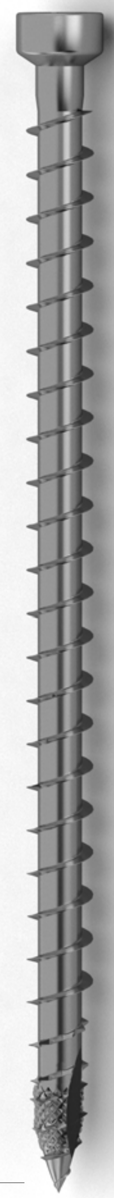
BIT INCLUDED | MY PROJECT SOFTWARE | CE ETA 11/0030

VGZ HARDWOOD

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 timber without any pre-drill. Approved for structural applications subject to stresses in any direction vs. the grain (α = 0° - 90°).

TENSION

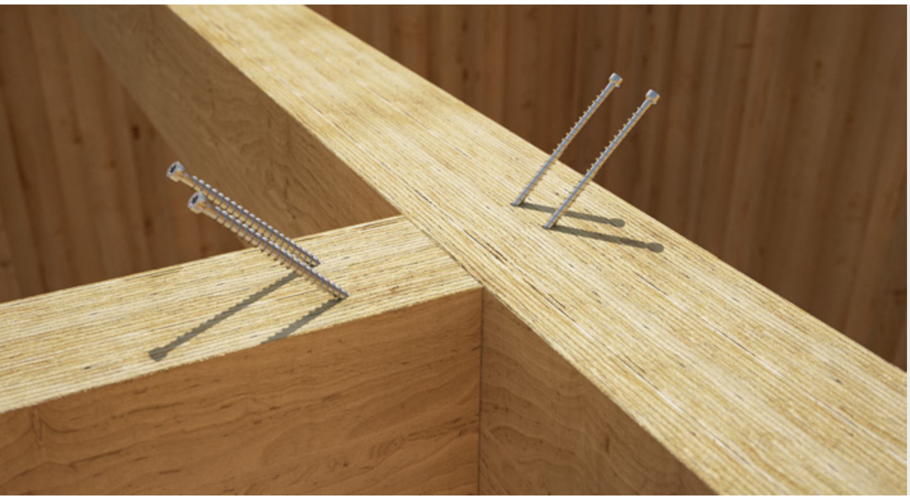
Deep thread and high resistance steel ($f_{y,k}$ = 1000 N/mm²) for excellent tensile performance. Inner tip diameter increased to ensure tightening in the highest density woods. Excellent twisting moment values.

CYLINDRICAL HEAD

Ideal for concealed joints, timber couplings and structural reinforcements. Guarantees fire protection and earthquake suitability.

CHARACTERISTICS

FOCUS	screw for hardwoods
HEAD	cylindrical, countersunk
DIAMETER	7,0 | 9,0 mm
LENGTH	from 140 mm to 320 mm



MATERIAL

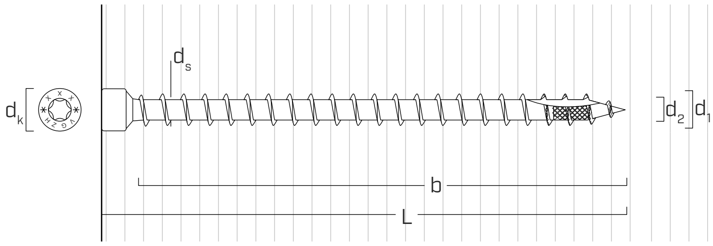
Galvanized carbon steel.

FIELDS OF USE

- wood based panels
- Solid timber and glulam
- CLT, LVL
- high density woods
- beech, cypress, eucalyptus, bamboo

Service classes 1 and 2.

GEOMETRY AND MECHANICAL CHARACTERISTICS



Nominal diameter eq.	**d_1 eq.**	**[mm]**	**7**	**9**
Nominal diameter	d_1	[mm]	6	8
Head diameter	d_k	[mm]	9,50	11,50
Tip diameter	d_2	[mm]	4,50	5,90
Shank diameter	d_s	[mm]	4,80	6,30
Pre-drilling hole diameter	d_v	[mm]	4,0	6,0
Characteristic yield moment	$M_{y,k}$	[Nmm]	18987,4	40115,0
Characteristic withdrawal-resistance parameter	$f_{ax,k,90°}$	[N/mm²]	46,0	46,0
	$f_{ax,k,0°}$	[N/mm²]	20,0	20,0
Associated density	ρ_a	[kg/m³]	730	730
Characteristic head-pull-through parameter	$f_{head,k}$	[N/mm²]	50,0	50,0
Associated density	ρ_a	[kg/m³]	730	730
Characteristic tensile strength	$f_{tens,k}$	[kN]	17,0	20,1

Mechanical parameters from experimental tests obtained from "Test Report No. 196104" of Karlsruher Institut für Technologie (KIT).

