TBS

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

FLANGE HEAD SCREW

INTEGRATED WASHER

The flange head serves as washer and ensures high tensile strength. Ideal in the presence of wind or variations in timber dimensions.

STRUCTURAL APPLICATIONS

Approved for structural applications subject to stresses in any direction vs. the grain (α = 0° - 90°). Asymmetric "umbrella" threading for better wood pull-through.

SUPERIOR STRENGTH

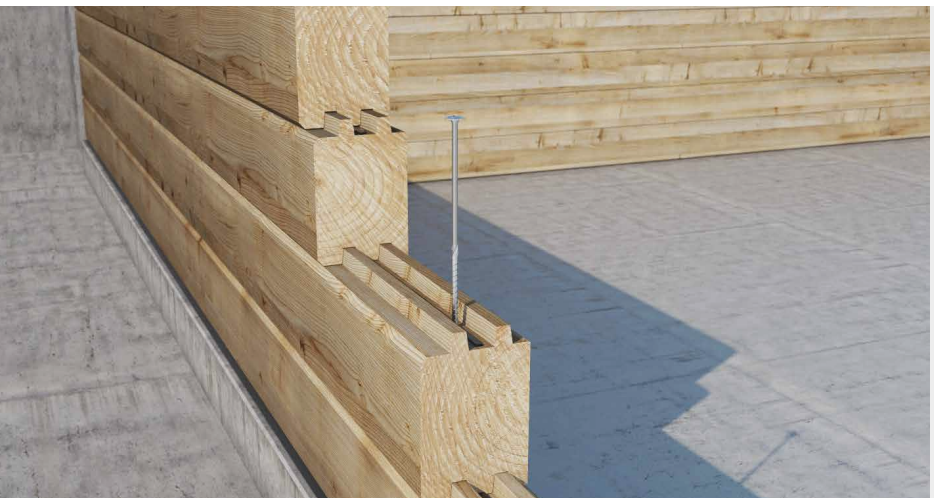
Steel with superb yield and failure strength ($f_{y,k}$ = 1000 N/mm² | *145,038 psi*). Very high torsional strength $f_{tor,k}$ for safer screwing.

DUCTILITY

Bending angle 20° greater than standard, certified according to ETA-11/0030, Cyclical SEISMIC-REV tests according to EN 12512. Seismic performance tested according to EN 14592.

CHARACTERISTICS

FOCUS	screw with built-in washer	
HEAD	flange	
DIAMETER	from 6 mm to 10 mm	*0.24 to 0.40 inch*
LENGTH	from 40 mm to 520 mm	*1 9/16 to 20 1/2 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.

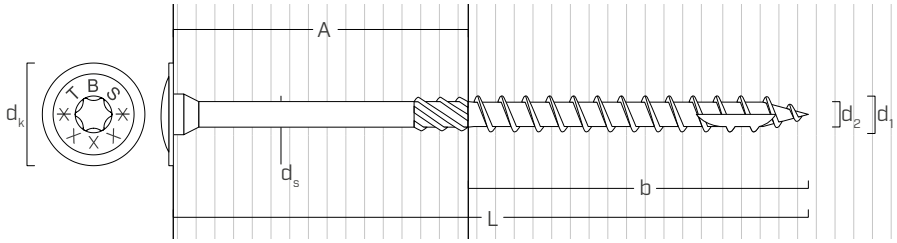
SECONDARY BEAMS

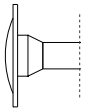
Ideal for fastening joists to sill beams to achieve high wind uplift resistance. The flange head guarantees excellent tensile strength which means the use of additional lateral fastening systems can be avoided.

I-JOIST

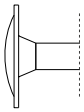
Values also tested, certified and calculated for CLT and high density woods such as Microllam® LVL.

GEOMETRY AND MECHANICAL CHARACTERISTICS





Ø 6 - 8



Ø 10

		[mm]	6	8	10
Nominal diameter	**d_1**	***[in]***	***0.24***	***0.32***	***0.40***
		[in][(1)]	*1/4*	*5/16*	*3/8*
Head diameter	d_k	[mm]	15.50	19.00	25.00
		[in]	*0.610*	*0.748*	*0.984*
Tip diameter	d_2	[mm]	3.95	5.40	6.40
		[in]	*0.156*	*0.213*	*0.252*
Shank diameter	d_s	[mm]	4.30	5.80	7.00
		[in]	*0.169*	*0.228*	*0.276*
Pre-drilling diameter	d_v	[mm]	4.00	5.00	6.00
		[in]	*0.157*	*0.197*	*0.236*
Characteristic yield moment	$M_{y,k}$	[Nm]	9.5	20.1	35.8
		[lbf.in]	*84.1*	*177.9*	*316.9*
Characteristic withdrawal-resistance parameter[(2)]	$f_{ax,k}$	[N/mm²]	11.7	11.7	11.7
		[psi]	*1,697*	*1,697*	*1,697*
Associated density	ρ_a	[kg/m³]	350	350	350
Characteristic head-pull-through parameter[(2)]	$f_{head,k}$	[N/mm²]	10.5	10.5	10.5
		[psi]	*1,523*	*1,523*	*1,523*
Associated density	ρ_a	[kg/m³]	350	350	350
Characteristic tensile strength	$f_{tens,k}$	[kN]	11.3	20.1	31.4
		[lbf]	*2,540*	*4,519*	*7,059*
Associated density	ρ_a	[kg/m³]	350	350	350

