UKCA UKTA-0836 22/6195 | ICC ES AC233 | AC257 ESR-4645 | CE ETA-11/0030

VGZ EVO

FULLY THREADED SCREW WITH CYLINDRICAL HEAD

C4 EVO COATING

Multilayer coating with a surface treatment of epoxy resin and aluminium flakes. No rust after 1440 hours of salt spray exposure test, as per ISO 9227. Can be used in service class 3 outdoor applications and under class C4 atmospheric corrosion conditions.

AUTOCLAVE-TREATED TIMBER

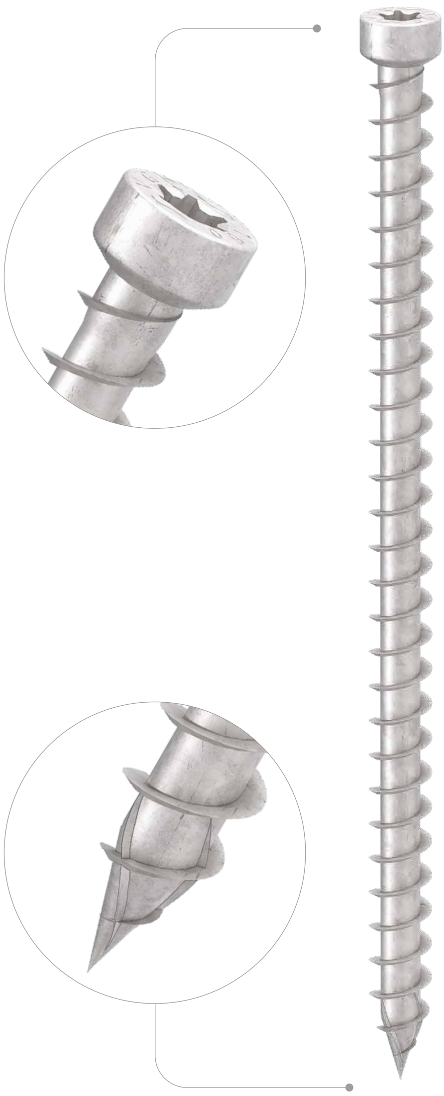
The C4 EVO coating has been certified according to US acceptance criterion AC257 for outdoor use with ACQ-treated timber.

STRUCTURAL APPLICATIONS

Deep thread and high resistance steel ($f_{y,k}$ = 1000 N/mm²) for excellent tensile performance. Approved for structural applications subject to stresses in any direction vs the grain (0° - 90°). Reduced minimum distances.

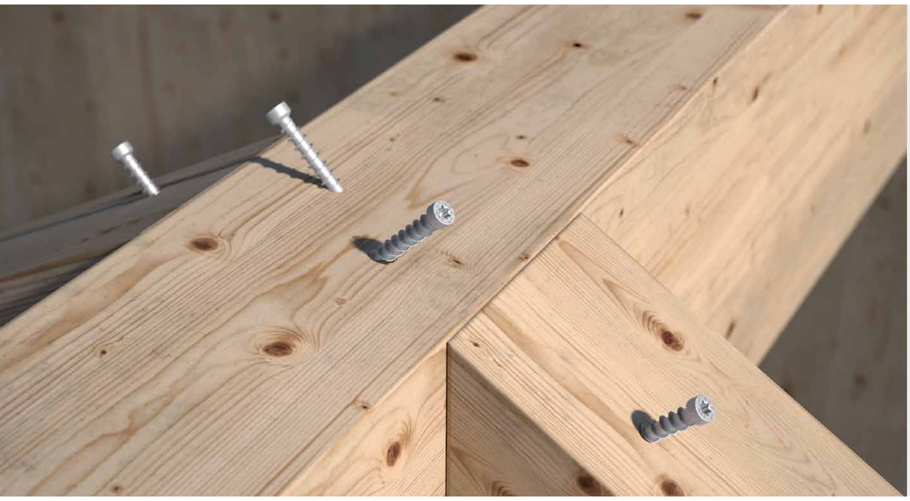
CYLINDRICAL HEAD

It allows the screw to penetrate and pass through the surface of the wood substrate. Ideal for concealed joints, timber couplings and structural reinforcements. It is the right choice for increased fire performance.



