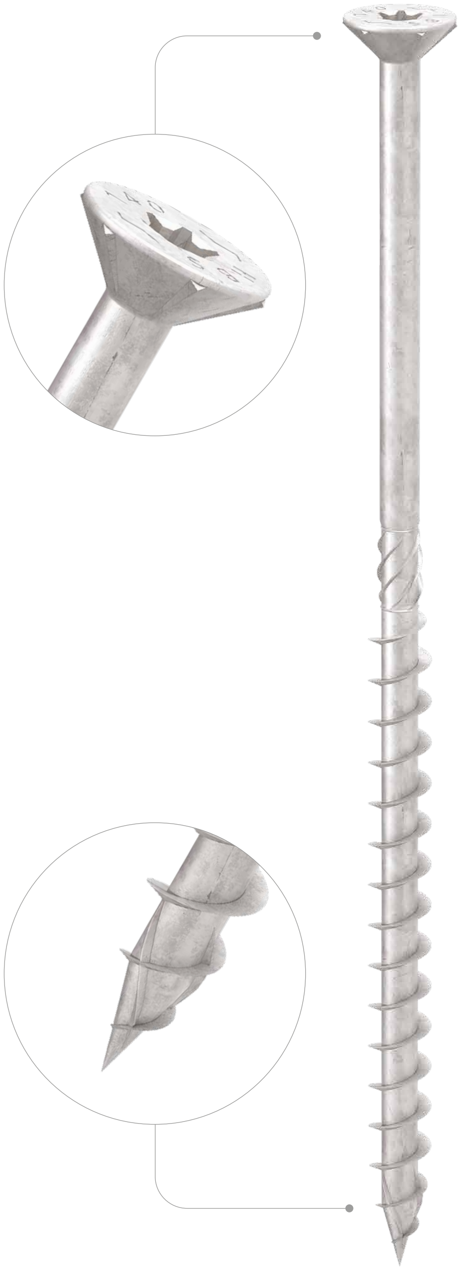
HBS EVO

COUNTERSUNK 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 sprayexposure test, as per ISO 9227. It can be used for service class 3 outdoor applications and under class C4 atmospheric corrosion conditions tested by the Research Institutes of Sweden - RISE.

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.

AUTOCLAVE-TREATED TIMBER

The C4 EVO coating has been certified according to US acceptance criterion AC257 for outdoor use with ACQ-treated timber.

T3 TIMBER CORROSIVITY

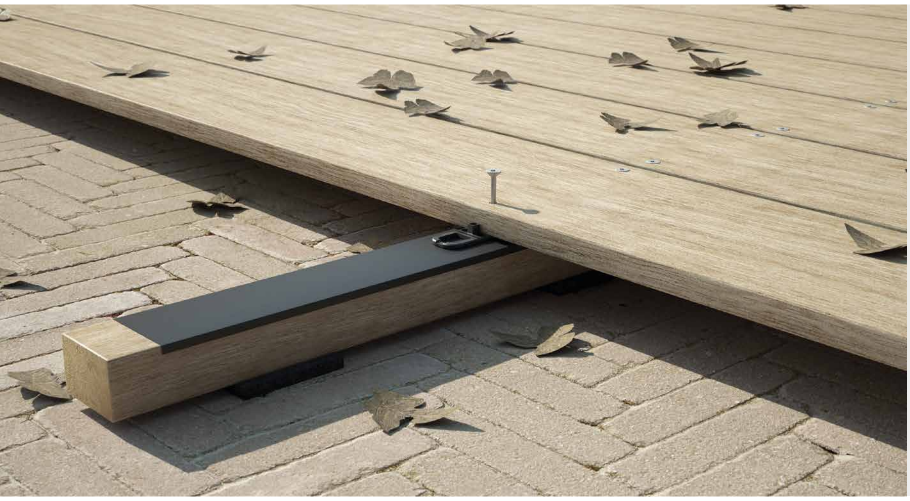
Coating suitable for use in applications on wood with an acidity level (pH) greater than 4, such as spruce, larch and pine (see page 314).

