# HBS PLATE

BIT INCLUDED MY PROJECT SOFTWARE ETA-11/0030

## PAN HEAD SCREW FOR PLATES

### HBS P
Designed for steel-to-timber joints: the head has a shoulder and the thickness is increased for completely safe, reliable fastening plates to the timber.

### PLATE FASTENING
The under-head shoulder achieves an interlocking effect with the circular hole in the plate, thus guaranteeing excellent static performance.

### LONGER THREAD
Increased thread length for excellent shear strength and tensile strength in steel-to-timber joints. Values higher than normal.

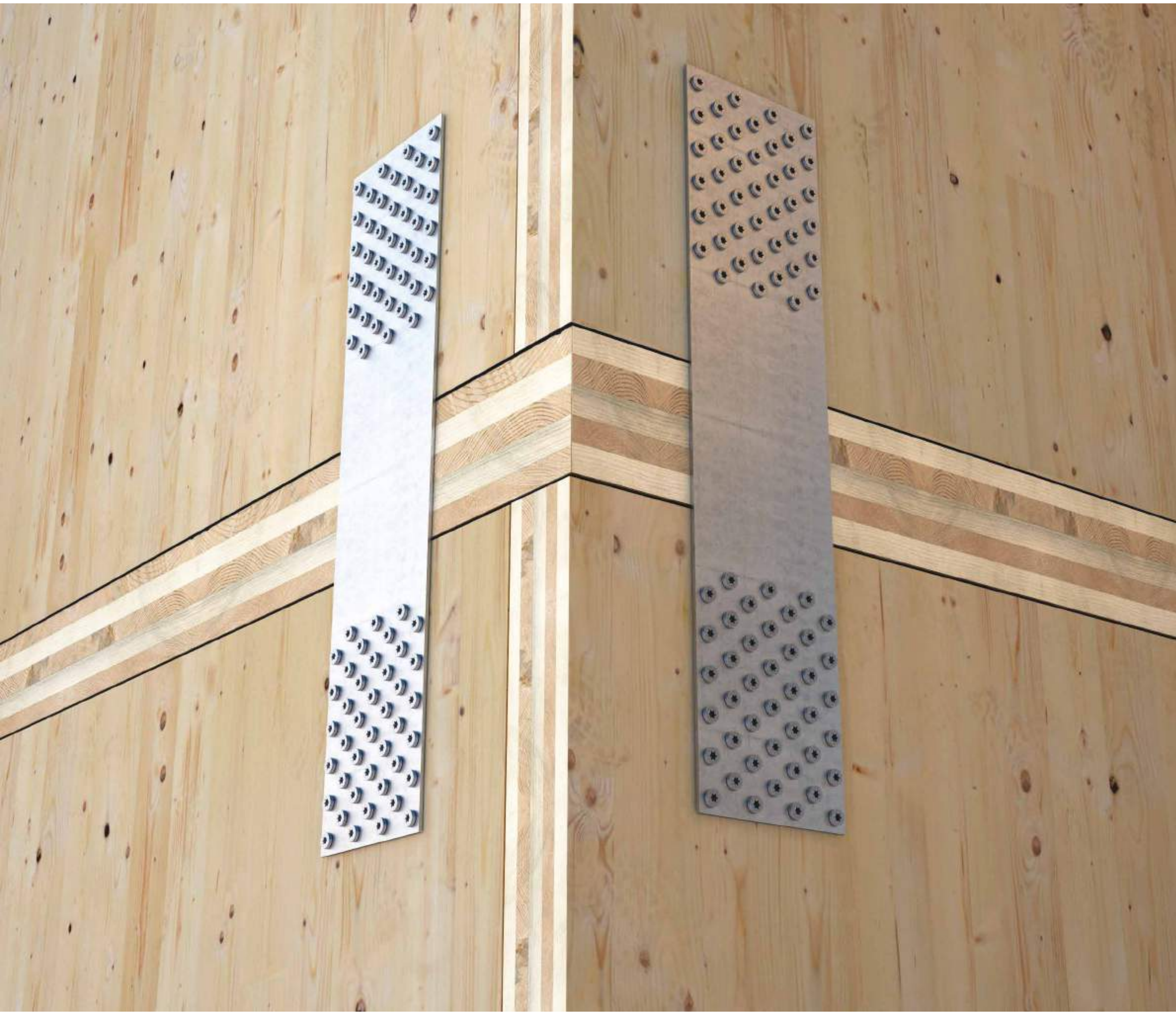
## CHARACTERISTICS

| | |
|---|---|
| **FOCUS** | steel-to-timber joints |
| **HEAD** | shoulder for plate |
| **DIAMETER** | from 8,0 to 12,0 mm |
| **LENGTH** | from 80 to 200 mm |

## MATERIAL
Galvanized carbon steel.

## FIELDS OF USE
- timber based panels
- solid timber
- glulam (Glued Laminated Timber)
- CLT, LVL
- high density woods

Service classes 1 and 2.



