

2: NEBGEN 15.3 S.225

1. Eingabedaten

1.1. Allgemeine Angaben

Nutzungsklasse 1, Ursprung des Koordinatensystems im Schnittpunkt der Stäbe

1.2. Knotenblech

Innen liegendes Stahlblech S235 (St37), Dicke $t=15.0$ mm, Form: Kontur
Koordinaten des Konturblechs

| Nr | x _k mm | y _k mm | Nr | x _k mm | y _k mm | Nr | x _k mm | y _k mm | Nr | x _k mm | y _k mm |
|----|----------------------|----------------------|----|----------------------|----------------------|----|----------------------|----------------------|----|----------------------|----------------------|
| 1 | 40.7 | 158.0 | 5 | 128.0 | -78.0 | 9 | -351.7 | 122.7 | 13 | 40.7 | 158.0 |
| 2 | 241.7 | 373.5 | 6 | 0.0 | -78.0 | 10 | -296.9 | 225.0 | | | |
| 3 | 355.8 | 267.1 | 7 | -128.0 | -78.0 | 11 | -58.0 | 96.9 | | | |
| 4 | 128.0 | 22.9 | 8 | -128.0 | 2.8 | 12 | -58.0 | 158.0 | | | |

1.3. Angeschlossene Stäbe

| Nr. | Stab | Material | b mm | t mm | α ° |
|-----|------------------|-------------------------------|---------|---------|---------------|
| 1 | Gurt durchgehend | Brettschichtholz DIN, GL24h (| 160 | 160 | 0 |
| 2 | Stiel | Brettschichtholz DIN, GL24h (| 120 | 120 | 90 |
| 3 | Diagonale links | Brettschichtholz DIN, GL24h (| 120 | 120 | 28 |
| 4 | Diagonale rechts | Brettschichtholz DIN, GL24h (| 160 | 160 | 47 |

1.4. Verbindungsmittel

1.4.1. Gurt

Stabdübel 16 mm, S235 (1052)

$F_{v,Rd}$ wird mit dem vereinfachten Nachweis nach NA.8.2.4 berechnet

6 Verbindungsmittel, $a_1 = 80$ mm, $a_2 = 50$ mm

Schwerpunkt der Verbindungsmittel vom Knotenpunkt S bei $x_s = 0$ mm, $y_s = 0$ mm

Polares Trägheitsmoment $I_p = 29350$ mm⁴

Koordinaten der Verbindungsmittel

| Nr | x _k mm | y _k mm | Nr | x _k mm | y _k mm |
|----|----------------------|----------------------|----|----------------------|----------------------|
| 1 | -80.0 | 25.0 | 4 | 0.0 | -25.0 |
| 2 | -80.0 | -25.0 | 5 | 80.0 | 25.0 |
| 3 | 0.0 | 25.0 | 6 | 80.0 | -25.0 |

1.4.2. Stiel

Stabdübel 12 mm, S235 (1052)

$F_{v,Rd}$ wird mit dem vereinfachten Nachweis nach NA.8.2.4 berechnet

2 Verbindungsmittel, $a_1 = 60$ mm, $a_2 = 40$ mm

Schwerpunkt der Verbindungsmittel vom Knotenpunkt S bei $x_s = 0$ mm, $y_s = 118$ mm

Polares Trägheitsmoment $I_p = 800$ mm⁴

Koordinaten der Verbindungsmittel

| Nr | x _k mm | y _k mm |
|----|----------------------|----------------------|
| 1 | 20.0 | 118.0 |
| 2 | -20.0 | 118.0 |

1.4.3. Diagonale links

Stabdübel 12 mm, S235 (1052)

$F_{v,Rd}$ wird mit dem vereinfachten Nachweis nach NA.8.2.4 berechnet

5 Verbindungsmittel, $a_1 = 60$ mm, $a_2 = 39$ mm

Schwerpunkt der Verbindungsmittel vom Knotenpunkt S bei $x_s = -244$ mm, $y_s = 135$ mm

Polares Trägheitsmoment $I_p = 11844$ mm⁴

Koordinaten der Verbindungsmittel

| Nr | x _k mm | y _k mm | Nr | x _k mm | y _k mm |
|----|----------------------|----------------------|----|----------------------|----------------------|
| 1 | -173.0 | 115.0 | 4 | -279.0 | 171.0 |
| 2 | -226.0 | 143.0 | 5 | -297.0 | 138.0 |
| 3 | -244.0 | 109.0 | | | |

1.4.4. Diagonale rechts

Stabdübel 12 mm, S235 (1052)

$F_{V,Rd}$ wird mit dem vereinfachten Nachweis nach NA.8.2.4 berechnet

8 Verbindungsmittel, $a_1 = 60$ mm, $a_2 = 40$ mm

Schwerpunkt der Verbindungsmittel vom Knotenpunkt S bei $x_s = 207$ mm, $y_s = 222$ mm

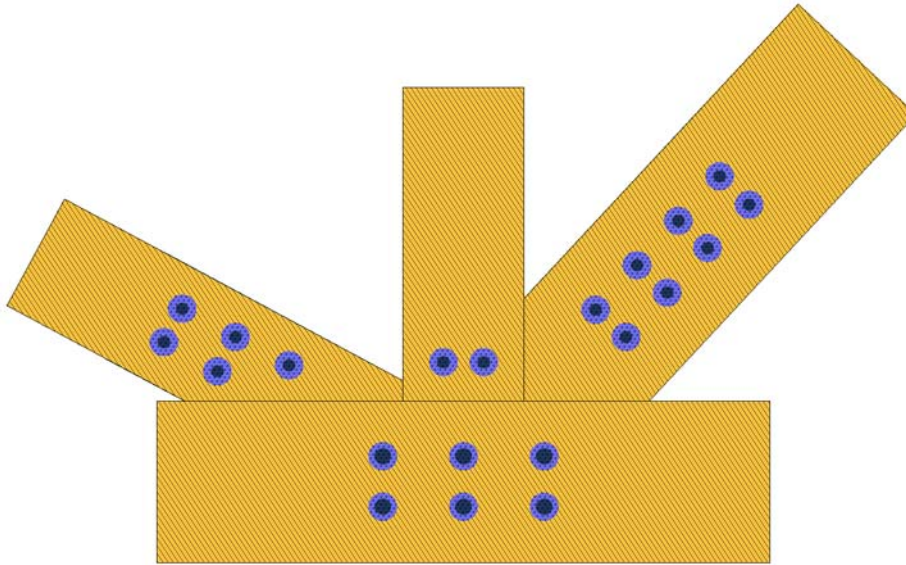
Polares Trägheitsmoment $I_p = 39101$ mm⁴

Koordinaten der Verbindungsmittel

| Nr | x_k mm | y_k mm | Nr | x_k mm | y_k mm |
|----|-------------|-------------|----|-------------|-------------|
| 1 | 161.0 | 143.0 | 5 | 242.0 | 231.0 |
| 2 | 131.0 | 170.0 | 6 | 213.0 | 258.0 |
| 3 | 202.0 | 187.0 | 7 | 283.0 | 274.0 |
| 4 | 172.0 | 214.0 | 8 | 254.0 | 302.0 |

