VGZ HARDWOOD

UKCA UKTA-0836 22/6195 · CE ETA-11/0030

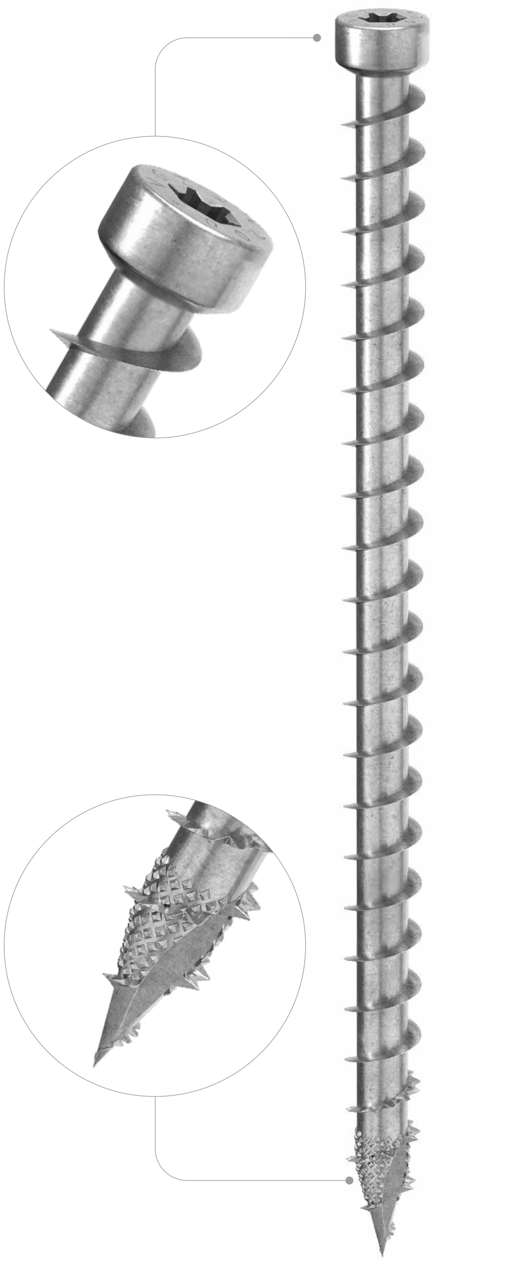
FULLY THREADED SCREW FOR HARDWOODS

HARDWOOD CERTIFICATION
Special tip with diamond geometry and notched, serrated thread. ETA-11/0030 certification for use with high-density wood without pre-drilling hole or with an appropriate pilot hole. Approved for structural applications subject to stresses in any direction vs the grain (0° ÷ 90°).

HYBRID SOFTWOOD-HARDWOOD
The high-strength steel and the increased screw diameter allow excellent tensile and torsional performance to be achieved, thus ensuring safe screwing in high-density wood.

INCREASED DIAMETER
Deep thread and high resistance steel for excellent tensile performance. Characteristics that, together with an excellent torsional moment value, guarantee screwing in the highest densities of wood.

CYLINDRICAL HEAD
Ideal for concealed joints, timber couplings and structural reinforcements. Improved performance in fire conditions compared to countersunk head.



BIT INCLUDED

DIAMETER [mm]	5 — 6 – 8 — 11
LENGTH [mm]	80 — 140 – 440 — 1000
SERVICE CLASS	SC1 SC2
ATMOSPHERIC CORROSIVITY	C1 C2
WOOD CORROSIVITY	T1 T2
MATERIAL	Zn ELECTRO PLATED electrogalvanized carbon steel

FIELDS OF USE

- timber based panels
- solid timber and glulam
- CLT and LVL
- high density woods
- hybrid engineered timbers (softwood-hardwood)
- beech, oak, cypress, ash, eucalyptus, bamboo

HARDWOOD PERFORMANCE

Geometry developed for high performance and use without pre-drilling on structural woods such as beech, oak, cypress, ash, eucalyptus, bamboo.

BEECH LVL

Values also tested, certified and calculated for high density woods such as beechwood Microllam® LVL. Certified for use for densities of up to 800 kg/m^3.

