TBS MAX

ELC-4645 ESR-4645 UKTA-0836 22/6195 ETA-11/0030

XL FLANGE HEAD SCREW

FLANGE HEAD OF INCREASED SIZE

The oversized head provides excellent head pull-through strength and joint tightening capacity.

LONGER THREAD

The oversized thread of the TBS MAX guarantees excellent withdrawal resistance and closing strength of the joint.

RIBBED FLOORS

Thanks to its large head and oversized thread, it is the ideal screw in the production of ribbed floors (Rippendecke). Used in conjunction with SHARP METAL, it optimises the number of fasteners by avoiding the use of presses when gluing timber elements together.

3 THORNS TIP

Thanks to the 3 THORNS tip, minimum installation distances are reduced. More screws can be used in less space and larger screws in smaller elements. Costs and time for project implementation are reduced.

MY PROJECT SOFTWARE

BIT INCLUDED

DIAMETER [mm]	6 – **8** – 16
LENGTH [mm]	40 – **120 – 400** – 1000
SERVICE CLASS	SC1 SC2
ATMOSPHERIC CORROSIVITY	C1 C2
WOOD CORROSIVITY	T1 T2
MATERIAL	Zn ELECTRO PLATED – electrogalvanized carbon steel

FIELDS OF USE

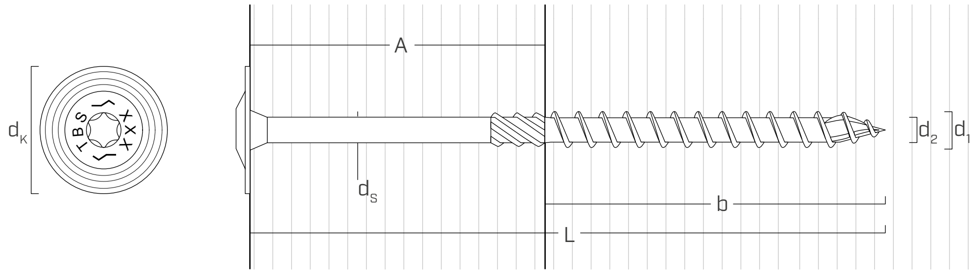
- timber based panels
- fibreboard and MDF panels
- SIP and ribbed panels.
- solid timber and glulam
- CLT and LVL
- high density woods

CODES AND DIMENSIONS

d_1 [mm]	d_K [mm]	CODE	L [mm]	b [mm]	A [mm]	pcs
8 TX 40	24,5	**TBSMAX8120**	120	100	20	50
		TBSMAX8160	160	120	40	50
		TBSMAX8180	180	120	60	50
		TBSMAX8200	200	120	80	50
		TBSMAX8220	220	120	100	50

d_1 [mm]	d_K [mm]	CODE	L [mm]	b [mm]	A [mm]	pcs
8 TX 40	24,5	**TBSMAX8240**	240	120	120	50
		TBSMAX8280	280	120	160	50
		TBSMAX8320	320	120	200	50
		TBSMAX8360	360	120	240	50
		TBSMAX8400	400	120	280	50

GEOMETRY AND MECHANICAL CHARACTERISTICS



GEOMETRY

Nominal diameter	d_1	**[mm]**	**8**
Head diameter	d_K	[mm]	24,50
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

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

CHARACTERISTIC MECHANICAL PARAMETERS

Nominal diameter	d_1	**[mm]**	**8**
Tensile strength	$f_{tens,k}$	[kN]	20,1
Yield moment	$M_{y,k}$	[Nm]	20,1

			softwood *(softwood)*	**LVL softwood** *(LVL softwood)*	**pre-drilled beech LVL** *(beech LVL predrilled)*
Withdrawal resistance parameter	$f_{ax,k}$	[N/mm²]	11,7	15,0	29,0
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.

TBS MAX FOR RIB TIMBER

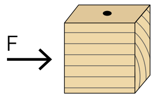
With its increased thread (120 mm) and enlarged head (24,5 mm), the TBS MAX guarantees excellent grip and superb joint closure. Ideal for the production of ribbed floors (Rippendecke), optimising the number of fastenings.

SHARP METAL

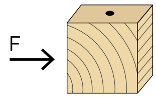
Ideal in combination with the SHARP METAL system, as the enlarged head guarantees excellent joint tightening, making the use of presses unnecessary when gluing wooden elements together.

