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

LBS EVO

ROUND HEAD SCREW FOR PLATES

SCREW FOR PERFORATED PLATES FOR OUTDOOR USE
LBS EVO version designed for steel-timber joints for outdoor use. Achieves an interlocking effect with the hole in the plate, thus guaranteeing excellent static performance.

C4 EVO COATING
The atmospheric corrosion strength class (C4) of the C4 EVO coating was tested by the Research Institutes of Sweden - RISE. 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).

STATICS
These can be calculated according to Eurocode 5 under thick steel-timber plate connections, even with thin metal elements.
Excellent shear strength values.

MANUALS

BIT INCLUDED

DIAMETER [mm]

3,5 — 5 – 7 — 12

LENGTH [mm]

25 — 40 – 100 — 200

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

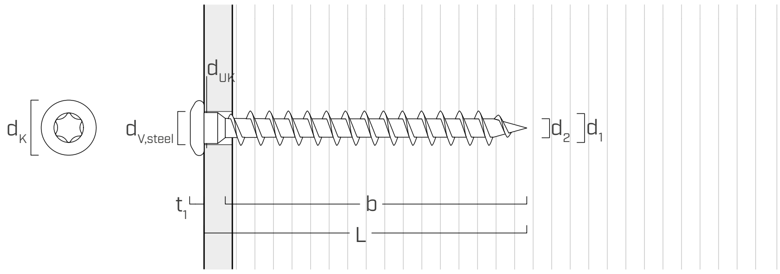
FIELDS OF USE
- timber based panels
- solid timber and glulam
- CLT and LVL
- high density woods
- ACQ, CCA treated timber

CODES AND DIMENSIONS

d_1 [mm]	CODE	L [mm]	b [mm]	pcs
5 TX 20	LBSEVO540	40	36	500
	LBSEVO550	50	46	200
	LBSEVO560	60	56	200
	LBSEVO570	70	66	200

d_1 [mm]	CODE	L [mm]	b [mm]	pcs
7 TX 30	LBSEVO780	80	75	100
	LBSEVO7100	100	95	100

GEOMETRY AND MECHANICAL CHARACTERISTICS



Nominal diameter	d_1	[mm]	5	7
Head diameter	d_K	[mm]	7,80	11,00
Thread diameter	d_2	[mm]	3,00	4,40
Underhead diameter	d_{UK}	[mm]	4,90	7,00
Head thickness	t_1	[mm]	2,40	3,50
Hole diameter on steel plate	$d_{V,steel}$	[mm]	5,0÷5,5	7,5÷8,0
Pre-drilling hole diameter(1)	$d_{V,S}$	[mm]	3,0	4,0
Pre-drilling hole diameter(2)	$d_{V,H}$	[mm]	3,5	5,0
Characteristic tensile strength	$f_{tens,k}$	[kN]	7,9	15,4
Characteristic yield moment	$M_{y,k}$	[Nm]	5,4	14,2

(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)*	**LVL beech (3)** *(Beech LVL)*
Characteristic withdrawal-resistance parameter	$f_{ax,k}$	[N/mm²]	11,7	15,0	29,0	42,0
Characteristic head-pull-through parameter	$f_{head,k}$	[N/mm²]	10,5	20,0	-	-
Associated density	ρ_a	[kg/m³]	350	500	730	730
Calculation density	ρ_k	*[kg/m³]*	*≤ 440*	*410 ÷ 550*	*590 ÷ 750*	590 ÷ 750

(3)Valid for d_1 = 5 mm and $l_{ef} \leq$ 34 mm
For applications with different materials please see ETA-11/0030.

T3 TIMBER CORROSIVITY

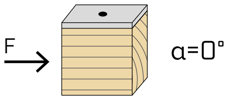
Coating suitable for use in applications on wood with an acidity level (pH) greater than 4, such as spruce, larch, pine, ash and birch (see page 314).

STEEL-TO-TIMBER APPLICATION

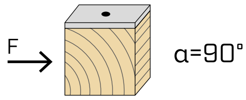
The LBSEVO screw with diameter 7 is particularly suitable for custom-designed connections, which are characteristic of steel structures.

