HBS PLATE

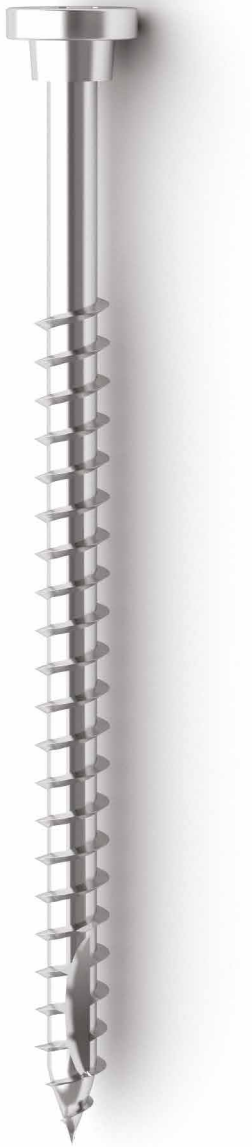
PAN HEAD SCREW FOR PLATES

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

HBS P
Designed for steel-to-timber joints: the head has a shoulder and the thickness is increased for completely safe, reliable fastening plates to the timber.

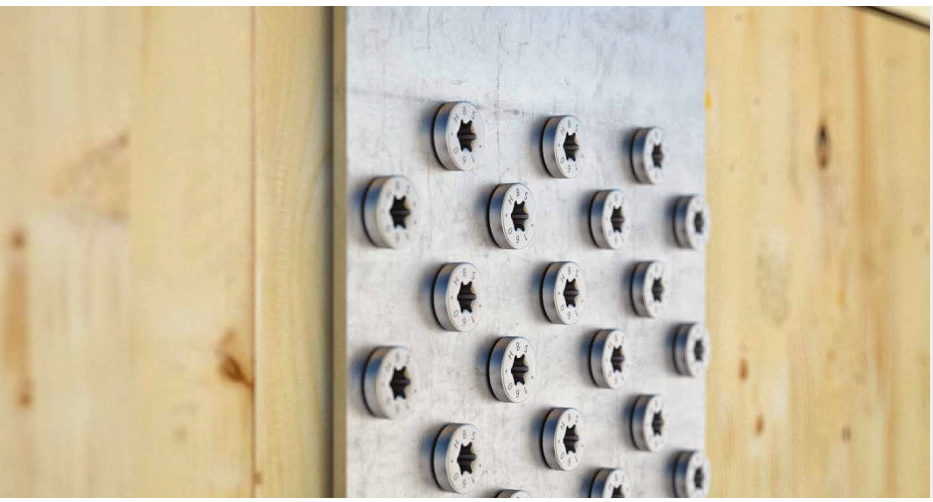
PLATE FASTENING
The under-head shoulder achieves an interlocking effect with the circular hole in the plate, thus guaranteeing excellent static performance.

LONGER THREAD
Increased thread length for excellent shear strength and tensile strength in steel-to-timber joints. Values higher than normal.