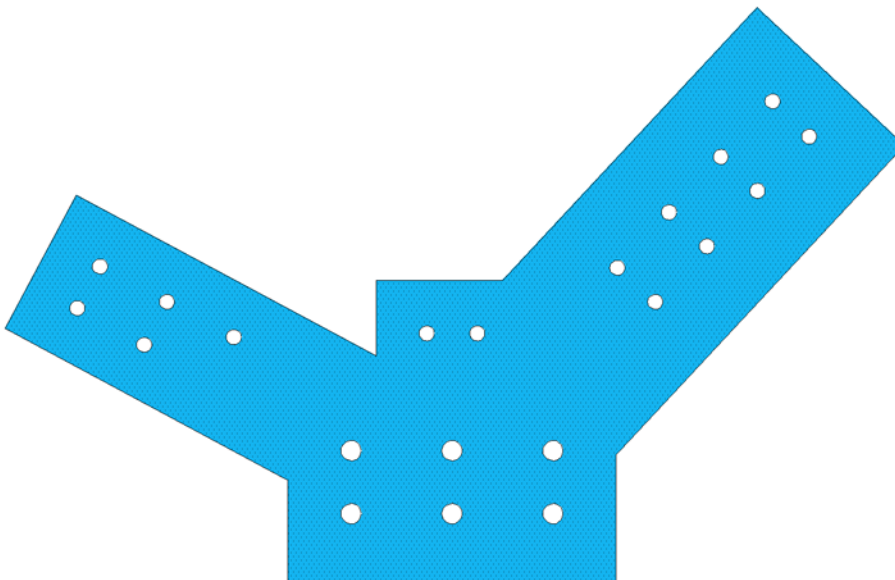
1.5. Knotenpunkt

Ansicht Maßstab 1:75



1.6. Knotenblech

Ansicht Maßstab 1:60



1.7. Lastkombinationen (Bemessungsschnittgrößen)

1.7.1. Lf1, KLED: frei

| Nr | Stab | N _d kN | M _d kNm | V _d kN | k _{mod} - | γ - |
|----|--------------|----------------------|-----------------------|----------------------|-----------------------|--------|
| 1 | Gurt links | 68.61 | -0.01 | -0.15 | 0.600 | 1.30 |
| 2 | Gurt rechts | 46.13 | 0.01 | 0.00 | 0.600 | 1.30 |
| 3 | Stiel | -5.28 | 0.00 | 0.00 | 0.600 | 1.30 |
| 4 | Diag. links | -13.18 | 0.00 | 0.00 | 0.600 | 1.30 |
| 5 | Diag. rechts | 15.93 | 0.00 | 0.00 | 0.600 | 1.30 |
| 6 | ΣH, ΣM, ΣV | -22.48 | 0.00 | 0.15 | --- | --- |

1.7.2. 1.35*Lf1, KLED: frei

| Nr | Stab | N _d kN | M _d kNm | V _d kN | k _{mod} - | γ - |
|----|--------------|----------------------|-----------------------|----------------------|-----------------------|--------|
| 1 | Gurt links | 92.63 | -0.01 | -0.20 | 0.600 | 1.30 |
| 2 | Gurt rechts | 62.28 | 0.01 | 0.00 | 0.600 | 1.30 |
| 3 | Stiel | -7.12 | 0.00 | 0.00 | 0.600 | 1.30 |
| 4 | Diag. links | -17.79 | 0.00 | 0.00 | 0.600 | 1.30 |
| 5 | Diag. rechts | 21.51 | 0.00 | 0.00 | 0.600 | 1.30 |
| 6 | ΣH, ΣM, ΣV | -30.35 | 0.00 | 0.20 | --- | --- |

1.7.3. 1.35*Lf1+1.5*Lf2, KLED: frei

| Nr | Stab | N _d kN | M _d kNm | V _d kN | k _{mod} - | γ - |
|----|--------------|----------------------|-----------------------|----------------------|-----------------------|--------|
| 1 | Gurt links | 244.48 | -0.03 | -0.53 | 0.900 | 1.30 |
| 2 | Gurt rechts | 164.37 | 0.03 | 0.00 | 0.900 | 1.30 |
| 3 | Stiel | -18.80 | 0.00 | 0.00 | 0.900 | 1.30 |
| 4 | Diag. links | -46.95 | 0.00 | 0.00 | 0.900 | 1.30 |
| 5 | Diag. rechts | 56.77 | 0.00 | 0.00 | 0.900 | 1.30 |
| 6 | ΣH, ΣM, ΣV | -80.11 | 0.00 | 0.53 | --- | --- |

1.7.4. Lf1+1.5*Lf2, KLED: frei

| Nr | Stab | N _d kN | M _d kNm | V _d kN | k _{mod} - | γ - |
|----|--------------|----------------------|-----------------------|----------------------|-----------------------|--------|
| 1 | Gurt links | 220.46 | -0.03 | -0.47 | 0.900 | 1.30 |
| 2 | Gurt rechts | 148.22 | 0.03 | 0.00 | 0.900 | 1.30 |
| 3 | Stiel | -16.95 | 0.00 | 0.00 | 0.900 | 1.30 |
| 4 | Diag. links | -42.34 | 0.00 | 0.00 | 0.900 | 1.30 |
| 5 | Diag. rechts | 51.19 | 0.00 | 0.00 | 0.900 | 1.30 |
| 6 | ΣH, ΣM, ΣV | -72.24 | 0.00 | 0.47 | --- | --- |

2. Ergebnisse

2.1. Verbindungsmittel Gurt

2.1.1. Lf1

N_d = 22.482 kN, V_d = -0.148 kN, M_{v,d} = -0.000 + -0.000 x -0.148 + -0.000 x 22.482 = -0.000 KNm

Kräfte pro Verbindungsmittelpunkt (f_{red} = t_{vorn} / t_{req})

| Nr | F _{M1} kN | F _{MH1} kN | F _{MV1} kN | F _{t0tH1} kN | F _{t0tV1} kN | F _{t0t1} kN | α _{t0t1} ° | f _{h,α,k} N/mm ² | f _{red} - | F _{v,Rd} kN | U _{n,ef} - | U _{F,v} - |
|----|-----------------------|------------------------|------------------------|--------------------------|--------------------------|-------------------------|------------------------|---|-----------------------|-------------------------|------------------------|-----------------------|
| 1 | -0.00 | -0.00 | 0.00 | 3.75 | -0.02 | 3.75 | -0.4 | 26.17 | 0.844 | 14.4007 | 0.37 | 0.26 |
| 2 | -0.00 | 0.00 | 0.00 | 3.75 | -0.02 | 3.75 | -0.4 | 26.17 | 0.844 | 14.4007 | 0.37 | 0.26 |
| 3 | -0.00 | -0.00 | -0.00 | 3.75 | -0.02 | 3.75 | -0.4 | 26.17 | 0.844 | 14.4007 | 0.37 | 0.26 |
| 4 | -0.00 | 0.00 | -0.00 | 3.75 | -0.02 | 3.75 | -0.4 | 26.17 | 0.844 | 14.4007 | 0.37 | 0.26 |
| 5 | -0.00 | -0.00 | -0.00 | 3.75 | -0.02 | 3.75 | -0.4 | 26.17 | 0.844 | 14.4007 | 0.37 | 0.26 |
| 6 | -0.00 | 0.00 | -0.00 | 3.75 | -0.02 | 3.75 | -0.4 | 26.17 | 0.844 | 14.4007 | 0.37 | 0.26 |

Maximale Ausnutzung der Verbindungsmittel U_{max} = 0.37 ≤ 1 ⇒ **Nachweis erfüllt**

2.1.2. 1.35*Lf1

N_d = 30.351 kN, V_d = -0.199 kN, M_{v,d} = -0.000 + -0.000 x -0.199 + -0.000 x 30.351 = -0.000 KNm

Kräfte pro Verbindungsmittelpunkt (f_{red} = t_{vorn} / t_{req})

| Nr | F _{M1} kN | F _{MH1} kN | F _{MV1} kN | F _{t0tH1} kN | F _{t0tV1} kN | F _{t0t1} kN | α _{t0t1} ° | f _{h,α,k} N/mm ² | f _{red} - | F _{v,Rd} kN | U _{n,ef} - | U _{F,v} - |
|----|-----------------------|------------------------|------------------------|--------------------------|--------------------------|-------------------------|------------------------|---|-----------------------|-------------------------|------------------------|-----------------------|
| 1 | -0.00 | -0.00 | 0.00 | 5.06 | -0.03 | 5.06 | -0.4 | 26.17 | 0.844 | 14.4007 | 0.50 | 0.35 |
| 2 | -0.00 | 0.00 | 0.00 | 5.06 | -0.03 | 5.06 | -0.4 | 26.17 | 0.844 | 14.4007 | 0.50 | 0.35 |
| 3 | -0.00 | -0.00 | -0.00 | 5.06 | -0.03 | 5.06 | -0.4 | 26.17 | 0.844 | 14.4007 | 0.50 | 0.35 |
| 4 | -0.00 | 0.00 | -0.00 | 5.06 | -0.03 | 5.06 | -0.4 | 26.17 | 0.844 | 14.4007 | 0.50 | 0.35 |
| 5 | -0.00 | -0.00 | -0.00 | 5.06 | -0.03 | 5.06 | -0.4 | 26.17 | 0.844 | 14.4007 | 0.50 | 0.35 |
| 6 | -0.00 | 0.00 | -0.00 | 5.06 | -0.03 | 5.06 | -0.4 | 26.17 | 0.844 | 14.4007 | 0.50 | 0.35 |

Maximale Ausnutzung der Verbindungsmittel U_{max} = 0.50 ≤ 1 ⇒ **Nachweis erfüllt**

2.1.3. 1.35*Lf1+1.5*Lf2

$$N_d = 80.106 \text{ kN}, V_d = -0.526 \text{ kN}, M_{v,d} = -0.000 + -0.000 \times -0.526 + -0.000 \times 80.106 = -0.000 \text{ KNm}$$