MINIMUM DISTANCES FOR SHEAR LOADS | STEEL-TO-TIMBER

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

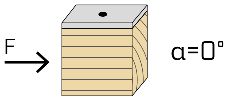


d_1	[mm]		5	7
a_1	[mm]	**12·d·0,7**	42	59
a_2	[mm]	**5·d·0,7**	18	25
$a_{3,t}$	[mm]	**15·d**	75	105
$a_{3,c}$	[mm]	**10·d**	50	70
$a_{4,t}$	[mm]	**5·d**	25	35
$a_{4,c}$	[mm]	**5·d**	25	35

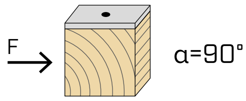


d_1	[mm]		5	7
a_1	[mm]	**5·d·0,7**	18	25
a_2	[mm]	**5·d·0,7**	18	25
$a_{3,t}$	[mm]	**10·d**	50	70
$a_{3,c}$	[mm]	**10·d**	50	70
$a_{4,t}$	[mm]	**10·d**	50	70
$a_{4,c}$	[mm]	**5·d**	25	35

screws inserted **WITHOUT pre-drilled hole** — $420\ kg/m^3 < \rho_k \leq 500\ kg/m^3$

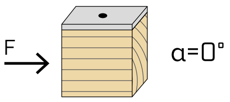


d_1	[mm]		5	7
a_1	[mm]	**15·d·0,7**	53	74
a_2	[mm]	**7·d·0,7**	25	34
$a_{3,t}$	[mm]	**20·d**	100	140
$a_{3,c}$	[mm]	**15·d**	75	105
$a_{4,t}$	[mm]	**7·d**	35	49
$a_{4,c}$	[mm]	**7·d**	35	49

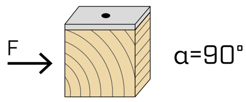


d_1	[mm]		5	7
a_1	[mm]	**7·d·0,7**	25	34
a_2	[mm]	**7·d·0,7**	25	34
$a_{3,t}$	[mm]	**15·d**	75	105
$a_{3,c}$	[mm]	**15·d**	75	105
$a_{4,t}$	[mm]	**12·d**	60	84
$a_{4,c}$	[mm]	**7·d**	35	49

screws inserted **WITH pre-drilled hole**

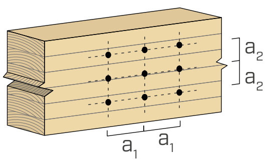


d_1	[mm]		5	7
a_1	[mm]	**5·d·0,7**	18	25
a_2	[mm]	**3·d·0,7**	11	15
$a_{3,t}$	[mm]	**12·d**	60	84
$a_{3,c}$	[mm]	**7·d**	35	49
$a_{4,t}$	[mm]	**3·d**	15	21
$a_{4,c}$	[mm]	**3·d**	15	21

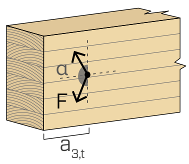


d_1	[mm]		5	7
a_1	[mm]	**4·d·0,7**	14	20
a_2	[mm]	**4·d·0,7**	14	20
$a_{3,t}$	[mm]	**7·d**	35	49
$a_{3,c}$	[mm]	**7·d**	35	49
$a_{4,t}$	[mm]	**7·d**	35	49
$a_{4,c}$	[mm]	**3·d**	15	21

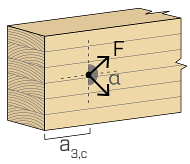
α = load-to-grain angle
$d = d_1$ = nominal screw diameter



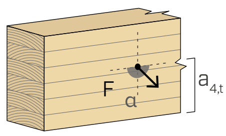
stressed end
-90° < α < 90°



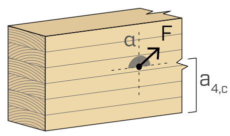
unloaded end
90° < α < 270°



stressed edge
0° < α < 180°

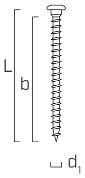


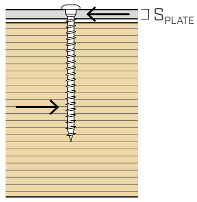
unload edge
180° < α < 360°

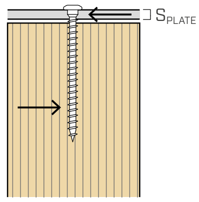


NOTES

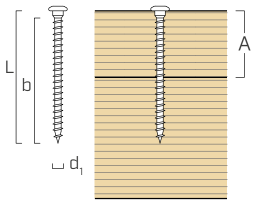
- The minimum distances comply with the EN 1995:2014 standard in accordance with ETA-11/0030.
- In the case of timber-to-timber joints, the minimum spacing (a_1, a_2) can be multiplied by a coefficient of 1,5.
- In the case of joints with elements in Douglas fir (Pseudotsuga menziesii), the minimum spacing and distances parallel to the grain must be multiplied by a coefficient of 1.5.