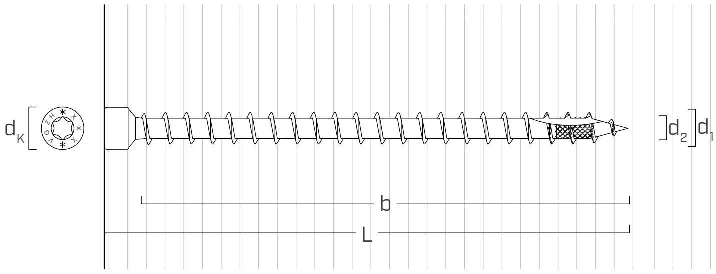
CODES AND DIMENSIONS

d_1 [mm]	CODE	L [mm]	b [mm]	pcs
6 TX30	VGZH6140	140	130	25
	VGZH6180	180	170	25
	VGZH6220	220	210	25
	VGZH6260	260	250	25
	VGZH6280	280	270	25
	VGZH6320	320	310	25
	VGZH6420	420	410	25

d_1 [mm]	CODE	L [mm]	b [mm]	pcs
8 TX 40	VGZH8200	200	190	25
	VGZH8240	240	230	25
	VGZH8280	280	270	25
	VGZH8320	320	310	25
	VGZH8360	360	350	25
	VGZH8400	400	390	25
	VGZH8440	440	430	25

NOTES: upon request, EVO version is available.

GEOMETRY AND MECHANICAL CHARACTERISTICS



GEOMETRY

Nominal diameter	d_1	[mm]	6	8
Head diameter	d_K	[mm]	9,50	11,50
Thread diameter	d_2	[mm]	4,50	5,90
Pre-drilling hole diameter(1)	$d_{V,S}$	[mm]	4,0	5,0
Pre-drilling hole diameter(2)	$d_{V,H}$	[mm]	4,0	6,0

(1) Pre-drilling valid for softwood.
(2) Pre-drilling valid for hardwood and beech LVL.

CHARACTERISTIC MECHANICAL PARAMETERS

Nominal diameter	d_1	[mm]	6	8
Tensile strength	$f_{tens,k}$	[kN]	18,0	38,0
Yield strength	$f_{y,k}$	[N/mm^2]	1000	1000
Yield moment	$M_{y,k}$	[Nm]	15,8	33,4

			softwood *(softwood)*	**oak, beech** *(hardwood)*	**ash** *(hardwood)*	**beech LVL** *(Beech LVL)*
Withdrawal resistance parameter	$f_{ax,k}$	[N/mm^2]	11,7	22,0	30,0	42,0
Associated density	ρ_a	[kg/m^3]	350	530	530	730
Calculation density	ρ_k	*[kg/m^3]*	*≤ 440*	*≤ 590*	*≤ 590*	*590 ÷ 750*

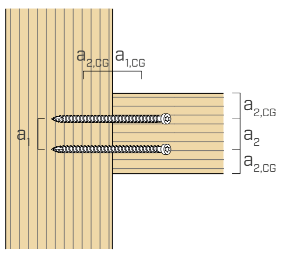
For applications with different materials please see ETA-11/0030.

MINIMUM DISTANCES FOR AXIAL STRESSES

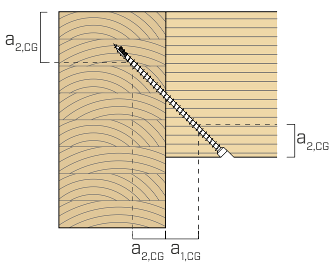
screws inserted **WITH and WITHOUT pre-drilled hole**

d_1	[mm]		6	8
a_1	[mm]	5·d	30	40
a_2	[mm]	5·d	30	40
$a_{2,LIM}$	[mm]	2,5·d	15	20
$a_{1,CG}$	[mm]	10·d	60	80
$a_{2,CG}$	[mm]	4·d	24	32
a_{CROSS}	[mm]	1,5·d	9	12

