prof. dr.-ing. h a r t m u t Werner
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 l_g = 120 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.

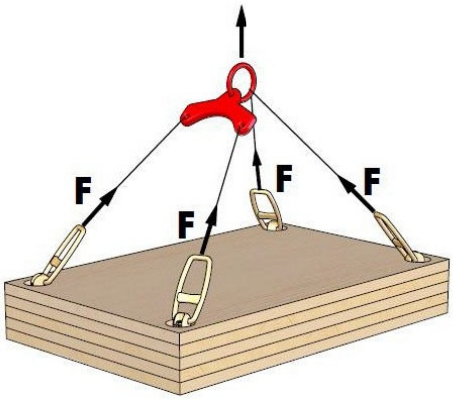
These loads, however, can swing when suspended from a crane. It is recommended to multiply the forces acting on the transport anchor system by the specified dynamic coefficients φ .

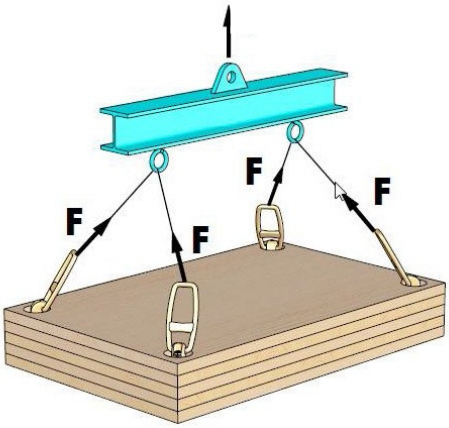
Recommended coefficients φ

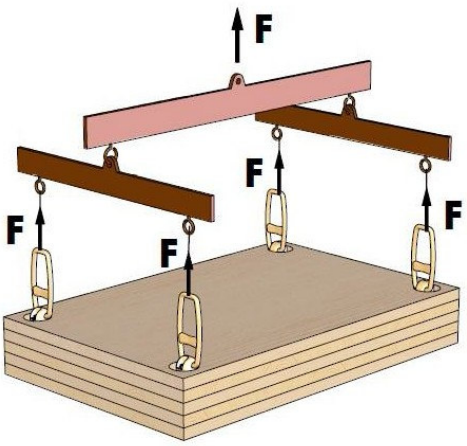
Lifting device	Lifting speed	Dynamic coefficient φ
Stationary crane, rotary crane Rail crane	< 90 m/min	1.10
Stationary crane, rotary crane Rail crane	≥ 90 m/min	1.30
Lifting and transporting on level ground		1.65
Lifting and transporting on		2.00

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.

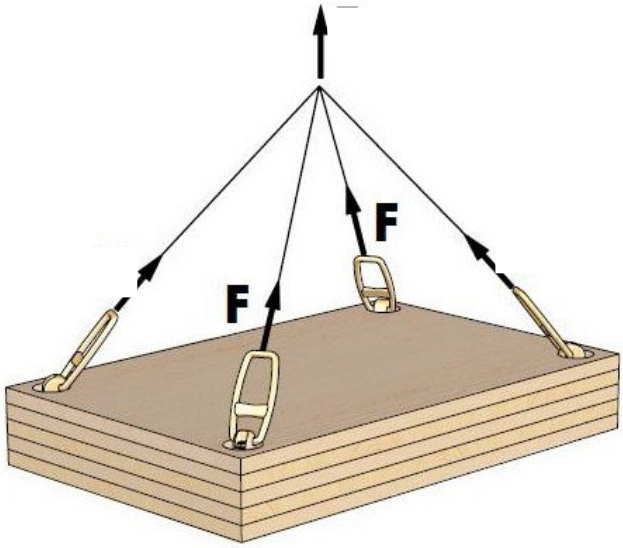






Spreader beam (n = 4)

