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 = 145 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.

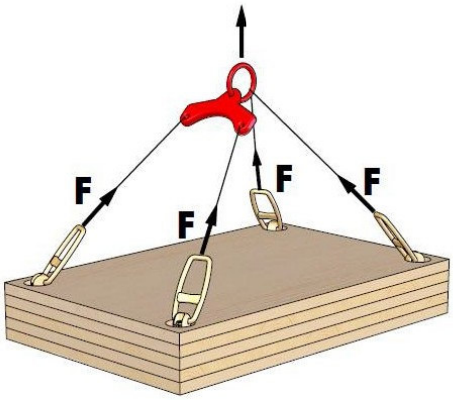
These loads, however, can swing when suspended from a crane. It is recommended to multiply the forces acting on the transport anchor system by the specified dynamic coefficients φ .

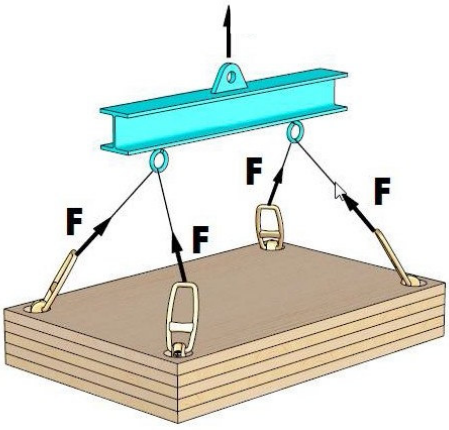
Recommended coefficients φ

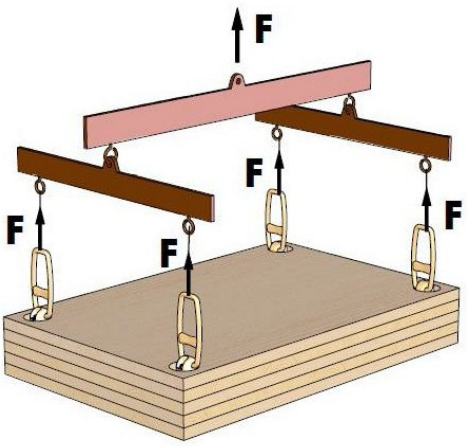
Lifting device	Lifting speed	Dynamic coefficient φ
Stationary crane, rotary crane Rail crane	< 90 m/min	1.10
Stationary crane, rotary crane Rail crane	≥ 90 m/min	1.30
Lifting and transporting on level ground		1.65
Lifting and transporting on		2.00

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.

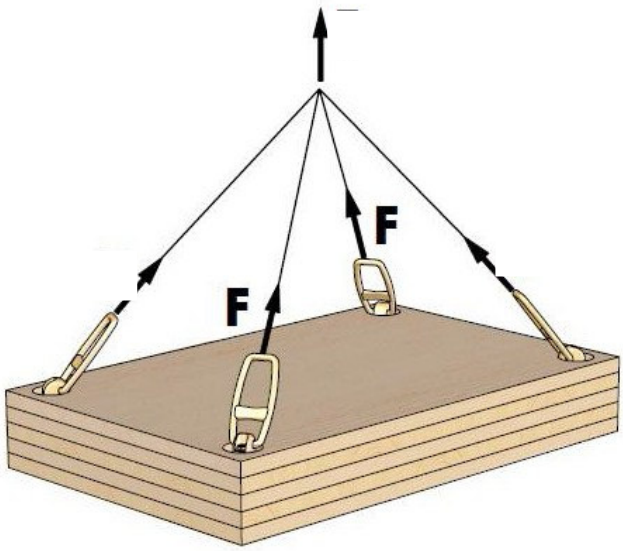






Spreader beam (n = 4)