MINIMUM DISTANCES FOR SHEAR LOADS | TIMBER

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



α=0°



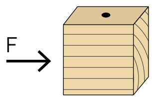
α=90°

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

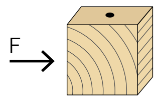
d_1	[mm]		8
a_1	[mm]	5·d	40
a_2	[mm]	5·d	40
$a_{3,t}$	[mm]	10·d	80
$a_{3,c}$	[mm]	10·d	80
$a_{4,t}$	[mm]	10·d	80
$a_{4,c}$	[mm]	5·d	40

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

screws inserted **WITH pre-drilled hole**



α=0°



α=90°

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

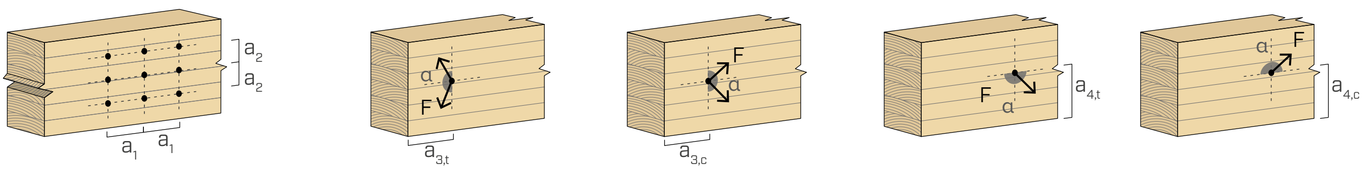
α = load-to-grain angle
$d = d_1$ = nominal screw diameter

stressed end
-90° < α < 90°

unloaded end
90° < α < 270°

stressed edge
0° < α < 180°

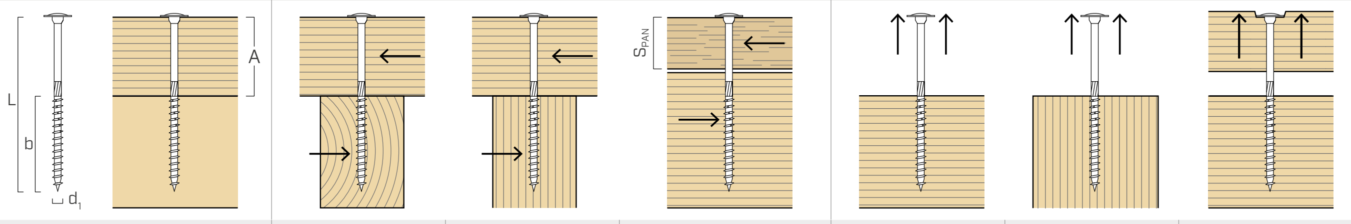
unload edge
180° < α < 360°



NOTES

- Minimum distances are in accordance with EN 1995:2014 as per ETA-11/0030 considering a timber characteristic density of $\rho_k \leq 420\ kg/m^3$.
- The minimum spacing for all panel-to-timber connections (a_1, a_2) can be multiplied by a coefficient of 0,85.
- 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 and $d_1 \geq 5$ mm inserted without pre-drilling hole in timber elements with density $\rho_k \leq 420\ kg/m^3$ with minimum height and width equal to 10·d and load-to-grain angle α= 0° equal to 10·d. Alternatively, adopt 12·d in accordance with EN 1995:2014.

STRUCTURAL VALUES | TIMBER



geometry				SHEAR timber-to-timber ε=90°	SHEAR timber-to-timber ε=0°	SHEAR panel-to-timber		TENSION thread withdrawal ε=90°	TENSION thread withdrawal ε=0°	TENSION head pull-through
d_1 [mm]	L [mm]	b [mm]	A [mm]	$R_{V,90,k}$ [kN]	$R_{V,0,k}$ [kN]	S_{PAN} [mm]	$R_{V,k}$ [kN]	$R_{ax,90,k}$ [kN]	$R_{ax,0,k}$ [kN]	$R_{head,k}$ [kN]
8	120	100	20	2,71	2,17	65	4,27	10,10	3,03	9,72
	160	120	40	4,78	2,84		5,28	12,12	3,64	9,72
	180	120	60	5,11	2,94		5,28	12,12	3,64	9,72
	200	120	80	5,11	2,94		5,28	12,12	3,64	9,72
	220	120	100	5,11	2,94		5,28	12,12	3,64	9,72
	240	120	120	5,11	2,94		5,28	12,12	3,64	9,72
	280	120	160	5,11	2,94		5,28	12,12	3,64	9,72
	320	120	200	5,11	2,94		5,28	12,12	3,64	9,72
	360	120	240	5,11	2,94		5,28	12,12	3,64	9,72
	400	120	280	5,11	2,94		5,28	12,12	3,64	9,72

ε = screw-to-grain angle

NOTES | TIMBER

- The characteristic timber-to-timber shear strengths were evaluated considering both an ε angle of 90° ($R_{V,90,k}$) and 0° ($R_{V,0,k}$) between the grains of the second element and the connector.
- The characteristic panel-timber shear strengths were evaluated considering an angle ε of 90° between the grains of the timber 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 on the table (timber-to-timber shear and tensile) can be converted by the k_{dens} coefficient.