## MULTISTOREY

Ideal for steel-to-timber joints with large customized plates, designed for multi-story timber buildings.

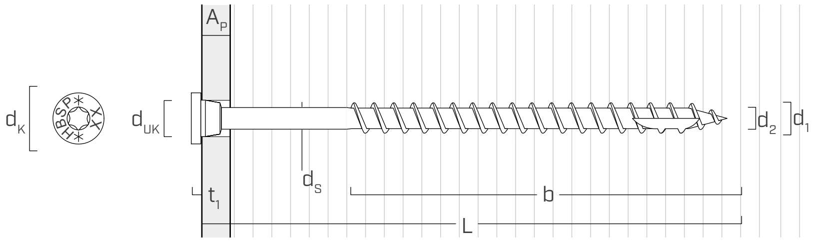
## TITAN

Values also tested, certified and calculated for fastening standard Rothoblaas plates.

Steel-to-timber shear joint

Mixed steel-to-timber structural joint

## GEOMETRY AND MECHANICAL CHARACTERISTICS




| Nominal diameter | $d_1$ | [mm] | 8 | 10 | 12 |
|---|---|---|---|---|---|
| Head diameter | $d_K$ | [mm] | 14,50 | 18,25 | 20,75 |
| Tip diameter | $d_2$ | [mm] | 5,40 | 6,40 | 6,80 |
| Shank diameter | $d_S$ | [mm] | 5,80 | 7,00 | 8,00 |
| Head thickness | $t_1$ | [mm] | 3,40 | 4,35 | 5,00 |
| Underhead diameter | $d_{UK}$ | [mm] | 10,00 | 12,00 | 14,00 |
| Pre-drilling hole diameter(1) | $d_V$ | [mm] | 5,0 | 6,0 | 7,0 |
| Recommended hole diameter on steel plate | $d_{v,steel}$ | [mm] | 11,0 | 13,0 | 15,0 |
| Characteristic yield moment | $M_{y,k}$ | [Nm] | 20,1 | 35,8 | 48,0 |
| Characteristic withdrawal-resistance parameter(2) | $f_{ax,k}$ | [N/mm²] | 11,7 | 11,7 | 11,7 |
| Associated density | $\rho_a$ | [kg/m³] | 350 | 350 | 350 |
| Characteristic head-pull-through parameter(2) | $f_{head,k}$ | [N/mm²] | 10,5 | 10,5 | 10,5 |
| Associated density | $\rho_a$ | [kg/m³] | 350 | 350 | 350 |
| Characteristic tensile strength | $f_{tens,k}$ | [kN] | 20,1 | 31,4 | 33,9 |

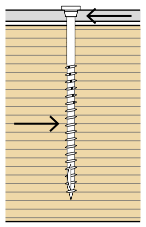
(1) Pre-drilling valid for softwood.
(2) Valid for softwood - maximum density 440 kg/m³.
For applications with different materials or with high density please see ETA-11/0030.

## CODES AND DIMENSIONS

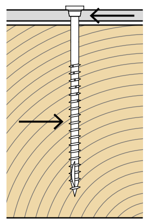
| $d_1$ [mm] [in] | CODE | L [mm] | L [in] | b [mm] | $A_P$ [mm] | pcs |
|---|---|---|---|---|---|---|
| 8 0.32 TX 40 | **HBSP880** | 80 | *3 1/8* | 55 | 1.0 ÷ 15.0 | 100 |
| | **HBSP8100** | 100 | *4* | 75 | 1.0 ÷ 15.0 | 100 |
| | **HBSP8120** | 120 | *4 3/4* | 95 | 1.0 ÷ 15.0 | 100 |
| | **HBSP8140** | 140 | *5 1/2* | 110 | 1,0 ÷ 20,0 | 100 |
| | **HBSP8160** | 160 | *6 1/4* | 130 | 1,0 ÷ 20,0 | 100 |
| 10 0.40 TX 40 | **HBSP10100** | 100 | *4* | 75 | 1.0 ÷ 15.0 | 50 |
| | **HBSP10120** | 120 | *4 3/4* | 95 | 1.0 ÷ 15.0 | 50 |
| | **HBSP10140** | 140 | *5 1/2* | 110 | 1,0 ÷ 20,0 | 50 |
| | **HBSP10160** | 160 | *6 1/4* | 130 | 1,0 ÷ 20,0 | 50 |
| | **HBSP10180** | 180 | *7 1/8* | 150 | 1,0 ÷ 20,0 | 50 |