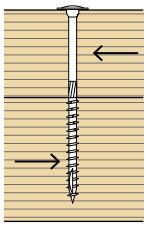
(1) The value in fractional inches is rounded to the closest fraction for simplicity of use. For the precise value of the nominal diameter d_1, see the value in decimal inches.
(2) Valid for softwood - maximum density 440 kg/m³.
For applications on different timber types (e.g. LVL) or with a high density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

CODES AND DIMENSIONS

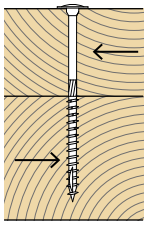
d_1 [mm]	CODE	L [mm]	L *[in]*	b [mm]	b *[in]*	A [mm]	A *[in]*	pcs
6 *0.24* TX30	**TBS660**	60	*2 3/8*	40	*1 9/16*	20	*13/16*	100
	TBS670	70	*2 3/4*	40	*1 9/16*	30	*1 3/16*	100
	TBS680	80	*3 1/8*	50	*1 15/16*	30	*1 3/16*	100
	TBS690	90	*3 1/2*	50	*1 15/16*	40	*1 9/16*	100
	TBS6100	100	*4*	60	*2 3/8*	40	*1 9/16*	100
	TBS6120	120	*4 3/4*	75	*2 15/16*	45	*1 3/4*	100
	TBS6140	140	*5 1/2*	75	*2 15/16*	65	*2 9/16*	100
	TBS6160	160	*6 1/4*	75	*2 15/16*	85	*3 3/8*	100
	TBS6180	180	*7 1/8*	75	*2 15/16*	105	*4 1/8*	100
	TBS6200	200	*8*	75	*2 15/16*	125	*4 15/16*	100
	TBS6220	220	*8 5/8*	100	*4*	120	*4 3/4*	100
	TBS6240	240	*9 1/2*	100	*4*	140	*5 1/2*	100
	TBS6260	260	*10 1/4*	100	*4*	160	*6 1/4*	100
	TBS6280	280	*11*	100	*4*	180	*7 1/8*	100
	TBS6300	300	*11 3/4*	100	*4*	200	*8*	100
8 *0.32* TX 40	**TBS840**	40	*1 9/16*	32	*1 1/4*	8	*5/16*	100
	TBS860	60	*2 3/8*	52	*2 1/16*	10	*3/8*	100
	TBS880	80	*3 1/8*	52	*2 1/16*	28	*1 1/8*	50
	TBS8100	100	*4*	80	*3 1/8*	48	*1 7/8*	50
	TBS8120	120	*4 3/4*	80	*3 1/8*	40	*1 9/16*	50
	TBS8140	140	*5 1/2*	80	*3 1/8*	60	*2 3/8*	50
	TBS8160	160	*6 1/4*	100	*4*	60	*2 3/8*	50
	TBS8180	180	*7 1/8*	100	*4*	80	*3 1/8*	50
	TBS8200	200	*8*	100	*4*	100	*4*	50
	TBS8220	220	*8 5/8*	100	*4*	120	*4 3/4*	50
	TBS8240	240	*9 1/2*	100	*4*	140	*5 1/2*	50
	TBS8260	260	*10 1/4*	100	*4*	160	*6 1/4*	50
	TBS8280	280	*11*	100	*4*	180	*7 1/8*	50
	TBS8300	300	*11 3/4*	100	*4*	200	*8*	50
	TBS8320	320	*12 5/8*	100	*4*	220	*8 5/8*	50
	TBS8340	340	*13 3/8*	100	*4*	240	*9 1/2*	50
	TBS8360	360	*14 1/4*	100	*4*	260	*10 1/4*	50
	TBS8380	380	*15*	100	*4*	280	*11*	50
	TBS8400	400	*15 3/4*	100	*4*	300	*11 3/4*	50
	TBS8440	440	*17 1/4*	100	*4*	340	*13 3/8*	50
	TBS8480	480	*19*	100	*4*	380	*15*	50
	TBS8520	520	*20 1/2*	100	*4*	420	*16 9/16*	50