$$R'_{V,k} = k_{dens,v} \cdot R_{V,k}$$
$$R'_{ax,k} = k_{dens,ax} \cdot R_{ax,k}$$
$$R'_{head,k} = k_{dens,ax} \cdot R_{head,k}$$

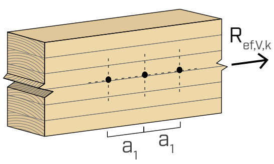
ρ_k [kg/m^3]	350	380	**385**	405	425	430	440
C-GL	C24	C30	GL24h	GL26h	GL28h	GL30h	GL32h
$k_{dens,v}$	0,90	0,98	1,00	1,02	1,05	1,05	1,07
$k_{dens,ax}$	0,92	0,98	1,00	1,04	1,08	1,09	1,11

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

GENERAL PRINCIPLES on page 97.

EFFECTIVE NUMBER FOR SHEAR LOADS

The load-bearing capacity of a connection made with several screws, all of the same type and size, may be lower than the sum of the load-bearing capacities of the individual connection system. For a row of n screws arranged parallel to the direction of the grain at a distance a_1, the characteristic effective load-bearing capacity is equal to:

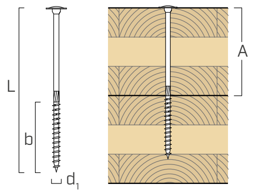


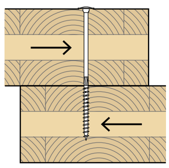
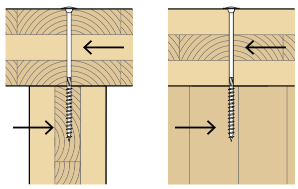
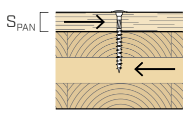
$$R_{ef,V,k} = n_{ef} \cdot R_{V,k}$$

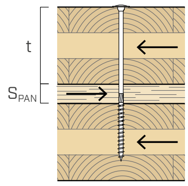
The n_{ef} value is given in the table below as a function of n and a_1.

n	a_1(*) 4·d	5·d	6·d	7·d	8·d	9·d	10·d	11·d	12·d	13·d	≥ 14·d
2	1,41	1,48	1,55	1,62	1,68	1,74	1,80	1,85	1,90	1,95	2,00
3	1,73	1,86	2,01	2,16	2,28	2,41	2,54	2,65	2,76	2,88	3,00
4	2,00	2,19	2,41	2,64	2,83	3,03	3,25	3,42	3,61	3,80	4,00
5	2,24	2,49	2,77	3,09	3,34	3,62	3,93	4,17	4,43	4,71	5,00

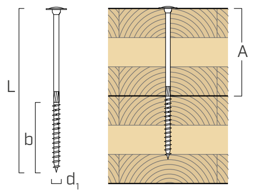
(*)For intermediate a_1 values a linear interpolation is possible.

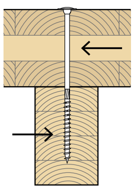
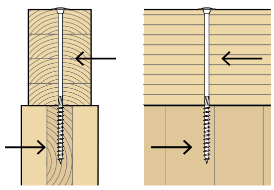
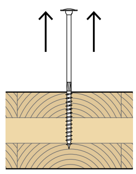
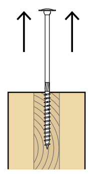
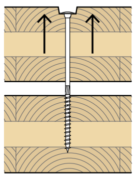




geometry				SHEAR						
				CLT-CLT lateral face	CLT-CLT lateral face-narrow face	panel-CLT lateral face		CLT-panel-CLT lateral face		
d_1 [mm]	L [mm]	b [mm]	A [mm]	$R_{V,k}$ [kN]	$R_{V,k}$ [kN]	S_{PAN} [mm]	$R_{V,k}$ [kN]	S_{PAN} [mm]	t [mm]	$R_{V,k}$ [kN]
	120	100	20	2,46	2,46		3,64		45	3,64
	160	120	40	4,43	3,71		3,64		65	3,64
	180	120	60	4,81	3,99		3,64		75	3,64
	200	120	80	4,81	3,99		3,64		85	3,64
8	220	120	100	4,81	3,99	22	3,64	22	95	3,64
	240	120	120	4,81	3,99		3,64		105	3,64
	280	120	160	4,81	3,99		3,64		125	3,64
	320	120	200	4,81	3,99		3,64		145	3,64
	360	120	240	4,81	3,99		3,64		165	3,64



