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 = 80 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.

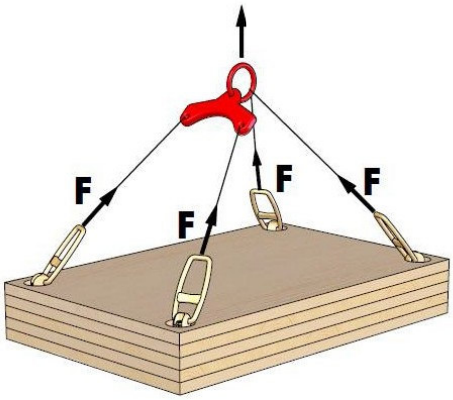
These loads, however, can swing when suspended from a crane. It is recommended to multiply the forces acting on the transport anchor system by the specified dynamic coefficients φ .

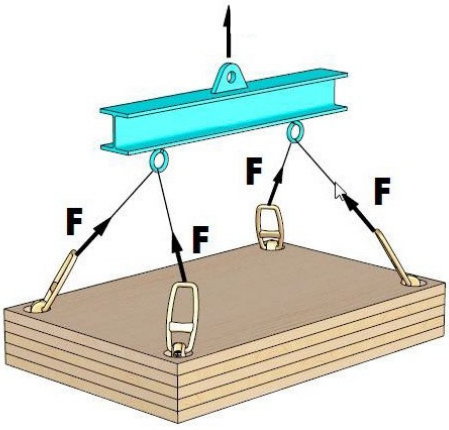
Recommended coefficients φ

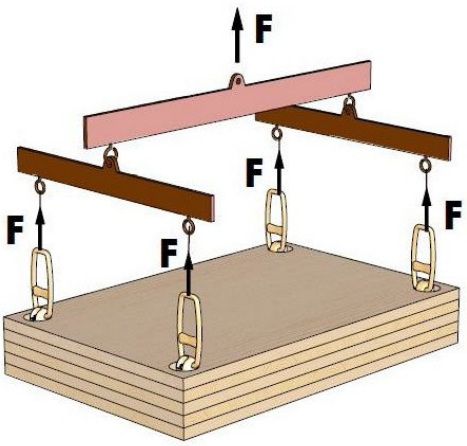
Lifting device	Lifting speed	Dynamic coefficient φ
Stationary crane, rotary crane Rail crane	< 90 m/min	1.10
Stationary crane, rotary crane Rail crane	≥ 90 m/min	1.30
Lifting and transporting on level ground		1.65
Lifting and transporting on		2.00

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.

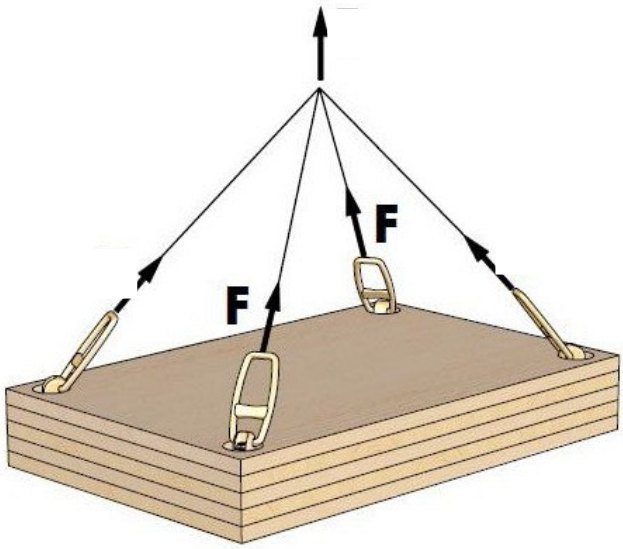






Spreader beam (n = 4)

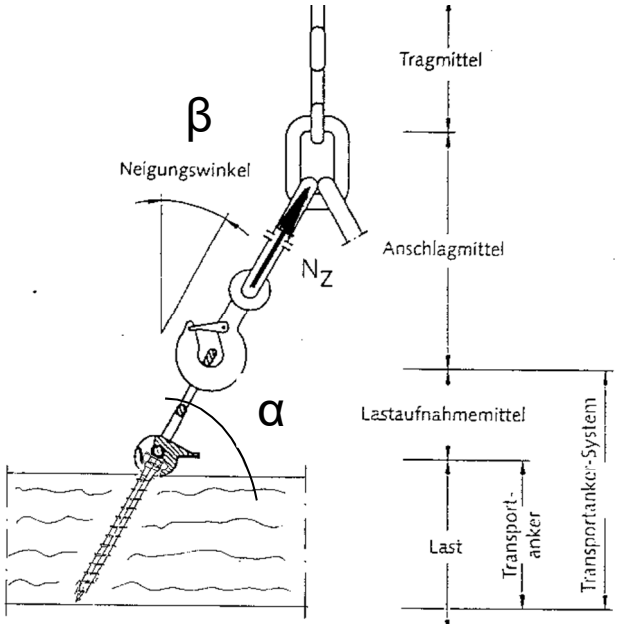
In the case of statically undefined suspension gear, BGR 500 (Section 2.8) stipulates that the anchors' dimensions must allow two of them to carry the entire load. The loads at the anchor sites must be calculated from the triangle of forces. For safety reasons, the screws may only be used **once**.