CODES AND DIMENSIONS

d_1 eq. [mm]	CODE	d_1 [mm]	L [mm]	b [mm]	pcs
7 TX 30	**VGZH7140**	6	140	130	25
	VGZH7180	6	180	170	25
	VGZH7220	6	220	210	25
	VGZH7260	6	260	250	25

d_1 eq. [mm]	CODE	d_1 [mm]	L [mm]	b [mm]	pcs
9 TX 40	**VGZH9200**	8	200	190	25
	VGZH9240	8	240	230	25
	VGZH9280	8	280	270	25
	VGZH9320	8	320	310	25

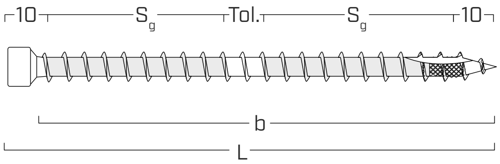
d_1 eq. = nominal diameter equivalent to a screw with the same d_s

NOTES: upon request, EVO version is available.

BEECH LVL

Values also tested, certified and calculated for high density woods such as beechwood Microllam® LVL. Certified for use without pre-drilling, for densities of up to 780 kg/m³. Also tested on structural woods such as chestnut, oak, cypress, eucalyptus, bamboo

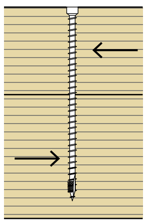
EFFECTIVE THREAD USED IN CALCULATION



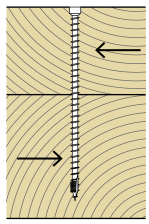
b =	L - 10 mm	represents the entire length of the threaded part
S_g =	(L - 10 mm - 10 mm - Tol.)/ 2	represents the partial length of the threaded part net of a laying tolerance (Tol.) of 10 mm

The timber-to-timber withdrawal, shear and sliding values were calculated considering the centre of gravity of the connector placed in correspondence with the shear plane.

MINIMUM DISTANCES FOR SHEAR LOADS [1]



Load-to-grain angle α = 0°

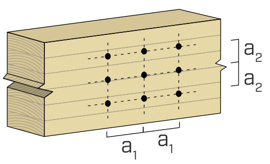


Load-to-grain angle α = 90°

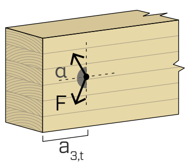
		SCREWS INSERTED WITH PRE-DRILLING HOLES (α = 0°)			**SCREWS INSERTED WITH PRE-DRILLING HOLES** (α = 90°)		
d_1 eq.			**7**	**9**		**7**	**9**
d_1			6	8		6	8
a_1	[mm]	**$5 \cdot d_1$**	30	40	**$4 \cdot d_1$**	24	32
a_2	[mm]	**$3 \cdot d_1$**	18	24	**$4 \cdot d_1$**	24	32
$a_{3,t}$	[mm]	**$12 \cdot d_1$**	72	96	**$7 \cdot d_1$**	42	56
$a_{3,c}$	[mm]	**$7 \cdot d_1$**	42	56	**$7 \cdot d_1$**	42	56
$a_{4,t}$	[mm]	**$3 \cdot d_1$**	18	24	**$7 \cdot d_1$**	42	56
$a_{4,c}$	[mm]	**$3 \cdot d_1$**	18	24	**$3 \cdot d_1$**	18	24

		SCREWS INSERTED WITHOUT PRE-DRILLING HOLE (α = 0°)			**SCREWS INSERTED WITHOUT PRE-DRILLING HOLE** (α = 90°)		
d_1 eq.			**7**	**9**		**7**	**9**
d_1			6	8		6	8
a_1	[mm]	**$15 \cdot d_1$**	90	120	**$7 \cdot d_1$**	42	56
a_2	[mm]	**$7 \cdot d_1$**	42	56	**$7 \cdot d_1$**	42	56
$a_{3,t}$	[mm]	**$20 \cdot d_1$**	120	160	**$15 \cdot d_1$**	90	120
$a_{3,c}$	[mm]	**$15 \cdot d_1$**	90	120	**$15 \cdot d_1$**	90	120
$a_{4,t}$	[mm]	**$7 \cdot d_1$**	42	56	**$12 \cdot d_1$**	72	96
$a_{4,c}$	[mm]	**$7 \cdot d_1$**	42	56	**$7 \cdot d_1$**	42	56