MY PROJECT SOFTWARE | MANUALS | BIT INCLUDED

DIAMETER [mm]	5 – 5 … 11 – 11
LENGTH [mm]	80 – 80 … 600 – 1000
SERVICE CLASS	SC1 SC2 SC3
ATMOSPHERIC CORROSIVITY	C1 C2 C3 C4
WOOD CORROSIVITY	T1 T2 T3
MATERIAL	C4 EVO COATING — carbon steel with C4 EVO coating



FIELDS OF USE

- timber based panels
- solid timber and glulam
- CLT and LVL
- high density woods
- ACQ, CCA treated timber

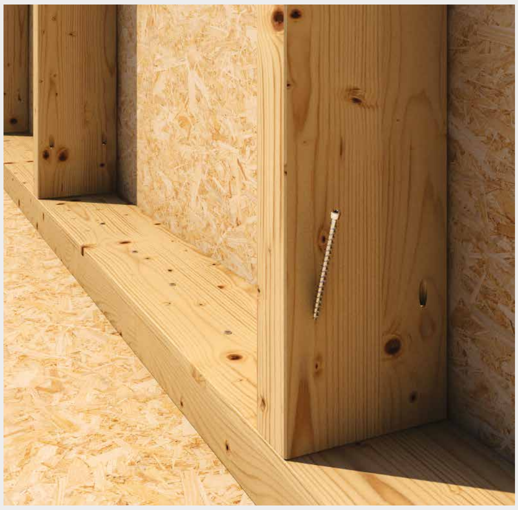
TRUSS & RAFTER JOINTS

Ideal for joining small timber elements such as the crossbeams and uprights of light frame structures. Certified for application parallel to the grain and with reduced minimum distances.

TIMBER STUDS

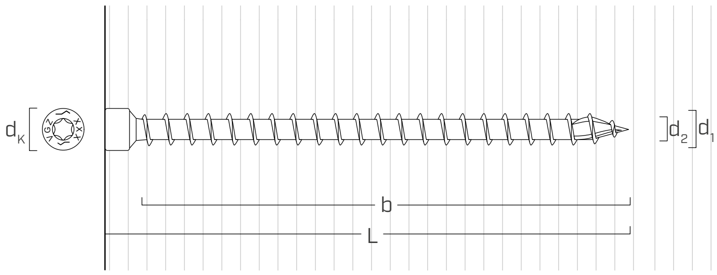
Values also tested, certified and calculated for CLT and high density woods such as Microllam® LVL. Ideal for fastening I-Joist beams.

Fastening Wood Trusses outdoors.



Fastening the uprights of light frame structures with VGZ EVO Ø5 mm.

GEOMETRY AND MECHANICAL CHARACTERISTICS



GEOMETRY

Nominal diameter	d_1	[mm]	5,3	5,6	7	9	11
Head diameter	d_K	[mm]	8,00	8,00	9,50	11,50	13,50
Thread diameter	d_2	[mm]	3,60	3,80	4,60	5,90	6,60
Pre-drilling hole diameter(1)	$d_{V,S}$	[mm]	3,5	3,5	4,0	5,0	6,0
Pre-drilling hole diameter(2)	$d_{V,H}$	[mm]	4,0	4,0	5,0	6,0	7,0

