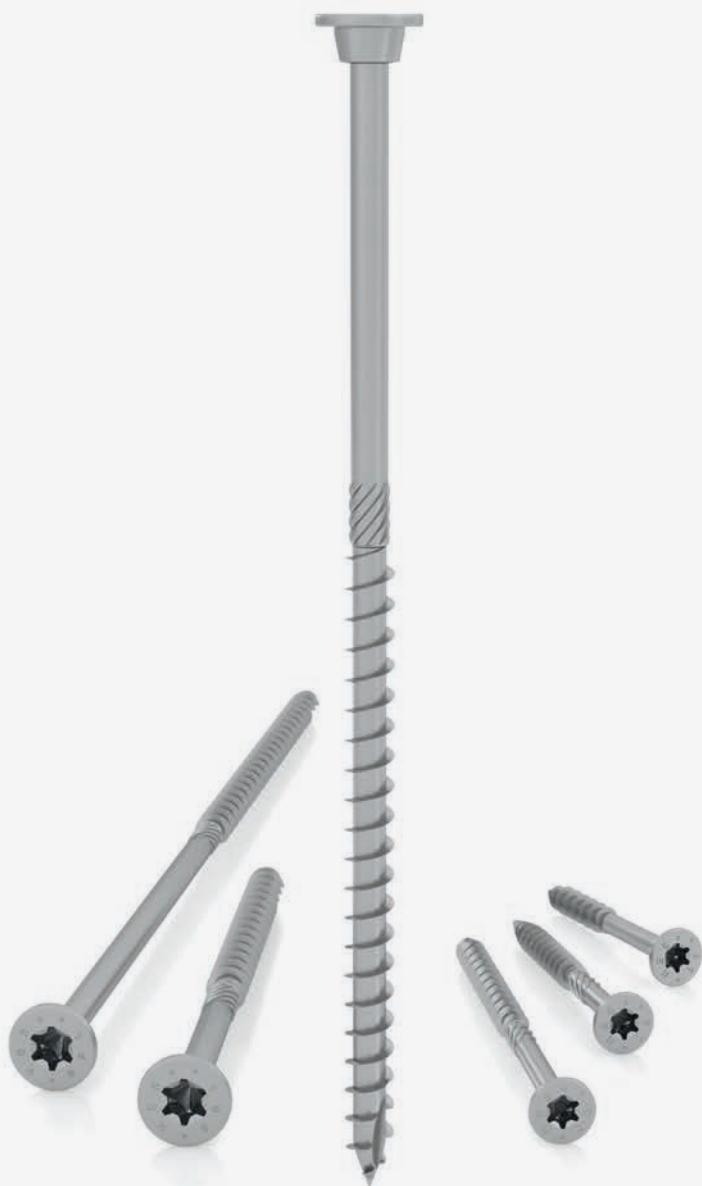


# HBS + evo

Exterior screws, pan head

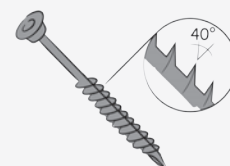
Carbon steel with revodip coating

CE



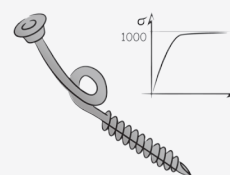
## SPECIAL THREADING

Longer length (60%) asymmetric "umbrella" thread



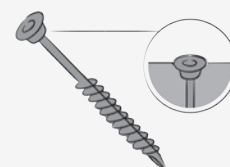
## SPECIAL STEEL

Highly ductile (moves with the wood) and resistant steel ( $f_{y,k} = 1000 \text{ N/mm}^2$ )



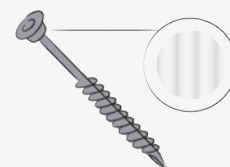
## PAN HEAD

Guarantees an excellent surface finish and the possibility of usage on steel plates with circular holes