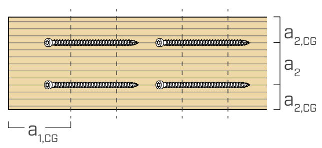
SCREWS UNDER TENSION INSERTED WITH AN ANGLE α WITH RESPECT TO THE GRAIN



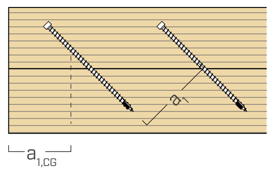
plan



front

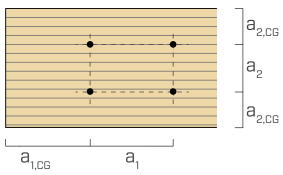


plan

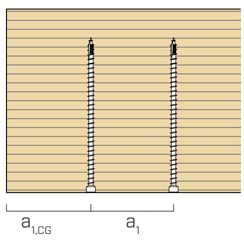


front

SCREWS INSERTED WITH α = 90° ANGLE WITH RESPECT TO THE GRAIN

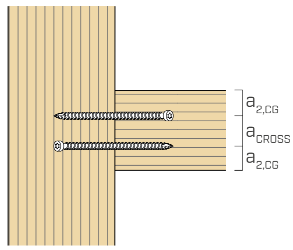


plan

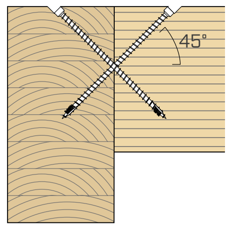


front

CROSS SCREWS INSERTED WITH AN ANGLE α WITH RESPECT TO THE GRAIN



plan

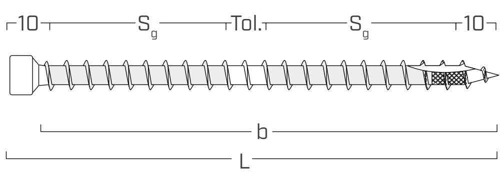


front

NOTES

- Minimum distances according to ETA-11/0030.
- The minimum distances are independent of the insertion angle of the connector and the angle of the force with respect to the grain.
- The axial distance a_2 can be reduced down to $a_{2,LIM}$ if for each connector a "joint surface" $a_1\ a_2 = 25\ d_1^2$ is maintained.

EFFECTIVE THREAD USED IN CALCULATION

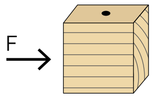


b $= S_{g,tot} = L - 10$ mm — represents the entire length of the threaded part

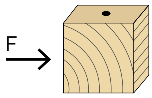
$S_g = (L - 10\text{ mm} - 10\text{ mm} - \text{Tol.})/ 2$ — represents the partial length of the threaded part net of a laying tolerance (Tol.) of 10 mm

MINIMUM DISTANCES FOR SHEAR LOADS | TIMBER

screws inserted **WITHOUT pre-drilled hole** $\rho_k > 420\ kg/m^3$



α=0°



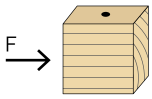
α=90°

d_1	[mm]		7	9	11
a_1	[mm]	**12·d**	84	108	132
a_2	[mm]	**5·d**	35	45	55
$a_{3,t}$	[mm]	**15·d**	105	135	165
$a_{3,c}$	[mm]	**10·d**	70	90	110
$a_{4,t}$	[mm]	**5·d**	35	45	55
$a_{4,c}$	[mm]	**5·d**	35	45	55

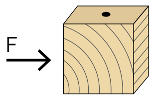
d_1	[mm]		7	9	11
a_1	[mm]	**5·d**	35	45	55
a_2	[mm]	**5·d**	35	45	55
$a_{3,t}$	[mm]	**10·d**	70	90	110
$a_{3,c}$	[mm]	**10·d**	70	90	110
$a_{4,t}$	[mm]	**10·d**	70	90	110
$a_{4,c}$	[mm]	**5·d**	35	45	55

α = load-to-grain angle
$d = d_1$ = nominal screw diameter

screws inserted **WITH pre-drilled hole**



α=0°

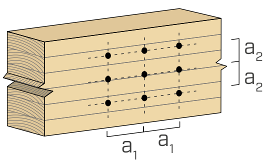


α=90°

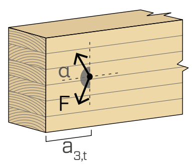
d_1	[mm]		7	9	11
a_1	[mm]	**5·d**	35	45	55
a_2	[mm]	**3·d**	21	27	33
$a_{3,t}$	[mm]	**12·d**	84	108	132
$a_{3,c}$	[mm]	**7·d**	49	63	77
$a_{4,t}$	[mm]	**3·d**	21	27	33
$a_{4,c}$	[mm]	**3·d**	21	27	33

d_1	[mm]		7	9	11
a_1	[mm]	**4·d**	28	36	44
a_2	[mm]	**4·d**	28	36	44
$a_{3,t}$	[mm]	**7·d**	49	63	77
$a_{3,c}$	[mm]	**7·d**	49	63	77
$a_{4,t}$	[mm]	**7·d**	49	63	77
$a_{4,c}$	[mm]	**3·d**	21	27	33

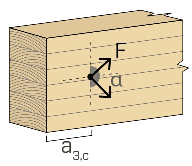
α = load-to-grain angle
$d = d_1$ = nominal screw diameter



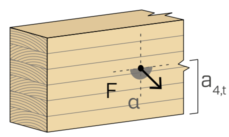
stressed end
-90° < α < 90°



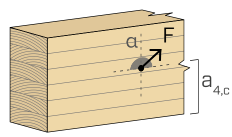
unloaded end
90° < α < 270°



stressed edge
0° < α < 180°



unload edge
180° < α < 360°



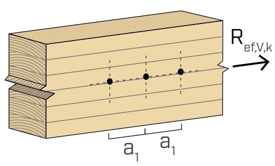
NOTES

- The minimum distances are in accordance with the EN 1995:2014 standard, according to ETA-11/0030, considering a timber characteristic density of $420 < \rho_k \leq 500\ kg/m^3$.
- The minimum spacing for all panel-to-timber connections (a_1, a_2) can be multiplied by a coefficient of 0,85.