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 80 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	9.6	4.92	492	448	379	298	246
85	9.6	4.92	490	446	377	297	245
80	9.6	4.92	485	441	373	294	242
75	9.6	4.92	476	432	366	288	238
70	9.6	4.92	463	421	356	280	231
65	9.6	4.92	446	406	343	270	223
60	9.6	4.92	426	388	328	258	213
55	9.6	4.92	403	367	310	244	202
50	9.6	4.92	377	343	290	229	189
45	9.6	4.92	348	316	268	211	174
40	8.9	4.54	292	265	224	177	146
35	8.1	4.16	238	217	183	145	119
30	7.4	3.77	189	172	145	114	94

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"

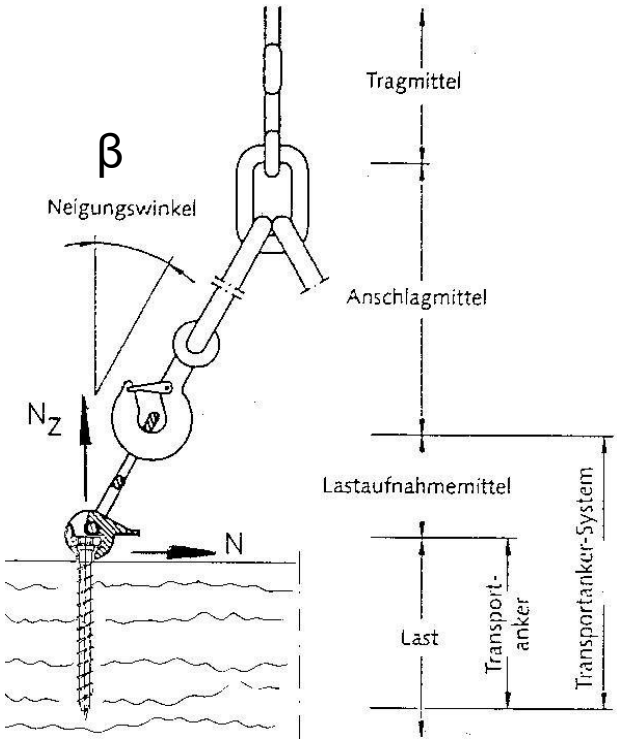
Würth *ASSY*® 4 Combi d = 12 mm, threaded length 80 mm

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	2.9	1.48	148	134	114	90	74
5	3.6	1.86	185	168	143	112	93
10	4.4	2.24	221	201	170	134	110
15	5.1	2.63	254	231	195	154	127
20	5.9	3.01	283	257	217	171	141
25	6.6	3.39	307	279	236	186	154
30	7.4	3.77	327	297	251	198	163
35	8.1	4.16	341	310	262	206	170
40	8.9	4.54	348	316	268	211	174
45	9.6	4.92	348	316	268	211	174

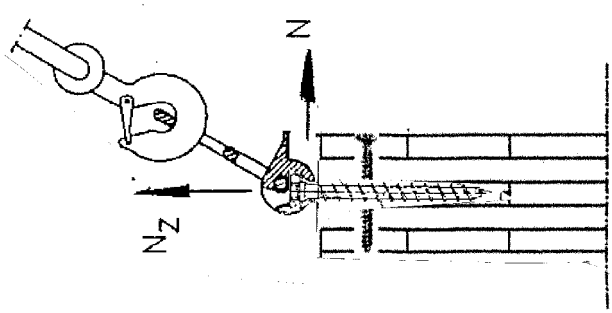
Fastening variant 2

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 80 mm (12x140/80)