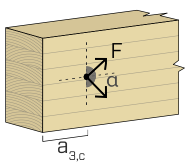
d_1 = nominal screw diameter



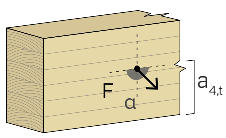
stressed end
-90° < α < 90°



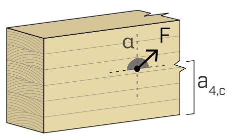
unloaded end
90° < α < 270°



stressed edge
0° < α < 180°



unload edge
180° < α < 360°

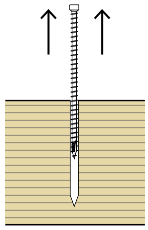


NOTES:

- The minimum distances are compliant with EN 1995:2014 - Table 8.2 considering a wood characteristic density of ρ_k > 420 kg/m^3 and calculation diameter of d = nominal screw diameter.
- For high density wood applications (ρ_k > 500 kg/m^3) please refer to ETA-11/0030.
- The minimum spacing for all steel-to-timber connections (a_1, a_2) can be multiplied by a coefficient of 0,7.
- The minimum spacing for all panel-to-timber connections (a_1, a_2) can be multiplied by a coefficient of 0,85.

Full technical data is available in the website www.rothoblaas.com.

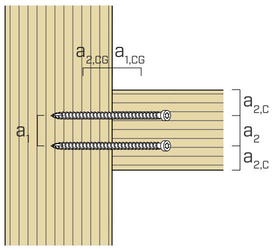
MINIMUM DISTANCES FOR AXIAL STRESSES [1]



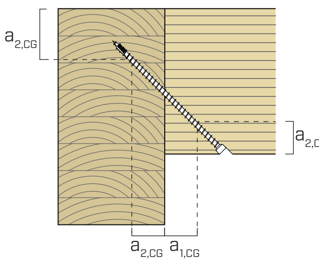
			SCREWS INSERTED WITH AND WITHOUT PRE-DRILLING HOLE	
d_1 eq.			**7**	**9**
d_1			6	8
a_1	[mm]	**$5 \cdot d_1$**	30	40
a_2	[mm]	**$5 \cdot d_1$**	30	40
$a_{2,LIM}$ (2)	[mm]	**$2{,}5 \cdot d_1$**	15	20
$a_{1,CG}$	[mm]	**$8 \cdot d_1$**	48	64
$a_{2,CG}$	[mm]	**$3 \cdot d_1$**	18	24
a_{CROSS}	[mm]	**$1{,}5 \cdot d_1$**	9	12

d_1 = nominal screw diameter

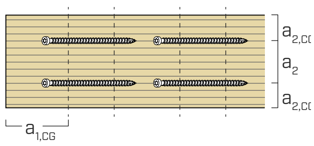
SCREWS UNDER TENSION INSERTED WITH AN ANGLE α WITH RESPECT TO THE GRAIN



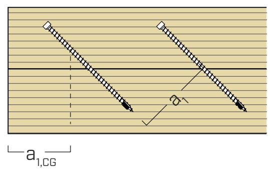
plan



front

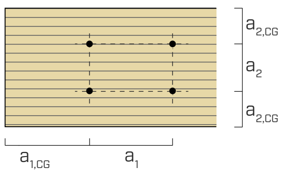


plan

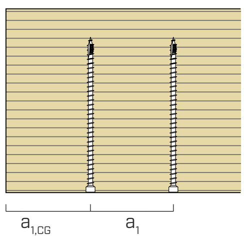


front

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

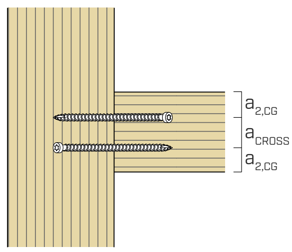


plan

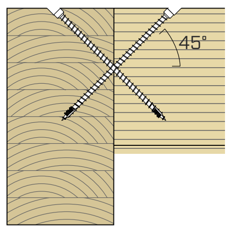


front

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



plan



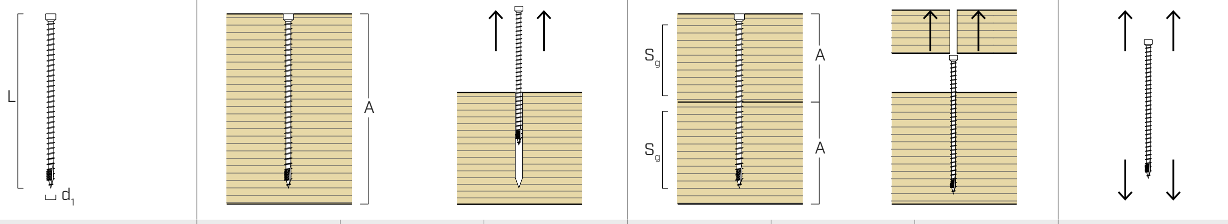
front

NOTES:

(1) The minimum distances for connectors stressed axially are independent of the insertion angle of the connector and the angle of the force with respect to the grain, in accordance with ETA-11/0030.