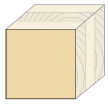






geometry				SHEAR		TENSION		
				CLT-timber lateral face	timber-CLT narrow face	thread withdrawal narrow face	thread withdrawal narrow face	head pull-through
d_1 [mm]	L [mm]	b [mm]	A [mm]	$R_{V,k}$ [kN]	$R_{V,k}$ [kN]	$R_{ax,k}$ [kN]	$R_{ax,k}$ [kN]	$R_{head,k}$ [kN]
	120	100	20	2,46	2,71	9,36	6,66	9,00
	160	120	40	4,50	3,91	11,23	7,85	9,00
	180	120	60	4,87	4,02	11,23	7,85	9,00
	200	120	80	4,87	4,02	11,23	7,85	9,00
8	220	120	100	4,87	4,02	11,23	7,85	9,00
	240	120	120	4,87	4,02	11,23	7,85	9,00
	280	120	160	4,87	4,02	11,23	7,85	9,00
	320	120	200	4,87	4,02	11,23	7,85	9,00
	360	120	240	4,87	4,02	11,23	7,85	9,00

NOTES and GENERAL PRINCIPLES on page 97.

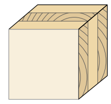
MINIMUM DISTANCES FOR SHEAR AND AXIAL LOADS | CLT

screws inserted **WITHOUT pre-drilled hole**



lateral face

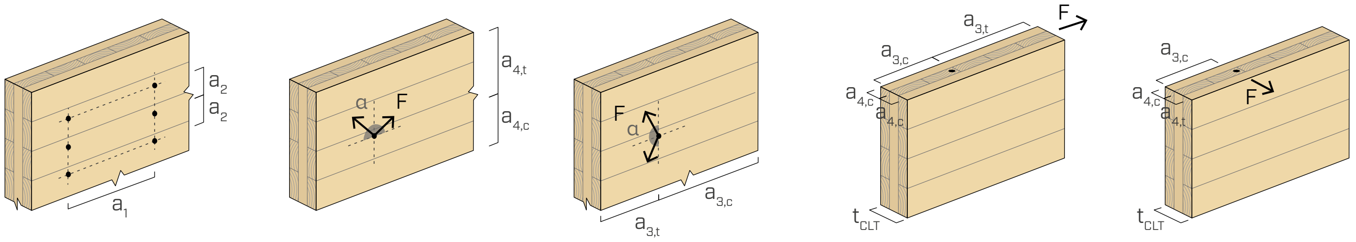
d_1	[mm]		8
a_1	[mm]	**4·d**	32
a_2	[mm]	**2,5·d**	20
$a_{3,t}$	[mm]	**6·d**	48
$a_{3,c}$	[mm]	**6·d**	48
$a_{4,t}$	[mm]	**6·d**	48
$a_{4,c}$	[mm]	**2,5·d**	20



narrow face

d_1	[mm]		8
a_1	[mm]	**10·d**	80
a_2	[mm]	**4·d**	32
$a_{3,t}$	[mm]	**12·d**	96
$a_{3,c}$	[mm]	**7·d**	56
$a_{4,t}$	[mm]	**6·d**	48
$a_{4,c}$	[mm]	**3·d**	24

d = d_1 = nominal screw diameter



NOTES

- The minimum distances are compliant with ETA-11/0030 and are to be considered valid unless otherwise specified in the technical documents for the CLT panels.
- Minimum distances are valid for minimum CLT thickness $t_{CLT,min}$ =10·d_1.
- The minimum distances referred to "narrow face" are valid for minimum screw pull-through depth t_{pen} = 10·d_1.

STRUCTURAL VALUES

GENERAL PRINCIPLES

- Characteristic values consistent with EN 1995:2014 and 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.
- Sizing and verification of the timber elements and panels must be done separately.
- 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 screws must be positioned in accordance with the minimum distances.
- The characteristic panel-timber shear strengths are calculated considering an OSB panel or particle board with a S_{PAN} thickness.
- 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.
- For different calculation configurations, the MyProject software is available (www.rothoblaas.com).

NOTES | CLT

- The characteristic values are according to the national specifications ÖNORM EN 1995 - Annex K.
- For the calculation process, a mass density of ρ_k = 350 kg/m^3 has been considered for CLT elements and a mass density of ρ_k = 385 kg/m^3 has been considered for timber elements.
- The characteristics shear resistance are calculated considering a minimum fixing length of 4 d_1.
- The characteristic shear strength is independent from the direction of the grain of the CLT panels outer layer.
- The axial thread withdrawal resistance is valid for minimum CLT thickness $t_{CLT,min}$ = 10·d_1 and minimum screw pull-through depth t_{pen} = 10·d_1.