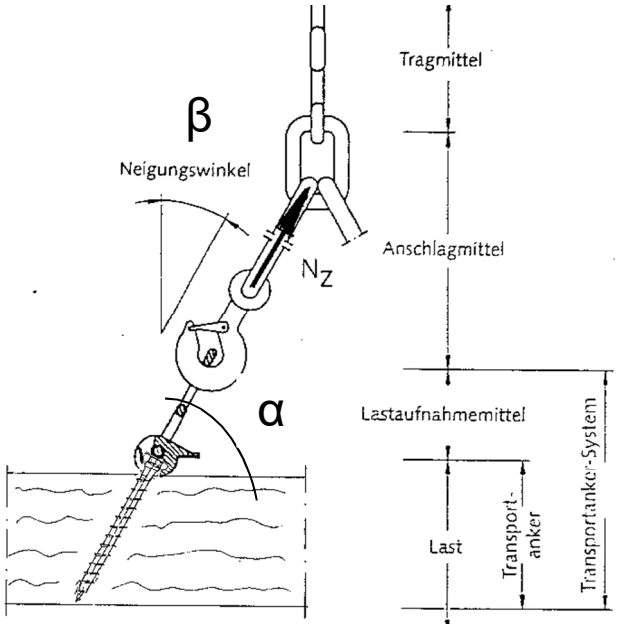
In the case of statically undefined suspension gear, BGR 500 (Section 2.8) stipulates that the anchors' dimensions must allow two of them to carry the entire load. The loads at the anchor sites must be calculated from the triangle of forces. For safety reasons, the screws may only be used **once**.



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 120 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	14.4	7.38	738	671	568	448	369
85	14.4	7.38	736	669	566	446	368
80	14.4	7.38	727	661	559	441	364
75	14.4	7.38	713	648	549	432	357
70	14.4	7.38	694	631	534	421	347
65	14.4	7.38	669	608	515	406	335
60	14.4	7.38	640	581	492	388	320
55	14.4	7.38	605	550	465	367	302
50	14.4	7.38	566	514	435	343	283
45	14.4	7.38	522	475	402	316	261
40	13.3	6.81	438	398	337	265	219
35	12.2	6.24	358	325	275	217	179
30	11.0	5.66	283	257	218	172	142

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

Fastening variant "axial loading on screw"

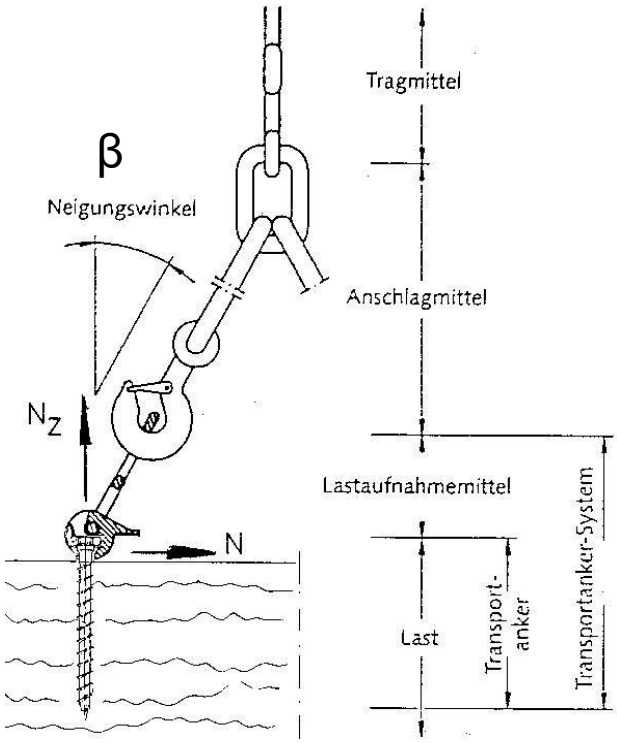
Würth *ASSY*® 4 Combi d = 12 mm, threaded length 120 mm

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	4.3	2.22	222	201	170	134	111
5	5.4	2.79	278	253	214	168	139
10	6.6	3.36	331	301	255	201	166
15	7.7	3.94	380	346	293	231	190
20	8.8	4.51	424	386	326	257	212
25	9.9	5.09	461	419	355	279	231
30	11.0	5.66	490	446	377	297	245
35	12.2	6.24	511	464	393	310	255
40	13.3	6.81	522	474	401	316	261
45	14.4	7.38	522	475	402	316	261

