SHS

60° COUNTERSUNK SCREW

UKTA-0836 22/6195

ETA-11/0030

SMALL HEAD AND 3 THORNS TIP

The 60° head and 3 THORNS tip allow easy insertion of the screw into small thickness without creating openings in the timber.

ENLARGED IMPRESSION

Compared to common carpentry screws, it has a larger Torx cavity: TX 25 for Ø4 and 4.5, TX 30 for Ø5. It is the right screw for users requiring strength and precision.

FASTENING ON TONGUE AND GROOVE BOARDS

For fixing beads or small elements, the 3.5 mm diameter version is perfectly suited for application in joints.

Ø3,5

Ø4 - Ø4,5 - Ø5

BIT INCLUDED

DIAMETER [mm]

3 — 3,5 — 5 — 12

LENGTH [mm]

12 — 30 — 120 — 1000

SERVICE CLASS

SC1 SC2

ATMOSPHERIC CORROSIVITY

C1 C2

WOOD CORROSIVITY

T1 T2

MATERIAL

Zn ELECTRO PLATED — electrogalvanized carbon steel

FIELDS OF USE

- tongue-and-groove boards
- timber based panels
- fibreboard, MDF, HDF and LDF
- plated and melamine faced panels
- solid timber
- glulam (Glued Laminated Timber)
- CLT and LVL

CODES AND DIMENSIONS

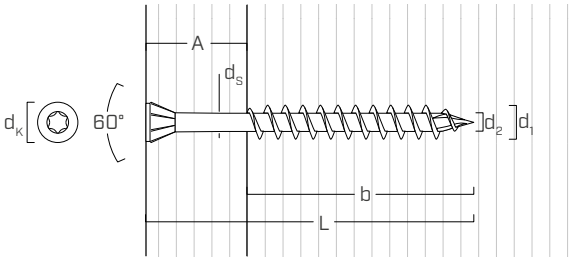
d_1 [mm]	CODE	L [mm]	b [mm]	A [mm]	pcs
3,5 TX 10	SHS3530(*)	30	20	10	500
	SHS3540(*)	40	26	14	500
	SHS3550(*)	50	34	16	500
	SHS3560(*)	60	40	20	500

(*) Not holding CE marking.

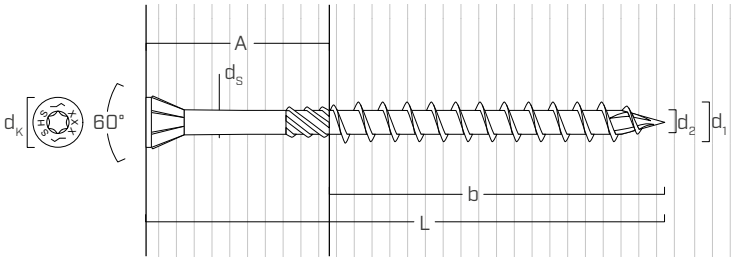
d_1 [mm]	CODE	L [mm]	b [mm]	A [mm]	pcs
4 TX 25	SHS440	40	24	16	500
	SHS450	50	30	20	400
	SHS460	60	35	25	200
	SHS470	70	40	30	200
4,5 TX 25	SHS4550	50	30	20	200
	SHS4560	60	35	25	200
	SHS4570	70	40	30	200
5 TX 30	SHS550	50	24	26	200
	SHS560	60	30	30	200
	SHS570	70	35	35	200
	SHS580	80	40	40	200
	SHS590	90	45	45	200
	SHS5100	100	50	50	200
	SHS5120	120	60	60	200

GEOMETRY AND MECHANICAL CHARACTERISTICS

SHS Ø3,5



SHS Ø4 - Ø4,5 - Ø5



GEOMETRY

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

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

CHARACTERISTIC MECHANICAL PARAMETERS

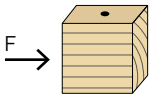
Nominal diameter	**d_1**	**[mm]**	**4**	**4,5**	**5**
Tensile strength	$f_{tens,k}$	[kN]	5,0	6,4	7,9
Yield moment	$M_{y,k}$	[Nm]	3,0	4,1	5,4

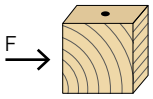
			softwood *(softwood)*	**LVL softwood** *(LVL softwood)*	**pre-drilled beech LVL** *(beech LVL predrilled)*
Withdrawal resistance parameter	$f_{ax,k}$	[N/mm²]	11,7	15,0	29,0
Head-pull-through parameter	$f_{head,k}$	[N/mm²]	10,5	20,0	-
Associated density	ρ_a	[kg/m³]	350	500	730
Calculation density	ρ_k	*[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** — $\rho_k \leq 420$ kg/m³