| $d_1$ [mm] [in] | CODE | L [mm] | L [in] | b [mm] | $A_P$ [mm] | pcs |
|---|---|---|---|---|---|---|
| 12 0.48 TX 50 | **HBSP12120** | 120 | *4 3/4* | 90 | 1,0 ÷ 20,0 | 25 |
| | **HBSP12140** | 140 | *5 1/2* | 110 | 1,0 ÷ 20,0 | 25 |
| | **HBSP12160** | 160 | *6 1/4* | 120 | 1,0 ÷ 30,0 | 25 |
| | **HBSP12180** | 180 | *7 1/8* | 140 | 1,0 ÷ 30,0 | 25 |
| | **HBSP12200** | 200 | *8* | 160 | 1,0 ÷ 30,0 | 25 |

## MINIMUM DISTANCES FOR SHEAR LOADS | STEEL-TO-TIMBER



Load-to-grain angle α = 0°

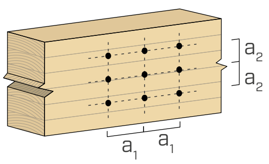


Load-to-grain angle α = 90°

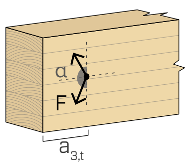
| | | SCREWS INSERTED WITH PRE-DRILLING HOLE | | | | SCREWS INSERTED WITH PRE-DRILLING HOLE | | | |
|---|---|---|---|---|---|---|---|---|---|
| $d_1$ | [mm] | | 8 | 10 | 12 | | 8 | 10 | 12 |
| $a_1$ | [mm] | 5·d · 0,7 | 28 | 35 | 42 | 4·d · 0,7 | 22 | 28 | 34 |
| $a_2$ | [mm] | 3·d · 0,7 | 17 | 21 | 25 | 4·d · 0,7 | 22 | 28 | 34 |
| $a_{3,t}$ | [mm] | 12·d | 96 | 120 | 144 | 7·d | 56 | 70 | 84 |
| $a_{3,c}$ | [mm] | 7·d | 56 | 70 | 84 | 7·d | 56 | 70 | 84 |
| $a_{4,t}$ | [mm] | 3·d | 24 | 30 | 36 | 7·d | 56 | 70 | 84 |
| $a_{4,c}$ | [mm] | 3·d | 24 | 30 | 36 | 3·d | 24 | 30 | 36 |

| | | SCREWS INSERTED WITHOUT PRE-DRILLING HOLE | | | | SCREWS INSERTED WITHOUT PRE-DRILLING HOLE | | | |
|---|---|---|---|---|---|---|---|---|---|
| $d_1$ | [mm] | | 8 | 10 | 12 | | 8 | 10 | 12 |
| $a_1$ | [mm] | 12·d · 0,7 | 67 | 84 | 101 | 5·d · 0,7 | 28 | 35 | 42 |
| $a_2$ | [mm] | 5·d · 0,7 | 28 | 35 | 42 | 5·d · 0,7 | 28 | 35 | 42 |
| $a_{3,t}$ | [mm] | 15·d | 120 | 150 | 180 | 10·d | 80 | 100 | 120 |
| $a_{3,c}$ | [mm] | 10·d | 80 | 100 | 120 | 10·d | 80 | 100 | 120 |
| $a_{4,t}$ | [mm] | 5·d | 40 | 50 | 60 | 10·d | 80 | 100 | 120 |
| $a_{4,c}$ | [mm] | 5·d | 40 | 50 | 60 | 5·d | 40 | 50 | 60 |