d_1 [mm]	CODE	L [mm]	L *[in]*	b [mm]	b *[in]*	A [mm]	A *[in]*	pcs
10 *0.40* TX 50	**TBS10100**	100	*4*	52	*2 1/16*	48	*1 7/8*	50
	TBS10120	120	*4 3/4*	60	*2 3/8*	60	*2 3/8*	50
	TBS10140	140	*5 1/2*	60	*2 3/8*	80	*3 1/8*	50
	TBS10160	160	*6 1/4*	80	*3 1/8*	80	*3 1/8*	50
	TBS10180	180	*7 1/8*	80	*3 1/8*	100	*4*	50
	TBS10200	200	*8*	100	*4*	100	*4*	50
	TBS10220	220	*8 5/8*	100	*4*	120	*4 3/4*	50
	TBS10240	240	*9 1/2*	100	*4*	140	*5 1/2*	50
	TBS10260	260	*10 1/4*	100	*4*	160	*6 1/4*	50
	TBS10280	280	*11*	100	*4*	180	*7 1/8*	50
	TBS10300	300	*11 3/4*	100	*4*	200	*8*	50
	TBS10320	320	*12 5/8*	120	*4 3/4*	200	*8*	50
	TBS10340	340	*13 3/8*	120	*4 3/4*	220	*8 5/8*	50
	TBS10360	360	*14 1/4*	120	*4 3/4*	240	*9 1/2*	50
	TBS10380	380	*15*	120	*4 3/4*	260	*10 1/4*	50
	TBS10400	400	*15 3/4*	120	*4 3/4*	280	*11*	50
	TBS10440	440	*17 1/4*	120	*4 3/4*	320	*12 5/8*	50
	TBS10480	480	*19*	120	*4 3/4*	360	*14 1/4*	50
	TBS10520	520	*20 1/2*	120	*4 3/4*	400	*15 3/4*	50

MINIMUM DISTANCES FOR SHEAR LOADS | WOOD ELEMENTS



Load-to-grain angle α = 0°



Load-to-grain angle α = 90°

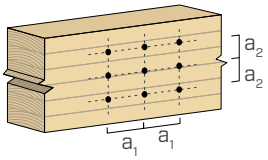
SCREWS INSERTED WITH PREDRILL

			α = 0°				α = 90°		
d_1	[mm] *[in]*		6 *0.24*	8 *0.32*	10 *0.40*		6 *0.24*	8 *0.32*	10 *0.40*
a_1	[mm] *[in]*	5·d (1)	30 *1.181*	40 *1.575*	50 *1.969*	4·d (1)	24 *0.945*	32 *1.260*	40 *1.575*
a_2	[mm] *[in]*	3·d	18 *0.709*	24 *0.945*	30 *1.181*	4·d	24 *0.945*	32 *1.260*	40 *1.575*
$a_{3,t}$	[mm] *[in]*	12·d (1)	72 *2.835*	96 *3.780*	120 *4.724*	7·d (1)	42 *1.654*	56 *2.205*	70 *2.756*
$a_{3,c}$	[mm] *[in]*	7·d (1)	42 *1.654*	56 *2.205*	70 *2.756*	7·d (1)	42 *1.654*	56 *2.205*	70 *2.756*
$a_{4,t}$	[mm] *[in]*	3·d	18 *0.709*	24 *0.945*	30 *1.181*	7·d	42 *1.654*	56 *2.205*	70 *2.756*
$a_{4,c}$	[mm] *[in]*	3·d	18 *0.709*	24 *0.945*	30 *1.181*	3·d	18 *0.709*	24 *0.945*	30 *1.181*

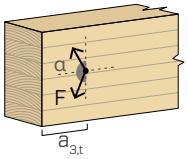
SCREWS INSERTED WITHOUT PREDRILL

			α = 0°				α = 90°		
d_1	[mm] *[in]*		6 *0.24*	8 *0.32*	10 *0.40*		6 *0.24*	8 *0.32*	10 *0.40*
a_1	[mm] *[in]*	12·d (1)	72 *2.835*	96 *3.780*	120 *4.724*	5·d (1)	30 *1.181*	40 *1.575*	50 *1.969*
a_2	[mm] *[in]*	5·d	30 *1.181*	40 *1.575*	50 *1.969*	5·d	30 *1.181*	40 *1.575*	50 *1.969*
$a_{3,t}$	[mm] *[in]*	15·d (1)	90 *3.543*	120 *4.724*	150 *5.906*	10·d (1)	60 *2.362*	80 *3.150*	100 *3.937*
$a_{3,c}$	[mm] *[in]*	10·d (1)	60 *2.362*	80 *3.150*	100 *3.937*	10·d (1)	60 *2.362*	80 *3.150*	100 *3.937*
$a_{4,t}$	[mm] *[in]*	5·d	30 *1.181*	40 *1.575*	50 *1.969*	10·d	60 *2.362*	80 *3.150*	100 *3.937*
$a_{4,c}$	[mm] *[in]*	5·d	30 *1.181*	40 *1.575*	50 *1.969*	5·d	30 *1.181*	40 *1.575*	50 *1.969*

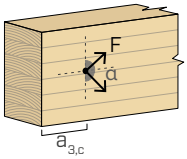
d = nominal screw diameter



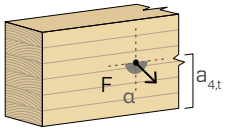
stressed end
-90° < α < 90°



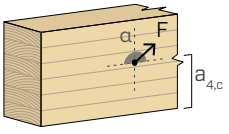
unloaded end
90° < α < 270°



stressed edge
0° < α < 180°



unload edge
180° < α < 360°

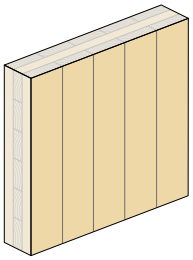


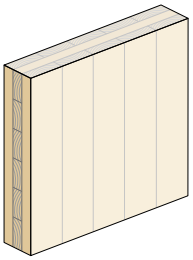
NOTES:

- 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%.