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

CHARACTERISTIC MECHANICAL PARAMETERS

Nominal diameter	d_1	[mm]	5,3	5,6	7	9	11
Tensile strength	$f_{tens,k}$	[kN]	11,0	12,3	15,4	25,4	38,0
Yield strength	$f_{y,k}$	[N/mm^2]	1000	1000	1000	1000	1000
Yield moment	$M_{y,k}$	[Nm]	9,2	10,6	14,2	27,2	45,9

			softwood *(softwood)*	**LVL softwood** *(LVL softwood)*	**pre-drilled beech LVL** *(beech LVL predrilled)*
Withdrawal resistance parameter	$f_{ax,k}$	[N/mm^2]	11,7	15,0	29,0
Associated density	ρ_a	[kg/m^3]	350	500	730
Calculation density	ρ_k	*[kg/m^3]*	*≤ 440*	*410 ÷ 550*	*590 ÷ 750*

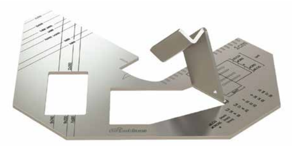
For applications with different materials please see ETA-11/0030.

CODES AND DIMENSIONS

d_1 [mm]	CODE	L [mm]	b [mm]	pcs
5,3 TX 25	VGZEVO580	80	70	50
	VGZEVO5100	100	90	50
	VGZEVO5120	120	110	50
5,6 TX 25	VGZEVO5140	140	130	50
	VGZEVO5150	150	140	50
	VGZEVO5160	160	150	50
7 TX 30	VGZEVO780	80	70	25
	VGZEVO7100	100	90	25
	VGZEVO7120	120	110	25
	VGZEVO7140	140	130	25
	VGZEVO7160	160	150	25
	VGZEVO7180	180	170	25
	VGZEVO7200	200	190	25
	VGZEVO7220	220	210	25
	VGZEVO7240	240	230	25
	VGZEVO7260	260	250	25
	VGZEVO7280	280	270	25
	VGZEVO7300	300	290	25
	VGZEVO7340	340	330	25
	VGZEVO7380	380	370	25
9 TX 40	VGZEVO9160	160	150	25
	VGZEVO9180	180	170	25
	VGZEVO9200	200	190	25
	VGZEVO9220	220	210	25
	VGZEVO9240	240	230	25
	VGZEVO9260	260	250	25
	VGZEVO9280	280	270	25
	VGZEVO9300	300	290	25
	VGZEVO9320	320	310	25
	VGZEVO9340	340	330	25
	VGZEVO9360	360	350	25
	VGZEVO9380	380	370	25
	VGZEVO9400	400	390	25
	VGZEVO9440	440	430	25
	VGZEVO9480	480	470	25
	VGZEVO9520	520	510	25

d_1 [mm]	CODE	L [mm]	b [mm]	pcs
11 TX 50	VGZEVO11250	250	240	25
	VGZEVO11300	300	290	25
	VGZEVO11350	350	340	25
	VGZEVO11400	400	390	25
	VGZEVO11450	450	440	25
	VGZEVO11500	500	490	25
	VGZEVO11550	550	540	25
	VGZEVO11600	600	590	25

RELATED PRODUCTS



JIG VGZ 45°

TEMPLATE FOR 45° SCREWS

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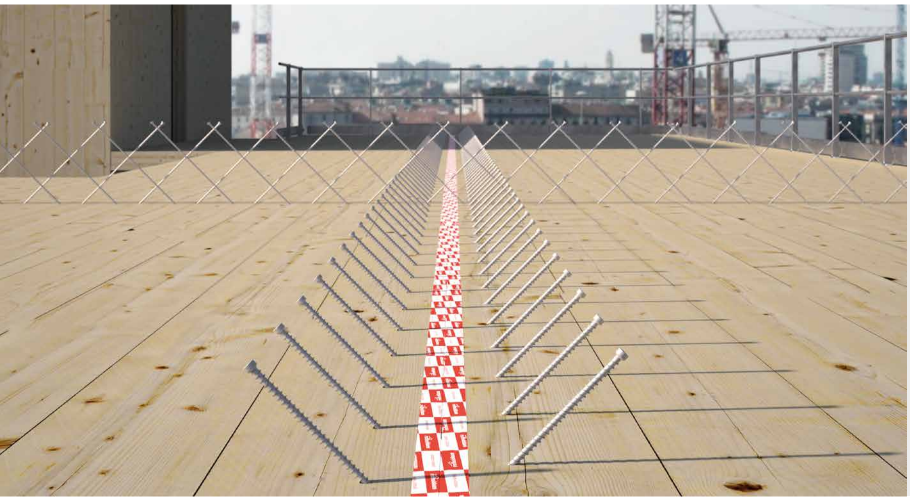