Kräfte pro Verbindungsmittelpunkt ($f_{red} = t_{vorh} / t_{req}$)

| Nr | F _{M1} kN | F _{MH1} kN | F _{MV1} kN | F _{totH1} kN | F _{totV1} kN | F _{tot1} kN | α _{tot1} ° | f _{h,α,k} N/mm ² | f _{red} - | F _{v,Rd} kN | U _{n,ef} - | U _{F,v} - |
|----|-----------------------|------------------------|------------------------|--------------------------|--------------------------|-------------------------|------------------------|---|-----------------------|-------------------------|------------------------|-----------------------|
| 1 | -0.00 | -0.00 | 0.00 | 13.35 | -0.09 | 13.35 | -0.4 | 26.17 | 0.844 | 21.6011 | 0.87 | 0.62 |
| 2 | -0.00 | 0.00 | 0.00 | 13.35 | -0.09 | 13.35 | -0.4 | 26.17 | 0.844 | 21.6011 | 0.87 | 0.62 |
| 3 | -0.00 | -0.00 | -0.00 | 13.35 | -0.09 | 13.35 | -0.4 | 26.17 | 0.844 | 21.6011 | 0.87 | 0.62 |
| 4 | -0.00 | 0.00 | -0.00 | 13.35 | -0.09 | 13.35 | -0.4 | 26.17 | 0.844 | 21.6011 | 0.87 | 0.62 |
| 5 | -0.00 | -0.00 | -0.00 | 13.35 | -0.09 | 13.35 | -0.4 | 26.17 | 0.844 | 21.6011 | 0.87 | 0.62 |
| 6 | -0.00 | 0.00 | -0.00 | 13.35 | -0.09 | 13.35 | -0.4 | 26.17 | 0.844 | 21.6011 | 0.87 | 0.62 |

Maximale Ausnutzung der Verbindungsmittel $U_{max} = 0.87 \leq 1 \Rightarrow$ **Nachweis erfüllt**

2.1.4. Lf1+1.5*Lf2

$$N_d = 72.237 \text{ kN}, V_d = -0.474 \text{ kN}, M_{v,d} = -0.000 + -0.000 \times -0.474 + -0.000 \times 72.237 = -0.000 \text{ KNm}$$

Kräfte pro Verbindungsmittelpunkt ($f_{red} = t_{vorh} / t_{req}$)

| Nr | F _{M1} kN | F _{MH1} kN | F _{MV1} kN | F _{totH1} kN | F _{totV1} kN | F _{tot1} kN | α _{tot1} ° | f _{h,α,k} N/mm ² | f _{red} - | F _{v,Rd} kN | U _{n,ef} - | U _{F,v} - |
|----|-----------------------|------------------------|------------------------|--------------------------|--------------------------|-------------------------|------------------------|---|-----------------------|-------------------------|------------------------|-----------------------|
| 1 | -0.00 | -0.00 | 0.00 | 12.04 | -0.08 | 12.04 | -0.4 | 26.17 | 0.844 | 21.6011 | 0.79 | 0.56 |
| 2 | -0.00 | 0.00 | 0.00 | 12.04 | -0.08 | 12.04 | -0.4 | 26.17 | 0.844 | 21.6011 | 0.79 | 0.56 |
| 3 | -0.00 | -0.00 | -0.00 | 12.04 | -0.08 | 12.04 | -0.4 | 26.17 | 0.844 | 21.6011 | 0.79 | 0.56 |
| 4 | -0.00 | 0.00 | -0.00 | 12.04 | -0.08 | 12.04 | -0.4 | 26.17 | 0.844 | 21.6011 | 0.79 | 0.56 |
| 5 | -0.00 | -0.00 | -0.00 | 12.04 | -0.08 | 12.04 | -0.4 | 26.17 | 0.844 | 21.6011 | 0.79 | 0.56 |
| 6 | -0.00 | 0.00 | -0.00 | 12.04 | -0.08 | 12.04 | -0.4 | 26.17 | 0.844 | 21.6011 | 0.79 | 0.56 |

Maximale Ausnutzung der Verbindungsmittel $U_{max} = 0.79 \leq 1 \Rightarrow$ **Nachweis erfüllt**

2.2. Verbindungsmittel Stiel

2.2.1. Lf1

$$N_d = -5.277 \text{ kN}, V_d = 0.000 \text{ kN}, M_{v,d} = 0.000 + -0.118 \times 0.000 + 0.000 \times -5.277 = -0.000 \text{ KNm}$$

Kräfte pro Verbindungsmittelpunkt ($f_{red} = t_{vorh} / t_{req}$)

| Nr | F _{M1} kN | F _{MH1} kN | F _{MV1} kN | F _{totH1} kN | F _{totV1} kN | F _{tot1} kN | α _{tot1} ° | f _{h,α,k} N/mm ² | f _{red} - | F _{v,Rd} kN | U _{n,ef} - | U _{F,v} - |
|----|-----------------------|------------------------|------------------------|--------------------------|--------------------------|-------------------------|------------------------|---|-----------------------|-------------------------|------------------------|-----------------------|
| 1 | -0.00 | -0.00 | -0.00 | -2.64 | -0.00 | 2.64 | -180.0 | 27.42 | 0.788 | 8.1937 | 0.32 | 0.32 |
| 2 | -0.00 | -0.00 | 0.00 | -2.64 | 0.00 | 2.64 | 180.0 | 27.42 | 0.788 | 8.1937 | 0.32 | 0.32 |

Maximale Ausnutzung der Verbindungsmittel $U_{max} = 0.32 \leq 1 \Rightarrow$ **Nachweis erfüllt**

2.2.2. 1.35*Lf1

$$N_d = -7.124 \text{ kN}, V_d = 0.000 \text{ kN}, M_{v,d} = 0.000 + -0.118 \times 0.000 + 0.000 \times -7.124 = -0.000 \text{ KNm}$$

Kräfte pro Verbindungsmittelpunkt ($f_{red} = t_{vorh} / t_{req}$)

| Nr | F _{M1} kN | F _{MH1} kN | F _{MV1} kN | F _{totH1} kN | F _{totV1} kN | F _{tot1} kN | α _{tot1} ° | f _{h,α,k} N/mm ² | f _{red} - | F _{v,Rd} kN | U _{n,ef} - | U _{F,v} - |
|----|-----------------------|------------------------|------------------------|--------------------------|--------------------------|-------------------------|------------------------|---|-----------------------|-------------------------|------------------------|-----------------------|
| 1 | -0.00 | -0.00 | -0.00 | -3.56 | -0.00 | 3.56 | -180.0 | 27.42 | 0.788 | 8.1937 | 0.43 | 0.43 |
| 2 | -0.00 | -0.00 | 0.00 | -3.56 | 0.00 | 3.56 | 180.0 | 27.42 | 0.788 | 8.1937 | 0.43 | 0.43 |

Maximale Ausnutzung der Verbindungsmittel $U_{max} = 0.43 \leq 1 \Rightarrow$ **Nachweis erfüllt**

2.2.3. 1.35*Lf1+1.5*Lf2

$$N_d = -18.802 \text{ kN}, V_d = 0.000 \text{ kN}, M_{v,d} = 0.000 + -0.118 \times 0.000 + 0.000 \times -18.802 = -0.000 \text{ KNm}$$

Kräfte pro Verbindungsmittelpunkt ($f_{red} = t_{vorh} / t_{req}$)

| Nr | F _{M1} kN | F _{MH1} kN | F _{MV1} kN | F _{totH1} kN | F _{totV1} kN | F _{tot1} kN | α _{tot1} ° | f _{h,α,k} N/mm ² | f _{red} - | F _{v,Rd} kN | U _{n,ef} - | U _{F,v} - |
|----|-----------------------|------------------------|------------------------|--------------------------|--------------------------|-------------------------|------------------------|---|-----------------------|-------------------------|------------------------|-----------------------|
| 1 | -0.00 | -0.00 | -0.00 | -9.40 | -0.00 | 9.40 | -180.0 | 27.42 | 0.788 | 12.2906 | 0.76 | 0.76 |
| 2 | -0.00 | -0.00 | 0.00 | -9.40 | 0.00 | 9.40 | 180.0 | 27.42 | 0.788 | 12.2906 | 0.76 | 0.76 |

Maximale Ausnutzung der Verbindungsmittel $U_{max} = 0.76 \leq 1 \Rightarrow$ **Nachweis erfüllt**