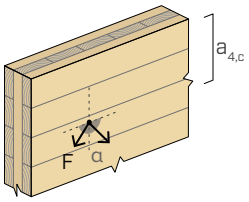
MINIMUM DISTANCES FOR SHEAR LOADS | CLT

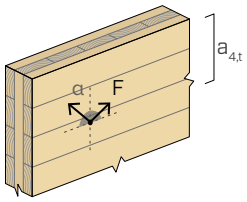


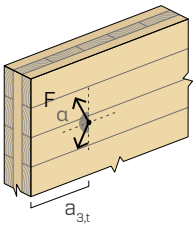


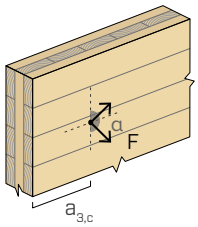
		SCREWS INSERTED WITHOUT PREDRILL							
		lateral face [2]				narrow face [3]			
d_1	[mm] *[in]*		6 *0.24*	8 *0.32*	10 *0.40*		6 *0.24*	8 *0.32*	10 *0.40*
a_1	[mm] *[in]*	4·d	24 *0.945*	32 *1.260*	40 *1.575*	10·d	60 *2.362*	80 *3.150*	100 *3.937*
a_2	[mm] *[in]*	2,5·d	15 *0.591*	20 *0.787*	25 *0.984*	4·d	24 *0.945*	32 *1.260*	40 *1.575*
$a_{3,t}$	[mm] *[in]*	6·d	36 *1.417*	48 *1.890*	60 *2.362*	12·d	72 *2.835*	96 *3.780*	120 *4.724*
$a_{3,c}$	[mm] *[in]*	6·d	36 *1.417*	48 *1.890*	60 *2.362*	7·d	42 *1.654*	56 *2.205*	70 *2.756*
$a_{4,t}$	[mm] *[in]*	6·d	36 *1.417*	48 *1.890*	60 *2.362*	6·d	36 *1.417*	48 *1.890*	60 *2.362*
$a_{4,c}$	[mm] *[in]*	2,5·d	15 *0.591*	20 *0.787*	25 *0.984*	3·d	18 *0.709*	24 *0.945*	30 *1.181*

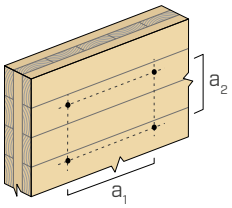
d = nominal screw diameter

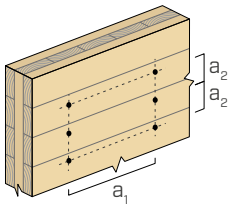


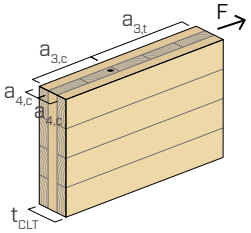


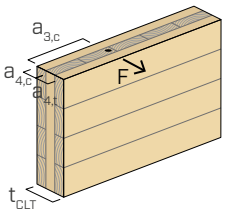












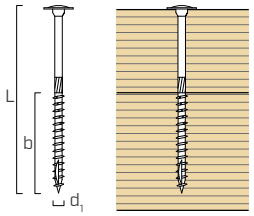
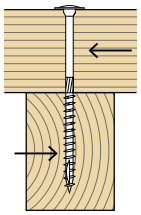
NOTES:

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

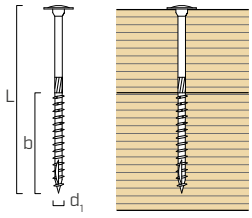
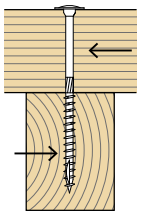
[2] Minimum thickness of CLT members $t_{CLT,min}$ = 10 d.

