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Publicly appointed and sworn-in expert

# Load tables for a transport anchor system
## with Würth *ASSY*® 4 Combi self-tapping screws
## d = 12 mm as defined under ETA-11/0190:2018
## Threaded length lg = 100 mm

**Transport anchor system with the ASSY 4 Combi self-tapping screw and DEHA universal coupling, load group 1-1.3**

### General information

The load tables are nonbinding design aids. The load values must be reduced for shorter screw-in depths and threaded lengths.

The specifications in the European Technical Approval and in the expertise must be observed. The load bearing capacity of the transport system depends on many factors, e.g. hoist, fastening type, and properties of the transported element.

The DEHA universal coupling, load group 1-1.3, or the BGW ball head lifter can be used as the load bearing equipment. The operating instructions issued by the manufacturers must be observed. When subjected to inclined loads, the wood can be provided with a cutout that serves to reroute the horizontal components of the force directly into the wood. The screws can be driven into both undrilled and drilled wood components. In the latter case, the diameter of the drilled hole must correspond to the specifications in the ETA.

The wood components must be at least 80 mm thick.

The minimum distances of the screws, specifically from the edges of the wood, must be observed.

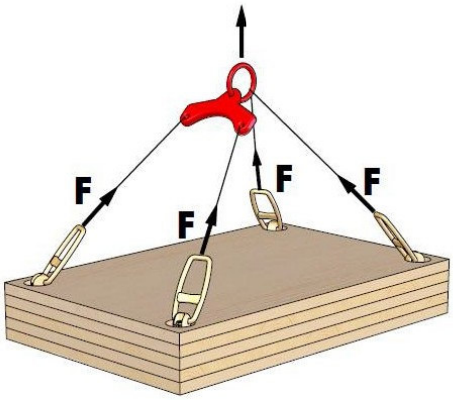
These loads, however, can swing when suspended from a crane. It is recommended to multiply the forces acting on the transport anchor system by the specified dynamic coefficients φ .

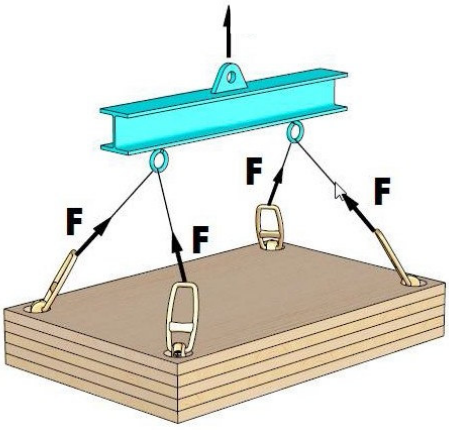
**Recommended coefficients φ**

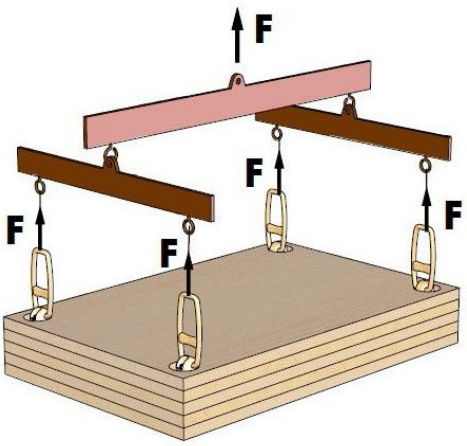
| Lifting device | Lifting speed | Dynamic coefficient φ |
|---|---|---|
| Stationary crane, rotary crane Rail crane | < 90 m/min | 1.10 |
| Stationary crane, rotary crane Rail crane | ≥ 90 m/min | 1.30 |
| Lifting and transporting on level ground | | 1.65 |
| Lifting and transporting on | | 2.00 |

The number of anchors n defines the suspension gear used. Suspension gear consisting of more than three lines is always statically undefined when suitable measures do not distribute the load uniformly over all three.