OUTDOOR STRUCTURAL PERFORMANCE

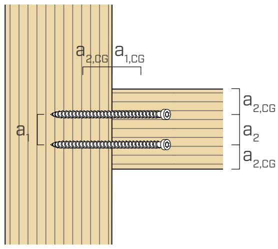
Values also tested, certified and calculated for CLT and high density woods such as Microllam® LVL. Ideal for fastening timber-framed panels and lattice beams (Rafter, Truss).

MINIMUM DISTANCES FOR AXIAL STRESSES

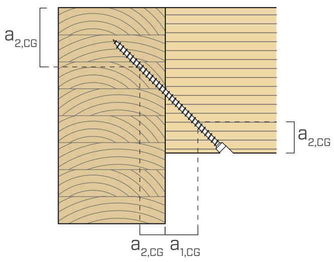
screws inserted **WITH and WITHOUT pre-drilled hole**

d_1	[mm]		5,3	5,6	7	9	11
a_1	[mm]	5·d	27	28	35	45	55
a_2	[mm]	5·d	27	28	35	45	55
$a_{2,LIM}$	[mm]	2,5·d	13	14	18	23	28
$a_{1,CG}$	[mm]	8·d	42	45	56	72	88
$a_{2,CG}$	[mm]	3·d	16	17	21	27	33
a_{CROSS}	[mm]	1,5·d	8	8	11	14	17

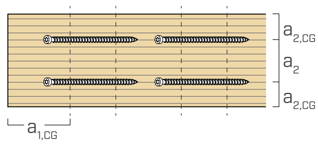
SCREWS UNDER TENSION INSERTED WITH AN ANGLE α WITH RESPECT TO THE GRAIN



plan



front



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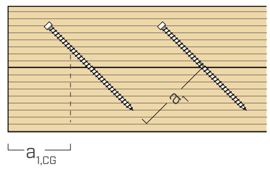

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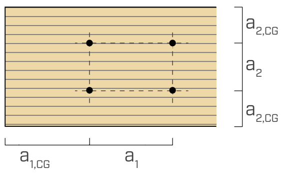
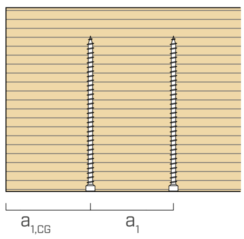
SCREWS INSERTED WITH α = 90° ANGLE WITH RESPECT TO THE GRAIN



plan



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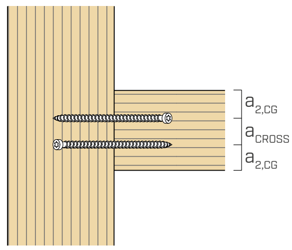
CROSSED SCREWS INSERTED WITH AN ANGLE α WITH RESPECT TO THE GRAIN



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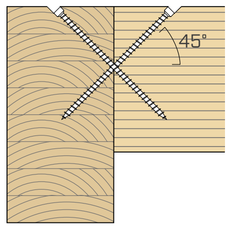

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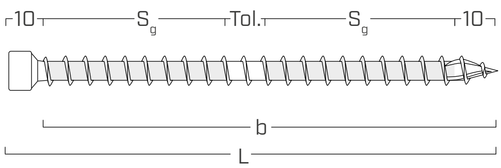
NOTES

- 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.
- For main beam-secondary beam joints with VGZ screws d = 7 mm inclined or crossed, inserted at an angle of 45° to the secondary beam head, with a minimum secondary beam height of 18 d, the minimum distance $a_{1,CG}$ can be taken equal to $8{\cdot}d_1$ anc the minimum distance $a_{2,CG}$ equal to $3{\cdot}d_1$.
- For 3 THORNS tip the minimum distances in the table are derived from experimental tests; alternatively, adopt $a_{1,CG} = 10{\cdot}d$ and $a_{2,CG} = 4{\cdot}d$ in accordance with EN 1995:2014.