2.2.4. Lf1+1.5*Lf2

$$N_d = -16.955 \text{ kN}, V_d = 0.000 \text{ kN}, M_{v,d} = 0.000 + -0.118 \times 0.000 + 0.000 \times -16.955 = -0.000 \text{ KNm}$$

Kräfte pro Verbindungsmittelpunkt ($f_{red} = t_{vorh} / t_{req}$)

| Nr | F _{M1} kN | F _{MH1} kN | F _{MV1} kN | F _{totH1} kN | F _{totV1} kN | F _{tot1} kN | α _{tot1} ° | f _{h,α,k} N/mm ² | f _{red} - | F _{v,Rd} kN | U _{n,ef} - | U _{F,v} - |
|----|-----------------------|------------------------|------------------------|--------------------------|--------------------------|-------------------------|------------------------|---|-----------------------|-------------------------|------------------------|-----------------------|
| 1 | -0.00 | -0.00 | -0.00 | -8.48 | -0.00 | 8.48 | -180.0 | 27.42 | 0.788 | 12.2906 | 0.69 | 0.69 |
| 2 | -0.00 | -0.00 | 0.00 | -8.48 | 0.00 | 8.48 | 180.0 | 27.42 | 0.788 | 12.2906 | 0.69 | 0.69 |

Maximale Ausnutzung der Verbindungsmittel $U_{max} = 0.69 \leq 1 \Rightarrow$ **Nachweis erfüllt**

2.3. Verbindungsmittel Diagonale links

2.3.1. Lf1

$N_d = -13.178 \text{ kN}$, $V_d = 0.000 \text{ kN}$, $M_{v,d} = 0.000 + -0.279 \times 0.000 + 0.004 \times -13.178 = -0.053 \text{ kNm}$

Kräfte pro Verbindungsmittelpunkt ($f_{red} = t_{vorh} / t_{req}$)

| Nr | F_{Mi} kN | F_{MHi} kN | F_{MV_i} kN | F_{tothi} kN | F_{totVi} kN | F_{toti} kN | α_{toti} ° | $f_{h,\alpha,k}$ N/mm ² | f_{red} - | $F_{v,Rd}$ kN | $U_{n,ef}$ - | $U_{F,v}$ - |
|----|----------------|-----------------|------------------|-------------------|-------------------|------------------|----------------------|---------------------------------------|----------------|------------------|-----------------|----------------|
| 1 | -0.33 | 0.09 | -0.31 | -2.55 | -0.31 | 2.57 | -173.0 | 27.20 | 0.785 | 8.1291 | 0.25 | 0.32 |
| 2 | -0.09 | -0.03 | -0.08 | -2.67 | -0.08 | 2.67 | -178.3 | 27.41 | 0.788 | 8.1899 | 0.25 | 0.33 |
| 3 | -0.12 | 0.12 | 0.00 | -2.52 | 0.00 | 2.52 | 180.0 | 27.42 | 0.788 | 8.1937 | 0.24 | 0.31 |
| 4 | -0.22 | -0.16 | 0.16 | -2.79 | 0.16 | 2.80 | 176.8 | 27.38 | 0.787 | 8.1802 | 0.27 | 0.34 |
| 5 | -0.24 | -0.01 | 0.24 | -2.65 | 0.24 | 2.66 | 174.9 | 27.31 | 0.786 | 8.1596 | 0.25 | 0.33 |

Maximale Ausnutzung der Verbindungsmittel $U_{max} = 0.34 \leq 1 \Rightarrow$ **Nachweis erfüllt**

2.3.2. 1.35*Lf1

$N_d = -17.790 \text{ kN}$, $V_d = 0.000 \text{ kN}$, $M_{v,d} = 0.000 + -0.279 \times 0.000 + 0.004 \times -17.790 = -0.071 \text{ kNm}$

Kräfte pro Verbindungsmittelpunkt ($f_{red} = t_{vorh} / t_{req}$)

| Nr | F_{Mi} kN | F_{MHi} kN | F_{MV_i} kN | F_{tothi} kN | F_{totVi} kN | F_{toti} kN | α_{toti} ° | $f_{h,\alpha,k}$ N/mm ² | f_{red} - | $F_{v,Rd}$ kN | $U_{n,ef}$ - | $U_{F,v}$ - |
|----|----------------|-----------------|------------------|-------------------|-------------------|------------------|----------------------|---------------------------------------|----------------|------------------|-----------------|----------------|
| 1 | -0.44 | 0.12 | -0.42 | -3.44 | -0.42 | 3.46 | -173.0 | 27.20 | 0.785 | 8.1291 | 0.33 | 0.43 |
| 2 | -0.12 | -0.05 | -0.11 | -3.60 | -0.11 | 3.61 | -178.3 | 27.41 | 0.788 | 8.1899 | 0.34 | 0.44 |
| 3 | -0.16 | 0.16 | 0.00 | -3.40 | 0.00 | 3.40 | 180.0 | 27.42 | 0.788 | 8.1937 | 0.32 | 0.42 |
| 4 | -0.30 | -0.21 | 0.21 | -3.77 | 0.21 | 3.78 | 176.8 | 27.38 | 0.787 | 8.1802 | 0.36 | 0.46 |
| 5 | -0.32 | -0.02 | 0.32 | -3.57 | 0.32 | 3.59 | 174.9 | 27.31 | 0.786 | 8.1596 | 0.34 | 0.44 |

Maximale Ausnutzung der Verbindungsmittel $U_{max} = 0.46 \leq 1 \Rightarrow$ **Nachweis erfüllt**

2.3.3. 1.35*Lf1+1.5*Lf2

$N_d = -46.954 \text{ kN}$, $V_d = 0.000 \text{ kN}$, $M_{v,d} = 0.000 + -0.279 \times 0.000 + 0.004 \times -46.954 = -0.187 \text{ kNm}$

Kräfte pro Verbindungsmittelpunkt ($f_{red} = t_{vorh} / t_{req}$)

| Nr | F_{Mi} kN | F_{MHi} kN | F_{MV_i} kN | F_{tothi} kN | F_{totVi} kN | F_{toti} kN | α_{toti} ° | $f_{h,\alpha,k}$ N/mm ² | f_{red} - | $F_{v,Rd}$ kN | $U_{n,ef}$ - | $U_{F,v}$ - |
|----|----------------|-----------------|------------------|-------------------|-------------------|------------------|----------------------|---------------------------------------|----------------|------------------|-----------------|----------------|
| 1 | -1.16 | 0.32 | -1.12 | -9.07 | -1.12 | 9.14 | -173.0 | 27.20 | 0.785 | 12.1937 | 0.59 | 0.75 |
| 2 | -0.31 | -0.12 | -0.28 | -9.51 | -0.28 | 9.52 | -178.3 | 27.41 | 0.788 | 12.2849 | 0.60 | 0.77 |
| 3 | -0.41 | 0.41 | 0.00 | -8.98 | 0.00 | 8.98 | 180.0 | 27.42 | 0.788 | 12.2906 | 0.56 | 0.73 |
| 4 | -0.79 | -0.57 | 0.56 | -9.96 | 0.56 | 9.97 | 176.8 | 27.38 | 0.787 | 12.2703 | 0.63 | 0.81 |
| 5 | -0.84 | -0.04 | 0.84 | -9.44 | 0.84 | 9.47 | 174.9 | 27.31 | 0.786 | 12.2394 | 0.60 | 0.77 |

Maximale Ausnutzung der Verbindungsmittel $U_{max} = 0.81 \leq 1 \Rightarrow$ **Nachweis erfüllt**

2.3.4. Lf1+1.5*Lf2

$N_d = -42.342 \text{ kN}$, $V_d = 0.000 \text{ kN}$, $M_{v,d} = 0.000 + -0.279 \times 0.000 + 0.004 \times -42.342 = -0.169 \text{ kNm}$