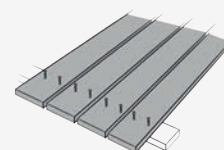
## REVODIP COATING

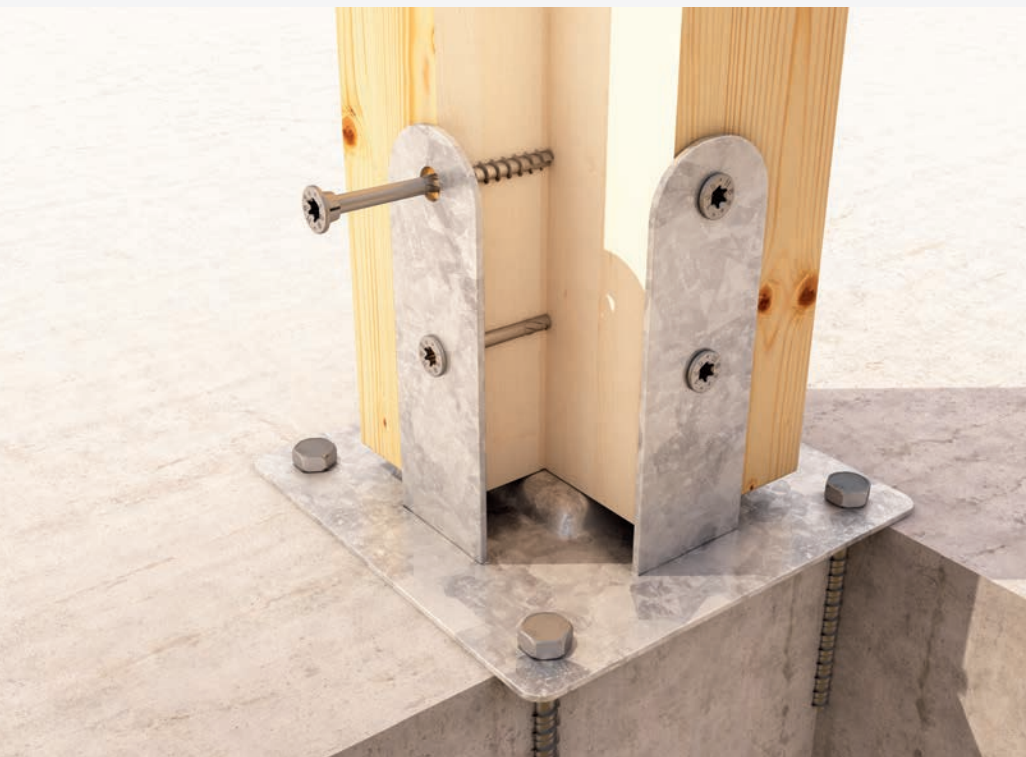
Surface treatment with high corrosion resistance, comparable to class C5



## FIELDS OF USE

Exterior use; appropriate for service classes 1-2-3





## AESTHETICS

The pan head with flat under head compresses the fibres at the end of the joint, guaranteeing a perfect aesthetic finish



## STATIC SAFETY

The special high resistance steel guarantees the possibility of safe joints with high static performance under all service conditions (service classes 1-2-3)



## STEEL – WOOD

Ideale per utilizzo su piastre in acciaio con foro circolare e Ideal for use on steel plates with circular holes and hence for exterior fastening systems in service class 3 (pillar bases)

# Applications



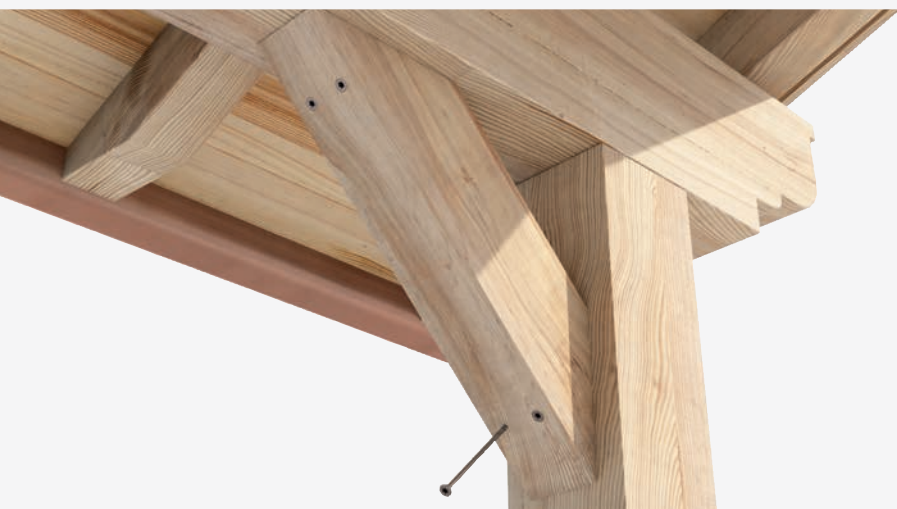
Sleeve pillar-base fastening  
in stainless steel



