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 T transport anchor 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 T 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.

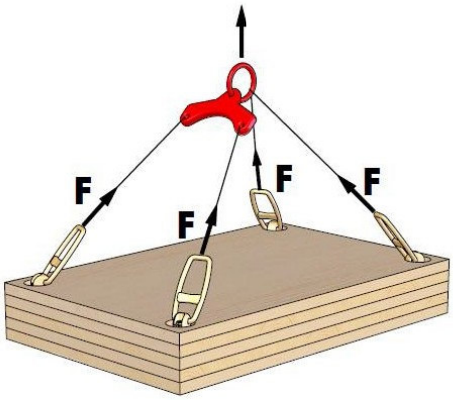
These loads, however, can swing when suspended from a crane. It is recommended to multiply the forces acting on the transport anchor system by the specified dynamic coefficients φ .

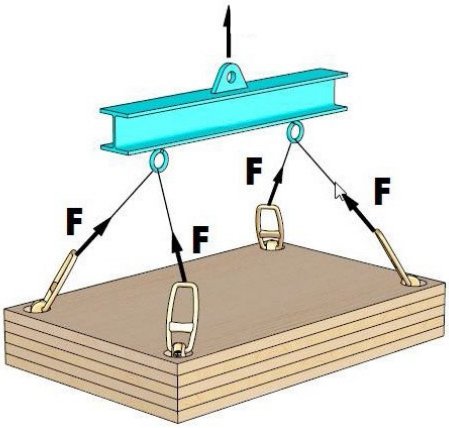
Recommended coefficients φ

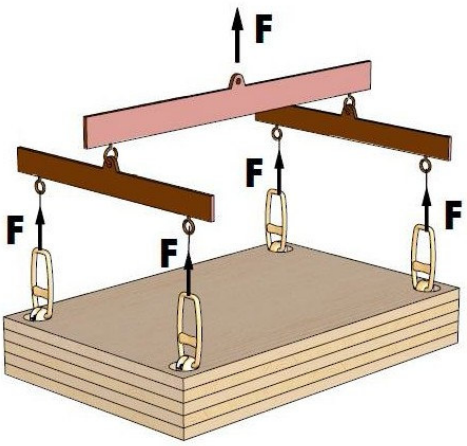
Lifting device	Lifting speed	Dynamic coefficient φ
Stationary crane, rotary crane Rail crane	< 90 m/min	1.10
Stationary crane, rotary crane Rail crane	≥ 90 m/min	1.30
Lifting and transporting on level ground		1.65
Lifting and transporting on		2.00

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.

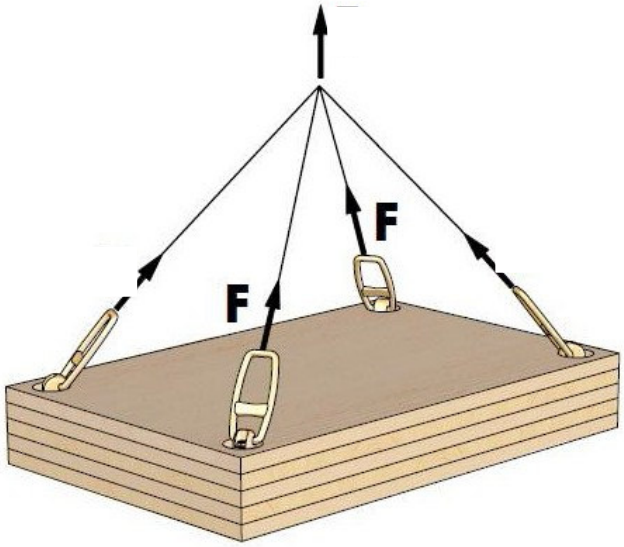






Spreader beam (n = 4)

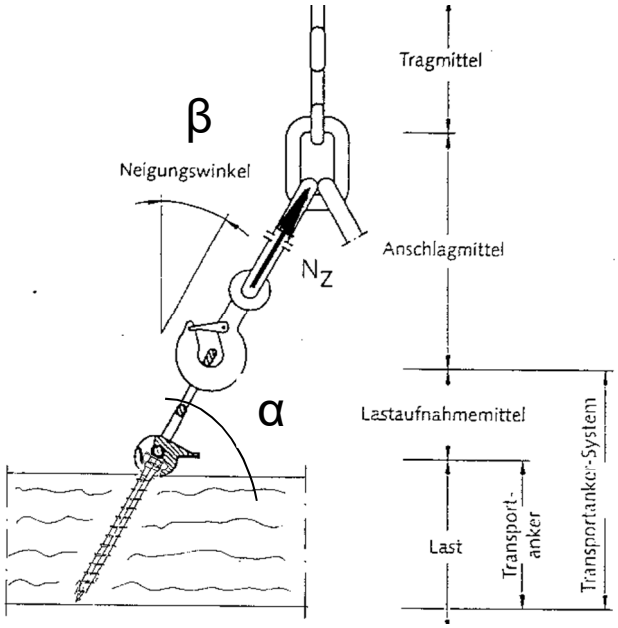
In the case of statically undefined suspension gear, BGR 500 (Section 2.8) stipulates that the anchors' dimensions must allow two of them to carry the entire load. The loads at the anchor sites must be calculated from the triangle of forces. For safety reasons, the screws may only be used **once**.



