TBS EVO

FLANGE HEAD SCREW

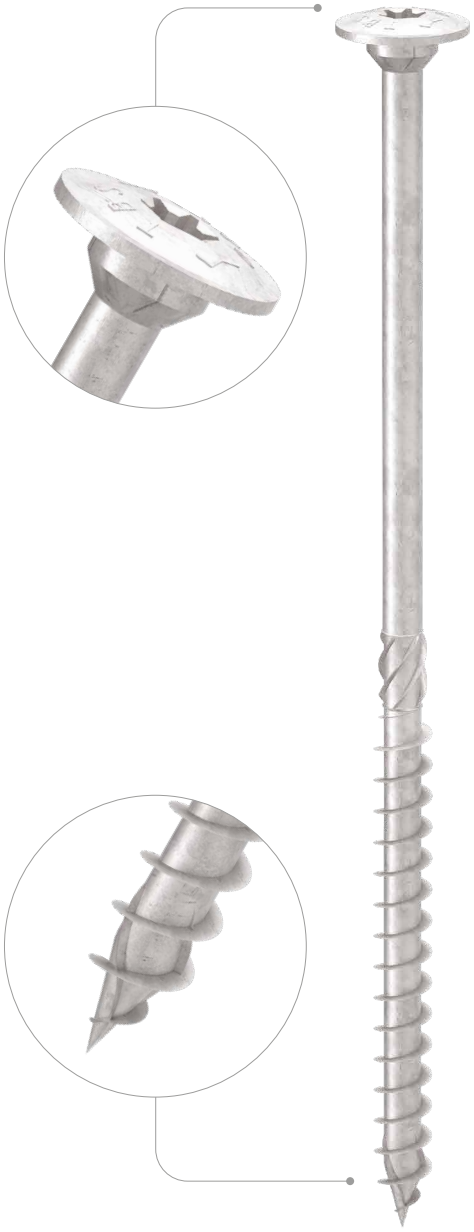
UKTA-0836 22/6195 | AC233 | AC257 ESR-4645 | ETA-11/0030

C4 EVO COATING
Multilayer coating with a surface treatment of epoxy resin and aluminium flakes. No rust after 1440 hours of salt spray exposure test, as per ISO 9227. Can be used in service class 3 outdoor applications and under class C4 atmospheric corrosion conditions.

INTEGRATED WASHER
The flange head serves as washer and ensures high head strength and pull-through. Ideal in the presence of wind or variations in timber dimensions.

AUTOCLAVE-TREATED TIMBER
The C4 EVO coating has been certified according to US acceptance criterion AC257 for outdoor use in ACQ-treated wood.

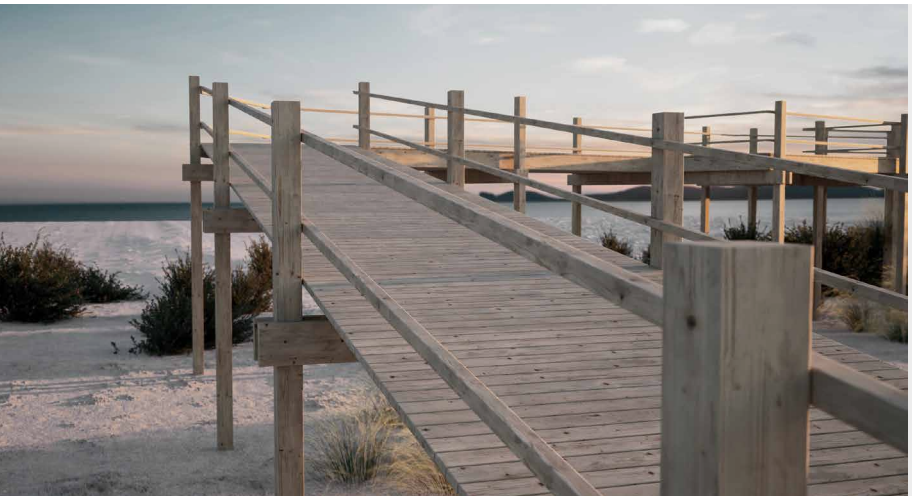
T3 TIMBER CORROSIVITY
Coating suitable for use in applications on wood with an acidity level (pH) greater than 4, such as spruce, larch and pine (see page 314).