The whole component should be secured with at least two self-tapping screws. However, it must be ensured that the screws are not driven into shrinkage cracks or similar.

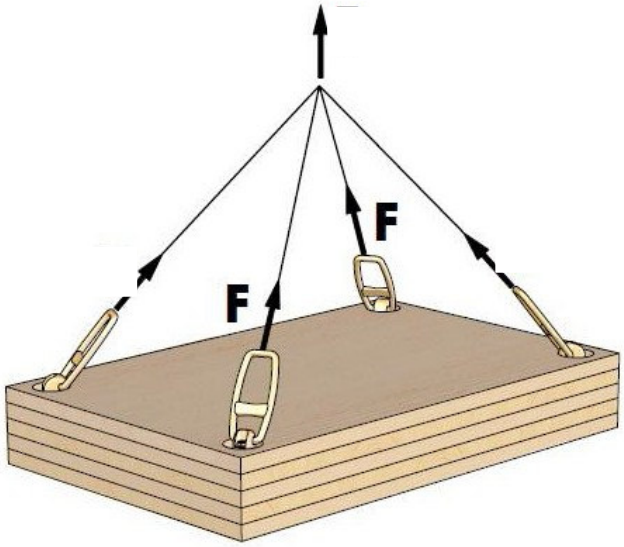



**Spreader beam (n = 4)**

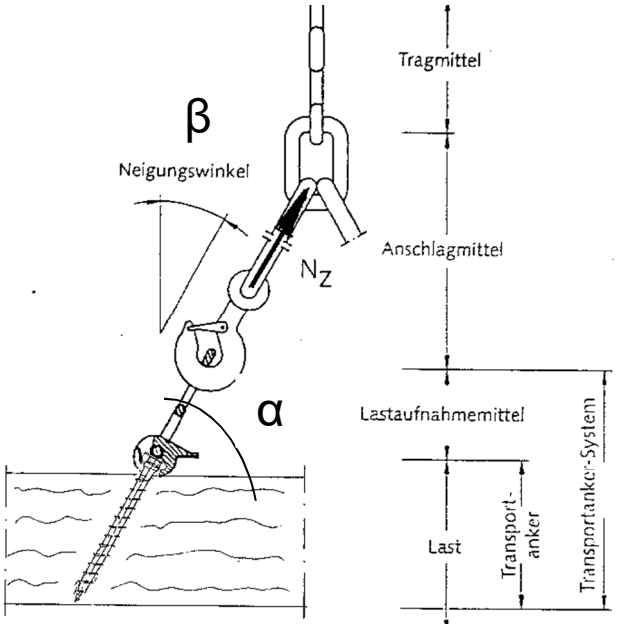
In the case of statically undefined suspension gear, BGR 500 (Section 2.8) stipulates that the anchors' dimensions must allow two of them to carry the entire load. The loads at the anchor sites must be calculated from the triangle of forces. For safety reasons, the screws may only be used **once**.




**Statically undefined suspension gear (n = 2)**

**Fastening variant 1**

## Axial loading on the screw




**Transport anchor under axial tensile load**

## Fastening variant "axial loading on screw"

## Würth *ASSY*® 4 Combi d = 12 mm, threaded length 100 mm

Attached to **solid structural timber, glued laminated timber or to the side of cross-laminated timber** and the face (angle between screw axis and direction of grain ≥ 45°)

