TBS FRAME

FLAT FLANGE HEAD SCREW

ICC ES AC233 ESR-4645

CE ETA-11/0030

FLAT FLANGE HEAD
The flange head ensures excellent tightening capacity of the joint; the flat shape allows a joint without additional thickness on the wooden surface, thus enabling the fixing of plates on the same element without interference.

SHORT THREAD
The short, fixed-length thread at 1 1/3" (34 mm) is optimised for fastening multi-layer elements (Multi-ply) for lightweight frame construction.

BLACK E-COATING
Coated with black E-coating for easy recognition on site and increased corrosion resistance.

3 THORNS TIP
TBSF is easily installed without pre-drilling hole. More screws can be used in less space and larger screws in smaller elements.

BIT INCLUDED

DIAMETER [mm]	6 — 8 — 16
LENGTH [mm]	40 — 73 175 — 1000
SERVICE CLASS	SC1 SC2
ATMOSPHERIC CORROSIVITY	C1 C2
WOOD CORROSIVITY	T1 T2
MATERIAL	Zn E-COATING electrogalvanised carbon steel with black E-Coating

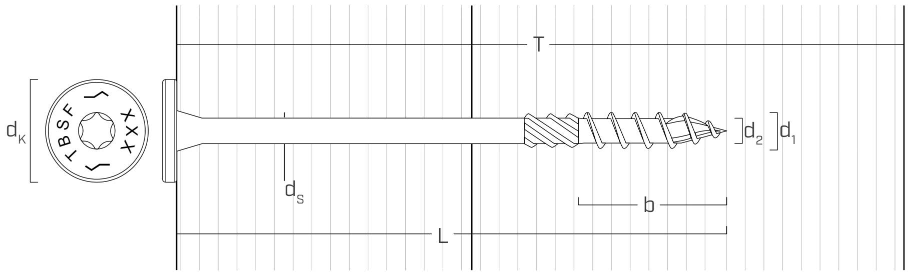
FIELDS OF USE

- timber based panels
- solid timber and glulam
- CLT and LVL
- high density woods
- multilayer lattice beams

CODES AND DIMENSIONS

d_1 [mm]	d_K [mm]	CODE	L [mm]	b [mm]	T [mm]	*L [in]*	*b [in]*	*T [in]*	pcs
8 TX 40	19	**TBSF873**	73	34	76	*2 7/8''*	*1 5/16''*	*3''*	50
		TBSF886	86	34	90	*3 3/8''*	*1 5/16''*	*3 1/2''*	50
		TBSF898	98	34	102	*3 7/8''*	*1 5/16''*	*4''*	50
		TBSF8111	111	34	114	*4 3/8''*	*1 5/16''*	*4 1/2''*	50
		TBSF8130	130	34	134	*5 1/8''*	*1 5/16''*	*5 1/4''*	50
		TBSF8149	149	34	152	*5 7/8''*	*1 5/16''*	*6''*	50
		TBSF8175	175	34	178	*6 7/8''*	*1 5/16''*	*7''*	50

GEOMETRY AND MECHANICAL CHARACTERISTICS



Nominal diameter	d_1	**[mm]**	**8**
Head diameter	d_K	[mm]	19,00
Thread diameter	d_2	[mm]	5,40
Shank diameter	d_S	[mm]	5,80
Pre-drilling hole diameter(1)	$d_{V,S}$	[mm]	5,0
Pre-drilling hole diameter(2)	$d_{V,H}$	[mm]	6,0
Characteristic tensile strength	$f_{tens,k}$	[kN]	20,1
Characteristic yield moment	$M_{y,k}$	[Nm]	20,1

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

			softwood *(softwood)*	**LVL softwood** *(LVL softwood)*	**pre-drilled beech LVL** *(beech LVL predrilled)*
Characteristic withdrawal resistance parameter	$f_{ax,k}$	[N/mm²]	11,7	15,0	29,0
Characteristic head-pull-through parameter	$f_{head,k}$	[N/mm²]	10,5	20,0	-
Associated density	ρ_a	[kg/m³]	350	500	730
Calculation density	ρ_k	*[kg/m³]*	*≤ 440*	*410 ÷ 550*	*590 ÷ 750*

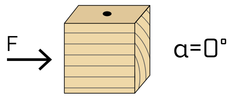
For applications with different materials please see ETA-11/0030.

MULTILAYER LATTICE

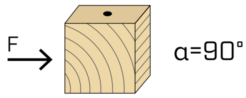
It is available in optimised lengths for fastening 2-, 3- and 4-layer lattice elements of the most common solid timber and LVL dimensions.