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 T 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 ρ_k =350 kg/m³**
The thread is anchored completely in the wood, without gaps in the component

Fastening variant "axial loading on screw"

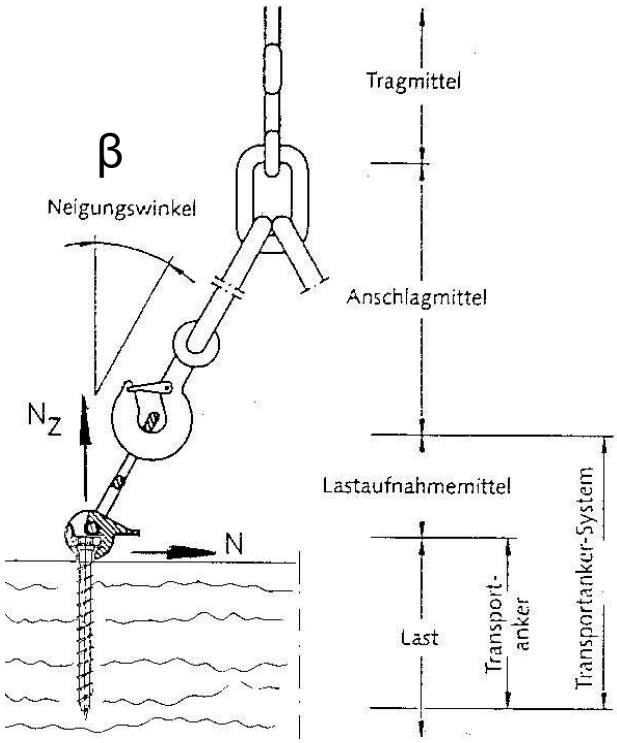
Würth *ASSY*® 4 Combi T d = 12 mm, threaded length 100 mm

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

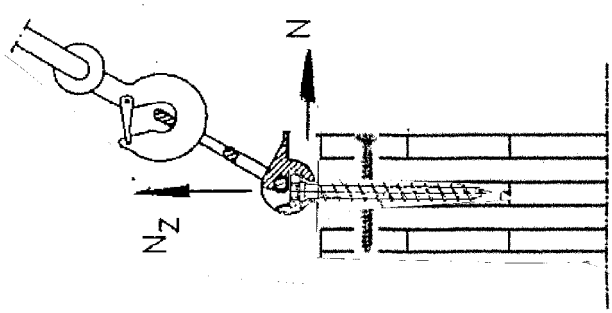
Fastening variant 2

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 T 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 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	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 α = 0°)

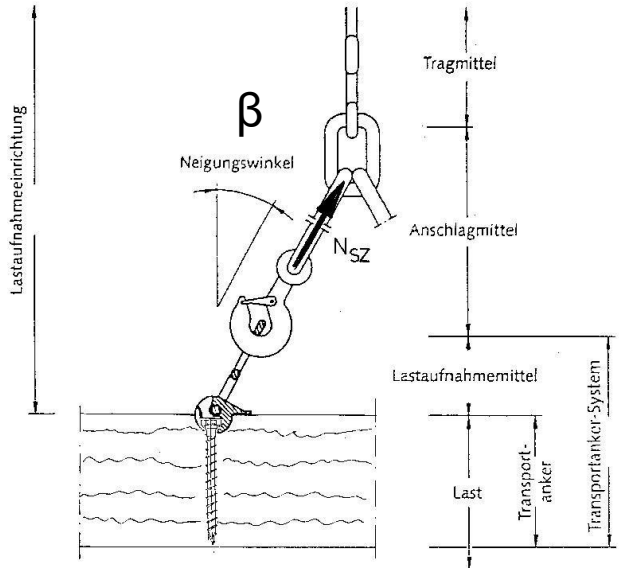
β	F_{Ed}	N_{SZ}	Load per attachment point				
°	in kN	in kN	kg				
			φ = 1.00	φ = 1.10	φ = 1.30	φ = 1.65	φ = 2.00
0	2.49	1.85	185	168	142	112	92
5	2.47	1.83	182	166	140	111	91
10	2.42	1.79	176	160	136	107	88
15	2.33	1.73	167	152	128	101	83
20	2.23	1.65	155	141	119	94	78
25	2.12	1.57	142	129	109	86	71
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 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 T 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 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	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 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	2.49	1.85	185	168	142	112	92

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