| α | $F_{ax,Rk}$ | $N_z$ | **Load per attachment point** | | | | |
|---|---|---|---|---|---|---|---|
| ° | in kN | in | **kg** | | | | |
| | | | φ = 1.0 | φ = 1.10 | φ = 1.30 | φ = 1.65 | φ = 2.00 |
| 90 | 12.0 | 6.15 | 615 | 559 | 473 | 373 | 308 |
| 85 | 12.0 | 6.15 | 613 | 557 | 472 | 372 | 307 |
| 80 | 12.0 | 6.15 | 606 | 551 | 466 | 367 | 303 |
| 75 | 12.0 | 6.15 | 594 | 540 | 457 | 360 | 297 |
| 70 | 12.0 | 6.15 | 578 | 526 | 445 | 350 | 289 |
| 65 | 12.0 | 6.15 | 558 | 507 | 429 | 338 | 279 |
| 60 | 12.0 | 6.15 | 533 | 484 | 410 | 323 | 266 |
| 55 | 12.0 | 6.15 | 504 | 458 | 388 | 306 | 252 |
| 50 | 12.0 | 6.15 | 471 | 429 | 363 | 286 | 236 |
| 45 | 12.0 | 6.15 | 435 | 396 | 335 | 264 | 218 |
| 40 | 11.1 | 5.68 | 365 | 332 | 281 | 221 | 182 |
| 35 | 10.1 | 5.20 | 298 | 271 | 229 | 181 | 149 |
| 30 | 9.2 | 4.72 | 236 | 214 | 181 | 143 | 118 |

**Assumptions:** **Characteristic density $\rho_k$ =350 kg/m³**
**The thread is anchored completely in the wood, without gaps in the component**

**Fastening variant "axial loading on screw"**

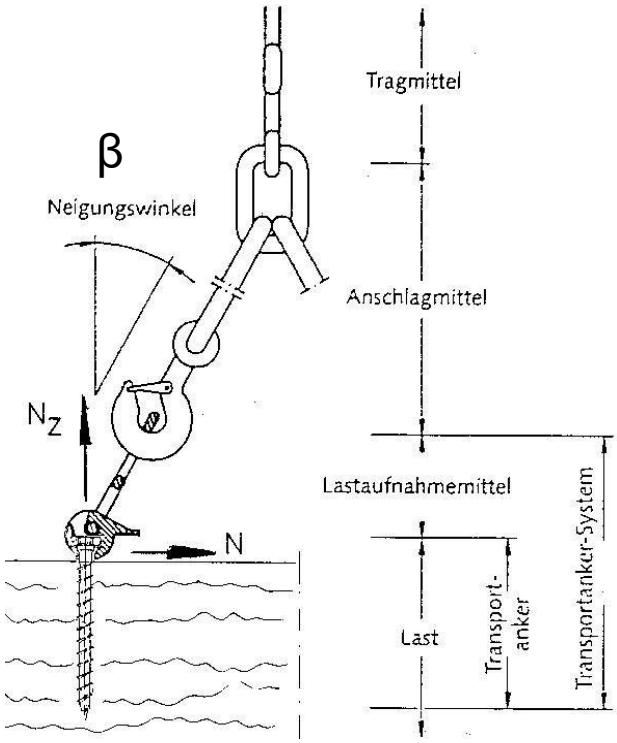
## Würth *ASSY*® 4 Combi d = 12 mm, threaded length 100 mm

Attached to **the face of cross-laminated timber**

| α = β | $F_{ax,Rk}$ | $N_z$ | **Load per attachment point** | | | | |
|---|---|---|---|---|---|---|---|
| ° | in kN | in | **kg** | | | | |
| | | | φ = 1.0 | φ = 1.10 | φ = 1.30 | φ = 1.65 | φ = 2.00 |
| 0 | 3.6 | 1.85 | 185 | 168 | 142 | 112 | 92 |
| 5 | 4.5 | 2.32 | 232 | 211 | 178 | 140 | 116 |
| 10 | 5.5 | 2.80 | 276 | 251 | 212 | 167 | 138 |
| 15 | 6.4 | 3.28 | 317 | 288 | 244 | 192 | 159 |
| 20 | 7.3 | 3.76 | 353 | 321 | 272 | 214 | 177 |
| 25 | 8.3 | 4.24 | 384 | 349 | 296 | 233 | 192 |
| 30 | 9.2 | 4.72 | 409 | 371 | 314 | 248 | 204 |
| 35 | 10.1 | 5.20 | 426 | 387 | 327 | 258 | 213 |
| 40 | 11.1 | 5.68 | 435 | 395 | 334 | 263 | 217 |
| 45 | 12.0 | 6.15 | 435 | 396 | 335 | 264 | 218 |