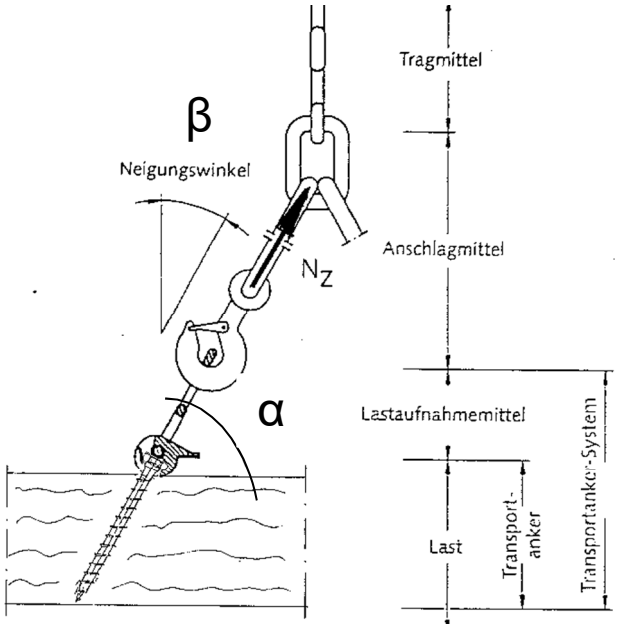
In the case of statically undefined suspension gear, BGR 500 (Section 2.8) stipulates that the anchors' dimensions must allow two of them to carry the entire load. The loads at the anchor sites must be calculated from the triangle of forces. For safety reasons, the screws may only be used **once**.



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 145 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	17.4	8.92	892	811	686	541	446
85	17.4	8.92	889	808	684	539	444
80	17.4	8.92	879	799	676	533	439
75	17.4	8.92	862	784	663	522	431
70	17.4	8.92	838	762	645	508	419
65	17.4	8.92	809	735	622	490	404
60	17.4	8.92	773	703	594	468	386
55	17.4	8.92	731	664	562	443	365
50	17.4	8.92	684	621	526	414	342
45	17.4	8.92	631	574	485	382	315
40	16.0	8.23	529	481	407	321	264
35	14.7	7.54	432	393	332	262	216
30	13.3	6.84	342	311	263	207	171

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

Fastening variant "axial loading on screw"

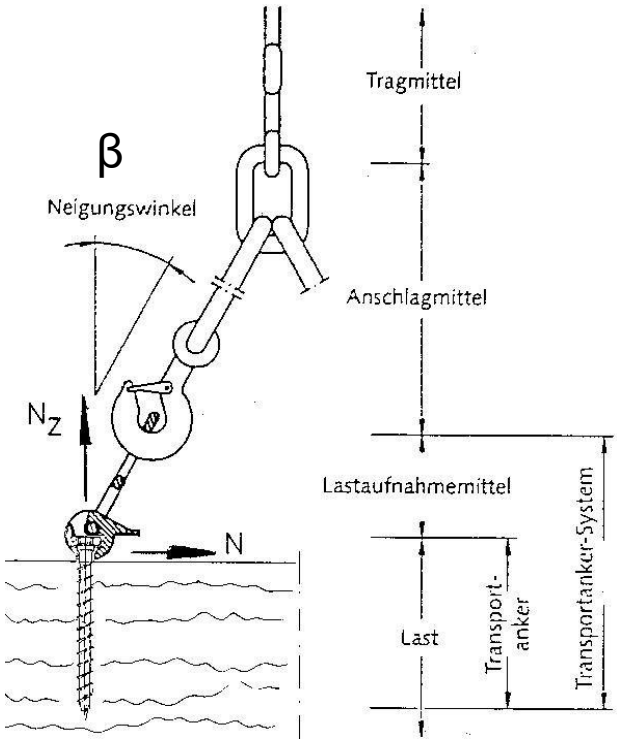
Würth *ASSY*® 4 Combi d = 12 mm, threaded length 145 mm