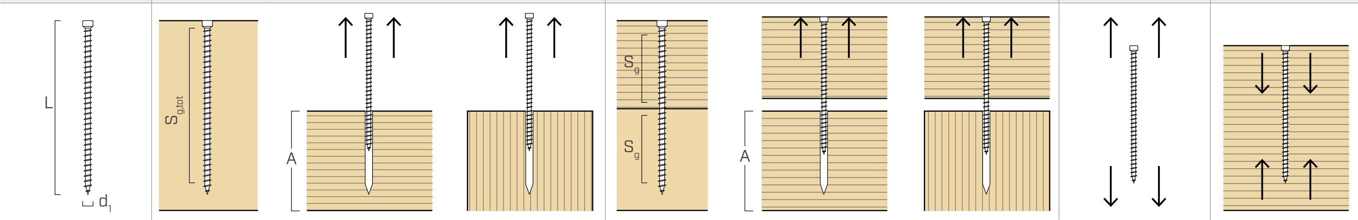
EFFECTIVE THREAD USED IN CALCULATION



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

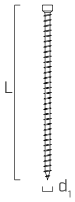
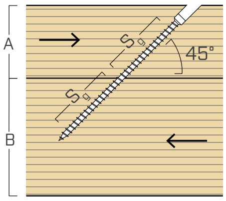
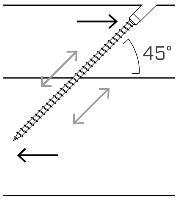
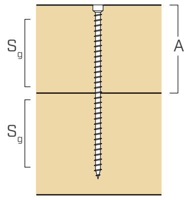
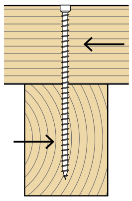
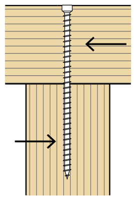
TENSION / COMPRESSION