EFFECTIVE NUMBER FOR SHEAR LOADS

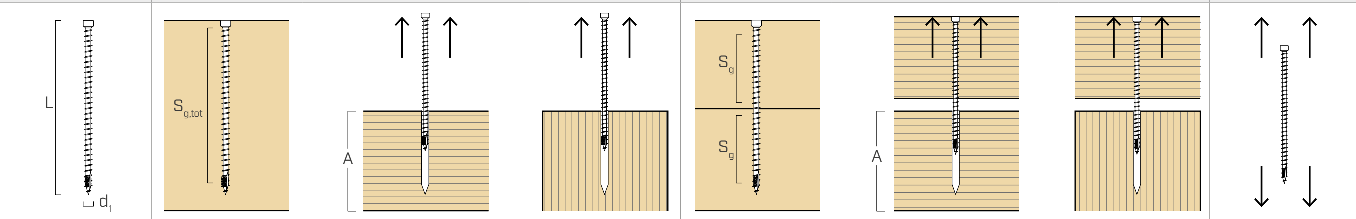
The load-bearing capacity of a connection made with several screws, all of the same type and size, may be lower than the sum of the load-bearing capacities of the individual connection system.

For a row of n screws arranged parallel to the direction of the grain at a distance a_1, the characteristic effective shear bearing capacity $R_{ef,V,k}$ can be calculated by means of the effective number n_{ef} (see page 169).



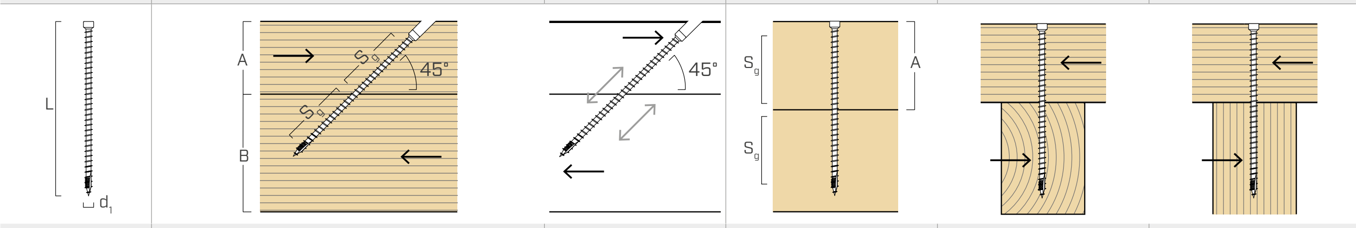
STRUCTURAL VALUES | TIMBER(SOFTWOOD)

CHARACTERISTIC VALUES
EN 1995:2014



		TENSION								
geometry		total thread withdrawal				partial thread withdrawal				steel tension
		ε=90°			ε=0°	ε=90°			ε=0°	
d_1 [mm]	L [mm]	$S_{g,tot}$ [mm]	A_{min} [mm]	$R_{ax,90,k}$ [kN]	$R_{ax,0,k}$ [kN]	S_g [mm]	A_{min} [mm]	$R_{ax,90,k}$ [kN]	$R_{ax,0,k}$ [kN]	$R_{tens,k}$ [kN]
6	140	130	150	9,85	2,95	55	75	4,17	1,25	18,00
	180	170	190	12,88	3,86	75	95	5,68	1,70	
	220	210	230	15,91	4,77	95	115	7,20	2,16	
	260	250	270	18,94	5,68	115	135	8,71	2,61	
	280	270	290	20,46	6,14	125	145	9,47	2,84	
	320	310	330	23,49	7,05	145	165	10,99	3,30	
	420	410	430	31,06	9,32	195	215	14,77	4,43	
8	200	190	210	19,19	5,76	85	105	8,59	2,58	32,00
	240	230	250	23,23	6,97	105	125	10,61	3,18	
	280	270	290	27,27	8,18	125	145	12,63	3,79	
	320	310	330	31,31	9,39	145	165	14,65	4,39	
	360	350	370	35,36	10,61	165	185	16,67	5,00	
	400	390	410	39,40	11,82	185	205	18,69	5,61	
	440	430	450	43,44	13,03	205	225	20,71	6,21	

