = 300.9$ mm

b_p = 280.0 mm ≥ min b_p = 280.0 mm
t_p = 12.0 mm > min t_p = 10.0 mm
chord plate ⇒ table 7.12 with $t_0 = t_p$ = 12.0 mm
range of validity (table 7.8, K/N joint)
chord: h_0/b_0 = 0.333 < 0.5 !!
chord: h_0/b_0 = 0.333 < 2.0 ok
chord: b_0/t_0 = 25.000 < 35 ok
chord: h_0/t_0 = 8.333 < 35 ok
chord: section class 1 < 2 ok
chord: g/b_0 = 0.092 < 0.5·(1-β) = 0.383 !!
chord: g/b_0 = 0.092 < 1.5·(1-β) = 1.150 ok
brace 1: b_1/b_0 = 0.233 < max(0.35, 0.1+0.01·b_0/t_0) = 0.35 !!
brace 1: b_1/b_0 = 0.233 < 1 ok
brace 1: b_1/t_1 = 23.333 < 35 ok
brace 1: section class 1 < 2 ok
brace 1: 0.5 < h_1/b_1 = 1.000 < 2 ok
brace 2: b_2/b_0 = 0.233 < max(0.35, 0.1+0.01·b_0/t_0) = 0.35 !!
brace 2: b_2/b_0 = 0.233 < 1 ok
brace 2: b_2/t_2 = 23.333 < 35 ok
brace 2: 0.5 < h_2/b_2 = 1.000 < 2 ok
range of validity not ensured !!
resistance (table 7.12, K/N joint)
coefficient $\gamma = b_0/(2 \cdot t_0)$ = 12.500
coefficient k_n = 1.3 - 0.4·n/β = 0.647 with $n = \sigma_0/(f_{y0} \cdot \gamma_{M5})$ = 0.381, $\sigma_0 = -N_0/A_0+M_0/W_{el,0}$ = 89.6 N/mm²
brace 2:
chord face failure
resistance: $N_{2,Rd} = (8.9 \cdot k_n \cdot f_{y0} \cdot t_0^2 \cdot \gamma^{1/2})/\sin(\Theta_2) \cdot \beta / \gamma_{M5}$ = 198.72 kN
utilisation: $U_2 = N_{2,Ed}/N_{2,Rd}$ = 0.788 < 1 ok
brace failure
parameters $b_{eff} = 10/(b_0/t_0) \cdot (f_{y0} \cdot t_0)/(f_{y2} \cdot t_2) \cdot b_2$ = 112.00 mm > b_2 ⇒ $b_{eff} = b_2$ = 70.0 mm
resistance: $N_{2,Rd} = (f_{y2} \cdot t_2) \cdot (2 \cdot h_2 - 4 \cdot t_2 + b_2 + b_{eff}) / \gamma_{M5}$ = 188.94 kN
utilisation: $U_2 = N_{2,Ed}/N_{2,Rd}$ = 0.829 < 1 ok
punching shear failure
parameters $b_{e,p} = 10/(b_0/t_0) \cdot b_2$ = 28.00 mm
resistance: $N_{2,Rd} = (f_{y0} \cdot t_0)/(3^{1/2} \cdot \sin(\Theta_2)) \cdot (2 \cdot h_2/\sin(\Theta_2) + b_2 + b_{e,p}) / \gamma_{M5}$ = 546.05 kN
utilisation: $U_2 = N_{2,Ed}/N_{2,Rd}$ = 0.287 < 1 ok
without chord plate ⇒ table 7.12 with t_0 = 10.0 mm
range of validity (table 7.8, K/N joint)
chord: h_0/b_0 = 0.333 < 0.5 !!
chord: h_0/b_0 = 0.333 < 2.0 ok
chord: b_0/t_0 = 30.000 < 35 ok
chord: h_0/t_0 = 10.000 < 35 ok
chord: section class 1 < 2 ok
chord: g/b_0 = 0.092 < 0.5·(1-β) = 0.383 !!
chord: g/b_0 = 0.092 < 1.5·(1-β) = 1.150 ok
brace 1: b_1/b_0 = 0.233 < max(0.35, 0.1+0.01·b_0/t_0) = 0.40 !!
brace 1: b_1/b_0 = 0.233 < 1 ok
brace 1: b_1/t_1 = 23.333 < 35 ok
brace 1: section class 1 < 2 ok
brace 1: 0.5 < h_1/b_1 = 1.000 < 2 ok
brace 2: b_2/b_0 = 0.233 < max(0.35, 0.1+0.01·b_0/t_0) = 0.40 !!
brace 2: b_2/b_0 = 0.233 < 1 ok
brace 2: b_2/t_2 = 23.333 < 35 ok
brace 2: 0.5 < h_2/b_2 = 1.000 < 2 ok
range of validity not ensured !!
resistance (table 7.12, K/N joint)
coefficient $\gamma = b_0/(2 \cdot t_0)$ = 15.000
coefficient k_n = 1.3 - 0.4·n/β = 0.647 with $n = \sigma_0/(f_{y0} \cdot \gamma_{M5})$ = 0.381, $\sigma_0 = -N_0/A_0+M_0/W_{el,0}$ = 89.6 N/mm²
chord:
shear failure of chord
shear area $A_v = (2 \cdot h_0 + \alpha \cdot b_0) \cdot t_0$ = 2902.0 mm², $\alpha = [1/(1+(4 \cdot g^2)/(3 \cdot t_0^2))]^{1/2}$ = 0.301
shear force $V_{Ed} = (N_i \cdot \sin(\Theta_i))_{max}$ = 126.6 kN
plastic shear resistance $V_{pl,Rd} = A_v \cdot (f_{y0}/(3^{1/2} \cdot \gamma_{M5})$ = 393.7 kN
resistance: $N_{0,Rd} = [(A_0-A_v) \cdot f_{y0} + A_v \cdot f_{y0} \cdot (1-(V_{Ed}/V_{pl,Rd})^2)^{1/2}] / \gamma_{M5}$ = 1689.29 kN
utilisation: $U_0 = N_{0,Ed}/N_{0,Rd}$ = 0.355 < 1 ok
brace 2:
shear failure of chord
shear area $A_v = (2 \cdot h_0 + \alpha \cdot b_0) \cdot t_0$ = 2902.0 mm², $\alpha = [1/(1+(4 \cdot g^2)/(3 \cdot t_0^2))]^{1/2}$ = 0.301
resistance: $N_{2,Rd} = (f_{y0} \cdot A_v)/(3^{1/2} \cdot \sin(\Theta_2)) / \gamma_{M5}$ = 487.00 kN
utilisation: $U_2 = N_{2,Ed}/N_{2,Rd}$ = 0.321 < 1 ok

total: U_{Lk3} = 0.829 < 1 ok

5. final result

maximum utilisation [Lk 1]: resistance max U = 0.829 < 1 ok

verification succeeded

range of validity of table not enclosed !!