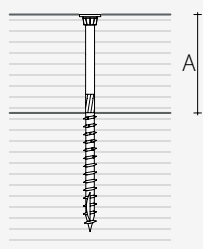
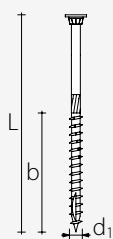
Adjustable pillar-base fastening  
in stainless steel with dacromet  
coating



Fastening of diagonal element  
to an exterior pergola



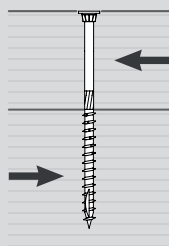
## Codes and dimensions



| d <sub>1</sub> [mm] | code      | L [mm] | b [mm] | A [mm] | pcs/pkg |
|---------------------|-----------|--------|--------|--------|---------|
| 4,5<br>TX20         | HBSP4540C | 40     | 24     | 16     | 500     |
|                     | HBSP4545C | 45     | 30     | 15     | 250     |
|                     | HBSP4550C | 50     | 30     | 20     |         |
|                     | HBSP4560C | 60     | 35     | 25     | 200     |
|                     | HBSP4570C | 70     | 40     | 30     |         |
| 5<br>TX25           | HBSP550C  | 50     | 30     | 20     | 200     |
|                     | HBSP560C  | 60     | 35     | 25     |         |
|                     | HBSP570C  | 70     | 40     | 30     |         |
|                     | HBSP580C  | 80     | 50     | 30     | 100     |
|                     | HBSP590C  | 90     | 55     | 35     |         |
|                     | HBSP5100C | 100    | 60     | 40     |         |
| 6<br>TX30           | HBSP680C  | 80     | 50     | 30     |         |
|                     | HBSP690C  | 90     | 55     | 35     |         |
|                     | HBSP6100C | 100    | 60     | 40     |         |
|                     | HBSP6120C | 120    | 75     | 45     |         |
|                     | HBSP6140C | 140    | 80     | 60     | 100     |
|                     | HBSP6160C | 160    | 90     | 70     |         |
|                     | HBSP6180C | 180    | 100    | 80     |         |
|                     | HBSP6200C | 200    | 100    | 100    |         |
| 8<br>TX40           | HBSP840C  | 40     | 32     | 10     |         |
|                     | HBSP860C  | 60     | 52     | 20     | 100     |
|                     | HBSP880C  | 80     | 52     | 30     |         |

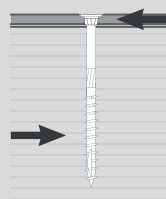
Black galvanic zinc coating version available in 8x40mm (NOHBSP840) and 8x60mm (NOHBSP860)

## SHEAR $V_{adm}$



### WOOD-WOOD

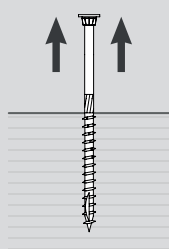
| $d_1$ [mm] | L [mm]    | $V_{adm}$ |
|------------|-----------|-----------|
| 4,5        | $\geq 50$ | 34 kg     |
| 5          | $\geq 60$ | 43 kg     |
| 6          | $\geq 80$ | 61 kg     |
| 8          | $\geq 80$ | 90 kg     |



### STEEL-WOOD

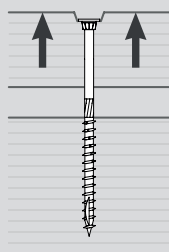
| $d_1$ [mm] | L [mm]    | $V_{adm}$ |
|------------|-----------|-----------|
| 4,5        | $\geq 40$ | 43 kg     |
| 5          | $\geq 50$ | 53 kg     |
| 6          | $\geq 80$ | 77 kg     |
| 8          | $\geq 40$ | 136 kg    |