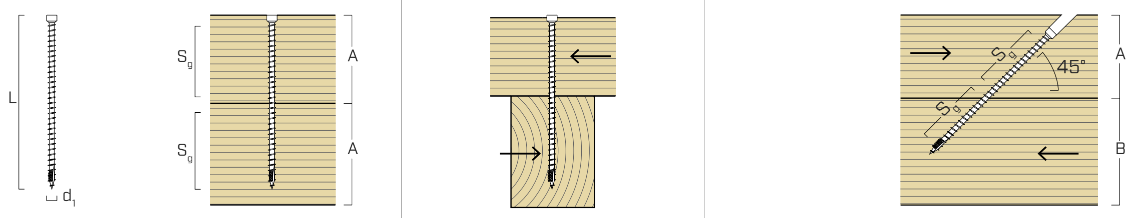
(2) The axial distance a_2 can be reduced down to 2,5 d_1 if for each connector a "joint surface" $a_1\, a_2 = 25\, d_1^2$ is maintained.

TENSION [1]



geometry			total thread withdrawal [2]			partial thread withdrawal [2]			steel tension
d_1 eq. [mm]	d_1 [mm]	L [mm]	b [mm]	A_{min} [mm]	timber $R_{V,k}$ [kN]	S_g [mm]	A_{min} [mm]	timber $R_{ax,k}$ [kN]	steel $R_{tens,k}$ [kN]
7	6	140	130	150	28,61	55	75	12,10	17,00
	6	180	170	190	37,41	75	95	16,50	
	6	220	210	230	46,21	95	115	20,91	
	6	260	250	270	55,01	115	135	25,31	
9	8	200	190	210	55,75	85	105	24,94	20,10
	8	240	230	250	67,49	105	125	30,81	
	8	280	270	290	79,22	125	145	36,68	
	8	320	310	330	90,96	145	165	42,54	

SHEAR / SLIDING



geometry				SHEAR timber-to-timber		SLIDING timber-to-timber [3]			
d_1 eq. [mm]	d_1 [mm]	L [mm]	S_g [mm]	A_{min} [mm]	$R_{V,k}$ [kN]	A_{min} [mm]	B_{min} [mm]	$R_{v,k}$ [kN]	steel $R_{tens,k\ 45°}$ [kN]
7	6	140	55	70	5,64	55	70	7,78	12,02
	6	180	75	90	5,64	70	85	10,61	
	6	220	95	110	5,64	80	100	12,02	
	6	260	115	130	5,64	95	110	12,02	
9	8	200	85	100	9,06	75	90	14,21	14,21
	8	240	105	120	9,06	90	105	14,21	
	8	280	125	140	9,06	105	120	14,21	
	8	320	145	160	9,06	120	135	14,21	

NOTES:

[1] The connector design resistance is the lowest between the wood side design resistance ($R_{ax,d}$) and the steel side resistance ($R_{tens,d}$).

$$R_{ax,d} = min \begin{cases} \dfrac{R_{ax,k} \cdot k_{mod}}{\gamma_m} \\ \dfrac{R_{tens,k}}{\gamma_{m2}} \end{cases}$$

[2] The axial resistance of the thread to withdrawal was calculated considering a 90° angle between the fibres and the connector and for a effective thread length of b or S_g.
For intermediate values of S_g it is possible to linearly interpolate.

[3] The design sliding resistance of the joint is either the timber-side design resistance ($R_{V,d}$) or the steel design resistance ($R_{tens,d}$ 45°), whichever is lower.

$$R_{V,d} = min \begin{cases} \dfrac{R_{V,k} \cdot k_{mod}}{\gamma_m} \\ \dfrac{R_{tens,k\ 45°}}{\gamma_{m2}} \end{cases}$$

GENERAL PRINCIPLES:

- Characteristic values comply with the EN 1995:2014 standard in accordance with ETA-11/0030.
- Design values can be obtained from characteristic values as follows:

$$R_d = \frac{R_k \cdot k_{mod}}{\gamma_m}$$

The coefficients γ_m and k_{mod} should be taken according to the current regulations used for the calculation.