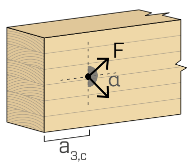
d = nominal screw diameter



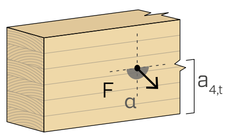

stressed end
-90° < α < 90°



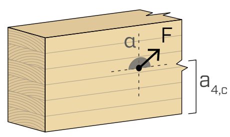

unloaded end
90° < α < 270°




stressed edge
0° < α < 180°




unload edge
180° < α < 360°

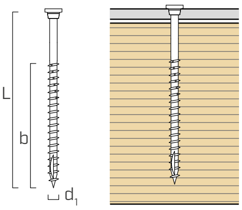
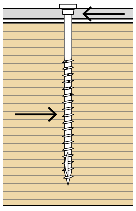
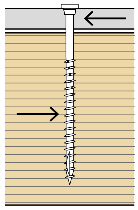
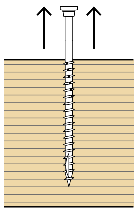
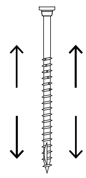



NOTES:

- The minimum distances are compliant with EN 1995:2014, according to ETA-11/0030, considering a timber characteristic density of $\rho_k \leq 420$ kg/m$^3$ and calculation diameter of d = nominal screw diameter.
- 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.

## STATIC VALUES

CHARACTERISTIC VALUES
EN 1995:2014

| | | | SHEAR | | | | TENSION | |
|---|---|---|---|---|---|---|---|---|
| **geometry** | | | **thin steel-to-timber plate (1)** | | **thick steel-to-timber plate (2)** | | **thread withdrawal(3)** | **steel tension** |
|  | | |  | |  | |  |  |
| $d_1$ [mm] | L [mm] | b [mm] | | $R_{V,k}$ [kN] | | $R_{V,k}$ [kN] | $R_{ax,k}$ [kN] | $R_{tens,k}$ [kN] |
| **8** | 80 | 55 | $S_{PLATE}$ = 4,0 mm | 4,07 | $S_{PLATE}$ = 8,0 mm | 5,18 | 5,56 | 20,10 |
| | 100 | 75 | | 4,58 | | 5,69 | 7,58 | |
| | 120 | 95 | | 5,08 | | 6,19 | 9,60 | |
| | 140 | 110 | | 5,36 | | 6,57 | 11,11 | |
| | 160 | 130 | | 5,36 | | 7,08 | 13,13 | |
| **10** | 100 | 75 | $S_{PLATE}$ = 5,0 mm | 6,01 | $S_{PLATE}$ = 10,0 mm | 7,84 | 9,47 | 31,40 |
| | 120 | 95 | | 6,87 | | 8,47 | 12,00 | |
| | 140 | 110 | | 7,34 | | 8,95 | 13,89 | |
| | 160 | 130 | | 7,74 | | 9,58 | 16,42 | |
| | 180 | 150 | | 7,74 | | 10,21 | 18,94 | |
| **12** | 120 | 90 | $S_{PLATE}$ = 6,0 mm | 8,19 | $S_{PLATE}$ = 12,0 mm | 10,17 | 13,64 | 33,90 |
| | 140 | 110 | | 8,94 | | 10,92 | 16,67 | |
| | 160 | 120 | | 9,32 | | 11,30 | 18,18 | |
| | 180 | 140 | | 9,55 | | 12,06 | 21,21 | |
| | 200 | 160 | | 9,55 | | 12,82 | 24,24 | |

### NOTES:

(1) The shear resistance characteristics are calculated considering the case of a thin plate ($S_{PLATE} \leq 0,5\ d_1$).

(2) The shear resistance characteristics are calculated considering the case of a thick plate ($S_{PLATE} \geq d_1$).

(3) The axial thread withdrawal resistance was calculated considering a 90° angle between the grain and the connector and for a fixing length of b.

In the case of steel-to-timber connections, generally the steel tensile strength is binding with respect to head separation or pull-through.

### 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 $\gamma_M$ and $k_{mod}$ should be taken according to the current regulations used for the calculation.

- The tensile design strength of the connector is the lower between the timber-side design strength ($R_{ax,d}$) and the steel-side design strength ($R_{tens,d}$).

$$R_{ax,d} = \min \begin{cases} \dfrac{R_{ax,k} \cdot k_{mod}}{\gamma_M} \\ \dfrac{R_{tens,k}}{\gamma_{M2}} \end{cases}$$

- For the mechanical resistance values and the geometry of the screws, reference was made to ETA-11/0030.
- For the calculation process a timber characteristic density $\rho_k$ = 385 kg/m$^3$ has been considered.
- Values were calculated considering the threaded part as being completely inserted into the wood.
- Sizing and verification of the timber elements, panels and steel 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.
- For different calculation methods, the MyProject software is available free of charge (www.rothoblaas.com).