## THREAD WITHDRAWAL $N_{adm}$



|                     | Length L [mm] |       |       |        |        |        |        |        |        |        |        |         |
|---------------------|---------------|-------|-------|--------|--------|--------|--------|--------|--------|--------|--------|---------|
| d <sub>1</sub> [mm] | 40            | 45    | 50    | 60     | 70     | 80     | 90     | 100    | 120    | 140    | 160    | 180-200 |
| 4,5                 | 54 kg         | 68 kg | 68 kg | 79 kg  | 90 kg  | -      | -      | -      | -      | -      | -      | -       |
| 5                   | -             | -     | 75 kg | 88 kg  | 100 kg | 125 kg | 138 kg | 150 kg | -      | -      | -      | -       |
| 6                   | -             | -     | -     | -      | -      | 150 kg | 165 kg | 180 kg | 225 kg | 240 kg | 270 kg | 300 kg  |
| 8                   | 128 kg        | -     | -     | 208 kg | -      | 208 kg | -      | -      | -      | -      | -      | -       |

## HEAD PENETRATION $N_{adm}$



| $d_1$ [mm] | $N_{adm}$ |
|------------|-----------|
| 4,5        | 38 kg     |
| 5          | 47 kg     |
| 6          | 72 kg     |
| 8          | 105 kg    |

## CALCULATION FORMULAS - SHEAR DIN 1052-2:1988

### WOOD-WOOD

$$V_{adm} = \min \{ 0,4 \cdot A \cdot d_1; 1,7 \cdot d_1^2 \}$$

$d_1$  [mm]  
A [mm]  
 $V_{adm}$  [kg]

### STEEL-WOOD

$$V_{adm} = 1,25 \cdot 1,7 \cdot d_1^2$$

### STEEL-WOOD EXAMPLE

HBS+ evo 8 x 60 mm

$$d_1 = 8 \text{ mm}$$

$$V_{adm} = 1,25 \cdot 1,7 \cdot d_1^2$$

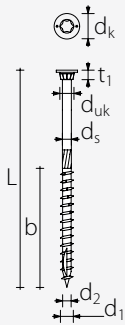
$$V_{adm} = 1,25 \cdot 1,7 \cdot 8^2 = 136 \text{ kg}$$

## NOTE

- Allowable values in accordance with DIN 1052:1988.
- The allowable extraction values are calculated considering the threaded part as being completely inserted into the wood.

# Geometry and minimum distances

## GEOMETRY AND MECHANICAL CHARACTERISTICS



### SCREW HBS+ evo

| Nominal diameter                               | $d_1$ [mm]                        | 4,5    | 5      | 6      | 8       |
|------------------------------------------------|-----------------------------------|--------|--------|--------|---------|
| Head diameter                                  | $d_k$ [mm]                        | 8,70   | 9,65   | 12,00  | 14,50   |
| Tip diameter                                   | $d_2$ [mm]                        | 2,80   | 3,40   | 3,95   | 5,40    |
| Shank diameter                                 | $d_s$ [mm]                        | 3,15   | 3,65   | 4,30   | 5,80    |
| Head thickness                                 | $t_1$ [mm]                        | 5,05   | 5,60   | 6,50   | 6,80    |
| Underhead diameter                             | $d_{uk}$ [mm]                     | 5,70   | 6,00   | 8,00   | 10,00   |
| Pre-bored hole diameter                        | $d_v$ [mm]                        | 3,0    | 3,0    | 4,0    | 5,0     |
| Characteristic yield moment                    | $M_{y,k}$ [Nmm]                   | 4119,1 | 5417,2 | 9493,7 | 20057,5 |
| Characteristic extraction-resistance parameter | $f_{ax,k}$ [N/mm <sup>2</sup> ]   | 11,7   | 11,7   | 11,7   | 11,7    |
| Characteristic head-penetration parameter      | $f_{head,k}$ [N/mm <sup>2</sup> ] | 10,5   | 10,5   | 10,5   | 10,5    |
| Characteristic tensile strength                | $f_{tens,k}$ [kN]                 | 6,4    | 7,9    | 11,3   | 20,1    |