- For the mechanical strength values and the geometry of the screws, reference was made to "Test Report No. 196104" of Karlsruher Institut für Technologie (KIT).
- A timber density of ρ_k = 550 kg/m³ was considered for the calculation process.
- Dimensioning and verification of the timber elements must be carried out separately.
- The shear characteristic resistances are calculated for screws inserted without pre-drilling holes. In the case of screws inserted with pre-drilling holes, greater resistance values can be obtained.
- The withdrawal, shear and sliding values were calculated considering the centre of gravity of the connector placed in correspondence with the shear plane.
- The shear characteristic resistances are calculated for screws inserted without pre-drilling holes. In the case of screws inserted with pre-drilling holes, greater resistance values can be obtained.

MINIMUM DISTANCES FOR CROSS SCREWS

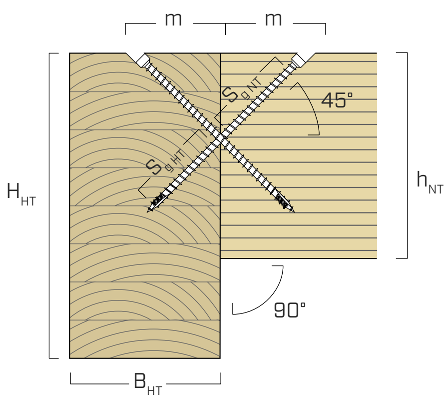
			SCREWS INSERTED WITH AND WITHOUT PRE-DRILLING HOLE	
d_1 eq.			**7**	**9**
d_1			6	8
$a_{2,CG}$	[mm]	**$3 \cdot d_1$**	18	24
a_{CROSS}	[mm]	**$1{,}5 \cdot d_1$**	8	12
e	[mm]	**$3{,}5 \cdot d_1$**	21	28

d_1 = nominal screw diameter

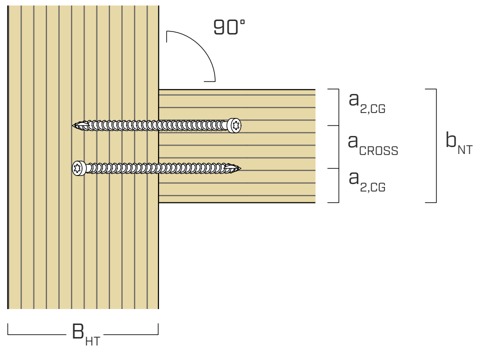
d_1 eq.		**7**	**9**
d_1		6	8
d_V (pre-drill)	[mm]	4,0	6,0