[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 TIMBER-TO-TIMBER

geometry					timber-to-timber					
										
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	
[mm] *[in]*		[mm]	*[in]*	[mm] *[in]*	[kN]	*[lbf]*	[kN]	*[lbf]*	[kN]	*[lbf]*
6 *0.24*		60	*2 3/8*	40 *1 9/16*	1.84	*413*	0.85	*191*	1.13	*254*
		70	*2 3/4*	40 *1 9/16*	2.09	*469*	0.96	*217*	1.28	*289*
		80	*3 1/8*	50 *1 15/16*	2.09	*469*	0.96	*217*	1.28	*289*
		90	*3 1/2*	50 *1 15/16*	2.29	*516*	1.06	*238*	1.41	*317*
		100	*4*	60 *2 3/8*	2.29	*516*	1.06	*238*	1.41	*317*
		120	*4 3/4*	75 *2 15/16*	2.29	*516*	1.06	*238*	1.41	*317*
		140	*5 1/2*	75 *2 15/16*	2.29	*516*	1.06	*238*	1.41	*317*
		160	*6 1/4*	75 *2 15/16*	2.29	*516*	1.06	*238*	1.41	*317*
		180	*7 1/8*	75 *2 15/16*	2.29	*516*	1.06	*238*	1.41	*317*
		200	*8*	75 *2 15/16*	2.29	*516*	1.06	*238*	1.41	*317*
		220	*8 5/8*	100 *4*	2.29	*516*	1.06	*238*	1.41	*317*
		240	*9 1/2*	100 *4*	2.29	*516*	1.06	*238*	1.41	*317*
		260	*10 1/4*	100 *4*	2.29	*516*	1.06	*238*	1.41	*317*
		280	*11*	100 *4*	2.29	*516*	1.06	*238*	1.41	*317*
		300	*11 3/4*	100 *4*	2.29	*516*	1.06	*238*	1.41	*317*
8 *0.32*		40	*1 9/16*	32 *1 1/4*	1.04	*234*	0.48	*108*	0.64	*144*
		60	*2 3/8*	52 *2 1/16*	1.30	*292*	0.60	*135*	0.80	*180*
		80	*3 1/8*	52 *2 1/16*	2.96	*665*	1.37	*307*	1.82	*409*
		100	*4*	80 *3 1/8*	2.60	*585*	1.20	*270*	1.60	*360*
		120	*4 3/4*	80 *3 1/8*	3.33	*748*	1.54	*345*	2.05	*460*
		140	*5 1/2*	80 *3 1/8*	3.68	*827*	1.70	*382*	2.26	*509*
		160	*6 1/4*	100 *4*	3.68	*827*	1.70	*382*	2.26	*509*
		180	*7 1/8*	100 *4*	3.68	*827*	1.70	*382*	2.26	*509*
		200	*8*	100 *4*	3.68	*827*	1.70	*382*	2.26	*509*
		220	*8 5/8*	100 *4*	3.68	*827*	1.70	*382*	2.26	*509*
		240	*9 1/2*	100 *4*	3.68	*827*	1.70	*382*	2.26	*509*
		260	*10 1/4*	100 *4*	3.68	*827*	1.70	*382*	2.26	*509*
		280	*11*	100 *4*	3.68	*827*	1.70	*382*	2.26	*509*
		300	*11 3/4*	100 *4*	3.68	*827*	1.70	*382*	2.26	*509*
		320	*12 5/8*	100 *4*	3.68	*827*	1.70	*382*	2.26	*509*
		340	*13 3/8*	100 *4*	3.68	*827*	1.70	*382*	2.26	*509*
		360	*14 1/4*	100 *4*	3.68	*827*	1.70	*382*	2.26	*509*
		380	*15*	100 *4*	3.68	*827*	1.70	*382*	2.26	*509*
		400	*15 3/4*	100 *4*	3.68	*827*	1.70	*382*	2.26	*509*
		440	*17 1/4*	100 *4*	3.68	*827*	1.70	*382*	2.26	*509*
		480	*19*	100 *4*	3.68	*827*	1.70	*382*	2.26	*509*
		520	*20 1/2*	100 *4*	3.68	*827*	1.70	*382*	2.26	*509*

STATIC VALUES | SHEAR TIMBER-TO-TIMBER

geometry	timber-to-timber
	

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]*
10 *0.40*	100	*4*	52	*2 1/16*	4.74	*1,066*	2.19	*492*	2.92	*656*	3.28	*738*
	120	*4 3/4*	60	*2 3/8*	5.49	*1,235*	2.54	*570*	3.38	*760*	3.80	*855*
	140	*5 1/2*	60	*2 3/8*	5.51	*1,238*	2.54	*571*	3.39	*762*	3.81	*857*
	160	*6 1/4*	80	*3 1/8*	5.51	*1,239*	2.54	*572*	3.39	*762*	3.81	*858*
	180	*7 1/8*	80	*3 1/8*	5.51	*1,239*	2.54	*572*	3.39	*762*	3.81	*858*
	200	*8*	100	*4*	5.51	*1,239*	2.54	*572*	3.39	*762*	3.81	*858*
	220	*8 5/8*	100	*4*	5.51	*1,239*	2.54	*572*	3.39	*762*	3.81	*858*
	240	*9 1/2*	100	*4*	5.51	*1,239*	2.54	*572*	3.39	*762*	3.81	*858*
	260	*10 1/4*	100	*4*	5.51	*1,239*	2.54	*572*	3.39	*762*	3.81	*858*
	280	*11*	100	*4*	5.51	*1,239*	2.54	*572*	3.39	*762*	3.81	*858*
	300	*11 3/4*	100	*4*	5.51	*1,239*	2.54	*572*	3.39	*762*	3.81	*858*
	320	*12 5/8*	120	*4 3/4*	5.51	*1,239*	2.54	*572*	3.39	*762*	3.81	*858*
	340	*13 3/8*	120	*4 3/4*	5.51	*1,239*	2.54	*572*	3.39	*762*	3.81	*858*
	360	*14 1/4*	120	*4 3/4*	5.51	*1,239*	2.54	*572*	3.39	*762*	3.81	*858*
	380	*15*	120	*4 3/4*	5.51	*1,239*	2.54	*572*	3.39	*762*	3.81	*858*
	400	*15 3/4*	120	*4 3/4*	5.51	*1,239*	2.54	*572*	3.39	*762*	3.81	*858*
	440	*17 1/4*	120	*4 3/4*	5.51	*1,239*	2.54	*572*	3.39	*762*	3.81	*858*
	480	*19*	120	*4 3/4*	5.51	*1,239*	2.54	*572*	3.39	*762*	3.81	*858*
	520	*20 1/2*	120	*4 3/4*	5.51	*1,239*	2.54	*572*	3.39	*762*	3.81	*858*

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:

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

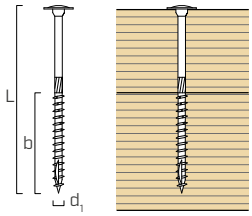
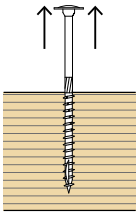
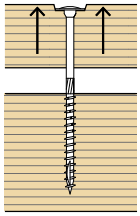
DMF: design modification factor based on k_{mod} as per Table 10 and for γ_M as per Table 11 (γ_M = 1.3). See "Background document" available at Rothoblaas.