CHARACTERISTICS

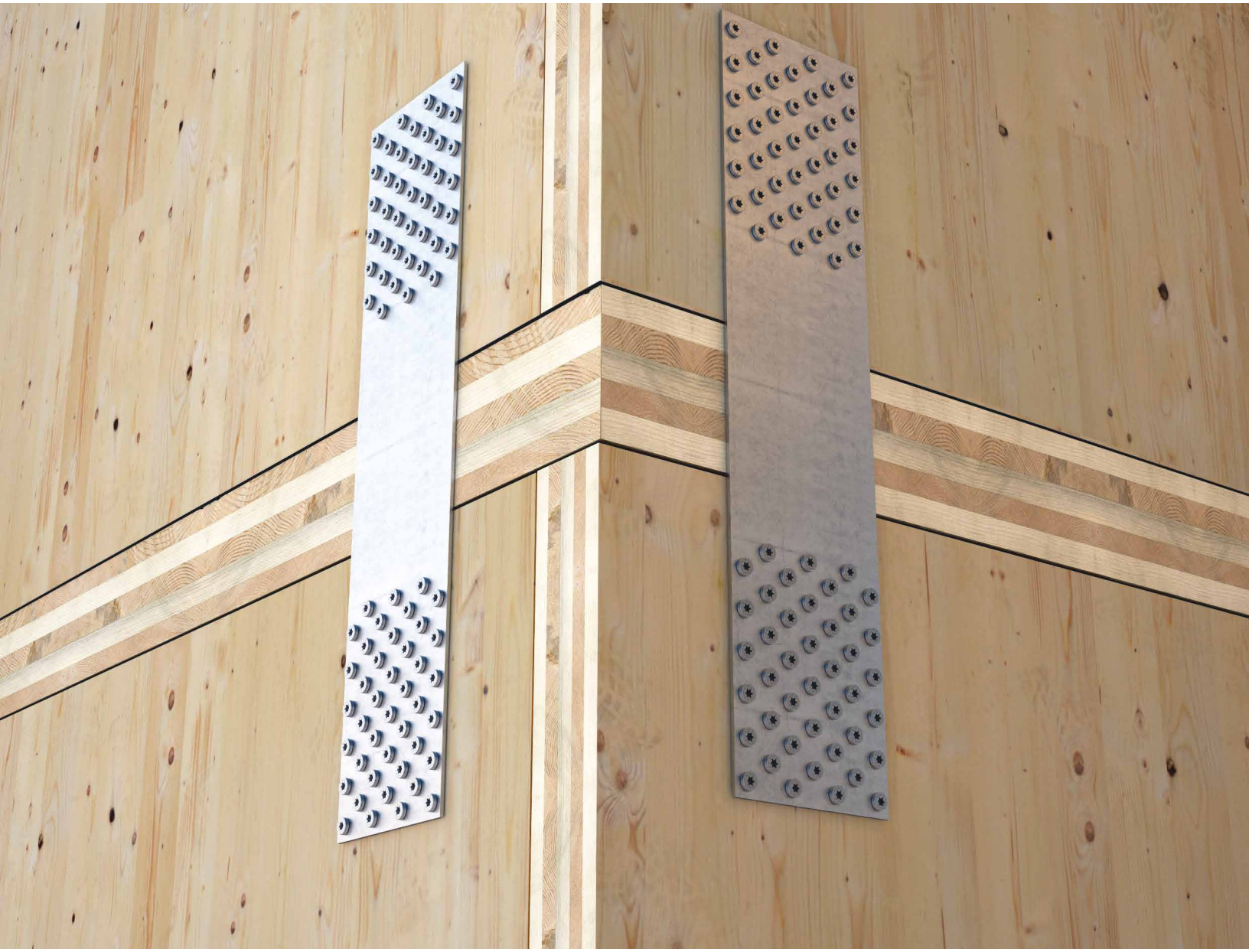
FOCUS	steel-to-timber joints	
HEAD	shoulder for plate	
DIAMETER	from 8 mm to 12 mm	*0.32 to 0.48 inch*
LENGTH	from 80 mm to 200 mm	*3 1/8 to 7 7/8 inch*

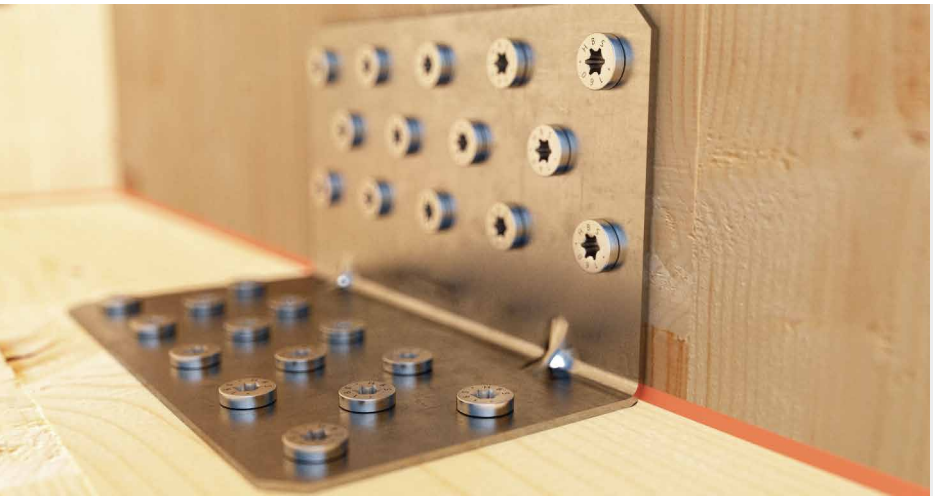


MATERIAL
Carbon steel with bright zinc plated.

FIELDS OF USE
- wood based panels
- solid timber
- glulam (Glued Laminated Timber)
- CLT, LVL
- high density woods

Service classes 1 and 2.