MINIMUM DISTANCES FOR SHEAR LOADS | TIMBER

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

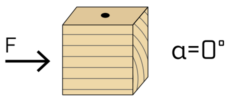


d_1	[mm]		8
a_1	[mm]	**10·d**	80
a_2	[mm]	**5·d**	40
$a_{3,t}$	[mm]	**15·d**	120
$a_{3,c}$	[mm]	**10·d**	80
$a_{4,t}$	[mm]	**5·d**	40
$a_{4,c}$	[mm]	**5·d**	40

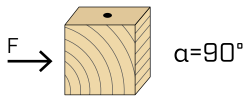


d_1	[mm]		8
a_1	[mm]	**5·d**	40
a_2	[mm]	**5·d**	40
$a_{3,t}$	[mm]	**10·d**	80
$a_{3,c}$	[mm]	**10·d**	80
$a_{4,t}$	[mm]	**10·d**	80
$a_{4,c}$	[mm]	**5·d**	40

screws inserted **WITH pre-drilled hole**

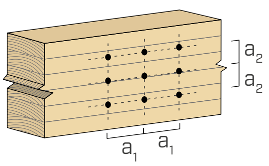


d_1	[mm]		8
a_1	[mm]	**5·d**	40
a_2	[mm]	**3·d**	24
$a_{3,t}$	[mm]	**12·d**	96
$a_{3,c}$	[mm]	**7·d**	56
$a_{4,t}$	[mm]	**3·d**	24
$a_{4,c}$	[mm]	**3·d**	24

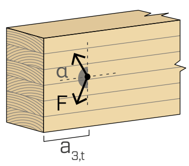


d_1	[mm]		8
a_1	[mm]	**4·d**	32
a_2	[mm]	**4·d**	32
$a_{3,t}$	[mm]	**7·d**	56
$a_{3,c}$	[mm]	**7·d**	56
$a_{4,t}$	[mm]	**7·d**	56
$a_{4,c}$	[mm]	**3·d**	24

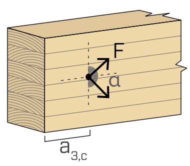
α = load-to-grain angle
d = d_1 = nominal screw diameter



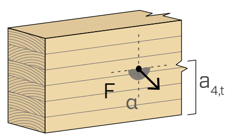
stressed end
-90° < α < 90°



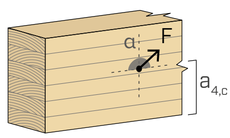
unloaded end
90° < α < 270°



stressed edge
0° < α < 180°



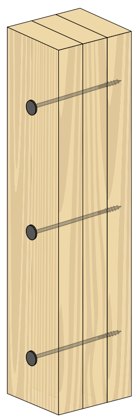
unload edge
180° < α < 360°

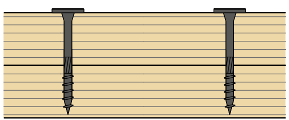


NOTES

- The minimum distances comply with the EN 1995:2014 standard in accordance with ETA-11/0030.
- In the case of joints with elements in Douglas fir (Pseudotsuga menziesii), the minimum spacing and distances parallel to the grain must be multiplied by a coefficient of 1.5.
- The spacing a_1 in the table for screws with 3 THORNS tip inserted without pre-drilling hole in timber elements with density $\rho_k \leq 420\ kg/m^3$ and load-to-grain angle α=0° was assumed to be 10·d based on experimental tests; alternatively, adopt 12·d in accordance with EN 1995:2014.
- For minimum distances on LVL see TBS on page 81.

APPLICATION EXAMPLES: LIGHTWEIGHT FRAME



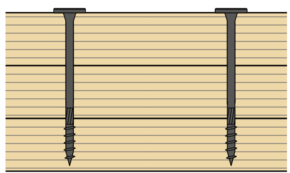


screw: TBSF873

timber element:
2 x 38 mm (*1 1/2''*)

total thickness:

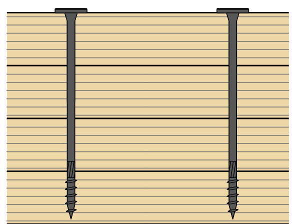
76 mm (*3 ''*)



screw: TBSF8111

timber element:
3 x 38 mm (*1 1/2''*)

total thickness:
114 mm (*4 1/2''*)

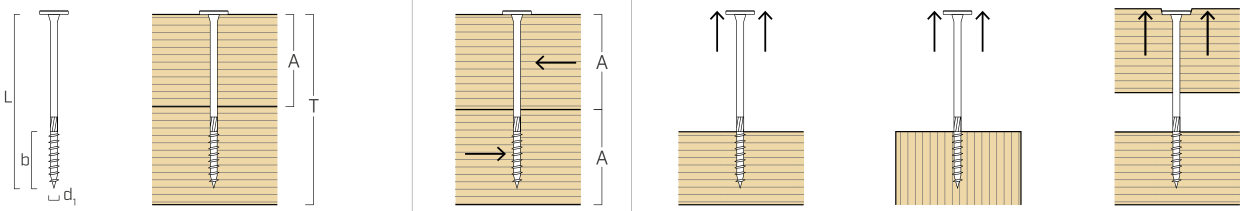


screw: TBSF8149

timber element:
4 x 38 mm (*1 1/2''*)