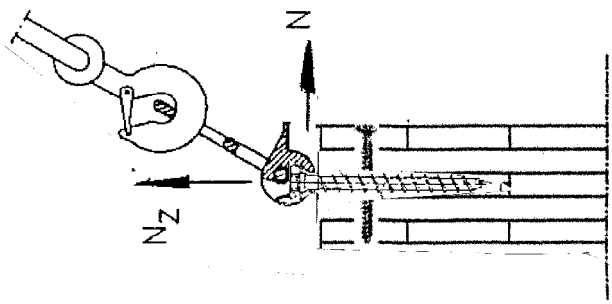
**Fastening variant 2**

**Inclined loading on the screw**




**Transport anchor under inclined load**

A force component acting perpendicular to the side may promote lateral tensile failure. Lateral tensile failure must be prevented by means of a reinforcement secured parallel to the face with full thread screws (see Figure below).




**Full thread screws preventing lateral tensile failure in a cross-laminated timber element**

## Fastening variant "inclined tensile loading on screw"

## Würth *ASSY*® 4 Combi d = 12 mm, threaded length 100 mm (12x160/100)

### Anchoring depth of the screw in the timber $t_1$ = 150 mm

Attached to **solid structural timber, glued laminated timber or to the side of cross-laminated timber** (angle between screw axis and direction of grain $\alpha$ = 90°)

| β | $F_{Ed}$ | $N_{SZ}$ | Load per attachment point | | | | |
|---|---|---|---|---|---|---|---|
| ° | in kN | in kN | kg | | | | |
| | | | φ = 1.00 | φ = 1.10 | φ = 1.30 | φ = 1.65 | φ = 2.00 |
| 0 | 8.31 | 6.15 | 615 | 559 | 473 | 373 | 308 |
| 5 | 8.27 | 6.13 | 610 | 555 | 470 | 370 | 305 |
| 10 | 8.17 | 6.05 | 596 | 542 | 459 | 361 | 298 |
| 15 | 8.02 | 5.94 | 574 | 521 | 441 | 348 | 287 |
| 20 | 7.82 | 5.79 | 544 | 495 | 419 | 330 | 272 |
| 25 | 7.59 | 5.63 | 510 | 463 | 392 | 309 | 255 |
| 30 | 7.36 | 5.45 | 472 | 429 | 363 | 286 | 236 |
| 35 | 7.12 | 5.27 | 432 | 393 | 332 | 262 | 216 |
| 40 | 6.89 | 5.10 | 391 | 355 | 301 | 237 | 195 |
| 45 | 6.67 | 4.94 | 349 | 318 | 269 | 212 | 175 |
| 50 | 6.47 | 4.80 | 308 | 280 | 237 | 187 | 154 |
| 55 | 6.30 | 4.67 | 268 | 243 | 206 | 162 | 134 |
| 60 | 6.15 | 4.55 | 228 | 207 | 175 | 138 | 114 |

Attached to **the face of cross-laminated timber**

(angle between screw axis and direction of grain $\alpha$ = 0°)