Kräfte pro Verbindungsmittelpunkt ($f_{red} = t_{vorh} / t_{req}$)

| Nr | F_{Mi} kN | F_{MHi} kN | F_{MV_i} kN | F_{tothi} kN | F_{totVi} kN | F_{toti} kN | α_{toti} ° | $f_{h,\alpha,k}$ N/mm ² | f_{red} - | $F_{v,Rd}$ kN | $U_{n,ef}$ - | $U_{F,v}$ - |
|----|----------------|-----------------|------------------|-------------------|-------------------|------------------|----------------------|---------------------------------------|----------------|------------------|-----------------|----------------|
| 1 | -1.05 | 0.29 | -1.01 | -8.18 | -1.01 | 8.24 | -173.0 | 27.20 | 0.785 | 12.1937 | 0.53 | 0.68 |
| 2 | -0.28 | -0.11 | -0.25 | -8.58 | -0.25 | 8.58 | -178.3 | 27.41 | 0.788 | 12.2849 | 0.54 | 0.70 |
| 3 | -0.37 | 0.37 | 0.00 | -8.09 | 0.00 | 8.09 | 180.0 | 27.42 | 0.788 | 12.2906 | 0.51 | 0.66 |
| 4 | -0.72 | -0.51 | 0.50 | -8.98 | 0.50 | 8.99 | 176.8 | 27.38 | 0.787 | 12.2703 | 0.57 | 0.73 |
| 5 | -0.76 | -0.04 | 0.76 | -8.51 | 0.76 | 8.54 | 174.9 | 27.31 | 0.786 | 12.2394 | 0.54 | 0.70 |

Maximale Ausnutzung der Verbindungsmittel $U_{max} = 0.73 \leq 1 \Rightarrow$ **Nachweis erfüllt**

2.4. Verbindungsmittel Diagonale rechts

2.4.1. Lf1

$N_d = 15.932 \text{ kN}$, $V_d = 0.000 \text{ kN}$, $M_{v,d} = 0.000 + -0.304 \times 0.000 + -0.000 \times 15.932 = -0.002 \text{ kNm}$

Kräfte pro Verbindungsmittelpunkt ($f_{red} = t_{vorh} / t_{req}$)

| Nr | F_{Mi} kN | F_{MHi} kN | F_{MV_i} kN | F_{tothi} kN | F_{totVi} kN | F_{toti} kN | α_{toti} ° | $f_{h,\alpha,k}$ N/mm ² | f_{red} - | $F_{v,Rd}$ kN | $U_{n,ef}$ - | $U_{F,v}$ - |
|----|----------------|-----------------|------------------|-------------------|-------------------|------------------|----------------------|---------------------------------------|----------------|------------------|-----------------|----------------|
| 1 | -0.01 | 0.00 | 0.00 | 2.00 | 0.00 | 2.00 | 0.1 | 27.42 | 1.000 | 10.4015 | 0.28 | 0.19 |
| 2 | -0.01 | 0.00 | 0.00 | 1.99 | 0.00 | 1.99 | 0.1 | 27.42 | 1.000 | 10.4015 | 0.28 | 0.19 |
| 3 | -0.00 | 0.00 | 0.00 | 1.99 | 0.00 | 1.99 | 0.0 | 27.42 | 1.000 | 10.4015 | 0.28 | 0.19 |
| 4 | -0.00 | 0.00 | 0.00 | 1.99 | 0.00 | 1.99 | 0.1 | 27.42 | 1.000 | 10.4015 | 0.28 | 0.19 |
| 5 | -0.00 | -0.00 | -0.00 | 1.99 | -0.00 | 1.99 | -0.1 | 27.42 | 1.000 | 10.4015 | 0.28 | 0.19 |
| 6 | -0.00 | -0.00 | -0.00 | 1.99 | -0.00 | 1.99 | -0.0 | 27.42 | 1.000 | 10.4015 | 0.28 | 0.19 |
| 7 | -0.01 | -0.00 | -0.00 | 1.99 | -0.00 | 1.99 | -0.1 | 27.42 | 1.000 | 10.4015 | 0.28 | 0.19 |
| 8 | -0.01 | -0.00 | -0.00 | 1.99 | -0.00 | 1.99 | -0.1 | 27.42 | 1.000 | 10.4015 | 0.28 | 0.19 |

Maximale Ausnutzung der Verbindungsmittel $U_{max} = 0.28 \leq 1 \Rightarrow$ **Nachweis erfüllt**

2.4.2. 1.35*Lf1

$N_d = 21.508 \text{ kN}$, $V_d = 0.000 \text{ kN}$, $M_{v,d} = 0.000 + -0.304 \times 0.000 + -0.000 \times 21.508 = -0.003 \text{ kNm}$

Kräfte pro Verbindungsmittelpunkt ($f_{red} = t_{vorh} / t_{req}$)

| Nr | F _{M1} kN | F _{MH1} kN | F _{MV1} kN | F _{totH1} kN | F _{totV1} kN | F _{tot1} kN | α _{tot1} ° | f _{h,α,k} N/mm ² | f _{red} - | F _{v,Rd} kN | U _{n,ef} - | U _{F,v} - |
|----|-----------------------|------------------------|------------------------|--------------------------|--------------------------|-------------------------|------------------------|---|-----------------------|-------------------------|------------------------|-----------------------|
| 1 | -0.01 | 0.01 | 0.00 | 2.69 | 0.00 | 2.69 | 0.1 | 27.42 | 1.000 | 10.4015 | 0.38 | 0.26 |
| 2 | -0.01 | 0.00 | 0.01 | 2.69 | 0.01 | 2.69 | 0.1 | 27.42 | 1.000 | 10.4015 | 0.38 | 0.26 |
| 3 | -0.00 | 0.00 | 0.00 | 2.69 | 0.00 | 2.69 | 0.0 | 27.42 | 1.000 | 10.4015 | 0.38 | 0.26 |
| 4 | -0.00 | 0.00 | 0.00 | 2.69 | 0.00 | 2.69 | 0.1 | 27.42 | 1.000 | 10.4015 | 0.38 | 0.26 |
| 5 | -0.00 | -0.00 | -0.00 | 2.69 | -0.00 | 2.69 | -0.1 | 27.42 | 1.000 | 10.4015 | 0.38 | 0.26 |
| 6 | -0.00 | -0.00 | -0.00 | 2.69 | -0.00 | 2.69 | -0.0 | 27.42 | 1.000 | 10.4015 | 0.38 | 0.26 |
| 7 | -0.01 | -0.00 | -0.01 | 2.68 | -0.01 | 2.68 | -0.1 | 27.42 | 1.000 | 10.4015 | 0.38 | 0.26 |
| 8 | -0.01 | -0.01 | -0.00 | 2.68 | -0.00 | 2.68 | -0.1 | 27.42 | 1.000 | 10.4015 | 0.38 | 0.26 |

Maximale Ausnutzung der Verbindungsmittel $U_{max} = 0.38 \leq 1 \Rightarrow$ **Nachweis erfüllt**

2.4.3. 1.35*Lf1+1.5*Lf2

$N_d = 56.766 \text{ kN}$, $V_d = 0.000 \text{ kN}$, $M_{v,d} = 0.000 + -0.304 \times 0.000 + -0.000 \times 56.766 = -0.008 \text{ kNm}$

Kräfte pro Verbindungsmittelpunkt ($f_{red} = t_{vorh} / t_{req}$)

| Nr | F _{M1} kN | F _{MH1} kN | F _{MV1} kN | F _{totH1} kN | F _{totV1} kN | F _{tot1} kN | α _{tot1} ° | f _{h,α,k} N/mm ² | f _{red} - | F _{v,Rd} kN | U _{n,ef} - | U _{F,v} - |
|----|-----------------------|------------------------|------------------------|--------------------------|--------------------------|-------------------------|------------------------|---|-----------------------|-------------------------|------------------------|-----------------------|
| 1 | -0.02 | 0.02 | 0.01 | 7.11 | 0.01 | 7.11 | 0.1 | 27.42 | 1.000 | 15.6023 | 0.66 | 0.46 |
| 2 | -0.02 | 0.01 | 0.02 | 7.11 | 0.02 | 7.11 | 0.1 | 27.42 | 1.000 | 15.6023 | 0.66 | 0.46 |
| 3 | -0.01 | 0.01 | 0.00 | 7.10 | 0.00 | 7.10 | 0.0 | 27.42 | 1.000 | 15.6023 | 0.66 | 0.46 |
| 4 | -0.01 | 0.00 | 0.01 | 7.10 | 0.01 | 7.10 | 0.1 | 27.42 | 1.000 | 15.6023 | 0.66 | 0.45 |
| 5 | -0.01 | -0.00 | -0.01 | 7.09 | -0.01 | 7.09 | -0.1 | 27.42 | 1.000 | 15.6023 | 0.66 | 0.45 |
| 6 | -0.01 | -0.01 | -0.00 | 7.09 | -0.00 | 7.09 | -0.0 | 27.42 | 1.000 | 15.6023 | 0.66 | 0.45 |
| 7 | -0.02 | -0.01 | -0.02 | 7.09 | -0.02 | 7.09 | -0.1 | 27.42 | 1.000 | 15.6023 | 0.66 | 0.45 |
| 8 | -0.02 | -0.02 | -0.01 | 7.08 | -0.01 | 7.08 | -0.1 | 27.42 | 1.000 | 15.6023 | 0.66 | 0.45 |