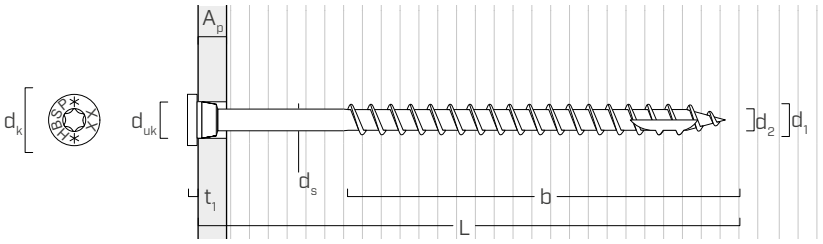
MULTISTOREY

Ideal for steel-to-timber joints with large customized plates, designed for multi-storey wooden buildings.

TITAN

Values also tested, certified and calculated for fastening standard Rothoblaas plates.

GEOMETRY AND MECHANICAL CHARACTERISTICS



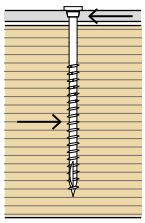
Nominal diameter	d_1	[mm] *[in]* [in][1]	8 *0.32* 5/16	10 *0.40* 3/8	12 *0.48* 1/2
Head diameter	d_k	[mm] *[in]*	14.50 *0.571*	18.25 *0.719*	20.75 *0.817*
Tip diameter	d_2	[mm] *[in]*	5.40 *0.213*	6.40 *0.252*	6.80 *0.268*
Shank diameter	d_s	[mm] *[in]*	5.80 *0.228*	7.00 *0.276*	8.00 *0.315*
Head thickness	t_1	[mm] *[in]*	3.40 *0.134*	4.35 *0.171*	5.00 *0.197*
Underhead diameter	d_{UK}	[mm] *[in]*	10.00 *0.394*	12.00 *0.472*	14.00 *0.551*
Pre-drilling diameter	d_v	[mm] *[in]*	5.0 *0.197*	6.0 *0.236*	7.0 *0.276*
Characteristic yield moment	$M_{y,k}$	[Nm] *[lbf.in]*	20.1 *177.9*	35.8 *316.9*	48.0 *424.8*
Characteristic withdrawal-resistance parameter[2]	$f_{ax,k}$	[N/mm²] *[psi]*	11.7 *1,697*	11.7 *1,697*	11.7 *1,697*
Associated density	ρ_a	[kg/m³]	350	350	350
Characteristic head-pull-through parameter[2]	$f_{head,k}$	[N/mm²] *[psi]*	10.5 *1,523*	10.5 *1,523*	10.5 *1,523*
Associated density	ρ_a	[kg/m³]	350	350	350
Characteristic tensile strength	$f_{tens,k}$	[kN] *[lbf]*	20.1 *4,519*	31.4 *7,059*	33.9 *7,621*
Associated density	ρ_a	[kg/m³]	350	350	350

[1] The value in fractional inches is rounded to the closest fraction for simplicity of use. For the precise value of the nominal diameter d_1, see the value in decimal inches.
[2] Valid for softwood - maximum density 440 kg/m³.
For applications on different timber types (e.g. LVL) or with a high density please check on the ETA-11/0030.

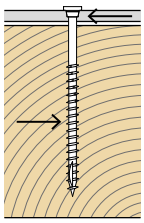
CODES AND DIMENSIONS

d_1 [mm] *[in]*	CODE	L [mm]	L *[in]*	b [mm]	b *[in]*	A_p [mm]	A_p *[in]*	pcs
8 *0.32* TX 40	**HBSP880**	80	*3 1/8*	55	*2 3/16*	1 - 15	*0,039 - 0,591*	100
	HBSP8100	100	*4*	75	*2 15/16*	1 - 15	*0,039 - 0,591*	100
	HBSP8120	120	*4 3/4*	95	*3 3/4*	1 - 15	*0,039 - 0,591*	100
	HBSP8140	140	*5 1/2*	110	*4 3/8*	1 - 20	*0,039 - 0,787*	100
	HBSP8160	160	*6 1/4*	130	*5 1/8*	1 - 20	*0,039 - 0,787*	100
10 *0.40* TX 40	**HBSP10100**	100	*4*	75	*2 15/16*	1 - 15	*0,039 - 0,591*	50
	HBSP10120	120	*4 3/4*	95	*3 3/4*	1 - 15	*0,039 - 0,591*	50
	HBSP10140	140	*5 1/2*	110	*4 3/8*	1 - 20	*0,039 - 0,787*	50
	HBSP10160	160	*6 1/4*	130	*5 1/8*	1 - 20	*0,039 - 0,787*	50
	HBSP10180	180	*7 1/8*	150	*6*	1 - 20	*0,039 - 0,787*	50
12 *0.48* TX 50	**HBSP12120**	120	*4 3/4*	90	*3 1/2*	1 - 20	*0,039 - 0,787*	25
	HBSP12140	140	*5 1/2*	110	*4 3/8*	1 - 20	*0,039 - 0,787*	25
	HBSP12160	160	*6 1/4*	120	*4 3/4*	1 - 30	*0,039 - 1,181*	25
	HBSP12180	180	*7 1/8*	140	*5 1/2*	1 - 30	*0,039 - 1,181*	25
	HBSP12200	200	*8*	160	*6 1/4*	1 - 30	*0,039 - 1,181*	25