geometry		total thread withdrawal ε=90°			total thread withdrawal ε=0°	partial thread withdrawal ε=90°			partial thread withdrawal ε=0°	steel tension	instability ε=90°
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]	$R_{ki,90,k}$ [kN]
5,3	80	70	90	4,68	1,41	25	45	1,67	0,50	11,00	6,20
	100	90	110	6,02	1,81	35	55	2,34	0,70		
	120	110	130	7,36	2,21	45	65	3,01	0,90		
5,6	140	130	150	9,19	2,76	55	75	3,89	1,17	12,30	6,93
	150	150	170	10,61	2,97	65	85	4,60	1,27		
	160	150	170	10,61	3,18	65	85	4,60	1,38		
7	80	70	90	6,19	1,86	25	45	2,21	0,66	15,40	10,30
	100	90	110	7,96	2,39	35	55	3,09	0,93		
	120	110	130	9,72	2,92	45	65	3,98	1,19		
	140	130	150	11,49	3,45	55	75	4,86	1,46		
	160	150	170	13,26	3,98	65	85	5,75	1,72		
	180	170	190	15,03	4,51	75	95	6,63	1,99		
	200	190	210	16,79	5,04	85	105	7,51	2,25		
	220	210	230	18,56	5,57	95	115	8,40	2,52		
	240	230	250	20,33	6,10	105	125	9,28	2,78		
	260	250	270	22,10	6,63	115	135	10,16	3,05		
	280	270	290	23,87	7,16	125	145	11,05	3,31		
	300	290	310	25,63	7,69	135	155	11,93	3,58		
	340	330	350	29,17	8,75	155	175	13,70	4,11		
	380	370	390	32,70	9,81	175	195	15,47	4,64		
9	160	150	170	17,05	5,11	65	85	7,39	2,22	25,40	17,25
	180	170	190	19,32	5,80	75	95	8,52	2,56		
	200	190	210	21,59	6,48	85	105	9,66	2,90		
	220	210	230	23,87	7,16	95	115	10,80	3,24		
	240	230	250	26,14	7,84	105	125	11,93	3,58		
	260	250	270	28,41	8,52	115	135	13,07	3,92		
	280	270	290	30,68	9,21	125	145	14,21	4,26		
	300	290	310	32,96	9,89	135	155	15,34	4,60		
	320	310	330	35,23	10,57	145	165	16,48	4,94		
	340	330	350	37,50	11,25	155	175	17,61	5,28		
	360	350	370	39,78	11,93	165	185	18,75	5,63		
	380	370	390	42,05	12,61	175	195	19,89	5,97		
	400	390	410	44,32	13,30	185	205	21,02	6,31		
	440	430	450	48,87	14,66	205	225	23,30	6,99		
	480	470	490	53,41	16,02	225	245	25,57	7,67		
	520	510	530	57,96	17,39	245	265	27,84	8,35		
11	250	240	260	33,34	10,00	110	130	15,28	4,58	38,00	21,93
	300	290	310	40,28	12,08	135	155	18,75	5,63		
	350	340	360	47,22	14,17	160	180	22,22	6,67		
	400	390	410	54,17	16,25	185	205	25,70	7,71		
	450	440	460	61,11	18,33	210	230	29,17	8,75		
	500	490	510	68,06	20,42	235	255	32,64	9,79		
	550	540	560	75,00	22,50	260	280	36,11	10,83		
	600	590	610	81,95	24,58	285	305	39,59	11,88		

ε = screw-to-grain angle

NOTES and GENERAL PRINCIPLES on page 151.

		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]	A [mm]	S_g [mm]	$R_{V,90,k}$ [mm]	$R_{V,0,k}$ [kN]
	80	25	35	50	1,18		40	25	1,99	1,03
5,3	100	35	40	55	1,66	7,78	50	35	2,16	1,19
	120	45	45	60	2,13		60	45	2,32	1,37
	140	55	55	70	2,75		70	55	2,69	1,59
5,6	150	65	60	75	3,25	8,70	80	65	2,87	1,62
	160	65	60	75	3,25		80	65	2,87	1,64
	80	25	35	50	1,56		40	25	2,59	1,34
	100	35	40	55	2,19		50	35	2,93	1,53
	120	45	45	60	2,81		60	45	3,15	1,74
	140	55	55	70	3,44		70	55	3,37	1,97
	160	65	60	75	4,06		80	65	3,59	2,06
	180	75	70	85	4,69		90	75	3,81	2,12
7	200	85	75	90	5,31	10,89	100	85	4,03	2,19
	220	95	85	100	5,94		110	95	4,25	2,26
	240	105	90	105	6,56		120	105	4,30	2,32
	260	115	95	110	7,19		130	115	4,30	2,39
	280	125	105	120	7,81		140	125	4,30	2,46
	300	135	110	125	8,44		150	135	4,30	2,52
	340	155	125	140	9,69		170	155	4,30	2,65
	380	175	140	155	10,94		190	175	4,30	2,79
	160	65	60	75	5,22		80	65	5,10	2,81
	180	75	70	85	6,03		90	75	5,38	3,08
	200	85	75	90	6,83		100	85	5,67	3,18
	220	95	85	100	7,63		110	95	5,95	3,27
	240	105	90	105	8,44		120	105	6,23	3,35
	260	115	95	110	9,24		130	115	6,50	3,44
	280	125	105	120	10,04		140	125	6,50	3,52
9	300	135	110	125	10,85	17,96	150	135	6,50	3,61
	320	145	120	135	11,65		160	145	6,50	3,69
	340	155	125	140	12,46		170	155	6,50	3,78
	360	165	130	145	13,26		180	165	6,50	3,86
	380	175	140	155	14,06		190	175	6,50	3,95
	400	185	145	160	14,87		200	185	6,50	4,03
	440	205	160	175	16,47		220	205	6,50	4,21
	480	225	175	190	18,08		240	225	6,50	4,38
	520	245	190	205	19,69		260	245	6,50	4,55
	250	110	95	110	10,80		125	110	8,35	4,57
	300	135	110	125	13,26		150	135	9,06	4,83
	350	160	130	145	15,71		175	160	9,06	5,09
11	400	185	145	160	18,17	26,87	200	185	9,06	5,35
	450	210	165	180	20,63		225	210	9,06	5,61
	500	235	180	195	23,08		250	235	9,06	5,87
	550	260	200	215	25,54		275	260	9,06	6,13
	600	285	215	230	27,99		300	285	9,06	6,39