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

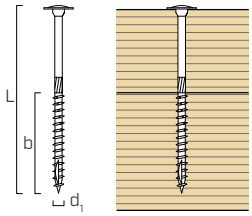
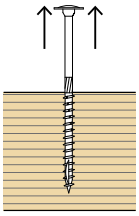
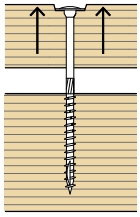
(1) If Live Load L is associated with long term loads such as storage, equipment areas etc., use 0,54.

- 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 | TRACTION

geometry					thread withdrawal							head penetration						
																		
d_1		L		b	characteristic values		design values (factored resistance)					characteristic values		design values (factored resistance)				
					$R_{ax,k}$		$R_{ax,d}$ Load Case 1		$R_{ax,d}$ Load Case 2&3		$R_{ax,d}$ Load Case 4&5	$R_{head,k}$		$R_{head,d}$ Load Case 1		$R_{head,d}$ Load Case 2&3		$R_{head,d}$ Load Case 4&5	
[mm] *[in]*	[mm]	*[in]*	[mm]	*[in]*	[kN]	*[lbf]*	[kN]	*[lbf]*	[kN]	*[lbf]*	[kN]	*[lbf]*	[kN]	*[lbf]*	[kN]	*[lbf]*	[kN]	*[lbf]*	[kN]	*[lbf]*
6 *0.24*	60	*2 3/8*	40	*1 9/16*	2.94	*660*	1.35	*305*	1.81	*406*	2.03	*457*	2.64	*593*	1.22	*274*	1.62	*365*	1.83	*410*
	70	*2 3/4*	40	*1 9/16*	2.94	*660*	1.35	*305*	1.81	*406*	2.03	*457*	2.64	*593*	1.22	*274*	1.62	*365*	1.83	*410*
	80	*3 1/8*	50	*1 15/16*	3.67	*825*	1.69	*381*	2.26	*508*	2.54	*571*	2.64	*593*	1.22	*274*	1.62	*365*	1.83	*410*
	90	*3 1/2*	50	*1 15/16*	3.67	*825*	1.69	*381*	2.26	*508*	2.54	*571*	2.64	*593*	1.22	*274*	1.62	*365*	1.83	*410*
	100	*4*	60	*2 3/8*	4.40	*990*	2.03	*457*	2.71	*609*	3.05	*685*	2.64	*593*	1.22	*274*	1.62	*365*	1.83	*410*
	120	*4 3/4*	75	*2 15/16*	5.50	*1,237*	2.54	*571*	3.39	*761*	3.81	*857*	2.64	*593*	1.22	*274*	1.62	*365*	1.83	*410*
	140	*5 1/2*	75	*2 15/16*	5.50	*1,237*	2.54	*571*	3.39	*761*	3.81	*857*	2.64	*593*	1.22	*274*	1.62	*365*	1.83	*410*
	160	*6 1/4*	75	*2 15/16*	5.50	*1,237*	2.54	*571*	3.39	*761*	3.81	*857*	2.64	*593*	1.22	*274*	1.62	*365*	1.83	*410*
	180	*7 1/8*	75	*2 15/16*	5.50	*1,237*	2.54	*571*	3.39	*761*	3.81	*857*	2.64	*593*	1.22	*274*	1.62	*365*	1.83	*410*
	200	*8*	75	*2 15/16*	5.50	*1,237*	2.54	*571*	3.39	*761*	3.81	*857*	2.64	*593*	1.22	*274*	1.62	*365*	1.83	*410*
	220	*8 5/8*	100	*4*	7.34	*1,650*	3.39	*761*	4.52	*1,015*	5.08	*1,142*	2.64	*593*	1.22	*274*	1.62	*365*	1.83	*410*
	240	*9 1/2*	100	*4*	7.34	*1,650*	3.39	*761*	4.52	*1,015*	5.08	*1,142*	2.64	*593*	1.22	*274*	1.62	*365*	1.83	*410*
	260	*10 1/4*	100	*4*	7.34	*1,650*	3.39	*761*	4.52	*1,015*	5.08	*1,142*	2.64	*593*	1.22	*274*	1.62	*365*	1.83	*410*
	280	*11*	100	*4*	7.34	*1,650*	3.39	*761*	4.52	*1,015*	5.08	*1,142*	2.64	*593*	1.22	*274*	1.62	*365*	1.83	*410*
	300	*11 3/4*	100	*4*	7.34	*1,650*	3.39	*761*	4.52	*1,015*	5.08	*1,142*	2.64	*593*	1.22	*274*	1.62	*365*	1.83	*410*