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	5.2	2.68	268	243	206	162	134
5	6.6	3.37	336	305	258	204	168
10	7.9	4.06	400	364	308	243	200
15	9.3	4.76	460	418	354	279	230
20	10.6	5.45	512	466	394	311	256
25	12.0	6.15	557	506	429	338	279
30	13.3	6.84	592	539	456	359	296
35	14.7	7.54	617	561	475	374	309
40	16.0	8.23	630	573	485	382	315
45	17.4	8.92	631	574	485	382	315

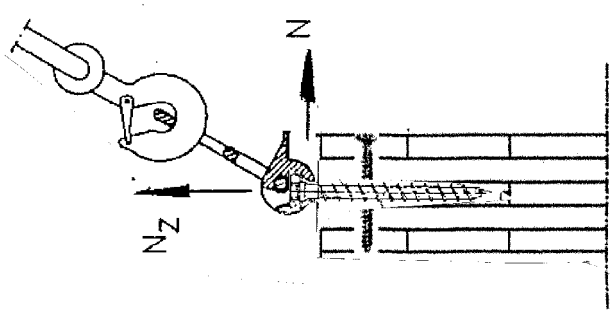
Fastening variant 2

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 145 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	12.05	8.92	892	811	686	541	446
5	11.94	8.85	881	801	678	534	441
10	11.65	8.63	850	773	654	515	425
15	11.22	8.31	803	730	618	487	402
20	10.71	7.93	745	678	573	452	373
25	10.16	7.53	682	620	525	414	341
30	9.62	7.13	617	561	475	374	309
35	9.12	6.75	553	503	426	335	277
40	8.66	6.41	491	447	378	298	246
45	8.25	6.11	432	393	332	262	216
50	7.89	5.85	376	342	289	228	188
55	7.59	5.62	322	293	248	195	161
60	7.33	5.43	272	247	209	165	136

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

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

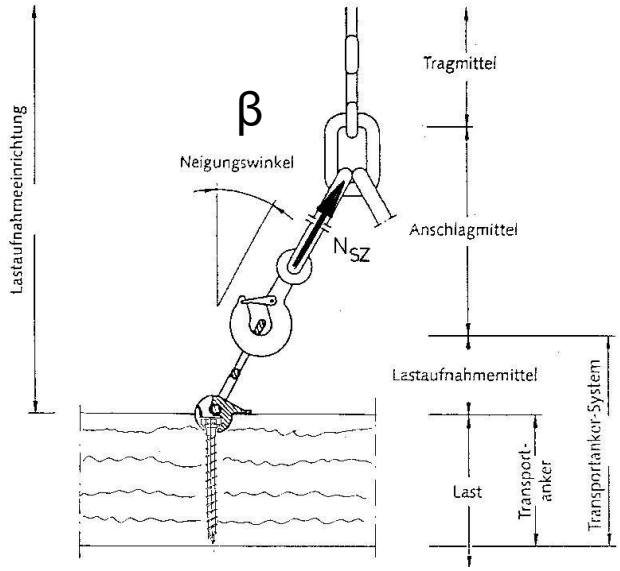
β	F_{Ed}	N_{SZ}	**Load per attachment point**				
°	in kN	in kN	**kg**				
			φ = 1.00	φ = 1.10	φ = 1.30	φ = 1.65	φ = 2.00
0	3.61	2.68	268	243	206	162	134
5	3.59	2.66	265	241	204	161	132
10	3.52	2.61	257	234	198	156	128
15	3.42	2.53	245	222	188	148	122
20	3.29	2.44	229	208	176	139	115
25	3.15	2.33	212	192	163	128	106
30	3.01	2.23	193	176	149	117	97
35	2.87	2.13	174	159	134	106	87
40	2.75	2.04	156	142	120	95	78
45	2.63	1.95	138	125	106	84	69
50	2.53	1.88	121	110	93	73	60
55	2.44	1.81	104	94	80	63	52
60	2.37	1.76	88	80	68	53	44

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 145 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	12.05	8.92	892	811	686	541	446

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	3.61	2.68	268	243	206	162	134

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