Maximale Ausnutzung der Verbindungsmittel $U_{max} = 0.66 \leq 1 \Rightarrow$ **Nachweis erfüllt**

2.4.4. Lf1+1.5*Lf2

$N_d = 51.190 \text{ kN}$, $V_d = 0.000 \text{ kN}$, $M_{v,d} = 0.000 + -0.304 \times 0.000 + -0.000 \times 51.190 = -0.007 \text{ kNm}$

Kräfte pro Verbindungsmittelpunkt ($f_{red} = t_{vorh} / t_{req}$)

| Nr | F _{M1} kN | F _{MH1} kN | F _{MV1} kN | F _{totH1} kN | F _{totV1} kN | F _{tot1} kN | α _{tot1} ° | f _{h,α,k} N/mm ² | f _{red} - | F _{v,Rd} kN | U _{n,ef} - | U _{F,v} - |
|----|-----------------------|------------------------|------------------------|--------------------------|--------------------------|-------------------------|------------------------|---|-----------------------|-------------------------|------------------------|-----------------------|
| 1 | -0.02 | 0.01 | 0.01 | 6.41 | 0.01 | 6.41 | 0.1 | 27.42 | 1.000 | 15.6023 | 0.60 | 0.41 |
| 2 | -0.02 | 0.01 | 0.01 | 6.41 | 0.01 | 6.41 | 0.1 | 27.42 | 1.000 | 15.6023 | 0.60 | 0.41 |
| 3 | -0.01 | 0.01 | 0.00 | 6.41 | 0.00 | 6.41 | 0.0 | 27.42 | 1.000 | 15.6023 | 0.60 | 0.41 |
| 4 | -0.01 | 0.00 | 0.01 | 6.40 | 0.01 | 6.40 | 0.1 | 27.42 | 1.000 | 15.6023 | 0.60 | 0.41 |
| 5 | -0.01 | -0.00 | -0.01 | 6.40 | -0.01 | 6.40 | -0.1 | 27.42 | 1.000 | 15.6023 | 0.60 | 0.41 |
| 6 | -0.01 | -0.01 | -0.00 | 6.39 | -0.00 | 6.39 | -0.0 | 27.42 | 1.000 | 15.6023 | 0.60 | 0.41 |
| 7 | -0.02 | -0.01 | -0.01 | 6.39 | -0.01 | 6.39 | -0.1 | 27.42 | 1.000 | 15.6023 | 0.60 | 0.41 |
| 8 | -0.02 | -0.01 | -0.01 | 6.38 | -0.01 | 6.38 | -0.1 | 27.42 | 1.000 | 15.6023 | 0.60 | 0.41 |

Maximale Ausnutzung der Verbindungsmittel $U_{max} = 0.60 \leq 1 \Rightarrow$ **Nachweis erfüllt**

2.5. Ergebnisse Stäbe

2.5.1. Gurt links mit $A_n = 20735 \text{ mm}^2$, $W_n = 598667 \text{ mm}^3$, $I_n = 47893343 \text{ mm}^4$, $k_h = 1.100$

| Last | f _{m,d} N/mm ² | f _{t,d} N/mm ² | f _{c,d} N/mm ² | f _{v,d} N/mm ² | N _d kN | M _d kNm | σ _{0,d} N/mm ² | σ _{mo,d} N/mm ² | σ _{mu,d} N/mm ² | V _d kN | τ _d N/mm ² | U _σ - | U _τ - |
|------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|----------------------|-----------------------|---------------------------------------|--|--|----------------------|-------------------------------------|---------------------|---------------------|
| 1 | 13.29 | 7.62 | 11.08 | 1.62 | 68.613 | -0.000 | 3.31 | 0.00 | 0.00 | 0.074 | 0.01 | 0.40 | 0.00 |
| 2 | 13.29 | 7.62 | 11.08 | 1.62 | 92.627 | -0.000 | 4.47 | 0.00 | 0.00 | 0.100 | 0.01 | 0.53 | 0.01 |
| 3 | 19.94 | 11.42 | 16.62 | 2.42 | 244.475 | -0.000 | 11.79 | 0.00 | 0.00 | 0.263 | 0.03 | 0.94 | 0.01 |
| 4 | 19.94 | 11.42 | 16.62 | 2.42 | 220.461 | -0.000 | 10.63 | 0.00 | 0.00 | 0.237 | 0.02 | 0.85 | 0.01 |

Maximale Ausnutzung des Stabes $U_{max} = 0.94 \leq 1 \Rightarrow$ **Nachweis erfüllt**

2.5.2. Gurt rechts mit $A_n = 20735 \text{ mm}^2$, $W_n = 598667 \text{ mm}^3$, $I_n = 47893343 \text{ mm}^4$, $k_h = 1.100$

| Last | f _{m,d} N/mm ² | f _{t,d} N/mm ² | f _{c,d} N/mm ² | f _{v,d} N/mm ² | N _d kN | M _d kNm | σ _{0,d} N/mm ² | σ _{mo,d} N/mm ² | σ _{mu,d} N/mm ² | V _d kN | τ _d N/mm ² | U _σ - | U _τ - |
|------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|----------------------|-----------------------|---------------------------------------|--|--|----------------------|-------------------------------------|---------------------|---------------------|
| 1 | 13.29 | 7.62 | 11.08 | 1.62 | 46.131 | -0.000 | 2.22 | 0.00 | 0.00 | 0.000 | 0.00 | 0.27 | 0.00 |
| 2 | 13.29 | 7.62 | 11.08 | 1.62 | 62.277 | -0.000 | 3.00 | 0.00 | 0.00 | 0.000 | 0.00 | 0.36 | 0.00 |
| 3 | 19.94 | 11.42 | 16.62 | 2.42 | 164.370 | -0.000 | 7.93 | 0.00 | 0.00 | 0.000 | 0.00 | 0.63 | 0.00 |
| 4 | 19.94 | 11.42 | 16.62 | 2.42 | 148.224 | -0.000 | 7.15 | 0.00 | 0.00 | 0.000 | 0.00 | 0.57 | 0.00 |

Maximale Ausnutzung des Stabes $U_{max} = 0.63 \leq 1 \Rightarrow$ **Nachweis erfüllt**

2.5.3. Stiel mit $A_n = 11235 \text{ mm}^2$, $W_n = 242580 \text{ mm}^3$, $I_n = 14554776 \text{ mm}^4$, $k_h = 1.100$

| Last | $f_{m,d}$ N/mm ² | $f_{t,d}$ N/mm ² | $f_{c,d}$ N/mm ² | $f_{v,d}$ N/mm ² | N_d kN | M_d kNm | $\sigma_{0,d}$ N/mm ² | $\sigma_{m0,d}$ N/mm ² | $\sigma_{mu,d}$ N/mm ² | V_d kN | τ_d N/mm ² | U_σ - | U_τ - |
|------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|-------------|--------------|-------------------------------------|--------------------------------------|--------------------------------------|-------------|-------------------------------|-----------------|---------------|
| 1 | 11.08 | 7.62 | 11.08 | 1.62 | -5.277 | -0.000 | -0.47 | -0.00 | -0.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| 2 | 11.08 | 7.62 | 11.08 | 1.62 | -7.124 | -0.000 | -0.63 | -0.00 | -0.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| 3 | 16.62 | 11.42 | 16.62 | 2.42 | -18.802 | -0.000 | -1.67 | -0.00 | -0.00 | 0.000 | 0.00 | 0.01 | 0.00 |
| 4 | 16.62 | 11.42 | 16.62 | 2.42 | -16.955 | -0.000 | -1.51 | -0.00 | -0.00 | 0.000 | 0.00 | 0.01 | 0.00 |

Maximale Ausnutzung des Stabes $U_{max} = 0.01 \leq 1 \Rightarrow$ **Nachweis erfüllt**