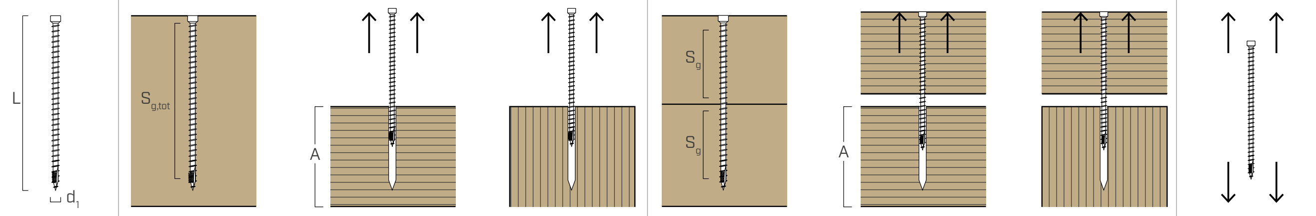
ε = screw-to-grain angle



		SLIDING					SHEAR			
geometry		timber-to-timber				steel tension	timber-to-timber		timber-to-timber ε=90°	timber-to-timber ε=0°
d_1 [mm]	L [mm]	S_g [mm]	A [mm]	B_{min} [mm]	$R_{V,k}$ [kN]	$R_{tens,45,k}$ [kN]	S_g [mm]	A [mm]	$R_{V,90,k}$ [mm]	$R_{V,0,k}$ [kN]
6	140	55	55	70	2,95	12,73	55	70	3,19	1,80
	180	75	70	85	4,02		75	90	3,57	2,05
	220	95	85	100	5,09		95	110	3,95	2,17
	260	115	95	110	6,16		115	130	4,30	2,28
	280	125	105	120	6,70		125	140	4,30	2,34
	320	145	120	135	7,77		145	160	4,30	2,45
	420	195	155	170	10,45		195	210	4,30	2,73
8	200	85	75	90	6,07	22,63	85	100	5,60	3,17
	240	105	90	105	7,50		105	120	6,11	3,41
	280	125	105	120	8,93		125	140	6,61	3,56
	320	145	120	135	10,36		145	160	6,92	3,71
	360	165	130	145	11,79		165	180	6,92	3,86
	400	185	145	160	13,21		185	200	6,92	4,02
	440	205	160	175	14,64		205	220	6,92	4,17

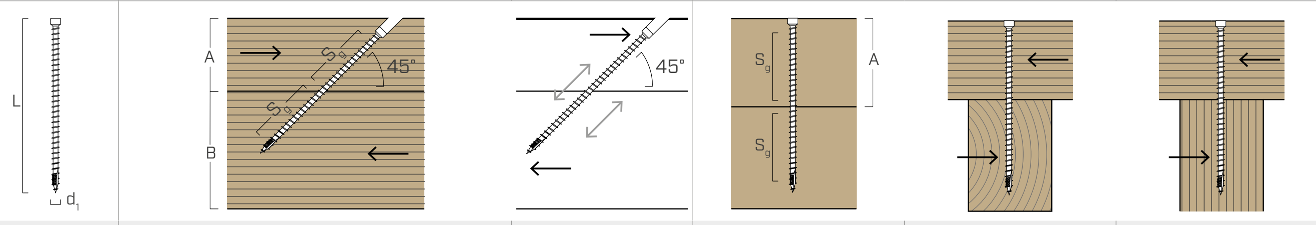
ε = screw-to-grain angle

NOTES and GENERAL PRINCIPLES on page 163.



geometry		TENSION								
		total thread withdrawal				partial thread withdrawal				steel tension
		ε=90°			ε=0°	ε=90°			ε=0°	
d_1 [mm]	L [mm]	$S_{g,tot}$ [mm]	A_{min} [mm]	$R_{ax,90,k}$ [kN]	$R_{ax,0,k}$ [kN]	S_g [mm]	A_{min} [mm]	$R_{ax,90,k}$ [kN]	$R_{ax,0,k}$ [kN]	$R_{tens,k}$ [kN]
6	140	130	150	17,68	5,30	55	75	7,48	2,24	18,00
	180	170	190	23,11	6,93	75	95	10,20	3,06	
	220	210	230	28,55	8,57	95	115	12,92	3,88	
	260	250	270	33,99	10,20	115	135	15,64	4,69	
	280	270	290	36,71	11,01	125	145	17,00	5,10	
	320	310	330	42,15	12,65	145	165	19,72	5,91	
8	200	190	210	34,45	10,33	85	105	15,41	4,62	32,00
	240	230	250	41,70	12,51	105	125	19,04	5,71	
	280	270	290	48,95	14,68	125	145	22,66	6,80	
	320	310	330	56,20	16,86	145	165	26,29	7,89	
	360	350	370	63,45	19,04	165	185	29,91	8,97	