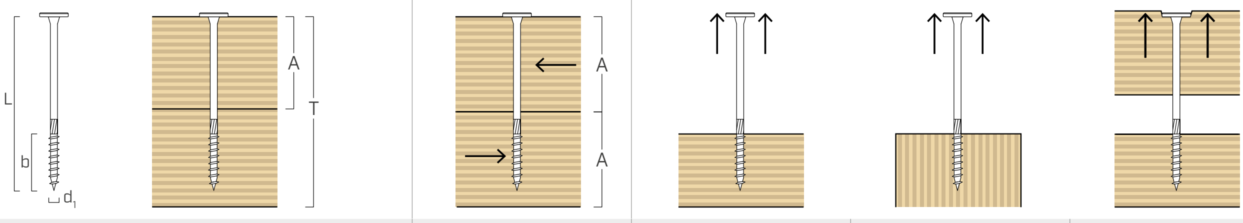
total thickness:
152 mm (*6 ''*)

STRUCTURAL VALUES | TIMBER



geometry							SHEAR	TENSION		
							timber-to-timber ε=90°	thread withdrawal ε=90°	thread withdrawal ε=0°	head pull-through
d_1 [mm]	L [mm]	b [mm]	T [mm]	*T [in]*	A [mm]	*A [in]*	$R_{V,90,k}$ [kN]	$R_{ax,90,k}$ [kN]	$R_{ax,0,k}$ [kN]	$R_{head,k}$ [kN]
8	73	34	76	*3''*	38	*1 1/2''*	2,91	3,43	1,03	4,09
	86	34	90	*3 1/2''*	45	*1 3/4''*	3,27	3,43	1,03	4,09
	98	34	102	*4''*	51	*2''*	3,51	3,43	1,03	4,09
	111	34	114	*4 1/2''*	57	*2 1/4''*	3,54	3,43	1,03	4,09
	130	34	134	*5 1/4''*	67	*2 5/8''*	3,54	3,43	1,03	4,09
	149	34	152	*6''*	76	*3''*	3,54	3,43	1,03	4,09
	175	34	178	*7''*	89	*3 1/2''*	3,54	3,43	1,03	4,09

STRUCTURAL VALUES | LVL



geometry							SHEAR	TENSION		
							LVL-LVL ε=90°	thread withdrawal ε=90°	thread withdrawal ε=0°	head pull-through
d_1 [mm]	L [mm]	b [mm]	T [mm]	*T [in]*	A [mm]	*A [in]*	$R_{V,90,k}$ [kN]	$R_{ax,90,k}$ [kN]	$R_{ax,0,k}$ [kN]	$R_{head,k}$ [kN]
8	73	34	76	*3''*	38	*1 1/2''*	3,54	3,95	2,63	6,99
	86	34	90	*3 1/2''*	45	*1 3/4''*	3,90	3,95	2,63	6,99
	98	34	102	*4''*	51	*2''*	3,98	3,95	2,63	6,99
	111	34	114	*4 1/2''*	57	*2 1/4''*	3,98	3,95	2,63	6,99
	130	34	134	*5 1/4''*	67	*2 5/8''*	3,98	3,95	2,63	6,99
	149	34	152	*6''*	76	*3''*	3,98	3,95	2,63	6,99
	175	34	178	*7''*	89	*3 1/2''*	3,98	3,95	2,63	6,99

ε = screw-to-grain angle

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 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 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.
- The characteristic shear strengths were evaluated by considering the threaded part fully inserted in the second element.
- The thread withdrawal characteristic strength has been evaluated considering a fixing length equal to b.
- The head pull-through characteristic strength was calculated using timber elements.

NOTES | TIMBER

- The characteristic timber-to-timber shear strengths were evaluated considering an angle ε of 90° ($R_{V,90,k}$) between the grains of the second element and the connector.
- 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.
- For the calculation process a timber characteristic density ρ_k = 385 kg/m^3 has been considered.
  For different ρ_k values, the strength values in the table can be converted by the k_{dens} coefficient (see page 87).
- For a row of n screws arranged parallel to the direction of the grain at a distance a_1, the characteristic effective shear bearing capacity $R_{ef,V,k}$ can be calculated by means of the effective number n_{ef} (see page 80).

NOTES | LVL

- For the calculation process a mass density equal to ρ_k = 480 kg/m^3 has been considered for softwood LVL elements.
- The characteristic shear strengths are evaluated for connectors inserted on the side face (wide face) considering, for individual timber elements, a 90° angle between the connector and the grain, a 90° angle between the connector and the side face of the LVL element and a 0° angle between the force and the grain.
- The axial thread-withdrawal resistance was calculated considering a 90° angle between the grains and the connector.