MINIMUM DISTANCES FOR SHEAR LOADS | WOOD ELEMENTS



Load-to-grain angle α = 0°



Load-to-grain angle α = 90°

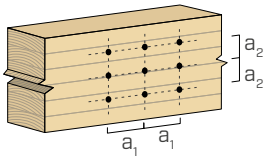
SCREWS INSERTED WITH PREDRILL

		α = 0°				α = 90°			
d_1	[mm] *[in]*		8 *0.32*	10 *0.40*	12 *0.48*		8 *0.32*	10 *0.40*	12 *0.48*
a_1	[mm] *[in]*	5·d·0.7 (1)	28 *1.102*	35 *1.378*	42 *1.654*	4·d·0.7 (1)	22 *0.882*	28 *1.102*	34 *1.323*
a_2	[mm] *[in]*	3·d·0.7 (1)	17 *0.945*	21 *1.181*	25 *1.417*	4·d·0.7	32 *1.260*	40 *1.575*	48 *1.890*
$a_{3,t}$	[mm] *[in]*	12·d(1)	96 *3.780*	120 *4.724*	144 *5.669*	7·d(1)	56 *2.205*	70 *2.756*	84 *3.307*
$a_{3,c}$	[mm] *[in]*	7·d(1)	56 *2.205*	70 *2.756*	84 *3.307*	7·d(1)	56 *2.205*	70 *2.756*	84 *3.307*
$a_{4,t}$	[mm] *[in]*	3·d	24 *0.945*	30 *1.181*	36 *1.417*	7·d	56 *2.205*	70 *2.756*	84 *3.307*
$a_{4,c}$	[mm] *[in]*	3·d	24 *0.945*	30 *1.181*	36 *1.417*	3·d	24 *0.945*	30 *1.181*	36 *1.417*

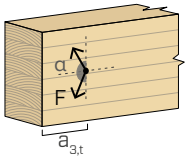
SCREWS INSERTED WITHOUT PREDRILL

		α = 0°				α = 90°			
d_1	[mm] *[in]*		8 *0.32*	10 *0.40*	12 *0.48*		8 *0.32*	10 *0.40*	12 *0.48*
a_1	[mm] *[in]*	12·d·0.7 (1)	67 *2.646*	84 *3.307*	101 *3.969*	5·d·0.7 (1)	40 *1.102*	50 *1.378*	60 *1.654*
a_2	[mm] *[in]*	5·d·0.7	40 *1.102*	50 *1.378*	60 *1.654*	5·d·0.7	40 *1.102*	50 *1.378*	60 *1.654*
$a_{3,t}$	[mm] *[in]*	15·d(1)	120 *4.724*	150 *5.906*	180 *7.087*	10·d(1)	80 *3.150*	100 *3.937*	120 *4.724*
$a_{3,c}$	[mm] *[in]*	10·d(1)	80 *3.150*	100 *3.937*	120 *4.724*	10·d(1)	80 *3.150*	100 *3.937*	120 *4.724*
$a_{4,t}$	[mm] *[in]*	5·d	40 *1.575*	50 *1.969*	60 *2.362*	10·d	80 *3.150*	100 *3.937*	120 *4.724*
$a_{4,c}$	[mm] *[in]*	5·d	40 *1.575*	50 *1.969*	60 *2.362*	5·d	40 *1.575*	50 *1.969*	60 *2.362*

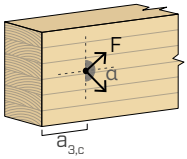
d = nominal screw diameter



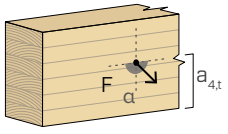
stressed end
-90° < α < 90°



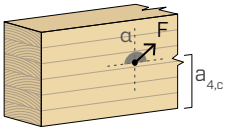
unloaded end
90° < α < 270°



stressed edge
0° < α < 180°



unload edge
180° < α < 360°

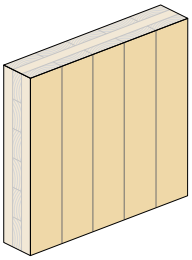


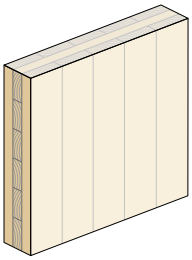
NOTES:

- The minimum distances are in accordance with the EN 1995:2014 standard, according to ETA-11/0030, considering a density of the wood elements $\rho_k \leq 420$ kg/m^3.
- For wood densities conversion (mean oven-dry relative density to 5th-percentile density 12% MC wt & vol) see "Background document" available at Rothoblaas.
- In the case of OSB-wood joints, the minimum spacings (a_1, a_2) can be multiplied by a coefficient of 0.85.
- In the case of steel-wood joints, the minimum spacings (a_1, a_2) can be multiplied by a coefficient of 0.7.

(1) For Douglas fir members minimum spacing and distances parallel to the grain shall be increased by 50%.

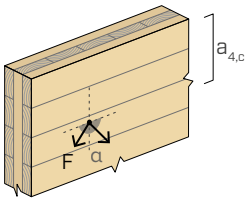
MINIMUM DISTANCES FOR SHEAR LOADS | CLT

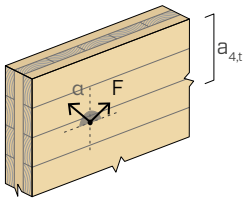


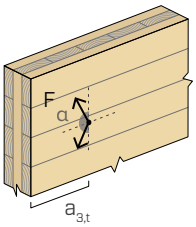


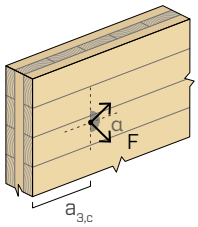
		SCREWS INSERTED WITHOUT PREDRILL							
		lateral face [2]				narrow face [3]			
d_1	[mm] *[in]*		8 *0.32*	10 *0.40*	12 *0.48*		8 *0.32*	10 *0.40*	12 *0.48*
a_1	[mm] *[in]*	4·d	32 *1.260*	40 *1.575*	48 *1.890*	10·d	80 *3.150*	100 *3.937*	120 *4.724*
a_2	[mm] *[in]*	2,5·d	20 *0.787*	25 *0.984*	30 *1.181*	4·d	32 *1.260*	40 *1.575*	48 *1.890*
$a_{3,t}$	[mm] *[in]*	6·d	48 *1.890*	60 *2.362*	72 *2.835*	12·d	96 *3.780*	120 *4.724*	144 *5.669*
$a_{3,c}$	[mm] *[in]*	6·d	48 *1.890*	60 *2.362*	72 *2.835*	7·d	56 *2.205*	70 *2.756*	84 *3.307*
$a_{4,t}$	[mm] *[in]*	6·d	48 *1.890*	60 *2.362*	72 *2.835*	6·d	48 *1.890*	60 *2.362*	72 *2.835*
$a_{4,c}$	[mm] *[in]*	2,5·d	20 *0.787*	25 *0.984*	30 *1.181*	3·d	24 *0.945*	30 *1.181*	36 *1.417*

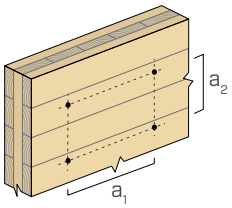
d = nominal screw diameter

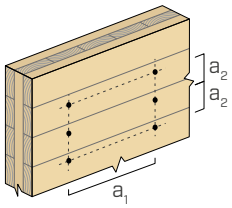


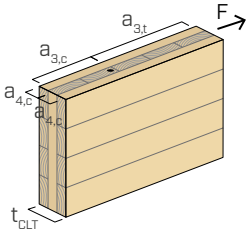


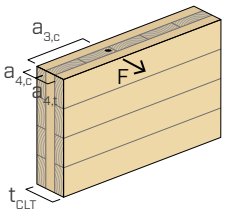












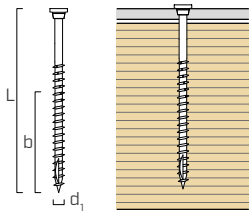
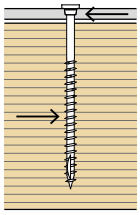
NOTES:

- The minimum distances are according to ETA-11/0030, unless otherwise specified in the technical specification (ETA or hEN) for the cross laminated timber.