8 *0.32*	40	*1 9/16*	32	*1 1/4*	3.13	*704*	1.45	*325*	1.93	*433*	2.17	*487*	3.96	*891*	1.83	*411*	2.44	*548*	2.74	*617*
	60	*2 3/8*	52	*2 1/16*	5.09	*1,144*	2.35	*528*	3.13	*704*	3.52	*792*	3.96	*891*	1.83	*411*	2.44	*548*	2.74	*617*
	80	*3 1/8*	52	*2 1/16*	5.09	*1,144*	2.35	*528*	3.13	*704*	3.52	*792*	3.96	*891*	1.83	*411*	2.44	*548*	2.74	*617*
	100	*4*	80	*3 1/8*	7.83	*1,760*	3.61	*812*	4.82	*1,083*	5.42	*1,218*	3.96	*891*	1.83	*411*	2.44	*548*	2.74	*617*
	120	*4 3/4*	80	*3 1/8*	7.83	*1,760*	3.61	*812*	4.82	*1,083*	5.42	*1,218*	3.96	*891*	1.83	*411*	2.44	*548*	2.74	*617*
	140	*5 1/2*	80	*3 1/8*	7.83	*1,760*	3.61	*812*	4.82	*1,083*	5.42	*1,218*	3.96	*891*	1.83	*411*	2.44	*548*	2.74	*617*
	160	*6 1/4*	100	*4*	9.79	*2,200*	4.52	*1,015*	6.02	*1,354*	6.77	*1,523*	3.96	*891*	1.83	*411*	2.44	*548*	2.74	*617*
	180	*7 1/8*	100	*4*	9.79	*2,200*	4.52	*1,015*	6.02	*1,354*	6.77	*1,523*	3.96	*891*	1.83	*411*	2.44	*548*	2.74	*617*
	200	*8*	100	*4*	9.79	*2,200*	4.52	*1,015*	6.02	*1,354*	6.77	*1,523*	3.96	*891*	1.83	*411*	2.44	*548*	2.74	*617*
	220	*8 5/8*	100	*4*	9.79	*2,200*	4.52	*1,015*	6.02	*1,354*	6.77	*1,523*	3.96	*891*	1.83	*411*	2.44	*548*	2.74	*617*
	240	*9 1/2*	100	*4*	9.79	*2,200*	4.52	*1,015*	6.02	*1,354*	6.77	*1,523*	3.96	*891*	1.83	*411*	2.44	*548*	2.74	*617*
	260	*10 1/4*	100	*4*	9.79	*2,200*	4.52	*1,015*	6.02	*1,354*	6.77	*1,523*	3.96	*891*	1.83	*411*	2.44	*548*	2.74	*617*
	280	*11*	100	*4*	9.79	*2,200*	4.52	*1,015*	6.02	*1,354*	6.77	*1,523*	3.96	*891*	1.83	*411*	2.44	*548*	2.74	*617*
	300	*11 3/4*	100	*4*	9.79	*2,200*	4.52	*1,015*	6.02	*1,354*	6.77	*1,523*	3.96	*891*	1.83	*411*	2.44	*548*	2.74	*617*
	320	*12 5/8*	100	*4*	9.79	*2,200*	4.52	*1,015*	6.02	*1,354*	6.77	*1,523*	3.96	*891*	1.83	*411*	2.44	*548*	2.74	*617*
	340	*13 3/8*	100	*4*	9.79	*2,200*	4.52	*1,015*	6.02	*1,354*	6.77	*1,523*	3.96	*891*	1.83	*411*	2.44	*548*	2.74	*617*
	360	*14 1/4*	100	*4*	9.79	*2,200*	4.52	*1,015*	6.02	*1,354*	6.77	*1,523*	3.96	*891*	1.83	*411*	2.44	*548*	2.74	*617*
	380	*15*	100	*4*	9.79	*2,200*	4.52	*1,015*	6.02	*1,354*	6.77	*1,523*	3.96	*891*	1.83	*411*	2.44	*548*	2.74	*617*
	400	*15 3/4*	100	*4*	9.79	*2,200*	4.52	*1,015*	6.02	*1,354*	6.77	*1,523*	3.96	*891*	1.83	*411*	2.44	*548*	2.74	*617*
	440	*17 1/4*	100	*4*	9.79	*2,200*	4.52	*1,015*	6.02	*1,354*	6.77	*1,523*	3.96	*891*	1.83	*411*	2.44	*548*	2.74	*617*
	480	*19*	100	*4*	9.79	*2,200*	4.52	*1,015*	6.02	*1,354*	6.77	*1,523*	3.96	*891*	1.83	*411*	2.44	*548*	2.74	*617*
	520	*20 1/2*	100	*4*	9.79	*2,200*	4.52	*1,015*	6.02	*1,354*	6.77	*1,523*	3.96	*891*	1.83	*411*	2.44	*548*	2.74	*617*