MY PROJECT SOFTWARE | MANUALS | BIT INCLUDED

DIAMETER [mm]	3 – 4 – 8 – 12
LENGTH [mm]	12 – 40 – 320 – 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



SERVICE CLASS 3

Certified for use in service class 3 outdoor applications and under class C4 atmospheric corrosion conditions. Ideal for fastening timber framed panels and trusses (Rafter, Truss).

PERGOLAS AND DECKS

The smaller sizes are ideal for securing boards and battens of decks set up outdoors.

CODES AND DIMENSIONS

d_1 [mm]	CODE	L [mm]	b [mm]	A [mm]	pcs
4 TX 20	**HBSEVO440**	40	24	16	500
	HBSEVO450	50	30	20	500
	HBSEVO460	60	35	25	500
4,5 TX 20	**HBSEVO4545**	45	30	15	400
	HBSEVO4550	50	30	20	200
	HBSEVO4560	60	35	25	200
	HBSEVO4570	70	40	30	200
5 TX 25	**HBSEVO550**	50	24	26	200
	HBSEVO560	60	30	30	200
	HBSEVO570	70	35	35	100
	HBSEVO580	80	40	40	100
	HBSEVO590	90	45	45	100
	HBSEVO5100	100	50	50	100
6 TX 30	**HBSEVO660**	60	30	30	100
	HBSEVO670	70	40	30	100
	HBSEVO680	80	40	40	100
	HBSEVO6100	100	50	50	100
	HBSEVO6120	120	60	60	100
	HBSEVO6140	140	75	65	100
	HBSEVO6160	160	75	85	100
	HBSEVO6180	180	75	105	100
	HBSEVO6200	200	75	125	100

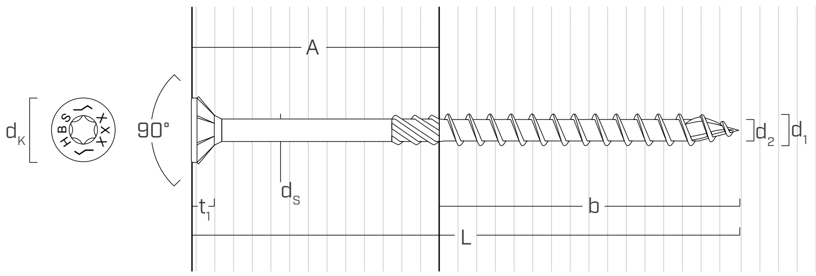
d_1 [mm]	CODE	L [mm]	b [mm]	A [mm]	pcs
8 TX 40	**HBSEVO8100**	100	52	48	100
	HBSEVO8120	120	60	60	100
	HBSEVO8140	140	60	80	100
	HBSEVO8160	160	80	80	100
	HBSEVO8180	180	80	100	100
	HBSEVO8200	200	80	120	100
	HBSEVO8220	220	80	140	100
	HBSEVO8240	240	80	160	100
	HBSEVO8260	260	80	180	100
	HBSEVO8280	280	80	200	100
	HBSEVO8300	300	100	200	100
	HBSEVO8320	320	100	220	100

RELATED PRODUCTS

HUS EVO
TURNED WASHER

see page 68

GEOMETRY AND MECHANICAL CHARACTERISTICS



GEOMETRY

Nominal diameter	d_1	**[mm]**	**4**	**4,5**	**5**	**6**	**8**
Head diameter	d_K	[mm]	8,00	9,00	10,00	12,00	14,50
Thread diameter	d_2	[mm]	2,55	2,80	3,40	3,95	5,40
Shank diameter	d_S	[mm]	2,75	3,15	3,65	4,30	5,80
Head thickness	t_1	[mm]	2,80	2,80	3,10	4,50	4,50
Pre-drilling hole diameter(1)	$d_{V,S}$	[mm]	2,5	2,5	3,0	4,0	5,0
Pre-drilling hole diameter(2)	$d_{V,H}$	[mm]	-	-	3,5	4,0	6,0