ε = screw-to-grain angle

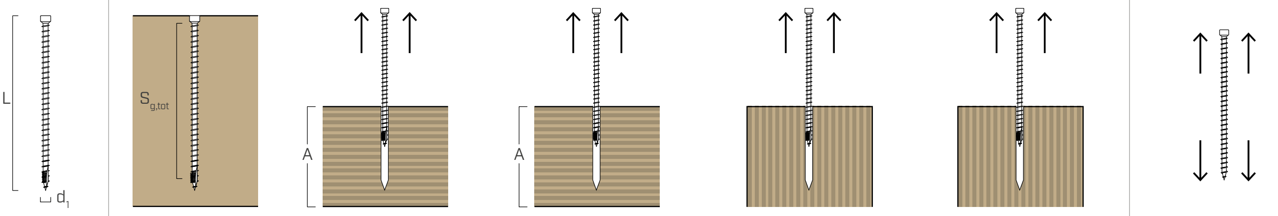


geometry		SLIDING					SHEAR			
		hardwood-hardwood				steel tension			hardwood-hardwood ε=90°	hardwood-hardwood ε=0°
d_1 [mm]	L [mm]	S_g [mm]	A [mm]	B_{min} [mm]	$R_{V,k}$ [kN]	$R_{tens,45,k}$ [kN]	S_g [mm]	A [mm]	$R_{V,90,k}$ [mm]	$R_{V,0,k}$ [kN]
6	140	55	55	70	5,29	12,73	55	70	4,44	2,50
	180	75	70	85	7,21		75	90	5,12	2,71
	220	95	85	100	9,13		95	110	5,14	2,91
	260	115	95	110	11,06		115	130	5,14	3,12
	280	125	105	120	12,02		125	140	5,14	3,22
	320	145	120	135	13,94		145	160	5,14	3,42
8	200	85	75	90	10,90	22,63	85	100	7,99	4,28
	240	105	90	105	13,46		105	120	8,27	4,55
	280	125	105	120	16,02		125	140	8,27	4,82
	320	145	120	135	18,59		145	160	8,27	5,10
	360	165	130	145	21,15		165	180	8,27	5,37

ε = screw-to-grain angle

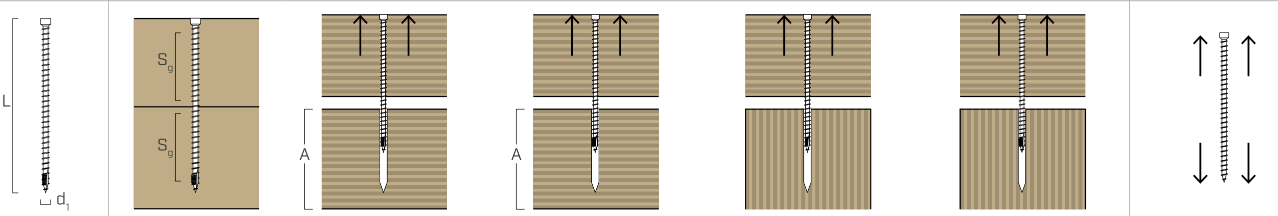
NOTES and GENERAL PRINCIPLES on page 163.

TENSION



geometry				total thread withdrawal				steel tension
				wide		edge		
				without pre-drilled hole	with pre-drilled hole	without pre-drilled hole	with pre-drilled hole	
d_1 [mm]	L [mm]	$S_{g,tot}$ [mm]	A_{min} [mm]	$R_{ax,90,k}$ [kN]	$R_{ax,90,k}$ [kN]	$R_{ax,0,k}$ [kN]	$R_{ax,0,k}$ [kN]	$R_{tens,k}$ [kN]
6	140	130	150	32,76	22,62	21,84	15,08	18,00
	180	170	190	42,84	29,58	28,56	19,72	
	220	210	230	52,92	36,54	35,28	24,36	
	260	250	270	63,00	43,50	42,00	29,00	
	280	270	290	68,04	46,98	45,36	31,32	
	320	310	330	78,12	53,94	52,08	35,96	
	420	410	430	-	71,34	-	47,56	
8	200	190	210	63,84	44,08	42,56	29,39	32,00
	240	230	250	77,28	53,36	51,52	35,57	
	280	270	290	90,72	62,64	60,48	41,76	
	320	310	330	104,16	71,92	69,44	47,95	
	360	350	370	117,60	81,20	78,40	54,13	
	400	390	410	-	90,48	-	60,32	
	440	430	450	-	99,76	-	66,51	

TENSION

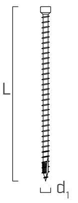


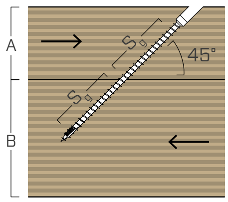
geometry				partial thread withdrawal				steel tension
				wide		edge		
				without pre-drilled hole	with pre-drilled hole	without pre-drilled hole	with pre-drilled hole	
d_1 [mm]	L [mm]	S_g [mm]	A_{min} [mm]	$R_{ax,90,k}$ [kN]	$R_{ax,90,k}$ [kN]	$R_{ax,0,k}$ [kN]	$R_{ax,0,k}$ [kN]	$R_{tens,k}$ [kN]
6	140	55	75	13,86	9,57	9,24	6,38	18,00
	180	75	95	18,90	13,05	12,60	8,70	
	220	95	115	23,94	16,53	15,96	11,02	
	260	115	135	28,98	20,01	19,32	13,34	
	280	125	145	31,50	21,75	21,00	14,50	
	320	145	165	36,54	25,23	24,36	16,82	
	420	195	215	-	33,93	-	22,62	
8	200	85	105	28,56	19,72	19,04	13,15	32,00
	240	105	125	35,28	24,36	23,52	16,24	
	280	125	145	42,00	29,00	28,00	19,33	
	320	145	165	48,72	33,64	32,48	22,43	
	360	165	185	55,44	38,28	36,96	25,52	
	400	185	205	-	42,92	-	28,61	
	440	205	225	-	47,56	-	31,71	