Pre-drilling hole required for connectors Ø11 ≥ 400 mm

SHEAR CONNECTION WITH CROSSED CONNECTORS - 1 PAIR

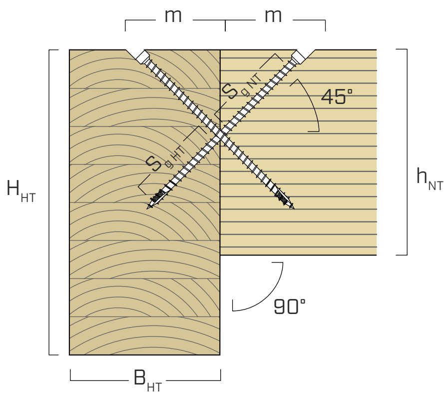


section

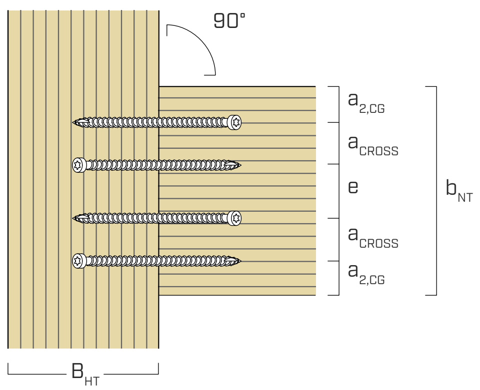


plan

SHEAR CONNECTION WITH CROSSED CONNECTORS - 2 OR MORE PAIRS



section



plan

STATIC VALUES

SHEAR CONNECTION WITH CROSSED CONNECTORS
RIGHT-ANGLE JOINT - MAIN BEAM / SECONDARY BEAM

d_1 eq. [mm]	d_1 [mm]	L [mm]	$S_{g\,HT}$ (1) [mm]	$S_{g\,NT}$ (1) [mm]	$B_{HT\,min}$ [kN]	$H_{HT\,min} = h_{NT\,min}$ [mm]	$b_{NT\,min}$ [mm]	no. pairs	$R_{1\,V,k}$ (1) [kN] withdrawal (4)	$R_{2\,V,k}$ (2) [kN] instability	$R_{3\,V,k}$ (2) [kN] tension	m (3) [mm]
7	6	140	40	70	65	110	45	1	12,4	14,0	24,0	60
							75	2	23,2	26,1	44,9	
							105	3	33,5	37,7	64,6	
	6	180	75	75	80	140	45	1	23,3	14,0	24,0	64
							75	2	43,6	26,1	44,9	
							105	3	62,7	37,7	64,6	
	6	220	95	95	95	170	45	1	26,9	14,0	24,0	78
							75	2	50,2	26,1	44,9	
							105	3	72,2	37,7	64,6	
	6	260	115	115	110	195	45	1	32,5	14,0	24,0	92
							75	2	60,7	26,1	44,9	
							105	3	87,5	37,7	64,6	
9	6	200	75	95	90	155	60	1	31,1	45,5	28,4	78
							100	2	58,1	85,0	53,0	
							140	3	83,6	122,4	76,4	
	8	240	105	105	100	185	60	1	39,6	45,5	28,4	85
							100	2	73,9	85,0	53,0	
							140	3	106,5	122,4	76,4	
	8	280	125	125	115	210	60	1	47,2	45,5	28,4	99
							100	2	88,0	85,0	53,0	
							140	3	126,7	122,4	76,4	
	8	320	145	145	130	240	60	1	54,7	45,5	28,4	113
							100	2	102,1	85,0	53,0	
							140	3	147,0	122,4	76,4	

NOTES:

(1) The values given are calculated considering a fastener distance arrangement of $a_{1,CG} \geq 5d$. In some cases the asymmetrical laying of connectors is needed $S_{g\,HT} \neq S_{g\,NT}$).

(2) The compression design strength of the connector is the lower between the withdrawal-side design strength ($R_{1V,d}$) and the instability design strength ($R_{2V,d}$).

$$R_{V,d} = min \begin{cases} \dfrac{R_{1V,k} \cdot k_{mod}}{\gamma_m} \\ \dfrac{R_{2V,k}}{\gamma_{m1}} \\ \dfrac{R_{3V,k}}{\gamma_{m2}} \end{cases}$$

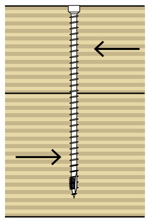
(3) The assembly height (m) applies in the event of symmetrical installation of the flush connectors ($S_{g\,HT} = S_{g\,NT}$) above the elements.

(4) The thread axial resistance to withdrawal has been evaluated considering an effective thread length equal to S_g. The connectors must be inserted at 45° with respect to the shear plane.

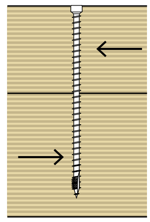
GENERAL PRINCIPLES:

- Characteristic values comply with the EN 1995:2014 standard in accordance with ETA-11/0030.
- For the mechanical strength values and the geometry of the screws, reference was made to "Test Report No. 196104" of Karlsruher Institut für Technologie (KIT).
- For the calculation process a timber characteristic density ρ_k = 555 kg/m³ has been considered.
- Dimensioning and verification of the timber elements must be carried out separately.