Anchoring depth of the screw in the timber t_1 = 130 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	6.65	4.92	492	448	379	298	246
5	6.63	4.91	489	445	376	297	245
10	6.59	4.88	481	437	370	291	240
15	6.52	4.83	467	424	359	283	233
20	6.44	4.77	448	407	345	272	224
25	6.34	4.69	425	387	327	258	213
30	6.22	4.61	399	363	307	242	200
35	6.10	4.52	370	337	285	224	185
40	5.99	4.43	340	309	261	206	170
45	5.87	4.35	307	280	237	186	154
50	5.76	4.27	274	249	211	166	137
55	5.66	4.19	241	219	185	146	120
60	5.57	4.13	206	188	159	125	103

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	1.99	1.48	148	134	114	90	74
5	1.99	1.47	147	134	113	89	73
10	1.98	1.47	144	131	111	88	72
15	1.97	1.46	141	128	108	85	70
20	1.94	1.44	135	123	104	82	68
25	1.92	1.42	129	117	99	78	64
30	1.89	1.40	121	110	93	74	61
35	1.86	1.38	113	103	87	69	57
40	1.83	1.36	104	95	80	63	52
45	1.81	1.34	95	86	73	57	47
50	1.78	1.32	85	77	65	51	42
55	1.75	1.30	74	68	57	45	37
60	1.73	1.28	64	58	49	39	32

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 "inclined tensile loading on screw"

Würth *ASSY*® 4 Combi d = 12 mm, threaded length 80 mm (12x120/80)

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**				
°	kN	kN	**kg**				
			φ =1,00	φ =1,10	φ =1,30	φ =1,65	φ =2,00
0	6.65	4.92	492	448	379	298	246
5	6.63	4.91	489	445	376	296	244
10	6.57	4.87	479	436	369	290	240
15	6.48	4.80	464	421	357	281	232
20	6.36	4.71	443	403	341	268	221
25	6.23	4.61	418	380	321	253	209
30	6.08	4.50	390	354	300	236	195
35	5.93	4.39	360	327	277	218	180
40	5.78	4.28	328	298	252	199	164
45	5.63	4.17	295	268	227	179	148
50	5.50	4.08	262	238	202	159	131
55	5.38	3.99	229	208	176	139	114
60	5.28	3.91	195	178	150	118	98

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**				
°	kN	kN	**kg**				
			φ =1,00	φ =1,10	φ = 1,30	φ =1,65	φ =2,00
0	1.99	1.48	148	134	114	90	74
5	1.99	1.47	147	133	113	89	73
10	1.96	1.45	143	130	110	87	72
15	1.93	1.43	138	126	106	84	69
20	1.89	1.40	131	119	101	80	66
25	1.84	1.36	123	112	95	75	62
30	1.78	1.32	114	104	88	69	57
35	1.73	1.28	105	95	81	64	52
40	1.67	1.24	95	86	73	58	48
45	1.63	1.20	85	77	65	52	43
50	1.58	1.17	75	68	58	46	38
55	1.54	1.14	65	59	50	40	33
60	1.50	1.11	56	51	43	34	28

Assumptions: **Characteristic density ρ_k =350 kg/m³**

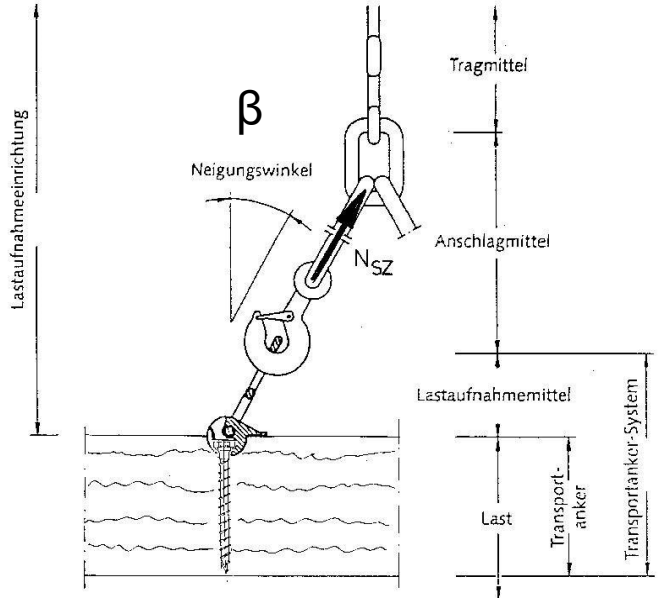
The thread is anchored completely in the wood, without gaps in the component

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 80 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	6.46	4.79	479	435	368	290	239

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	1.99	1.48	148	134	114	90	74

Assumptions: **Characteristic density ρ_k =350 kg/m³**

Anchoring depth of the screw in the face ≥ 120 mm
The thread is anchored completely in the wood, without gaps in the component
Screws arranged at the center of a layer in the faces