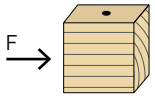


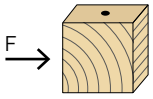
d_1	[mm]		4	4,5		5
a_1	[mm]	**10·d**	40	45	**10·d**	50
a_2	[mm]	**5·d**	20	23	**5·d**	25
$a_{3,t}$	[mm]	**15·d**	60	68	**15·d**	75
$a_{3,c}$	[mm]	**10·d**	40	45	**10·d**	50
$a_{4,t}$	[mm]	**5·d**	20	23	**5·d**	25
$a_{4,c}$	[mm]	**5·d**	20	23	**5·d**	25

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

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

screws inserted **WITH pre-drilled hole**

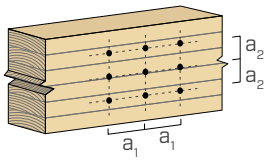




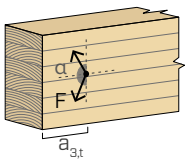
d_1	[mm]		4	4,5		5
a_1	[mm]	**5·d**	20	23	**5·d**	25
a_2	[mm]	**3·d**	12	14	**3·d**	15
$a_{3,t}$	[mm]	**12·d**	48	54	**12·d**	60
$a_{3,c}$	[mm]	**7·d**	28	32	**7·d**	35
$a_{4,t}$	[mm]	**3·d**	12	14	**3·d**	15
$a_{4,c}$	[mm]	**3·d**	12	14	**3·d**	15

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

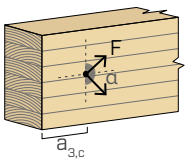
α = load-to-grain angle
d = d_1 = nominal screw diameter



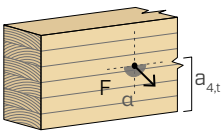
stressed end
-90° < α < 90°



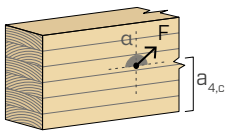
unloaded end
90° < α < 270°



stressed edge
0° < α < 180°



unload edge
180° < α < 360°

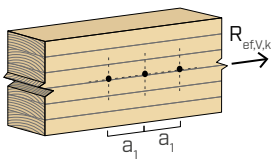


NOTE on page 19.

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:

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



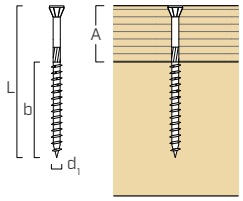
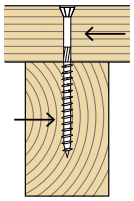
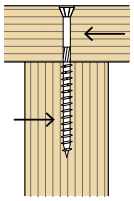
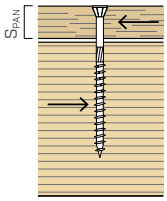
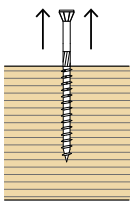
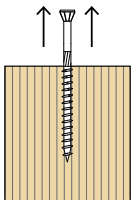
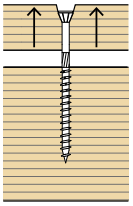
The n_{ef} value is given in the table below as a function of n and a_1.

		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.

STRUCTURAL VALUES

CHARACTERISTIC VALUES
EN 1995:2014

geometry				SHEAR				TENSION		
				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]
4	40	24	16	0,83	0,51	12	0,84	1,21	0,36	0,73
	50	30	20	0,91	0,62		0,84	1,52	0,45	0,73
	60	35	25	0,99	0,69		0,84	1,77	0,53	0,73
	70	40	30	0,99	0,77		0,84	2,02	0,61	0,73
4,5	50	30	20	1,06	0,69	15	1,06	1,70	0,51	0,92
	60	35	25	1,18	0,79		1,06	1,99	0,60	0,92
	70	40	30	1,22	0,86		1,06	2,27	0,68	0,92
5	50	24	26	1,29	0,73	15	1,20	1,52	0,45	1,13
	60	30	30	1,46	0,81		1,20	1,89	0,57	1,13
	70	35	35	1,46	0,88		1,20	2,21	0,66	1,13
	80	40	40	1,46	0,96		1,20	2,53	0,76	1,13
	90	45	45	1,46	1,05		1,20	2,84	0,85	1,13
	100	50	50	1,46	1,13		1,20	3,16	0,95	1,13
	120	60	60	1,46	1,17		1,20	3,79	1,14	1,13

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 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 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.

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 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.

MINIMUM DISTANCES

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 and $d_1 \geq 5$ mm 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.