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

CHARACTERISTIC MECHANICAL PARAMETERS

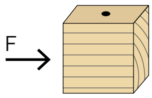
Nominal diameter	d_1	**[mm]**	**4**	**4,5**	**5**	**6**	**8**
Tensile strength	$f_{tens,k}$	[kN]	5,0	6,4	7,9	11,3	20,1
Yield moment	$M_{y,k}$	[Nm]	3,0	4,1	5,4	9,5	20,1

			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*

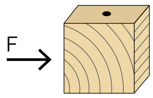
For applications with different materials please see ETA-11/0030.

MINIMUM DISTANCES FOR SHEAR LOADS

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



α=0°

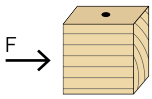


α=90°

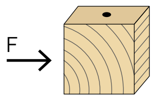
d_1	[mm]		4	4,5		5	6	8
a_1	[mm]	**10·d**	40	45	**10·d**	50	60	80
a_2	[mm]	**5·d**	20	23	**5·d**	25	30	40
$a_{3,t}$	[mm]	**15·d**	60	68	**15·d**	75	90	120
$a_{3,c}$	[mm]	**10·d**	40	45	**10·d**	50	60	80
$a_{4,t}$	[mm]	**5·d**	20	23	**5·d**	25	30	40
$a_{4,c}$	[mm]	**5·d**	20	23	**5·d**	25	30	40

d_1	[mm]		4	4,5		5	6	8
a_1	[mm]	**5·d**	20	23	**5·d**	25	30	40
a_2	[mm]	**5·d**	20	23	**5·d**	25	30	40
$a_{3,t}$	[mm]	**10·d**	40	45	**10·d**	50	60	80
$a_{3,c}$	[mm]	**10·d**	40	45	**10·d**	50	60	80
$a_{4,t}$	[mm]	**7·d**	28	32	**10·d**	50	60	80
$a_{4,c}$	[mm]	**5·d**	20	23	**5·d**	25	30	40

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



α=0°

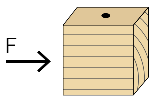


α=90°

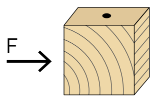
d_1	[mm]		4	4,5		5	6	8
a_1	[mm]	**15·d**	60	68	**15·d**	75	90	120
a_2	[mm]	**7·d**	28	32	**7·d**	35	42	56
$a_{3,t}$	[mm]	**20·d**	80	90	**20·d**	100	120	160
$a_{3,c}$	[mm]	**15·d**	60	68	**15·d**	75	90	120
$a_{4,t}$	[mm]	**7·d**	28	32	**7·d**	35	42	56
$a_{4,c}$	[mm]	**7·d**	28	32	**7·d**	35	42	56

d_1	[mm]		4	4,5		5	6	8
a_1	[mm]	**7·d**	28	32	**7·d**	35	42	56
a_2	[mm]	**7·d**	28	32	**7·d**	35	42	56
$a_{3,t}$	[mm]	**15·d**	60	68	**15·d**	75	90	120
$a_{3,c}$	[mm]	**15·d**	60	68	**15·d**	75	90	120
$a_{4,t}$	[mm]	**9·d**	36	41	**12·d**	60	72	96
$a_{4,c}$	[mm]	**7·d**	28	32	**7·d**	35	42	56

screws inserted **WITH pre-drilled hole**



α=0°

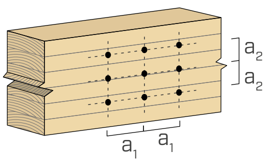


α=90°

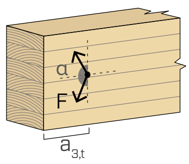
d_1	[mm]		4	4,5		5	6	8
a_1	[mm]	**5·d**	20	23	**5·d**	25	30	40
a_2	[mm]	**3·d**	12	14	**3·d**	15	18	24
$a_{3,t}$	[mm]	**12·d**	48	54	**12·d**	60	72	96
$a_{3,c}$	[mm]	**7·d**	28	32	**7·d**	35	42	56
$a_{4,t}$	[mm]	**3·d**	12	14	**3·d**	15	18	24
$a_{4,c}$	[mm]	**3·d**	12	14	**3·d**	15	18	24