MY PROJECT SOFTWARE | MANUALS

BIT INCLUDED

DIAMETER [mm]	6 (6 – 10) 16
LENGTH [mm]	40 (60 – 400) 1000
SERVICE CLASS	SC1 SC2 SC3
ATMOSPHERIC CORROSIVITY	C1 C2 C3 C4
WOOD CORROSIVITY	T1 T2 T3
MATERIAL	C4 EVO COATING carbon steel with C4 EVO coating



FIELDS OF USE
- timber based panels
- solid timber and glulam
- CLT and LVL
- high density woods
- ACQ, CCA treated timber

OUTDOOR WALKWAYS

Ideal for the construction of outdoor structures such as walkways and arcades. Values also certified for screw insertion parallel to the grain. Ideal for fastening aggressive woods containing tannins.

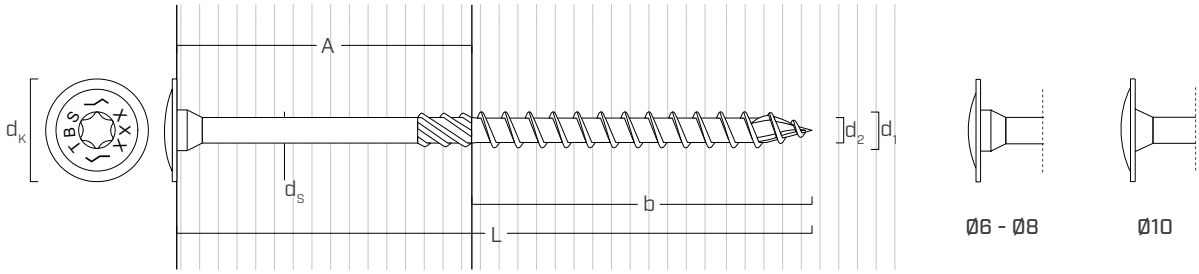
SIP PANELS

Values also tested, certified and calculated for CLT and high density woods such as Microllam® LVL. Suitable for fastening SIP and sandwich panels.

Fastening Wood Trusses outdoors.

Multi-ply beam fastening.

GEOMETRY AND MECHANICAL CHARACTERISTICS



GEOMETRY

Nominal diameter	**d_1**	**[mm]**	**6**	**8**	**10**
Head diameter	d_K	[mm]	15,50	19,00	25,00
Thread diameter	d_2	[mm]	3,95	5,40	6,40
Shank diameter	d_S	[mm]	4,30	5,80	7,00
Pre-drilling hole diameter(1)	$d_{V,S}$	[mm]	4,0	5,0	6,0
Pre-drilling hole diameter(2)	$d_{V,H}$	[mm]	4,0	6,0	7,0

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

CHARACTERISTIC MECHANICAL PARAMETERS

Nominal diameter	**d_1**	**[mm]**	**6**	**8**	**10**
Tensile strength	$f_{tens,k}$	[kN]	11,3	20,1	31,4
Yield moment	$M_{y,k}$	[Nm]	9,5	20,1	35,8

			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*

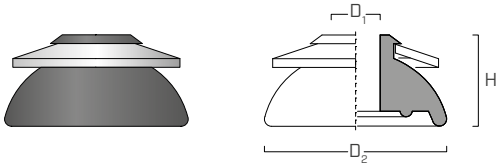
For applications with different materials please see ETA-11/0030.