| β | $F_{Ed}$ | $N_{SZ}$ | Load per attachment point | | | | |
|---|---|---|---|---|---|---|---|
| ° | in kN | in kN | kg | | | | |
| | | | φ = 1.00 | φ = 1.10 | φ = 1.30 | φ = 1.65 | φ = 2.00 |
| 0 | 2.49 | 1.85 | 185 | 168 | 142 | 112 | 92 |
| 5 | 2.49 | 1.84 | 183 | 167 | 141 | 111 | 92 |
| 10 | 2.47 | 1.83 | 180 | 164 | 138 | 109 | 90 |
| 15 | 2.44 | 1.80 | 174 | 158 | 134 | 106 | 87 |
| 20 | 2.40 | 1.78 | 167 | 152 | 128 | 101 | 83 |
| 25 | 2.35 | 1.74 | 158 | 144 | 121 | 96 | 79 |
| 30 | 2.30 | 1.71 | 148 | 134 | 114 | 89 | 74 |
| 35 | 2.25 | 1.67 | 137 | 124 | 105 | 83 | 68 |
| 40 | 2.20 | 1.63 | 125 | 113 | 96 | 76 | 62 |
| 45 | 2.15 | 1.59 | 113 | 102 | 87 | 68 | 56 |
| 50 | 2.10 | 1.56 | 100 | 91 | 77 | 61 | 50 |
| 55 | 2.06 | 1.53 | 88 | 80 | 67 | 53 | 44 |
| 60 | 2.02 | 1.50 | 75 | 68 | 58 | 45 | 37 |

**Assumptions:** **Characteristic density $\rho_k$ =350 kg/m³**
**The thread is anchored completely in the wood, without gaps in the component**
**Screws arranged at the center of a layer in the faces**

## Fastening variant "inclined tensile loading on screw"

## Würth *ASSY*® 4 Combi d = 12 mm, threaded length 100 mm (12x120/100)

### Anchoring depth of the screw in the timber $t_1$ = 110 mm

Attached to **solid structural timber, glued laminated timber or to the side of cross-laminated timber** (angle between screw axis and direction of grain $\alpha$ = 90°)

| β | $F_{Ed}$ | $N_{SZ}$ | **Load per attachment point** | | | | |
|---|---|---|---|---|---|---|---|
| ° | in kN | in kN | **kg** | | | | |
| | | | φ = 1.00 | φ = 1.10 | φ = 1.30 | φ = 1.65 | φ = 2.00 |
| 0 | 8.31 | 6.15 | 615 | 559 | 473 | 373 | 308 |
| 5 | 8.25 | 6.11 | 609 | 554 | 468 | 369 | 304 |
| 10 | 8.09 | 5.99 | 590 | 537 | 454 | 358 | 295 |
| 15 | 7.85 | 5.82 | 562 | 511 | 432 | 340 | 281 |
| 20 | 7.56 | 5.60 | 526 | 478 | 405 | 319 | 263 |
| 25 | 7.23 | 5.36 | 486 | 442 | 374 | 294 | 243 |
| 30 | 6.91 | 5.12 | 443 | 403 | 341 | 269 | 222 |
| 35 | 6.59 | 4.88 | 400 | 364 | 308 | 242 | 200 |
| 40 | 6.30 | 4.67 | 358 | 325 | 275 | 217 | 179 |
| 45 | 6.04 | 4.47 | 316 | 288 | 243 | 192 | 158 |
| 50 | 5.81 | 4.30 | 276 | 251 | 213 | 168 | 138 |
| 55 | 5.60 | 4.15 | 238 | 216 | 183 | 144 | 119 |
| 60 | 5.43 | 4.02 | 201 | 183 | 155 | 122 | 101 |

Attached to **the face of cross-laminated timber**

(angle between screw axis and direction of grain $\alpha$ = 0°)