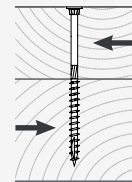
## MINIMUM DISTANCES FOR SHEAR LOADS

$\alpha = 0^\circ$

$\alpha = 90^\circ$

### SCREWS INSERTED WITH PRE-BORED HOLES <sup>(1)</sup>

|                | 4,5 | 5  | 6  | 8  | 4,5 | 5  | 6  | 8  |
|----------------|-----|----|----|----|-----|----|----|----|
| $a_1$ [mm]     | 23  | 25 | 30 | 40 | 18  | 20 | 24 | 32 |
| $a_2$ [mm]     | 14  | 15 | 18 | 24 | 18  | 20 | 24 | 32 |
| $a_{3,t}$ [mm] | 54  | 60 | 72 | 96 | 32  | 35 | 42 | 56 |
| $a_{3,c}$ [mm] | 32  | 35 | 42 | 56 | 32  | 35 | 42 | 56 |
| $a_{4,t}$ [mm] | 14  | 15 | 18 | 24 | 23  | 25 | 30 | 40 |
| $a_{4,c}$ [mm] | 14  | 15 | 18 | 24 | 14  | 15 | 18 | 24 |



Angle between strength and grain  $\alpha = 0^\circ$     Angle between strength and grain  $\alpha = 90^\circ$

### CHARACTERISTIC DENSITY: $\rho_k \leq 420 \text{ kg/m}^3$

$\alpha = 0^\circ$

$\alpha = 90^\circ$

### SCREWS INSERTED WITHOUT PRE-BORED HOLES <sup>(2)</sup>

|                | 4,5 | 5  | 6  | 8   | 4,5 | 5  | 6  | 8  |
|----------------|-----|----|----|-----|-----|----|----|----|
| $a_1$ [mm]     | 45  | 60 | 72 | 96  | 23  | 25 | 30 | 40 |
| $a_2$ [mm]     | 23  | 25 | 30 | 40  | 23  | 25 | 30 | 40 |
| $a_{3,t}$ [mm] | 68  | 75 | 90 | 120 | 45  | 50 | 60 | 80 |
| $a_{3,c}$ [mm] | 45  | 50 | 60 | 80  | 45  | 50 | 60 | 80 |
| $a_{4,t}$ [mm] | 23  | 25 | 30 | 40  | 32  | 35 | 42 | 56 |
| $a_{4,c}$ [mm] | 23  | 25 | 30 | 40  | 23  | 25 | 30 | 40 |

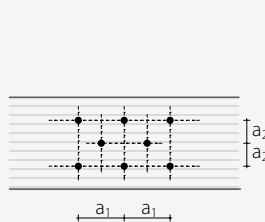
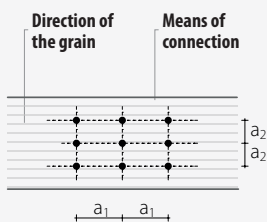
### CHARACTERISTIC DENSITY: $420 \leq \rho_k \leq 500 \text{ kg/m}^3$

$\alpha = 0^\circ$

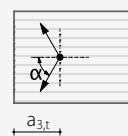
$\alpha = 90^\circ$

### SCREWS INSERTED WITHOUT PRE-BORED HOLES <sup>(3)</sup>

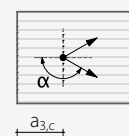
|                | 4,5 | 5   | 6   | 8   | 4,5 | 5  | 6  | 8   |
|----------------|-----|-----|-----|-----|-----|----|----|-----|
| $a_1$ [mm]     | 68  | 75  | 90  | 120 | 32  | 35 | 42 | 56  |
| $a_2$ [mm]     | 32  | 35  | 42  | 56  | 32  | 35 | 42 | 56  |
| $a_{3,t}$ [mm] | 90  | 100 | 120 | 160 | 68  | 75 | 90 | 120 |
| $a_{3,c}$ [mm] | 68  | 75  | 90  | 120 | 68  | 75 | 90 | 120 |
| $a_{4,t}$ [mm] | 32  | 35  | 42  | 56  | 41  | 45 | 54 | 72  |
| $a_{4,c}$ [mm] | 32  | 35  | 42  | 56  | 32  | 35 | 42 | 56  |



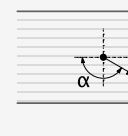
stressed end  
 $-90^\circ < \alpha < 90^\circ$



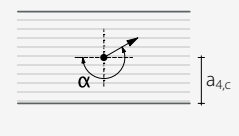
discharged end  
 $90^\circ < \alpha < 270^\circ$



stressed edge  
 $0^\circ < \alpha < 180^\circ$



unload edge  
 $180^\circ < \alpha < 360^\circ$



## NOTE

<sup>(1)</sup> The minimum distances comply with the EN 1995:2008 standard, in accordance with ETA-11/0030.