CODES AND DIMENSIONS

d_1 [mm]	d_K [mm]	CODE	L [mm]	b [mm]	A [mm]	pcs
6 TX 30	15,5	TBSEVO660	60	40	20	100
		TBSEVO680	80	50	30	100
		TBSEVO6100	100	60	40	100
		TBSEVO6120	120	75	45	100
		TBSEVO6140	140	75	65	100
		TBSEVO6160	160	75	85	100
		TBSEVO6180	180	75	105	100
		TBSEVO6200	200	75	125	100
8 TX 40	19,0	TBSEVO8100	100	52	48	50
		TBSEVO8120	120	80	40	50
		TBSEVO8140	140	80	60	50
		TBSEVO8160	160	100	60	50
		TBSEVO8180	180	100	80	50
		TBSEVO8200	200	100	100	50
		TBSEVO8220	220	100	120	50
		TBSEVO8240	240	100	140	50
		TBSEVO8280	280	100	180	50
		TBSEVO8320	320	100	220	50
		TBSEVO8360	360	100	260	50
		TBSEVO8400	400	100	300	50

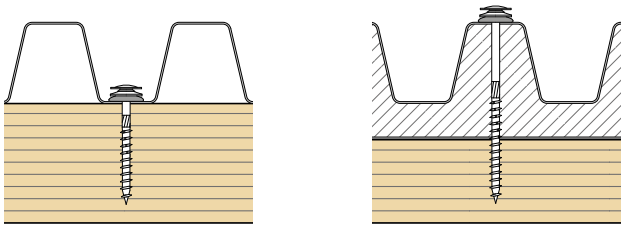
d_1 [mm]	d_K [mm]	CODE	L [mm]	b [mm]	A [mm]	pcs
10 TX 50	25,0	TBSEVO10120	120	60	60	50
		TBSEVO10140	140	60	80	50
		TBSEVO10160	160	80	80	50
		TBSEVO10180	180	80	100	50
		TBSEVO10200	200	100	100	50
		TBSEVO10220	220	100	120	50
		TBSEVO10240	240	100	140	50
		TBSEVO10280	280	100	180	50

WBAZ WASHER



CODE	screw [mm]	D_2 [mm]	H [mm]	D_1 [mm]	pcs
WBAZ25A2	6,0 - 6,5	25	15	6,5	100

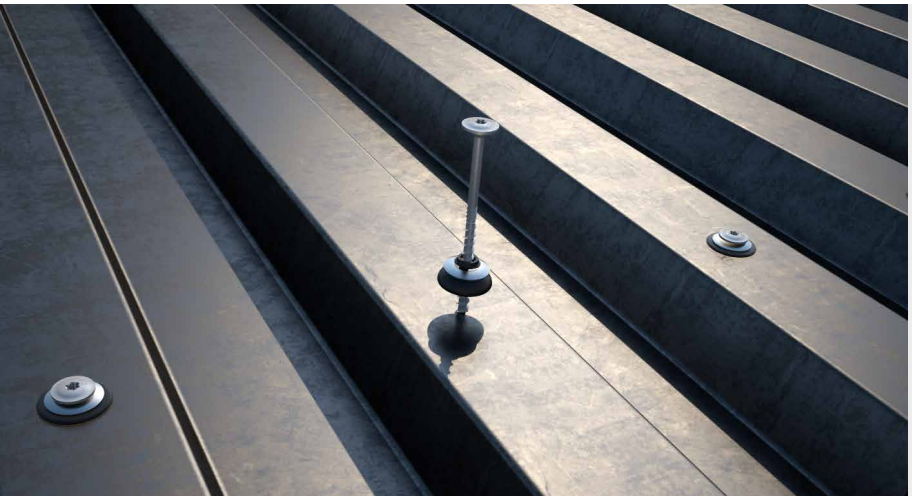
INSTALLATION



TBS EVO + WBAZ Ø x L	fastening package [mm]
6 x 60	min. 0 - max. 30
6 x 80	min. 10 - max. 50
6 x 100	min. 30 - max. 70
6 x 120	min. 50 - max. 90
6 x 140	min. 70 - max. 110
6 x 160	min. 90 - max. 130
6 x 180	min. 110 - max. 150
6 x 200	min. 130 - max. 170

Correct tightening | Excessive tightening | Insufficient tightening | Tightening off axis

NOTE: The thickness of the washer after installation is approximately 8-9 mm.
The maximum thickness of the fastening package was calculated by ensuring a minimum penetration length into the wood of 4·d.