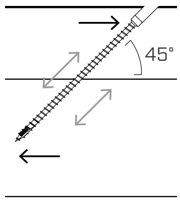
NOTES and GENERAL PRINCIPLES on page 163.

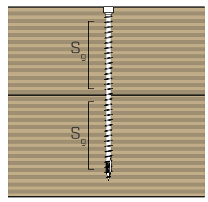
STRUCTURAL VALUES | BEECH LVL

CHARACTERISTIC VALUES
EN 1995:2014



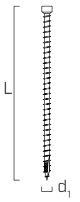


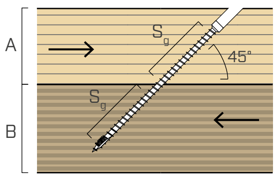


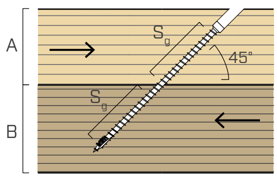


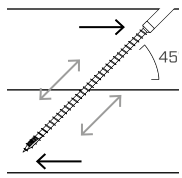
		SLIDING						SHEAR			
geometry		beech LVL-beech LVL					steel tension	beech LVL-beech LVL			
					without pre-drilled hole	with pre-drilled hole				without pre-drilled hole	with pre-drilled hole
d_1 [mm]	L [mm]	S_g [mm]	A [mm]	B_{min} [mm]	$R_{V,k}$ [kN]	$R_{V,k}$ [kN]	$R_{tens,45,k}$ [kN]	S_g [mm]	A [mm]	$R_{V,90,k}$ [kN]	$R_{V,90,k}$ [kN]
	140	55	55	70	7,84	5,41		55	70	6,77	5,78
	180	75	70	85	10,69	7,38		75	90	6,77	6,65
	220	95	85	100	13,54	9,35		95	110	6,77	6,77
6	260	115	95	110	16,39	11,32	12,73	115	130	6,77	6,77
	280	125	105	120	17,82	12,30		125	140	6,77	6,77
	320	145	120	135	20,67	14,27		145	160	6,77	6,77
	420	195	155	170	-	19,19		195	210	-	6,77
	200	85	75	90	16,16	11,16		85	100	11,13	10,50
	240	105	90	105	19,96	13,78		105	120	11,13	11,13
	280	125	105	120	23,76	16,40		125	140	11,13	11,13
8	320	145	120	135	27,56	19,03	22,63	145	160	11,13	11,13
	360	165	130	145	31,36	21,65		165	180	11,13	11,13
	400	185	145	160	-	24,28		185	200	-	11,13
	440	205	160	175	-	26,90		205	220	-	11,13

STRUCTURAL VALUES | HYBRID CONNECTIONS









		SLIDING										
geometry		timber-beech LVL					timber-hardwood					steel tension
d_1 [mm]	L [mm]	$S_{g,A}$ [mm]	A [mm]	$S_{g,B}$ [mm]	B_{min} [mm]	$R_{V,k}$ [kN]	$S_{g,A}$ [mm]	A [mm]	$S_{g,B}$ [mm]	B_{min} [mm]	$R_{V,k}$ [kN]	$R_{tens,45,k}$ [kN]
	140	70	65	40	45	3,75	65	60	45	50	3,21	
	180	110	90	40	45	5,83	95	80	55	55	4,23	
	220	130	105	60	60	6,96	125	100	65	65	5,00	
6	260	170	135	60	60	8,74	150	120	80	75	6,15	12,73
	280	170	135	80	75	9,11	160	125	90	80	6,70	
	320	205	160	85	75	10,98	185	145	105	90	7,77	
	420	305	230	85	75	12,38	270	205	120	100	9,23	
	200	120	100	50	50	8,57	110	90	60	60	6,15	
	240	150	120	60	60	10,71	135	110	75	70	7,69	
	280	180	140	70	65	12,86	160	125	90	80	8,93	
8	320	210	160	80	75	15,00	185	145	105	90	10,36	22,63
	360	235	180	95	85	16,79	210	160	120	100	11,43	
	400	265	200	105	90	18,93	250	190	120	100	12,31	
	440	305	230	105	90	20,39	265	200	145	120	14,29	

NOTES and GENERAL PRINCIPLES on page 163.