(2) Minimum thickness of CLT members $t_{CLT,min}$ = 10 d.

(3) Minimum thickness of CLT members $t_{CLT,min}$ = 10 d and minimum screw penetration depth perpendicular to the edge surface of 10 d.

STATIC VALUES | SHEAR STEEL-TO-TIMBER

geometry					steel-to-timber thin plate (1)							
												
d_1		L		b		characteristic values		design values (factored resistance)				
						$R_{V,k}$		$R_{V,d}$ Load Case 1		$R_{V,d}$ Load Case 2&3		$R_{V,d}$ Load Case 4&5	
[mm] *[in]*		[mm]	*[in]*	[mm]	*[in]*	[kN]	*[lbf]*	[kN]	*[lbf]*	[kN]	*[lbf]*	[kN]	*[lbf]*
8 *0.32*	$S_{PLATE} \geq 4,0$ mm *0.157 in*	80	*3 1/8*	55	*2 3/16*	3.95	*889*	1.82	*410*	2.43	*547*	2.74	*615*
		100	*4*	75	*2 15/16*	4.46	*1,004*	2.06	*463*	2.75	*618*	3.09	*695*
		120	*4 3/4*	95	*3 3/4*	4.95	*1,114*	2.29	*514*	3.05	*685*	3.43	*771*
		140	*5 1/2*	110	*4 3/8*	5.26	*1,182*	2.43	*546*	3.24	*728*	3.64	*819*
		160	*6 1/4*	130	*5 1/8*	5.26	*1,182*	2.43	*546*	3.24	*728*	3.64	*819*
10 *0.40*	$S_{PLATE} \geq 5,0$ mm *0.197 in*	100	*4*	75	*2 15/16*	5.78	*1,299*	2.67	*600*	3.56	*799*	4.00	*899*
		120	*4 3/4*	95	*3 3/4*	6.70	*1,506*	3.09	*695*	4.12	*927*	4.64	*1,043*
		140	*5 1/2*	110	*4 3/8*	7.16	*1,609*	3.30	*743*	4.41	*990*	4.96	*1,114*
		160	*6 1/4*	130	*5 1/8*	7.59	*1,706*	3.50	*787*	4.67	*1,050*	5.25	*1,181*
		180	*7 1/8*	150	*6*	7.59	*1,706*	3.50	*787*	4.67	*1,050*	5.25	*1,181*
12 *0.48*	$S_{PLATE} \geq 6,0$ mm *0.236 in*	120	*4 3/4*	90	*3 1/2*	7.88	*1,771*	3.64	*817*	4.85	*1,090*	5.45	*1,226*
		140	*5 1/2*	110	*4 3/8*	8.72	*1,960*	4.02	*905*	5.37	*1,206*	6.04	*1,357*
		160	*6 1/4*	120	*4 3/4*	9.09	*2,043*	4.19	*943*	5.59	*1,257*	6.29	*1,414*
		180	*7 1/8*	140	*5 1/2*	9.37	*2,106*	4.32	*972*	5.76	*1,296*	6.48	*1,458*
		200	*8*	160	*6 1/4*	9.37	*2,106*	4.32	*972*	5.76	*1,296*	6.48	*1,458*

NOTES:

(1) The shear characteristics resistances are calculated considering the case of a thin plate ($S_{PLATE} \leq 0,5\ d_1$).

(2) The shear characteristic resistances are calculated considering the case of a thick plate ($S_{PLATE} \geq d_1$).

(3) The axial thread-extraction resistance was calculated considering a 90° angle between the grain and the connector and for a fixing length of b.

In the case of steel-to-timber connections, generally the steel tensile strength is binding with respect to head separation or penetration.

GENERAL PRINCIPLES:

- Characteristic values comply with the EN 1995:2014 standard in accordance with ETA-11/0030.
- According to EN 1995:2014 for shear characteristic values the contribution from the rope effect ($F_{ax,Rk}$ / 4) is considered. This is resulting in higher shear resistances compared to shear resistances calculated in accordance with CSA O86-14.
- Design values for wood-side are obtained from the following characteristic values:

$$R_d = R_k \cdot \text{DMF}$$

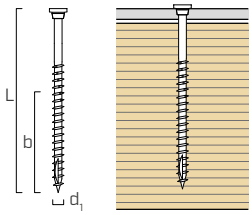
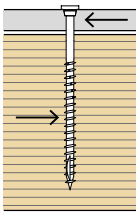
DMF: design modification factor based on k_{mod} as per Table 10 and for γ_M as per Table 11 (γ_M = 1.3). See "Background document" available at Rothoblaas.