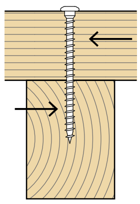


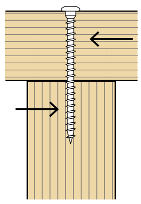


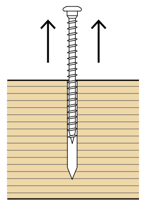


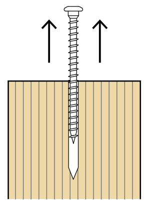
geometry			SHEAR steel-to-timber ε=90°							SHEAR steel-to-timber ε=0°						
d_1 [mm]	L [mm]	b [mm]	$R_{V,90,k}$ [kN]							$R_{V,0,k}$ [kN]						
	S_{PLATE} [mm]		**1,5**	**2,0**	**2,5**	**3,0**	**4,0**	**5,0**	**6,0**	**1,5**	**2,0**	**2,5**	**3,0**	**4,0**	**5,0**	**6,0**
5	40	36	2,24	2,24	2,24	2,24	2,23	2,18	2,13	0,98	0,98	0,97	0,96	0,95	0,94	0,92
	50	46	2,39	2,39	2,39	2,39	2,39	2,38	2,36	1,15	1,15	1,14	1,13	1,12	1,10	1,09
	60	56	2,55	2,55	2,55	2,55	2,55	2,54	2,52	1,32	1,32	1,32	1,32	1,30	1,28	1,27
	70	66	2,71	2,71	2,71	2,71	2,71	2,69	2,68	1,37	1,37	1,37	1,37	1,37	1,36	1,36
	S_{PLATE} [mm]		**3,0**	**4,0**	**5,0**	**6,0**	**8,0**	**10,0**	**12,0**	**3,0**	**4,0**	**5,0**	**6,0**	**8,0**	**10,0**	**12,0**
7	80	75	3,80	3,88	4,13	4,40	4,63	4,59	4,55	1,52	1,61	1,83	2,04	2,22	2,17	2,13
	100	95	4,25	4,38	4,63	4,87	5,08	5,03	4,99	1,91	1,99	2,17	2,35	2,53	2,52	2,51











geometry				SHEAR timber-to-timber ε=90°	SHEAR timber-to-timber ε=0°	TENSION thread withdrawal ε=90°	TENSION thread withdrawal ε=0°
d_1 [mm]	L [mm]	b [mm]	A [mm]	$R_{V,90,k}$ [kN]	$R_{V,0,k}$ [kN]	$R_{ax,90,k}$ [kN]	$R_{ax,0,k}$ [kN]
5	40	36	-	1,01	0,59	2,27	0,68
	50	46	20	1,19	0,75	2,90	0,87
	60	56	25	1,40	0,88	3,54	1,06
	70	66	30	1,59	0,96	4,17	1,25
7	80	75	35	2,57	1,54	6,63	1,99
	100	95	45	3,04	1,74	8,40	2,52

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.
- Sizing and verification of the timber elements and metal plates 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 thread withdrawal characteristic strength has been evaluated considering a fixing length equal to b.
- The characteristic shear-strength value for LBS Ø5 nails has been evaluated assuming a plate thickness = S_{PLATE}, always considering the case of thick plate according to ETA-11/0030 ($S_{PLATE} \geq 1,5$ mm).
- The characteristic shear-strength value for LBS Ø7 screws has been evaluated assuming a plate thickness = S_{PLATE}, and considering the thin ($S_{PLATE} \leq 3,5$ mm) intermediate (3,5 mm < S_{PLATE} < 7,0 mm) or thick ($S_{PLATE} \geq 7$ mm) plate case.

NOTES

- The characteristic shear strengths were evaluated considering both an ε-angle of 90° ($R_{V,90,k}$) and of 0° ($R_{V,0,k}$) between the grains of the timber elements 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 and the connector.
- For the calculation process a timber characteristic density ρ_k = 385 kg/m³ has been considered.
  For different ρ_k values, the strength values in the table can be converted by the k_{dens} coefficient.

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

ρ_k [kg/m³]	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.
- 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 230).