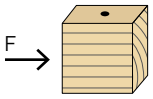


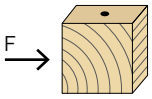
FASTENING METAL SHEET

Can be installed on sheets up to 0,7 mm thick without pre-drilling. TBS EVO Ø6 mm is ideal when used in combination with washer WBAZ. For outdoor use (Service class 3).

MINIMUM DISTANCES FOR SHEAR LOADS

screws inserted **WITHOUT pre-drilled hole** — $\rho_k \leq 420$ kg/m³

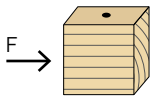


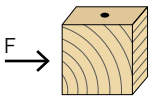


d_1	[mm]		6	8	10
a_1	[mm]	**10·d**	60	80	100
a_2	[mm]	**5·d**	30	40	50
$a_{3,t}$	[mm]	**15·d**	90	120	150
$a_{3,c}$	[mm]	**10·d**	60	80	100
$a_{4,t}$	[mm]	**5·d**	30	40	50
$a_{4,c}$	[mm]	**5·d**	30	40	50

d_1	[mm]		6	8	10
a_1	[mm]	**5·d**	30	40	50
a_2	[mm]	**5·d**	30	40	50
$a_{3,t}$	[mm]	**10·d**	60	80	100
$a_{3,c}$	[mm]	**10·d**	60	80	100
$a_{4,t}$	[mm]	**10·d**	60	80	100
$a_{4,c}$	[mm]	**5·d**	30	40	50

screws inserted **WITHOUT pre-drilled hole** — **420 kg/m³ < ρ_k ≤ 500 kg/m³**

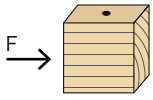


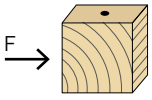


d_1	[mm]		6	8	10
a_1	[mm]	**15·d**	90	120	150
a_2	[mm]	**7·d**	42	56	70
$a_{3,t}$	[mm]	**20·d**	120	160	200
$a_{3,c}$	[mm]	**15·d**	90	120	150
$a_{4,t}$	[mm]	**7·d**	42	56	70
$a_{4,c}$	[mm]	**7·d**	42	56	70

d_1	[mm]		6	8	10
a_1	[mm]	**7·d**	42	56	70
a_2	[mm]	**7·d**	42	56	70
$a_{3,t}$	[mm]	**15·d**	90	120	150
$a_{3,c}$	[mm]	**15·d**	90	120	150
$a_{4,t}$	[mm]	**12·d**	72	96	120
$a_{4,c}$	[mm]	**7·d**	42	56	70

screws inserted **WITH pre-drilled hole**

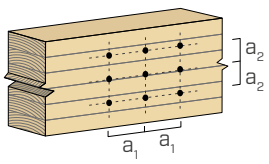




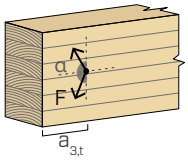
d_1	[mm]		6	8	10
a_1	[mm]	**5·d**	30	40	50
a_2	[mm]	**3·d**	18	24	30
$a_{3,t}$	[mm]	**12·d**	72	96	120
$a_{3,c}$	[mm]	**7·d**	42	56	70
$a_{4,t}$	[mm]	**3·d**	18	24	30
$a_{4,c}$	[mm]	**3·d**	18	24	30

d_1	[mm]		6	8	10
a_1	[mm]	**4·d**	24	32	40
a_2	[mm]	**4·d**	24	32	40
$a_{3,t}$	[mm]	**7·d**	42	56	70
$a_{3,c}$	[mm]	**7·d**	42	56	70
$a_{4,t}$	[mm]	**7·d**	42	56	70
$a_{4,c}$	[mm]	**3·d**	18	24	30

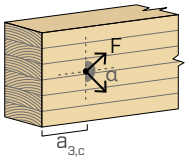
α = load-to-grain angle
d = d_1 = nominal screw diameter