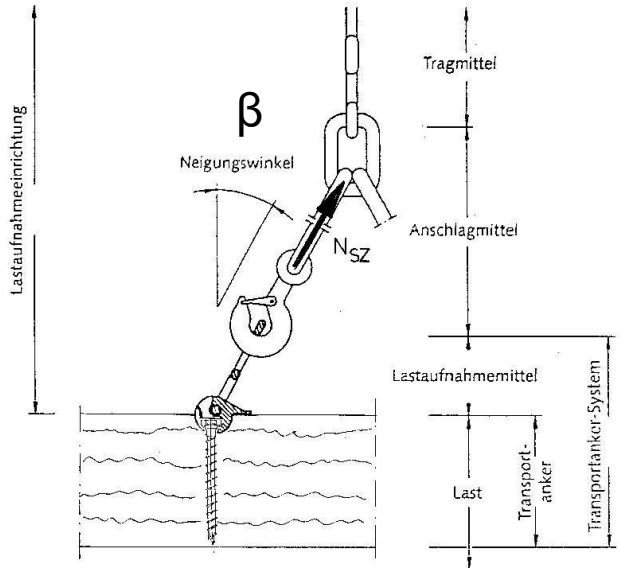
| β | $F_{Ed}$ | $N_{SZ}$ | **Load per attachment point** | | | | |
|---|---|---|---|---|---|---|---|
| ° | in kN | in kN | **kg** | | | | |
| | | | φ = 1.00 | φ = 1.10 | φ = 1.30 | φ = 1.65 | φ = 2.00 |
| 0 | 2.49 | 1.85 | 185 | 168 | 142 | 112 | 92 |
| 5 | 2.47 | 1.83 | 182 | 166 | 140 | 111 | 91 |
| 10 | 2.42 | 1.79 | 176 | 160 | 136 | 107 | 88 |
| 15 | 2.33 | 1.73 | 167 | 152 | 128 | 101 | 83 |
| 20 | 2.23 | 1.65 | 155 | 141 | 119 | 94 | 78 |
| 25 | 2.12 | 1.57 | 142 | 129 | 109 | 86 | 71 |
| 30 | 2.01 | 1.49 | 129 | 117 | 99 | 78 | 65 |
| 35 | 1.91 | 1.41 | 116 | 105 | 89 | 70 | 58 |
| 40 | 1.82 | 1.34 | 103 | 94 | 79 | 62 | 52 |
| 45 | 1.73 | 1.28 | 91 | 82 | 70 | 55 | 45 |
| 50 | 1.66 | 1.23 | 79 | 72 | 61 | 48 | 39 |
| 55 | 1.60 | 1.18 | 68 | 62 | 52 | 41 | 34 |
| 60 | 1.54 | 1.14 | 57 | 52 | 44 | 35 | 29 |

**Assumptions:** **Characteristic density $\rho_k$ =350 kg/m³**
**The thread is anchored completely in the wood, without gaps in the component**
**Screws arranged at the center of a layer in the faces**

**Fastening variant 3**

## Inclined loading on the screw with coupling head precision-fitted in cutout

When the coupling head of the load bearing equipment is **precision-fitted** in a cutout, it reroutes the horizontal force component of the inclined tensile load directly into the wood.




**Transport anchor under inclined tensile load-coupling head of the load bearing equipment precision-fitted in a cutout**

**Fastening variant "inclined tensile loading on the screw with precision-fitted cutout"**

## Würth *ASSY*® 4 Combi d = 12 mm, threaded length 100 mm

Attached to **solid structural timber, glued laminated timber, or to the side of cross-laminated timber**

(angle between screw axis and direction of grain $\alpha$ = 90°)

| β | $F_{ax,Rd}$ | $N_z$ | **Load per attachment point** | | | | |
|---|---|---|---|---|---|---|---|
| ° | in | in | **kg** | | | | |
| | | | φ=1.00 | φ = 1.10 | φ = 1.30 | φ = 1.65 | φ = 2.00 |
| 0 ÷ 60 | 8.31 | 6.15 | 615 | 559 | 473 | 373 | 308 |

Attached to **the face of cross-laminated timber**

(angle between screw axis and direction of grain $\alpha$ = 0°)

| β | $F_{ax,Rd}$ | $N_z$ | **Load per attachment point** | | | | |
|---|---|---|---|---|---|---|---|
| ° | in | in | **kg** | | | | |
| | | | φ =1.00 | φ = 1.10 | φ = 1.30 | φ = 1.65 | φ = 2.00 |
| 0 ÷ 60 | 2.49 | 1.85 | 185 | 168 | 142 | 112 | 92 |

**Assumptions:** **Characteristic density $\rho_k$ =350 kg/m³**

**The thread is anchored completely in the wood, without gaps in the component**
**Screws arranged at the center of a layer in the faces**