Load case	Load Combination Principal Load	Load Combination Companion Load	Design Modification Factor DMF
1	1.4D	-	0.46
2	(1.25D or 0.9D) + 1.5L	1.0S or 0.4W	0.62 (1)
3	(1.25D or 0.9D) + 1.5S	1.0L or 0.4W	0.62
4	(1.25D or 0.9D) + 1.4W	0.5L or 0.5S	0.69
5	1.0D + 1.0E	0.5L or 0.25S	0.69

(1) If Live Load L is associated with long term loads such as storage, equipment areas etc., use 0,54.

- For the mechanical resistance values and the geometry of the screws, reference was made to ETA-11/0030.
- In the calculations, the density of the wood elements was considered equal to ρ_k = 370 kg/m^3 (S-P-F sawn lumber). For wood densities conversion (mean ovendry relative density to 5th-percentile density 12% MC wt & vol) see "Background document" available at Rothoblaas.
  Characteristic resistances can also be considered as valid for higher densities, for the purposes of safety.
- Values were calculated considering the threaded part as being completely inserted into the wood.
- Sizing and verification of the wooden elements and steel plates must be done separately.
- The shear characteristic resistances are calculated for screws inserted without pre-bored holes. In the case of screws inserted with pre-bored holes, greater resistance values can be obtained.
- For different calculation methods, the MyProject software is available free of charge (www.rothoblaas.com).
- The characteristic resistances were calculated using solid wood or glulam. In the case of joints with CLT elements, the resistance values may be different and should be calculated on the basis of the characteristics of the panel and the connection configuration.

STATIC VALUES | SHEAR STEEL-TO-TIMBER

geometry					steel-to-timber thick plate (2)							
												
d_1		L		b		characteristic values		design values (factored resistance)				
						$R_{V,k}$		$R_{V,d}$ Load Case 1		$R_{V,d}$ Load Case 2&3		$R_{V,d}$ Load Case 4&5	
[mm] *[in]*		[mm]	*[in]*	[mm]	*[in]*	[kN]	*[lbf]*	[kN]	*[lbf]*	[kN]	*[lbf]*	[kN]	*[lbf]*
8 *0.32*		80	*3 1/8*	55	*2 3/16*	$S_{PLATE} \geq$ **8,0 mm** *0.315 in*	5.06	*1,139*	2.34	*525*	3.12	*701*	3.51	*788*
		100	*4*	75	*2 15/16*		5.55	*1,249*	2.56	*576*	3.42	*768*	3.84	*864*
		120	*4 3/4*	95	*3 3/4*		6.04	*1,359*	2.79	*627*	3.72	*836*	4.18	*941*
		140	*5 1/2*	110	*4 3/8*		6.41	*1,441*	2.96	*665*	3.94	*887*	4.44	*998*
		160	*6 1/4*	130	*5 1/8*		6.90	*1,551*	3.18	*716*	4.25	*954*	4.78	*1,074*
10 *0.40*		100	*4*	75	*2 15/16*	$S_{PLATE} \geq$ **10,0 mm** *0.394 in*	7.66	*1,722*	3.54	*795*	4.71	*1,060*	5.30	*1,192*
		120	*4 3/4*	95	*3 3/4*		8.27	*1,859*	3.82	*858*	5.09	*1,144*	5.73	*1,287*
		140	*5 1/2*	110	*4 3/8*		8.73	*1,963*	4.03	*906*	5.37	*1,208*	6.04	*1,359*
		160	*6 1/4*	130	*5 1/8*		9.34	*2,100*	4.31	*969*	5.75	*1,292*	6.47	*1,454*
		180	*7 1/8*	150	*6*		9.95	*2,238*	4.59	*1,033*	6.13	*1,377*	6.89	*1,549*
12 *0.48*		120	*4 3/4*	90	*3 1/2*	$S_{PLATE} \geq$ **12,0 mm** *0.472 in*	9.93	*2,231*	4.58	*1,030*	6.11	*1,373*	6.87	*1,545*
		140	*5 1/2*	110	*4 3/8*		10.66	*2,396*	4.92	*1,106*	6.56	*1,475*	7.38	*1,659*
		160	*6 1/4*	120	*4 3/4*		11.03	*2,479*	5.09	*1,144*	6.79	*1,525*	7.63	*1,716*
		180	*7 1/8*	140	*5 1/2*		11.76	*2,644*	5.43	*1,220*	7.24	*1,627*	8.14	*1,830*
		200	*8*	160	*6 1/4*		12.49	*2,809*	5.77	*1,296*	7.69	*1,729*	8.65	*1,945*

NOTES:

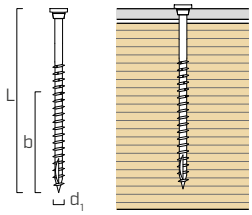
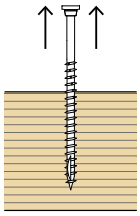
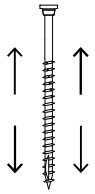
(1) The shear characteristics resistances are calculated considering the case of a thin plate ($S_{PLATE} \leq 0,5\ d_1$).