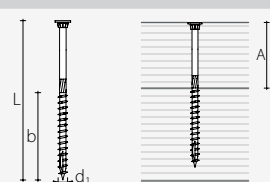
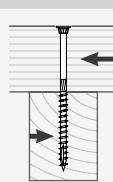
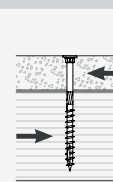
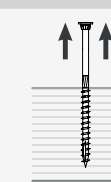
<sup>(2)</sup> The minimum distances comply with EN 1995:2008, according to ETA-11/0030, considering a mass density of the wood elements of  $\rho_k \leq 420 \text{ kg/m}^3$ .

<sup>(3)</sup> The minimum distances comply with EN 1995:2008, according to ETA-11/0030, considering a mass density of the wood elements of  $420 \leq \rho_k \leq 500 \text{ kg/m}^3$ .

- In the case of OSB-wood joints, the minimum spacings ( $a_1$ ,  $a_2$ ) can be multiplied by a coefficient of 0.85.
- In the case of steel-wood joints, the minimum spacings ( $a_1$ ,  $a_2$ ) can be multiplied by a coefficient of 0.7.
- In the case of Douglas fir elements (*Pseudotsuga menziesii*), the minimum distances parallel to the grain ( $a_1$ ,  $a_{3,t}$ ,  $a_{3,c}$ ) must be multiplied by a coefficient of 1.5.

## SHEAR

## TRACTION

| geometry                                                                          |           |           |           | wood-wood                                                                         | panel-wood <sup>(1)</sup>                                                         | thin steel-wood plate <sup>(2)</sup>                                              | thick steel-wood plate <sup>(3)</sup>                                              | thread withdrawal <sup>(4)</sup>                                                    | head penetration <sup>(5)</sup>                                                     |
|-----------------------------------------------------------------------------------|-----------|-----------|-----------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|  |           |           |           |  |  |  |  |  |  |
| d <sub>1</sub><br>[mm]                                                            | L<br>[mm] | b<br>[mm] | A<br>[mm] | R <sub>v,k</sub><br>[kN]                                                          | R <sub>v,k</sub><br>[kN]                                                          | R <sub>v,k</sub><br>[kN]                                                          | R <sub>v,k</sub><br>[kN]                                                           | R <sub>ax,k</sub><br>[kN]                                                           | R <sub>head,k</sub><br>[kN]                                                         |
| 4,5                                                                               | 40        | 24        | 16        | 1,03                                                                              | S <sub>PN</sub> = 15 mm                                                           | S <sub>PLATE</sub> ≤ 2,3 mm                                                       | S <sub>PLATE</sub> ≥ 4,5 mm                                                        | 1,46                                                                                | 0,92                                                                                |
|                                                                                   | 45        | 30        | 15        | 1,00                                                                              |                                                                                   |                                                                                   |                                                                                    | 1,83                                                                                | 0,92                                                                                |
|                                                                                   | 50        | 30        | 20        | 1,12                                                                              |                                                                                   |                                                                                   |                                                                                    | 1,92                                                                                | 0,92                                                                                |
|                                                                                   | 60        | 35        | 25        | 1,26                                                                              |                                                                                   |                                                                                   |                                                                                    | 2,00                                                                                | 0,92                                                                                |
|                                                                                   | 70        | 40        | 30        | 1,27                                                                              |                                                                                   |                                                                                   |                                                                                    | 2,08                                                                                | 0,92                                                                                |
| 5                                                                                 | 50        | 30        | 20        | 1,29                                                                              | S <sub>PN</sub> = 15 mm                                                           | S <sub>PLATE</sub> ≤ 2,5 mm                                                       | S <sub>PLATE</sub> ≥ 5,0 mm                                                        | 2,25                                                                                | 1,13                                                                                |
|                                                                                   | 60        | 35        | 25        | 1,43                                                                              |                                                                                   |                                                                                   |                                                                                    | 2,34                                                                                | 1,13                                                                                |
|                                                                                   | 70        | 40        | 30        | 1,52                                                                              |                                                                                   |                                                                                   |                                                                                    | 2,42                                                                                | 1,13                                                                                |
|                                                                                   | 80        | 50        | 30        | 1,52                                                                              |                                                                                   |                                                                                   |                                                                                    | 2,59                                                                                | 1,13                                                                                |
|                                                                                   | 90        | 55        | 35        | 1,52                                                                              |                                                                                   |                                                                                   |                                                                                    | 2,68                                                                                | 1,13                                                                                |
| 6                                                                                 | 100       | 60        | 40        | 1,52                                                                              | S <sub>PN</sub> = 15 mm                                                           | S <sub>PLATE</sub> ≤ 3,0 mm                                                       | S <sub>PLATE</sub> ≥ 6,0 mm                                                        | 2,76                                                                                | 1,13                                                                                |
|                                                                                   | 80        | 50        | 30        | 2,02                                                                              |                                                                                   |                                                                                   |                                                                                    | 3,48                                                                                | 1,75                                                                                |
|                                                                                   | 90        | 55        | 35        | 2,18                                                                              |                                                                                   |                                                                                   |                                                                                    | 3,58                                                                                | 1,75                                                                                |
|                                                                                   | 100       | 60        | 40        | 2,18                                                                              |                                                                                   |                                                                                   |                                                                                    | 3,68                                                                                | 1,75                                                                                |
|                                                                                   | 120       | 75        | 45        | 2,18                                                                              |                                                                                   |                                                                                   |                                                                                    | 3,99                                                                                | 1,75                                                                                |
|                                                                                   | 140       | 80        | 60        | 2,18                                                                              |                                                                                   |                                                                                   |                                                                                    | 4,09                                                                                | 1,75                                                                                |
|                                                                                   | 160       | 90        | 70        | 2,18                                                                              |                                                                                   |                                                                                   |                                                                                    | 4,29                                                                                | 1,75                                                                                |
| 8                                                                                 | 180       | 100       | 80        | 2,18                                                                              | S <sub>PN</sub> = 15 mm                                                           | S <sub>PLATE</sub> ≤ 4,0 mm                                                       | S <sub>PLATE</sub> = 8,0 mm                                                        | 4,49                                                                                | 1,75                                                                                |
|                                                                                   | 200       | 100       | 100       | 2,18                                                                              |                                                                                   |                                                                                   |                                                                                    | 4,49                                                                                | 1,75                                                                                |
|                                                                                   | 40        | 32        | 10        | 1,48                                                                              |                                                                                   |                                                                                   |                                                                                    | 3,66                                                                                | 2,55                                                                                |
|                                                                                   | 60        | 52        | 20        | 2,54                                                                              |                                                                                   |                                                                                   |                                                                                    | 5,12                                                                                | 2,55                                                                                |
|                                                                                   | 80        | 52        | 30        | 2,83                                                                              |                                                                                   |                                                                                   |                                                                                    | 5,37                                                                                | 2,55                                                                                |