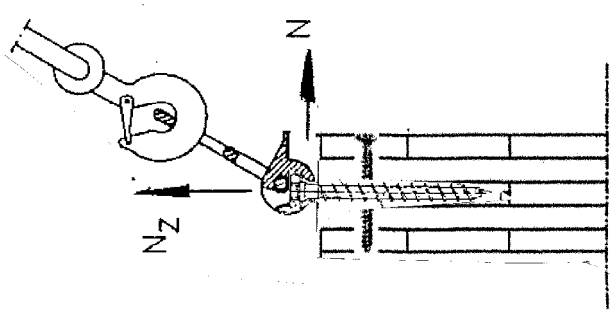
Fastening variant 2

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 120 mm

Anchoring depth of the screw in the timber $t_1 \geq 170$ 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 α = 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	9.97	7.38	738	671	568	448	369
5	9.91	7.34	731	665	562	443	366
10	9.73	7.21	710	645	546	430	355
15	9.47	7.01	677	616	521	410	339
20	9.14	6.77	636	578	489	385	318
25	8.77	6.50	589	535	453	357	294
30	8.40	6.22	539	490	415	327	270
35	8.04	5.96	488	444	375	296	244
40	7.71	5.71	437	397	336	265	219
45	7.40	5.48	388	352	298	235	194
50	7.13	5.28	339	308	261	206	170
55	6.89	5.10	293	266	225	177	146
60	6.69	4.95	248	225	190	150	124

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

(angle between screw axis and direction of grain α = 0°)

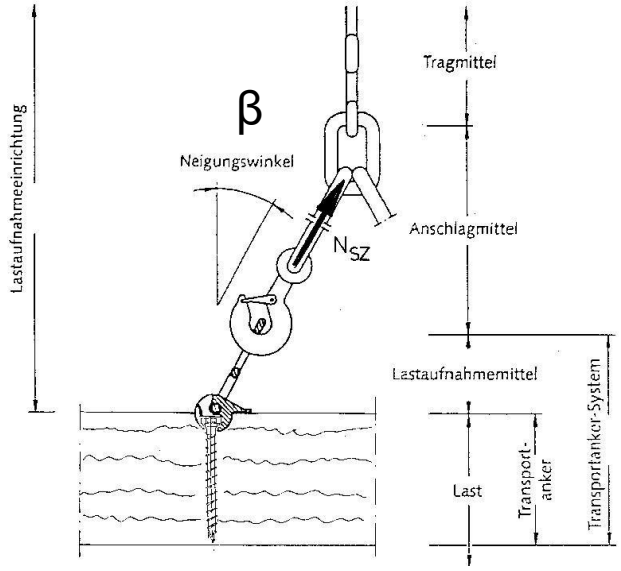
β	F_{Ed}	N_{SZ}	**Load per attachment point**				
°	in kN	in kN	**kg**				
			φ = 1.00	φ = 1.10	φ = 1.30	φ = 1.65	φ = 2.00
0	2.99	2.22	222	201	170	134	111
5	2.98	2.21	220	200	169	133	110
10	2.94	2.18	215	195	165	130	107
15	2.89	2.14	207	188	159	125	103
20	2.82	2.09	196	179	151	119	98
25	2.74	2.03	184	167	142	112	92
30	2.66	1.97	171	155	131	103	85
35	2.58	1.91	156	142	120	95	78
40	2.49	1.85	142	129	109	86	71
45	2.42	1.79	127	115	97	77	63
50	2.35	1.74	112	102	86	68	56
55	2.29	1.69	97	88	75	59	49
60	2.23	1.65	83	75	64	50	41

Assumptions: **Characteristic density ρ_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 120 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 α = 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	9.97	7.38	738	671	568	448	369

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

(angle between screw axis and direction of grain α = 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	2.99	2.22	222	201	170	134	111

Assumptions: **Characteristic density ρ_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