STATIC VALUES | TRACTION

geometry					thread withdrawal								head penetration							
																				
d_1		L		b	characteristic values		design values (factored resistance)						characteristic values		design values (factored resistance)					
					$R_{ax,k}$		$R_{ax,d}$ Load Case 1		$R_{ax,d}$ Load Case 2&3		$R_{ax,d}$ Load Case 4&5		$R_{head,k}$		$R_{head,d}$ Load Case 1		$R_{head,d}$ Load Case 2&3		$R_{head,d}$ Load Case 4&5	
[mm] *[in]*		[mm]	*[in]*	[mm]	*[in]*	[kN]	*[lbf]*	[kN]	*[lbf]*	[kN]	*[lbf]*	[kN]	*[lbf]*	[kN]	*[lbf]*	[kN]	*[lbf]*	[kN]	*[lbf]*	[kN]	*[lbf]*
		100	*4*	52	*2 1/16*	6.36	*1,430*	2.94	*660*	3.91	*880*	4.40	*990*	6.86	*1,542*	3.17	*712*	4.22	*949*	4.75	*1,068*
		120	*4 3/4*	60	*2 3/8*	7.34	*1,650*	3.39	*761*	4.52	*1,015*	5.08	*1,142*	6.86	*1,542*	3.17	*712*	4.22	*949*	4.75	*1,068*
		140	*5 1/2*	60	*2 3/8*	7.34	*1,650*	3.39	*761*	4.52	*1,015*	5.08	*1,142*	6.86	*1,542*	3.17	*712*	4.22	*949*	4.75	*1,068*
		160	*6 1/4*	80	*3 1/8*	9.79	*2,200*	4.52	*1,015*	6.02	*1,354*	6.77	*1,523*	6.86	*1,542*	3.17	*712*	4.22	*949*	4.75	*1,068*
		180	*7 1/8*	80	*3 1/8*	9.79	*2,200*	4.52	*1,015*	6.02	*1,354*	6.77	*1,523*	6.86	*1,542*	3.17	*712*	4.22	*949*	4.75	*1,068*
		200	*8*	100	*4*	12.23	*2,750*	5.65	*1,269*	7.53	*1,692*	8.47	*1,904*	6.86	*1,542*	3.17	*712*	4.22	*949*	4.75	*1,068*
		220	*8 5/8*	100	*4*	12.23	*2,750*	5.65	*1,269*	7.53	*1,692*	8.47	*1,904*	6.86	*1,542*	3.17	*712*	4.22	*949*	4.75	*1,068*
		240	*9 1/2*	100	*4*	12.23	*2,750*	5.65	*1,269*	7.53	*1,692*	8.47	*1,904*	6.86	*1,542*	3.17	*712*	4.22	*949*	4.75	*1,068*
		260	*10 1/4*	100	*4*	12.23	*2,750*	5.65	*1,269*	7.53	*1,692*	8.47	*1,904*	6.86	*1,542*	3.17	*712*	4.22	*949*	4.75	*1,068*
10	*0.40*	280	*11*	100	*4*	12.23	*2,750*	5.65	*1,269*	7.53	*1,692*	8.47	*1,904*	6.86	*1,542*	3.17	*712*	4.22	*949*	4.75	*1,068*
		300	*11 3/4*	100	*4*	12.23	*2,750*	5.65	*1,269*	7.53	*1,692*	8.47	*1,904*	6.86	*1,542*	3.17	*712*	4.22	*949*	4.75	*1,068*
		320	*12 5/8*	120	*4 3/4*	14.68	*3,300*	6.77	*1,523*	9.03	*2,031*	10.16	*2,284*	6.86	*1,542*	3.17	*712*	4.22	*949*	4.75	*1,068*
		340	*13 3/8*	120	*4 3/4*	14.68	*3,300*	6.77	*1,523*	9.03	*2,031*	10.16	*2,284*	6.86	*1,542*	3.17	*712*	4.22	*949*	4.75	*1,068*
		360	*14 1/4*	120	*4 3/4*	14.68	*3,300*	6.77	*1,523*	9.03	*2,031*	10.16	*2,284*	6.86	*1,542*	3.17	*712*	4.22	*949*	4.75	*1,068*
		380	*15*	120	*4 3/4*	14.68	*3,300*	6.77	*1,523*	9.03	*2,031*	10.16	*2,284*	6.86	*1,542*	3.17	*712*	4.22	*949*	4.75	*1,068*
		400	*15 3/4*	120	*4 3/4*	14.68	*3,300*	6.77	*1,523*	9.03	*2,031*	10.16	*2,284*	6.86	*1,542*	3.17	*712*	4.22	*949*	4.75	*1,068*
		440	*17 1/4*	120	*4 3/4*	14.68	*3,300*	6.77	*1,523*	9.03	*2,031*	10.16	*2,284*	6.86	*1,542*	3.17	*712*	4.22	*949*	4.75	*1,068*
		480	*19*	120	*4 3/4*	14.68	*3,300*	6.77	*1,523*	9.03	*2,031*	10.16	*2,284*	6.86	*1,542*	3.17	*712*	4.22	*949*	4.75	*1,068*
		520	*20 1/2*	120	*4 3/4*	14.68	*3,300*	6.77	*1,523*	9.03	*2,031*	10.16	*2,284*	6.86	*1,542*	3.17	*712*	4.22	*949*	4.75	*1,068*

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:

$$R_d = R_k \cdot DMF$$

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.

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