2.5.4. Diagonale links mit $A_n = 11235 \text{ mm}^2$, $W_n = 243029 \text{ mm}^3$, $I_n = 14581735 \text{ mm}^4$, $k_h = 1.100$

| Last | $f_{m,d}$ N/mm ² | $f_{t,d}$ N/mm ² | $f_{c,d}$ N/mm ² | $f_{v,d}$ N/mm ² | N_d kN | M_d kNm | $\sigma_{0,d}$ N/mm ² | $\sigma_{m0,d}$ N/mm ² | $\sigma_{mu,d}$ N/mm ² | V_d kN | τ_d N/mm ² | U_σ - | U_τ - |
|------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|-------------|--------------|-------------------------------------|--------------------------------------|--------------------------------------|-------------|-------------------------------|-----------------|---------------|
| 1 | 11.08 | 7.62 | 11.08 | 1.62 | -13.178 | -0.053 | -1.17 | -0.22 | -0.22 | 0.427 | 0.08 | 0.03 | 0.05 |
| 2 | 11.08 | 7.62 | 11.08 | 1.62 | -17.790 | -0.071 | -1.58 | -0.29 | -0.29 | 0.576 | 0.11 | 0.04 | 0.07 |
| 3 | 16.62 | 11.42 | 16.62 | 2.42 | -46.954 | -0.187 | -4.18 | -0.77 | -0.77 | 1.520 | 0.28 | 0.11 | 0.12 |
| 4 | 16.62 | 11.42 | 16.62 | 2.42 | -42.342 | -0.169 | -3.77 | -0.69 | -0.69 | 1.371 | 0.26 | 0.09 | 0.11 |

Maximale Ausnutzung des Stabes $U_{max} = 0.12 \leq 1 \Rightarrow$ **Nachweis erfüllt**

2.5.5. Diagonale rechts mit $A_n = 21315 \text{ mm}^2$, $W_n = 608910 \text{ mm}^3$, $I_n = 48712786 \text{ mm}^4$, $k_h = 1.100$

| Last | $f_{m,d}$ N/mm ² | $f_{t,d}$ N/mm ² | $f_{c,d}$ N/mm ² | $f_{v,d}$ N/mm ² | N_d kN | M_d kNm | $\sigma_{0,d}$ N/mm ² | $\sigma_{m0,d}$ N/mm ² | $\sigma_{mu,d}$ N/mm ² | V_d kN | τ_d N/mm ² | U_σ - | U_τ - |
|------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|-------------|--------------|-------------------------------------|--------------------------------------|--------------------------------------|-------------|-------------------------------|-----------------|---------------|
| 1 | 11.08 | 7.62 | 11.08 | 1.62 | 15.932 | -0.002 | 0.75 | -0.00 | -0.00 | 0.014 | 0.00 | 0.09 | 0.00 |
| 2 | 11.08 | 7.62 | 11.08 | 1.62 | 21.508 | -0.003 | 1.01 | -0.00 | -0.00 | 0.018 | 0.00 | 0.12 | 0.00 |
| 3 | 16.62 | 11.42 | 16.62 | 2.42 | 56.766 | -0.008 | 2.66 | -0.01 | -0.01 | 0.048 | 0.00 | 0.21 | 0.00 |
| 4 | 16.62 | 11.42 | 16.62 | 2.42 | 51.190 | -0.007 | 2.40 | -0.01 | -0.01 | 0.044 | 0.00 | 0.19 | 0.00 |

Maximale Ausnutzung des Stabes $U_{max} = 0.21 \leq 1 \Rightarrow$ **Nachweis erfüllt**

2.6. Ergebnisse Knotenblech

Maximale Ausnutzung des Knotenblechs $U_{max} = 0.00 \leq 1 \Rightarrow$ **Nachweis erfüllt**

2.7. Lochleibungskräfte Gurt

$p_1 = 80 \text{ mm}$, $e_1 = 370 \text{ mm}$, $e_2 = 53 \text{ mm}$, $p_2 = 50.00 \text{ mm}$, $\alpha_b = 1.00$, $k_1 = 2.50 \Rightarrow F_{b,RK} = 216.00 \text{ kN}$
 $e_1 = 370 \text{ mm}$, $e_2 = 53 \text{ mm}$, $p_2 = 50 \text{ mm}$, $\alpha_b = 1.00$, $k_1 = 2.50 \Rightarrow F_{b,RK,Rand} = 216.00 \text{ kN}$

2.7.1. Lf1

| Nr | F_{toti} kN | $F_{v,Rd}$ kN | U | Nr | F_{toti} kN | $F_{v,Rd}$ kN | U |
|----|------------------|------------------|------|----|------------------|------------------|------|
| 1 | 3.75 | 172.80 | 0.02 | 4 | 3.75 | 172.80 | 0.02 |
| 2 | 3.75 | 172.80 | 0.02 | 5 | 3.75 | 172.80 | 0.02 |
| 3 | 3.75 | 172.80 | 0.02 | 6 | 3.75 | 172.80 | 0.02 |

Maximale Ausnutzung der Lochleibungskräfte $U_{max} = 0.02 \leq 1 \Rightarrow$ **Nachweis erfüllt**

2.7.2. 1.35*Lf1

| Nr | F_{toti} kN | $F_{v,Rd}$ kN | U | Nr | F_{toti} kN | $F_{v,Rd}$ kN | U |
|----|------------------|------------------|------|----|------------------|------------------|------|
| 1 | 5.06 | 172.80 | 0.03 | 4 | 5.06 | 172.80 | 0.03 |
| 2 | 5.06 | 172.80 | 0.03 | 5 | 5.06 | 172.80 | 0.03 |
| 3 | 5.06 | 172.80 | 0.03 | 6 | 5.06 | 172.80 | 0.03 |

Maximale Ausnutzung der Lochleibungskräfte $U_{max} = 0.03 \leq 1 \Rightarrow$ **Nachweis erfüllt**

2.7.3. 1.35*Lf1+1.5*Lf2

| Nr | F_{toti} kN | $F_{v,Rd}$ kN | U | Nr | F_{toti} kN | $F_{v,Rd}$ kN | U |
|----|------------------|------------------|------|----|------------------|------------------|------|
| 1 | 13.35 | 172.80 | 0.08 | 4 | 13.35 | 172.80 | 0.08 |
| 2 | 13.35 | 172.80 | 0.08 | 5 | 13.35 | 172.80 | 0.08 |
| 3 | 13.35 | 172.80 | 0.08 | 6 | 13.35 | 172.80 | 0.08 |

Maximale Ausnutzung der Lochleibungskräfte $U_{max} = 0.08 \leq 1 \Rightarrow$ **Nachweis erfüllt**

2.7.4. Lf1+1.5*Lf2

| Nr | F_{toti} kN | $F_{v,Rd}$ kN | U | Nr | F_{toti} kN | $F_{v,Rd}$ kN | U |
|----|------------------|------------------|------|----|------------------|------------------|------|
| 1 | 12.04 | 172.80 | 0.07 | 4 | 12.04 | 172.80 | 0.07 |
| 2 | 12.04 | 172.80 | 0.07 | 5 | 12.04 | 172.80 | 0.07 |
| 3 | 12.04 | 172.80 | 0.07 | 6 | 12.04 | 172.80 | 0.07 |

Maximale Ausnutzung der Lochleibungskräfte $U_{max} = 0.07 \leq 1 \Rightarrow$ **Nachweis erfüllt**

2.8. Lochleibungskräfte Stiel

$p_1 = 60 \text{ mm}$, $e_1 = 102 \text{ mm}$, $e_2 = 38 \text{ mm}$, $p_2 = 40.00 \text{ mm}$, $\alpha_b = 1.00$, $k_1 = 2.50 \Rightarrow F_{b,RK} = 162.00 \text{ kN}$
 $e_1 = 102 \text{ mm}$, $e_2 = 38 \text{ mm}$, $p_2 = 40 \text{ mm}$, $\alpha_b = 1.00$, $k_1 = 2.50 \Rightarrow F_{b,RK,Rand} = 162.00 \text{ kN}$

2.8.1. Lf1

| Nr | F _{toti} kN | F _{v,Rd} kN | U |
|----|-------------------------|-------------------------|------|
| 1 | 2.64 | 129.60 | 0.02 |
| 2 | 2.64 | 129.60 | 0.02 |

Maximale Ausnutzung der Lochleibungskräfte $U_{\max} = 0.02 \leq 1 \Rightarrow$ **Nachweis erfüllt**

2.8.2. 1.35*Lf1

| Nr | F _{toti} kN | F _{v,Rd} kN | U |
|----|-------------------------|-------------------------|------|
| 1 | 3.56 | 129.60 | 0.03 |
| 2 | 3.56 | 129.60 | 0.03 |

Maximale Ausnutzung der Lochleibungskräfte $U_{\max} = 0.03 \leq 1 \Rightarrow$ **Nachweis erfüllt**

2.8.3. 1.35*Lf1+1.5*Lf2

| Nr | F _{toti} kN | F _{v,Rd} kN | U |
|----|-------------------------|-------------------------|------|
| 1 | 9.40 | 129.60 | 0.07 |
| 2 | 9.40 | 129.60 | 0.07 |