d_1	[mm]		4	4,5		5	6	8
a_1	[mm]	**4·d**	16	18	**4·d**	20	24	32
a_2	[mm]	**4·d**	16	18	**4·d**	20	24	32
$a_{3,t}$	[mm]	**7·d**	28	32	**7·d**	35	42	56
$a_{3,c}$	[mm]	**7·d**	28	32	**7·d**	35	42	56
$a_{4,t}$	[mm]	**5·d**	20	23	**7·d**	35	42	56
$a_{4,c}$	[mm]	**3·d**	12	14	**3·d**	15	18	24

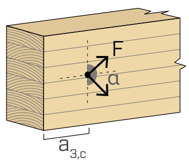
α = load-to-grain angle
d = d_1 = nominal screw diameter



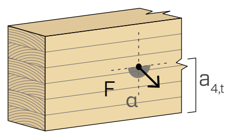
stressed end
-90° < α < 90°



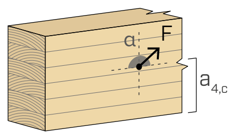
unloaded end
90° < α < 270°



stressed edge
0° < α < 180°

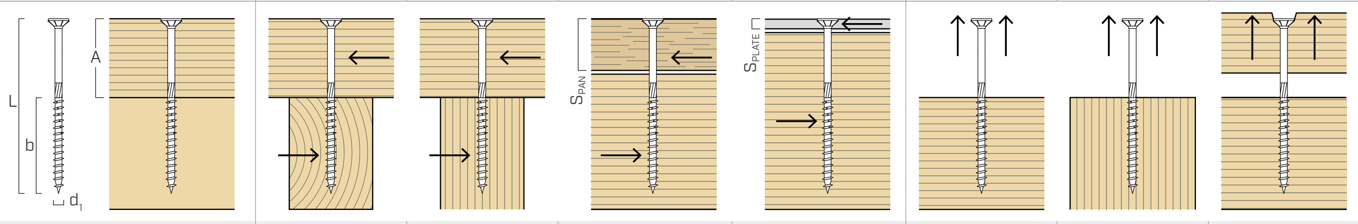


unload edge
180° < α < 360°



NOTES

- The minimum distances comply with the EN 1995:2014 standard in accordance with ETA-11/0030.
- The minimum spacing for all steel-to-timber connections (a_1, a_2) can be multiplied by a coefficient of 0,7.
- 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 $d_1 \ge 5$ mm inserted without pre-drilling hole in timber elements with density $\rho_k \le 420\ kg/m^3$ 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.