MINIMUM DISTANCES FOR SHEAR LOADS | LVL



Load-to-grain angle α = 0°

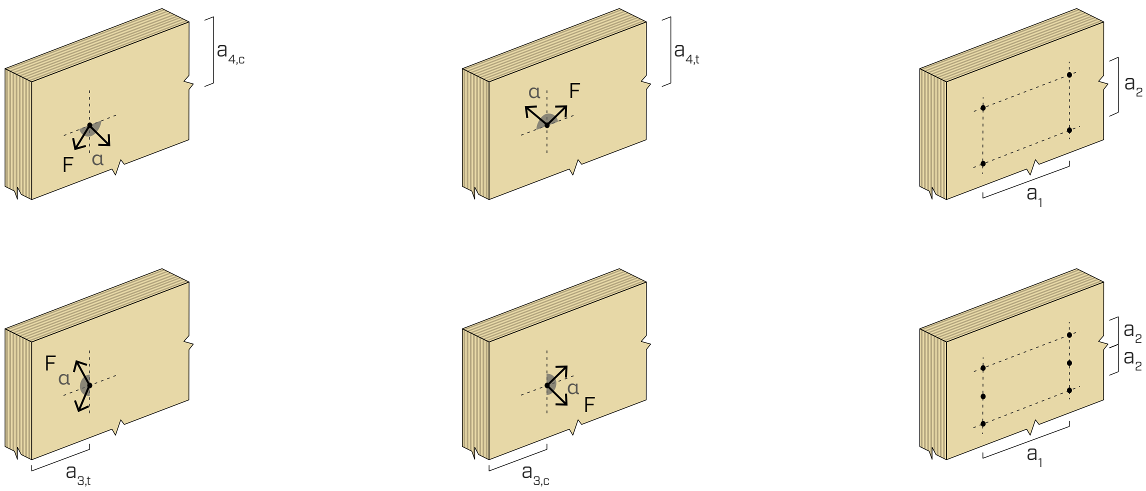


Load-to-grain angle α = 90°

		SCREWS INSERTED WITH PRE-DRILLING HOLES			SCREWS INSERTED WITH PRE-DRILLING HOLES		
d_1 eq.			**7**	**9**		**7**	**9**
d_1			6	8		6	8
a_1	[mm]	**$5 \cdot d_1$**	30	40	**$4 \cdot d_1$**	24	32
a_2	[mm]	**$3 \cdot d_1$**	18	24	**$4 \cdot d_1$**	24	32
$a_{3,t}$	[mm]	**$12 \cdot d_1$**	72	96	**$7 \cdot d_1$**	42	56
$a_{3,c}$	[mm]	**$7 \cdot d_1$**	42	56	**$7 \cdot d_1$**	42	56
$a_{4,t}$	[mm]	**$3 \cdot d_1$**	18	24	**$7 \cdot d_1$**	42	56
$a_{4,c}$	[mm]	**$3 \cdot d_1$**	18	24	**$3 \cdot d_1$**	18	24

		SCREWS INSERTED WITHOUT PRE-DRILLING HOLE			SCREWS INSERTED WITHOUT PRE-DRILLING HOLE		
d_1 eq.			**7**	**9**		**7**	**9**
d_1			6	8		6	8
a_1	[mm]	**$15 \cdot d_1$**	90	40	**$7 \cdot d_1$**	42	56
a_2	[mm]	**$7 \cdot d_1$**	42	24	**$7 \cdot d_1$**	42	56
$a_{3,t}$	[mm]	**$20 \cdot d_1$**	120	96	**$15 \cdot d_1$**	90	120
$a_{3,c}$	[mm]	**$15 \cdot d_1$**	90	56	**$15 \cdot d_1$**	90	120
$a_{4,t}$	[mm]	**$7 \cdot d_1$**	42	24	**$12 \cdot d_1$**	72	96
$a_{4,c}$	[mm]	**$7 \cdot d_1$**	42	24	**$7 \cdot d_1$**	42	56

d_1 = nominal screw diameter

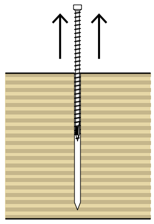


NOTES:

- The minimum distances are compliant with EN 1995:2014 - Table 8.2 considering a wood characteristic density of ρ_k > 420 kg/m³ and calculation diameter of d = nominal screw diameter.
- For high density wood applications (ρ_k > 500 kg/m³) please refer to ETA-11/0030.
- The minimum spacing for all steel-to-timber connections (a_1, a_2) can be multiplied by a coefficient of 0,7.
- The minimum spacing for all panel-to-timber connections (a_1, a_2) can be multiplied by a coefficient of 0,85.

Full technical data is available in the website www.rothoblaas.com.

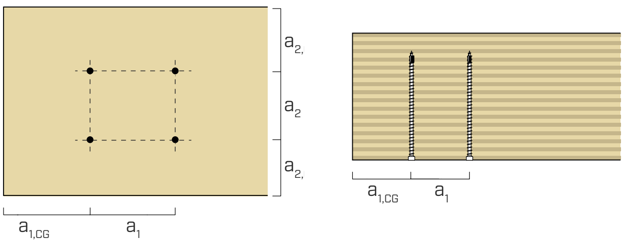
MINIMUM DISTANCES FOR AXIAL STRESSES [1] | LVL



			SCREWS INSERTED WITH AND WITHOUT PRE-DRILLING HOLE	
d_1 eq.			**7**	**9**
d_1			6	8
a_1	[mm]	**$5 \cdot d_1$**	30	40
a_2	[mm]	**$5 \cdot d_1$**	30	40
$a_{2,LIM}$ [(2)]	[mm]	**$2,5 \cdot d_1$**	15	20
$a_{1,CG}$	[mm]	**$8 \cdot d_1$**	48	64
$a_{2,CG}$	[mm]	**$3 \cdot d_1$**	18	24
a_{CROSS}	[mm]	**$1,5 \cdot d_1$**	9	12

d_1 = nominal screw diameter

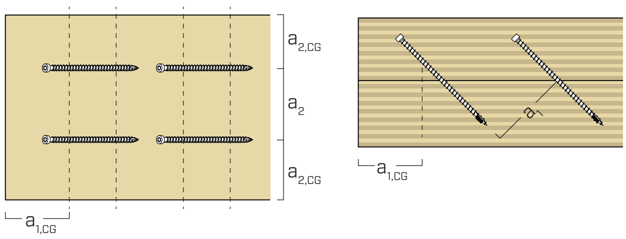
SCREWS INSERTED WITH α 90° ANGLE WITH RESPECT TO THE GRAIN (wide face)