Maximale Ausnutzung der Lochleibungskräfte $U_{\max} = 0.07 \leq 1 \Rightarrow$ **Nachweis erfüllt**

2.8.4. Lf1+1.5*Lf2

| Nr | F _{toti} kN | F _{v,Rd} kN | U |
|----|-------------------------|-------------------------|------|
| 1 | 8.48 | 129.60 | 0.07 |
| 2 | 8.48 | 129.60 | 0.07 |

Maximale Ausnutzung der Lochleibungskräfte $U_{\max} = 0.07 \leq 1 \Rightarrow$ **Nachweis erfüllt**

2.9. Lochleibungskräfte Diagonale links

$p_1 = 60 \text{ mm}$, $e_1 = 343 \text{ mm}$, $e_2 = 39 \text{ mm}$, $p_2 = 39.00 \text{ mm}$, $\alpha_b = 1.00$, $k_1 = 2.50 \Rightarrow F_{b,RK} = 162.00 \text{ kN}$
 $e_1 = 343 \text{ mm}$, $e_2 = 39 \text{ mm}$, $p_2 = 39 \text{ mm}$, $\alpha_b = 1.00$, $k_1 = 2.50 \Rightarrow F_{b,RK,Rand} = 162.00 \text{ kN}$

2.9.1. Lf1

| Nr | F _{toti} kN | F _{v,Rd} kN | U |
|----|-------------------------|-------------------------|------|
| 1 | 2.57 | 129.60 | 0.02 |
| 2 | 2.67 | 129.60 | 0.02 |
| 3 | 2.52 | 129.60 | 0.02 |

| Nr | F _{toti} kN | F _{v,Rd} kN | U |
|----|-------------------------|-------------------------|------|
| 4 | 2.80 | 129.60 | 0.02 |
| 5 | 2.66 | 129.60 | 0.02 |

Maximale Ausnutzung der Lochleibungskräfte $U_{\max} = 0.02 \leq 1 \Rightarrow$ **Nachweis erfüllt**

2.9.2. 1.35*Lf1

| Nr | F _{toti} kN | F _{v,Rd} kN | U |
|----|-------------------------|-------------------------|------|
| 1 | 3.46 | 129.60 | 0.03 |
| 2 | 3.61 | 129.60 | 0.03 |
| 3 | 3.40 | 129.60 | 0.03 |

| Nr | F _{toti} kN | F _{v,Rd} kN | U |
|----|-------------------------|-------------------------|------|
| 4 | 3.78 | 129.60 | 0.03 |
| 5 | 3.59 | 129.60 | 0.03 |

Maximale Ausnutzung der Lochleibungskräfte $U_{\max} = 0.03 \leq 1 \Rightarrow$ **Nachweis erfüllt**

2.9.3. 1.35*Lf1+1.5*Lf2

| Nr | F _{toti} kN | F _{v,Rd} kN | U |
|----|-------------------------|-------------------------|------|
| 1 | 9.14 | 129.60 | 0.07 |
| 2 | 9.52 | 129.60 | 0.07 |
| 3 | 8.98 | 129.60 | 0.07 |

| Nr | F _{toti} kN | F _{v,Rd} kN | U |
|----|-------------------------|-------------------------|------|
| 4 | 9.97 | 129.60 | 0.08 |
| 5 | 9.47 | 129.60 | 0.07 |

Maximale Ausnutzung der Lochleibungskräfte $U_{\max} = 0.08 \leq 1 \Rightarrow$ **Nachweis erfüllt**

2.9.4. Lf1+1.5*Lf2

| Nr | F _{toti} kN | F _{v,Rd} kN | U |
|----|-------------------------|-------------------------|------|
| 1 | 8.24 | 129.60 | 0.06 |
| 2 | 8.58 | 129.60 | 0.07 |
| 3 | 8.09 | 129.60 | 0.06 |

| Nr | F _{toti} kN | F _{v,Rd} kN | U |
|----|-------------------------|-------------------------|------|
| 4 | 8.99 | 129.60 | 0.07 |
| 5 | 8.54 | 129.60 | 0.07 |

Maximale Ausnutzung der Lochleibungskräfte $U_{\max} = 0.07 \leq 1 \Rightarrow$ **Nachweis erfüllt**

2.10. Lochleibungskräfte Diagonale rechts

$p_1 = 60 \text{ mm}$, $e_1 = 466 \text{ mm}$, $e_2 = 58 \text{ mm}$, $p_2 = 40.00 \text{ mm}$, $\alpha_b = 1.00$, $k_1 = 2.50 \Rightarrow F_{b,RK} = 162.00 \text{ kN}$
 $e_1 = 466 \text{ mm}$, $e_2 = 58 \text{ mm}$, $p_2 = 40 \text{ mm}$, $\alpha_b = 1.00$, $k_1 = 2.50 \Rightarrow F_{b,RK,Rand} = 162.00 \text{ kN}$

2.10.1. Lf1

| Nr | F _{toti} kN | F _{v,Rd} kN | U - | Nr | F _{toti} kN | F _{v,Rd} kN | U - |
|----|-------------------------|-------------------------|--------|----|-------------------------|-------------------------|--------|
| 1 | 2.00 | 129.60 | 0.02 | 5 | 1.99 | 129.60 | 0.02 |
| 2 | 1.99 | 129.60 | 0.02 | 6 | 1.99 | 129.60 | 0.02 |
| 3 | 1.99 | 129.60 | 0.02 | 7 | 1.99 | 129.60 | 0.02 |
| 4 | 1.99 | 129.60 | 0.02 | 8 | 1.99 | 129.60 | 0.02 |

Maximale Ausnutzung der Lochleibungskräfte $U_{\max} = 0.02 \leq 1 \Rightarrow$ **Nachweis erfüllt**

2.10.2. 1.35*Lf1

| Nr | F _{toti} kN | F _{v,Rd} kN | U - | Nr | F _{toti} kN | F _{v,Rd} kN | U - |
|----|-------------------------|-------------------------|--------|----|-------------------------|-------------------------|--------|
| 1 | 2.69 | 129.60 | 0.02 | 5 | 2.69 | 129.60 | 0.02 |
| 2 | 2.69 | 129.60 | 0.02 | 6 | 2.69 | 129.60 | 0.02 |
| 3 | 2.69 | 129.60 | 0.02 | 7 | 2.68 | 129.60 | 0.02 |
| 4 | 2.69 | 129.60 | 0.02 | 8 | 2.68 | 129.60 | 0.02 |

Maximale Ausnutzung der Lochleibungskräfte $U_{\max} = 0.02 \leq 1 \Rightarrow$ **Nachweis erfüllt**

2.10.3. 1.35*Lf1+1.5*Lf2

| Nr | F _{toti} kN | F _{v,Rd} kN | U - | Nr | F _{toti} kN | F _{v,Rd} kN | U - |
|----|-------------------------|-------------------------|--------|----|-------------------------|-------------------------|--------|
| 1 | 7.11 | 129.60 | 0.05 | 5 | 7.09 | 129.60 | 0.05 |
| 2 | 7.11 | 129.60 | 0.05 | 6 | 7.09 | 129.60 | 0.05 |
| 3 | 7.10 | 129.60 | 0.05 | 7 | 7.09 | 129.60 | 0.05 |
| 4 | 7.10 | 129.60 | 0.05 | 8 | 7.08 | 129.60 | 0.05 |

Maximale Ausnutzung der Lochleibungskräfte $U_{\max} = 0.05 \leq 1 \Rightarrow$ **Nachweis erfüllt**

2.10.4. Lf1+1.5*Lf2

| Nr | F _{toti} kN | F _{v,Rd} kN | U - | Nr | F _{toti} kN | F _{v,Rd} kN | U - |
|----|-------------------------|-------------------------|--------|----|-------------------------|-------------------------|--------|
| 1 | 6.41 | 129.60 | 0.05 | 5 | 6.40 | 129.60 | 0.05 |
| 2 | 6.41 | 129.60 | 0.05 | 6 | 6.39 | 129.60 | 0.05 |
| 3 | 6.41 | 129.60 | 0.05 | 7 | 6.39 | 129.60 | 0.05 |
| 4 | 6.40 | 129.60 | 0.05 | 8 | 6.38 | 129.60 | 0.05 |

Maximale Ausnutzung der Lochleibungskräfte $U_{\max} = 0.05 \leq 1 \Rightarrow$ **Nachweis erfüllt**

3. Zusammenfassung

Gesamtausnutzung aller Nachweise $U_{\max,Ges} = 0.938 \leq 1 \Rightarrow$ **ok.**