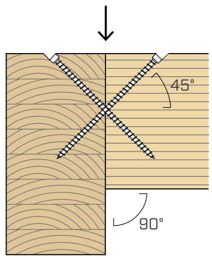
ε = screw-to-grain angle

NOTES and GENERAL PRINCIPLES on page 151.

STRUCTURAL VALUES | FURTHER APPLICATIONS

SHEAR CONNECTION WITH CROSSED CONNECTORS

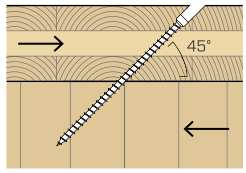
VGZ EVO Ø7-9-11 mm

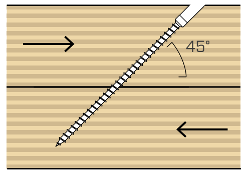


STRUCTURAL VALUES on page 130.

CONNECTIONS WITH CLT AND LVL ELEMENTS

VGZ EVO Ø7-9-11 mm





STRUCTURAL VALUES on page 134.

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 ($R_{tens,d}$).

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

- The compression design strength of the connector is the lower between the timber-side design strength ($R_{ax,d}$) and the instability design strength ($R_{ki,d}$).

$$R_{ax,d} = min \begin{cases} \dfrac{R_{ax,k} \cdot k_{mod}}{\gamma_M} \\ \dfrac{R_{ki,k}}{\gamma_{M1}} \end{cases}$$

- 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:

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

- 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.
- 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. A minimum penetration length of 4-d_1 is considered.
- The shear srength and sliding values were evaluated considering the centre of gravity of the connector placed in correspondence with the shear plane.
- 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 different calculation configurations, the MyProject software is available (www.rothoblaas.com).

NOTES

- 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.
- 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 (withdrawal, compression, sliding and shear) can be converted via the k_{dens} coefficient.

$$R'_{ax,k} = k_{dens,ax} \cdot R_{ax,k}$$
$$R'_{ki,k} = k_{dens,ki} \cdot R_{ki,k}$$
$$R'_{V,k} = k_{dens,ax} \cdot R_{V,k}$$
$$R'_{V,90,k} = k_{dens,V} \cdot R_{V,90,k}$$
$$R'_{V,0,k} = k_{dens,V} \cdot R_{V,0,k}$$

ρ_k [kg/m^3]	350	380	**385**	405	425	430	440
C-GL	*C24*	*C30*	*GL24h*	*GL26h*	*GL28h*	*GL30h*	*GL32h*
$k_{dens,ax}$	0,92	0,98	1,00	1,04	1,08	1,09	1,11
$k_{dens,ki}$	0,97	0,99	1,00	1,00	1,01	1,02	1,02
$k_{dens,v}$	0,90	0,98	1,00	1,02	1,05	1,05	1,07

Strength values thus determined may differ, for higher safety standards, from those resulting from an exact calculation.