(2) The shear characteristic resistances are calculated considering the case of a thick plate ($S_{PLATE} \geq d_1$).

(3) The axial thread-extraction resistance was calculated considering a 90° angle between the grain and the connector and for a fixing length of b.

In the case of steel-to-timber connections, generally the steel tensile strength is binding with respect to head separation or penetration.

STATIC VALUES | TRACTION THREAD WITHDRAWAL

geometry					thread withdrawal [3]						steel tension	
												
d_1	L		b		characteristic values	design values (factored resistance)					characteristic values	
					$R_{ax,k}$	$R_{ax,d}$ Load Case 1		$R_{ax,d}$ Load Case 2&3		$R_{ax,d}$ Load Case 4&5	$R_{tens,k}$	
[mm] *[in]*	[mm]	*[in]*	[mm]	*[in]*	[kN]	*[lbf]*	[kN]	*[lbf]*	[kN]	*[lbf]*	[kN]	*[lbf]*
8 *0.32*	80	*3 1/8*	55	*2 3/16*	5.38	*1,210*	2.48	*558*	3.31	*745*	3.73	*838*	20.10	*4,519*
	100	*4*	75	*2 15/16*	7.34	*1,650*	3.39	*761*	4.52	*1,015*	5.08	*1,142*		
	120	*4 3/4*	95	*3 3/4*	9.30	*2,090*	4.29	*965*	5.72	*1,286*	6.44	*1,447*		
	140	*5 1/2*	110	*4 3/8*	10.76	*2,420*	4.97	*1,117*	6.62	*1,489*	7.45	*1,675*		
	160	*6 1/4*	130	*5 1/8*	12.72	*2,860*	5.87	*1,320*	7.83	*1,760*	8.81	*1,980*		
10 *0.40*	100	*4*	75	*2 15/16*	9.17	*2,062*	4.23	*952*	5.65	*1,269*	6.35	*1,428*	31.40	*7,059*
	120	*4 3/4*	95	*3 3/4*	11.62	*2,612*	5.36	*1,206*	7.15	*1,608*	8.04	*1,809*		
	140	*5 1/2*	110	*4 3/8*	13.46	*3,025*	6.21	*1,396*	8.28	*1,861*	9.32	*2,094*		
	160	*6 1/4*	130	*5 1/8*	15.90	*3,575*	7.34	*1,650*	9.79	*2,200*	11.01	*2,475*		
	180	*7 1/8*	150	*6*	18.35	*4,125*	8.47	*1,904*	11.29	*2,538*	12.70	*2,856*		
12 *0.48*	120	*4 3/4*	90	*3 1/2*	13.21	*2,970*	6.10	*1,371*	8.13	*1,828*	9.15	*2,056*	33.90	*7,621*
	140	*5 1/2*	110	*4 3/8*	16.15	*3,630*	7.45	*1,675*	9.94	*2,234*	11.18	*2,513*		
	160	*6 1/4*	120	*4 3/4*	17.61	*3,960*	8.13	*1,828*	10.84	*2,437*	12.19	*2,741*		
	180	*7 1/8*	140	*5 1/2*	20.55	*4,620*	9.48	*2,132*	12.65	*2,843*	14.23	*3,198*		
	200	*8*	160	*6 1/4*	23.49	*5,280*	10.84	*2,437*	14.45	*3,249*	16.26	*3,655*		

NOTES:

(1) The shear characteristics resistances are calculated considering the case of a thin plate ($S_{PLATE} \leq 0,5\ d_1$).

(2) The shear characteristic resistances are calculated considering the case of a thick plate ($S_{PLATE} \geq d_1$).

(3) The axial thread-extraction resistance was calculated considering a 90° angle between the grain and the connector and for a fixing length of b.

In the case of steel-to-timber connections, generally the steel tensile strength is binding with respect to head separation or penetration.

Packaged quantities may vary.
Original text: Italian.
Reference unit of measurement: metric.