plan

front

SCREWS INSERTED WITH α ANGLE WITH RESPECT TO THE GRAIN (wide face)



plan

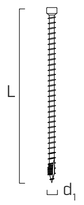
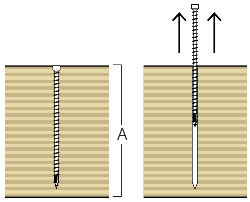
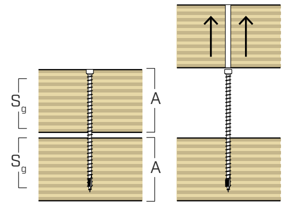
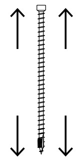
front

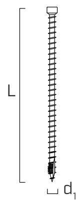
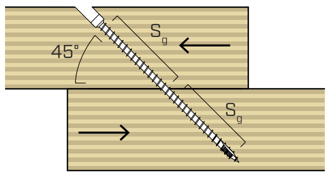
NOTES:

(1) The minimum distances for connectors stressed axially are independent of the insertion angle of the connector and the angle of the force with respect to the grain, in accordance with ETA-11/0030.

(2) The axial distance a_2 can be reduced down to 2,5 d_1 if for each connector a "joint surface" a_1 a_2 = 25 d_1^2 is maintained.

STATIC VALUES | LVL

geometry			TENSION [1]: total thread withdrawal [2] flat			TENSION [1]: partial thread withdrawal [2] flat			TENSION [1]: steel tension
									
					LVL			LVL	steel
d_1 eq. [mm]	d_1 [mm]	L [mm]	b [mm]	A_{min} [mm]	$R_{ax,k}$ [kN]	S_g [mm]	A_{min} [mm]	$R_{ax,k}$ [kN]	$R_{tens,k}$ [kN]
6	6	140	130	150	35,88	55	75	15,18	17,00
	6	180	170	190	46,92	75	95	20,70	
	6	220	210	230	57,96	95	115	26,22	
	6	260	250	270	69,00	115	135	31,74	
8	8	200	190	210	69,92	85	105	31,28	20,1
	8	240	230	250	84,64	105	125	38,64	
	8	280	270	290	99,36	125	145	46,00	
	8	320	310	330	114,08	145	165	53,36	

geometry			SLIDING [3]: LVL - LVL				
							
						LVL	steel
d_1 eq. [mm]	d_1 [mm]	L [mm]	S_g [mm]	A_{min} [mm]	B_{min} [mm]	$R_{ax,k}$ [kN]	$R_{tens,k\ 45°}$ [4] [kN]
7	6	140	55	55	70	9,76	12,02
	6	180	75	65	85	13,31	
	6	220	95	80	100	16,85	
	6	260	115	95	110	20,40	
9	8	200	85	75	90	20,11	14,21
	8	240	105	90	105	24,84	
	8	280	125	105	120	29,57	
	8	320	145	115	135	34,30	

NOTES:

[1] The connector design resistance is the lowest between the wood side design resistance ($R_{ax,d}$) and the steel side resistance ($R_{tens,d}$).

$$R_{ax,d} = min \begin{cases} \dfrac{R_{ax,k} \cdot k_{mod}}{\gamma_m} \\ \dfrac{R_{tens,k}}{\gamma_{m2}} \end{cases}$$

[2] The axial thread withdrawal resistance $R_{ax,90,k}$ was calculated considering a 90° angle between the grain and the connector and for a fixing length of b.

[3] The design sliding resistance of the joint is either the timber-side design resistance ($R_{V,d}$) or the steel design resistance ($R_{tens,d}$ 45°), whichever is lower.

$$R_{V,d} = min \begin{cases} \dfrac{R_{V,k} \cdot k_{mod}}{\gamma_m} \\ \dfrac{R_{tens,k\ 45°}}{\gamma_{m2}} \end{cases}$$

[4] The connector tensile strength was calculated considering a 45° angle between the fibres and the connector.

GENERAL PRINCIPLES:

- Characteristic values comply with the EN 1995:2014 standard in accordance with ETA-11/0030.
- Design values can be obtained from characteristic values as follows:

$$R_d = \frac{R_k \cdot k_{mod}}{\gamma_m}$$

The coefficients γ_m and k_{mod} should be taken according to the current regulations used for the calculation.

- For the mechanical strength values and the geometry of the screws, reference was made to ETA-11/0030.
- A timber density of ρ_k = 730 kg/m³ was considered for the calculation process.
- Dimensioning and verification of the timber elements must be carried out separately.
- The withdrawal and sliding values were calculated considering the centre of gravity of the connector placed in correspondence with the shear plane.