## GENERAL PRINCIPLES

- Characteristic values comply with the EN 1995:2008 standard in accordance with ETA-11/0030.
- Design values are obtained from the following characteristic values:

$$R_d = \frac{R_k \cdot k_{mod}}{\gamma_m}$$

The coefficients  $\gamma_m$  and  $k_{mod}$  should be taken according to the current regulations used for the calculation.

- For the mechanical resistance values and the geometry of the screws, reference was made to ETA-11/0030.
- In the calculations, the density of the wood elements was considered equal to  $\rho_k = 420 \text{ kg/m}^3$ .
- Values were calculated considering the threaded part as being completely inserted into the wood.
- Sizing and verification of the wooden elements, panels and steel plates must be done separately.
- The shear characteristic resistances are calculated for screws inserted without pre-bored holes. In the case of screws inserted with pre-bored holes, greater resistance values can be obtained.
- For different calculation methods, the myProject software is available free of charge ([www.rothoblaas.com](http://www.rothoblaas.com)).

## NOTE

- <sup>(1)</sup> The shear characteristic resistances are calculated considering an OSB panel or particle board with a  $S_{PN}$  thickness.
- <sup>(2)</sup> The shear resistance characteristics are calculated considering the case of a thin plate ( $S_{PLATE} \leq 0,5 d_1$ ).
- <sup>(3)</sup> The shear resistance characteristics are calculated considering the case of a thick plate ( $S_{PLATE} \geq d_1$ ).
- <sup>(4)</sup> The axial thread-extraction resistance was calculated considering a 90° angle between the grain and the connector and for a fixing length of b.
- <sup>(5)</sup> The axial resistance to head penetration was calculated using wood elements. In the case of steel-wood connections, generally the steel tensile strength is binding with respect to head separation or penetration.