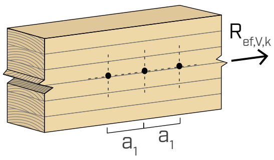


				SHEAR						TENSION		
geometry				timber-to-timber ε=90°	timber-to-timber ε=0°	panel-to-timber		steel-to-timber thin plate		thread withdrawal ε=90°	thread withdrawal ε=0°	head pull-through
d_1 [mm]	L [mm]	b [mm]	A [mm]	$R_{V,90,k}$ [kN]	$R_{V,0,k}$ [kN]	S_{PAN} [mm]	$R_{V,k}$ [kN]	S_{PLATE} [mm]	$R_{V,k}$ [kN]	$R_{ax,90,k}$ [kN]	$R_{ax,0,k}$ [kN]	$R_{head,k}$ [kN]
4	40	24	16	0,83	0,51	12	0,84	2	1,12	1,21	0,36	0,73
	50	30	20	0,91	0,62		0,84		1,19	1,52	0,45	0,73
	60	35	25	0,99	0,69		0,84		1,26	1,77	0,53	0,73
4,5	45	30	15	0,96	0,61	12	0,97	2,25	1,42	1,70	0,51	0,92
	50	30	20	1,06	0,69		0,97		1,42	1,70	0,51	0,92
	60	35	25	1,18	0,79		0,97		1,49	1,99	0,60	0,92
	70	40	30	1,22	0,86		0,97		1,56	2,27	0,68	0,92
5	50	24	26	1,29	0,73	15	1,20	2,5	1,56	1,52	0,45	1,13
	60	30	30	1,46	0,81		1,20		1,65	1,89	0,57	1,13
	70	35	35	1,46	0,88		1,20		1,73	2,21	0,66	1,13
	80	40	40	1,46	0,96		1,20		1,81	2,53	0,76	1,13
	90	45	45	1,46	1,05		1,20		1,89	2,84	0,85	1,13
	100	50	50	1,46	1,13		1,20		1,97	3,16	0,95	1,13
6	60	30	30	1,78	1,04	18	1,65	3	2,24	2,27	0,68	1,63
	70	40	30	1,88	1,20		1,65		2,43	3,03	0,91	1,63
	80	40	40	2,08	1,20		1,65		2,43	3,03	0,91	1,63
	100	50	50	2,08	1,38		1,65		2,61	3,79	1,14	1,63
	120	60	60	2,08	1,58		1,65		2,80	4,55	1,36	1,63
	140	75	65	2,08	1,67		1,65		3,09	5,68	1,70	1,63
	160	75	85	2,08	1,67		1,65		3,09	5,68	1,70	1,63
	180	75	105	2,08	1,67		1,65		3,09	5,68	1,70	1,63
	200	75	125	2,08	1,67		1,65		3,09	5,68	1,70	1,63
8	100	52	48	3,28	1,95	22	2,60	4	4,00	5,25	1,58	2,38
	120	60	60	3,28	2,13		2,60		4,20	6,06	1,82	2,38
	140	60	80	3,28	2,13		2,60		4,20	6,06	1,82	2,38
	160	80	80	3,28	2,60		2,60		4,70	8,08	2,42	2,38
	180	80	100	3,28	2,60		2,60		4,70	8,08	2,42	2,38
	200	80	120	3,28	2,60		2,60		4,70	8,08	2,42	2,38
	220	80	140	3,28	2,60		2,60		4,70	8,08	2,42	2,38
	240	80	160	3,28	2,60		2,60		4,70	8,08	2,42	2,38
	260	80	180	3,28	2,60		2,60		4,70	8,08	2,42	2,38
	280	80	200	3,28	2,60		2,60		4,70	8,08	2,42	2,38
	300	100	200	3,28	2,62		2,60		5,21	10,10	3,03	2,38
	320	100	220	3,28	2,62		2,60		5,21	10,10	3,03	2,38

ε = screw-to-grain angle

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.

		a_1(*)										
		4·d	**5·d**	**6·d**	**7·d**	**8·d**	**9·d**	**10·d**	**11·d**	**12·d**	**13·d**	**≥ 14·d**
n	**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.

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, panels and metal plates 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 strengths are calculated considering an OSB3 or OSB4 panel, as per EN 300, or a particle board panel, as per EN 312, with thickness S_{PAN} 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.
  In the case of steel-to-timber connections, generally the steel tensile strength is binding with respect to head separation or pull-through.
- For different calculation configurations, the MyProject software is available (www.rothoblaas.com).
- For minimum distances and structural values on CLT and LVL see HBS on page 30.
- The characteristic strengths of HBS EVO screws with HUS EVO can be found on page 52.

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 and steel-timber shear strengths were evaluated by considering a α angle of 90° between the grains of the timber element and the connector.
- The shear strength characteristics on the plate are calculated considering the case of a thin plate (S_{PLATE} = 0.5 d_1). For the case of a thick plate, refer to the structural values of the HBS screw on page 30.
- 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 values of ρ_k, the strength values in the table (timber-to-timber shear, steel-to-timber shear and tensile) can be converted by means of the coefficient k_{dens}.

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

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.