STRUCTURAL VALUES

GENERAL PRINCIPLES

- Characteristic values comply with the EN 1995:2014 standard in accordance with ETA-11/0030.
- The tensile design strength of the connector is the lower between the timber-side design strength ($R_{ax,d}$) and the steel-side design strength ($R_{tens,d}$).

$$R_{ax,d} = min \begin{cases} \frac{R_{ax,k} \cdot k_{mod}}{\gamma_M} \\ \frac{R_{tens,k}}{\gamma_{M2}} \end{cases}$$

- The design sliding strength of the joint is either the timber-side design strength ($R_{V,d}$) and the design strength on the steel side projected at 45°. ($R_{tens,45,d}$), whichever is lower:

$$R_{V,d} = min \begin{cases} \frac{R_{V,k} \cdot k_{mod}}{\gamma_M} \\ \frac{R_{tens,45,k}}{\gamma_{M2}} \end{cases}$$

- The design shear strength of the connector is obtained from the characteristic value as follows:

$$R_{V,d} = \frac{R_{V,k} \cdot k_{mod}}{\gamma_M}$$

- The coefficients γ_M and k_{mod} should be taken according to the current regulations used for the calculation.
- For the mechanical resistance values and the geometry of the screws, reference was made to ETA-11/0030.
- Dimensioning and verification of the timber elements must be carried out separately.
- The screws must be positioned in accordance with the minimum distances.
- A suitable pilot hole may be required for the insertion of some connectors. For further details please see ETA-11/0030.
- The characteristic thread withdrawal strengths were evaluated considering a penetration length of $S_{g,TOT}$ or S_g, as shown in the table. For intermediate values of S_g it is possible to linearly interpolate.
- The shear srength and sliding values were evaluated considering the centre of gravity of the connector placed in correspondence with the shear plane, unless otherwise specified.
- Connectors instability must be verified separately.

NOTES | TIMBER

- The characteristic thread withdrawal resistances were evaluated considering both an ε angle of 90° ($R_{ax,90,k}$) and of 0° ($R_{ax,0,k}$) between the grains of the timber element and the connector.
- The characteristic sliding strengths were evaluated by considering an angle ε of 45° between the grains of the timber element and the connector.
- The characteristic timber-to-timber shear strengths were evaluated considering both an ε angle of 90° ($R_{V,90,k}$) and 0° ($R_{V,0,k}$) between the grains of the second element and the connector.
- The characteristic shear resistances are calculated for screws inserted without pre-drilling hole. In the case of screws inserted with pre-drilling hole, greater resistance values can be obtained.
- For the calculation process a timber characteristic density ρ_k = 385 kg/m^3 has been considered. For different ρ_k values, the strength values in the table can be converted by the k_{dens} coefficient (see page 127).

NOTES | HARDWOOD

- The characteristic thread withdrawal resistances were evaluated considering both an ε angle of 90° ($R_{ax,90,k}$) and of 0° ($R_{ax,0,k}$) between the grains of the timber element and the connector.
- The characteristic sliding strengths were evaluated by considering an angle ε of 45° between the grains of the timber element and the connector.
- The characteristic timber-to-timber shear strengths were evaluated considering both an ε angle of 90° ($R_{V,90,k}$) and 0° ($R_{V,0,k}$) between the grains of the second element and the connector.
- The characteristic strength are calculated for screws inserted without pre-drilling hole.
- For the calculation process a mass density equal to ρ_k = 550 kg/m^3 has been considered for hardwood (oak) elements.
- Screws longer than the maximum value in the table do not comply with the installation requirements and are therefore not reported.

NOTES | BEECH LVL

- The characteristic sliding strengths were evaluated by considering, for individual timber elements, a 45° angle between the connector and the grain and a 45° angle between the connector and the side face of the LVL element.
- The characteristic shear strengths were evaluated by considering, for individual timber elements, a 90° angle between the connector and the grain, a 90° angle between the connector and the side face of the LVL element and a 0° angle between the force and the grain.
- For the calculation process a mass density equal to ρ_k = 730 kg/m^3 has been considered for LVL beech elements.
- The characteristic strength are calculated for screws inserted without and with pre-drilling hole.
- Screws longer than the maximum value in the table do not comply with the installation requirements and are therefore not reported.

NOTES | HYBRID

- The characteristic sliding strengths were evaluated by considering, for individual timber elements, a 45° angle between the connector and the grain and a 45° angle between the connector and the side face of the LVL element.
- The characteristic strength are calculated for screws inserted without pre-drilling hole.
- The geometry of the connection is designed to ensure balanced strengths between the two timber elements.