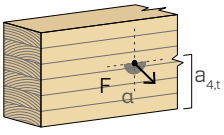
stressed end
-90° < α < 90°



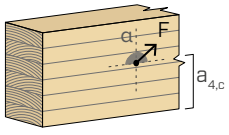
unloaded end
90° < α < 270°



stressed edge
0° < α < 180°

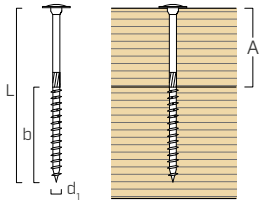
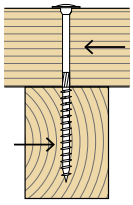
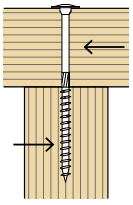
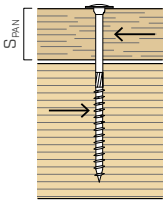
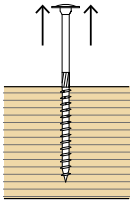
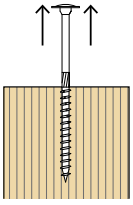
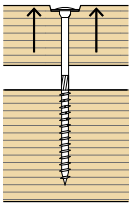


unload edge
180° < α < 360°



NOTES

- The minimum distances comply with the EN 1995:2014 standard in accordance with ETA-11/0030.
- 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 inserted without pre-drilling hole in timber elements with density $\rho_k \leq 420$ kg/m³ 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.

				SHEAR				TENSION		
geometry				timber-to-timber ε=90°	timber-to-timber ε=0°	panel-to-timber		thread withdrawal ε=90°	thread withdrawal ε=0°	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]
6	60	40	20	1,89	1,02	50	-	3,03	0,91	2,72
	80	50	30	2,15	1,37		2,14	3,79	1,14	2,72
	100	60	40	2,35	1,58		2,50	4,55	1,36	2,72
	120	75	45	2,35	1,69		2,50	5,68	1,70	2,72
	140	75	65	2,35	1,69		2,50	5,68	1,70	2,72
	160	75	85	2,35	1,69		2,50	5,68	1,70	2,72
	180	75	105	2,35	1,69		2,50	5,68	1,70	2,72
	200	75	125	2,35	1,69		2,50	5,68	1,70	2,72
8	100	52	48	3,71	1,95	65	3,22	5,25	1,58	4,09
	120	80	40	3,41	2,54		3,89	8,08	2,42	4,09
	140	80	60	3,71	2,61		3,89	8,08	2,42	4,09
	160	100	60	3,71	2,79		3,89	10,10	3,03	4,09
	180	100	80	3,71	2,79		3,89	10,10	3,03	4,09
	200	100	100	3,71	2,79		3,89	10,10	3,03	4,09
	220	100	120	3,71	2,79		3,89	10,10	3,03	4,09
	240	100	140	3,71	2,79		3,89	10,10	3,03	4,09
	280	100	180	3,71	2,79		3,89	10,10	3,03	4,09
	320	100	220	3,71	2,79		3,89	10,10	3,03	4,09
	360	100	260	3,71	2,79		3,89	10,10	3,03	4,09
	400	100	300	3,71	2,79		3,89	10,10	3,03	4,09
10	120	60	60	5,64	2,75	80	-	7,58	2,27	7,08
	140	60	80	5,64	2,75		5,84	7,58	2,27	7,08
	160	80	80	5,64	3,28		5,85	10,10	3,03	7,08
	180	80	100	5,64	3,28		5,85	10,10	3,03	7,08
	200	100	100	5,64	3,87		5,85	12,63	3,79	7,08
	220	100	120	5,64	3,87		5,85	12,63	3,79	7,08
	240	100	140	5,64	3,87		5,85	12,63	3,79	7,08
	280	100	180	5,64	3,87		5,85	12,63	3,79	7,08

ε = screw-to-grain angle

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 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.
- Shear strengths were calculated considering the threaded part fully inserted in the second element.
- The characteristic panel-timber shear strength are calculated considering an OSB panel or particle board with a S_{PAN} thickness and density ρ_k = 500 kg/m^3.
- 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 minimum distances and structural values on CLT and LVL see TBS on page 76.
- For different calculation configurations, the MyProject software is available (www.rothoblaas.com).

NOTES

- 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 values in the table (timber-to-timber shear and tensile strength) can be converted using 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 nef (see page 80).