# HBS

CE
ETA 11/0030

АДДсерт Russia

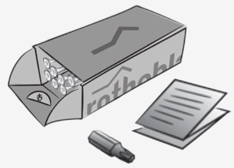
software myProject

## Countersunk screw

Carbon steel with white galvanic zinc coating

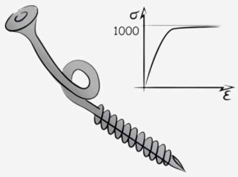
### PACKAGING

Box + CE paper + BIT



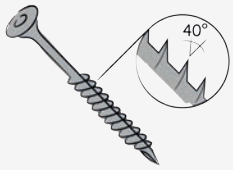
### SPECIAL STEEL

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




### SPECIAL THREADING

Asymmetric “umbrella” threading for better wood penetration

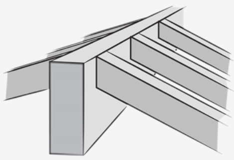


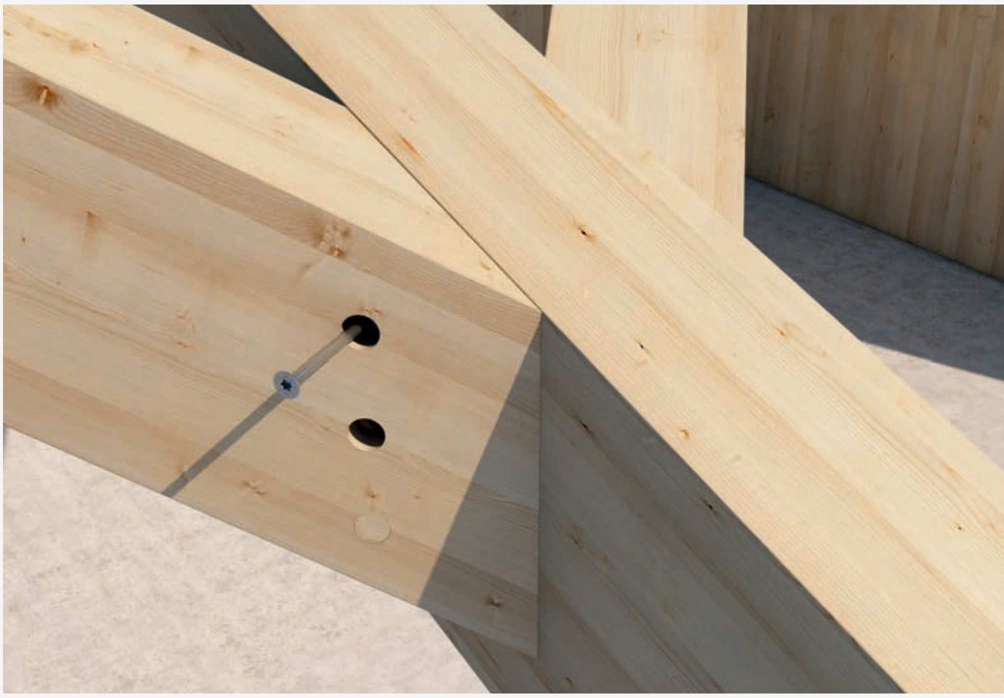

### ECO-FRIENDLY

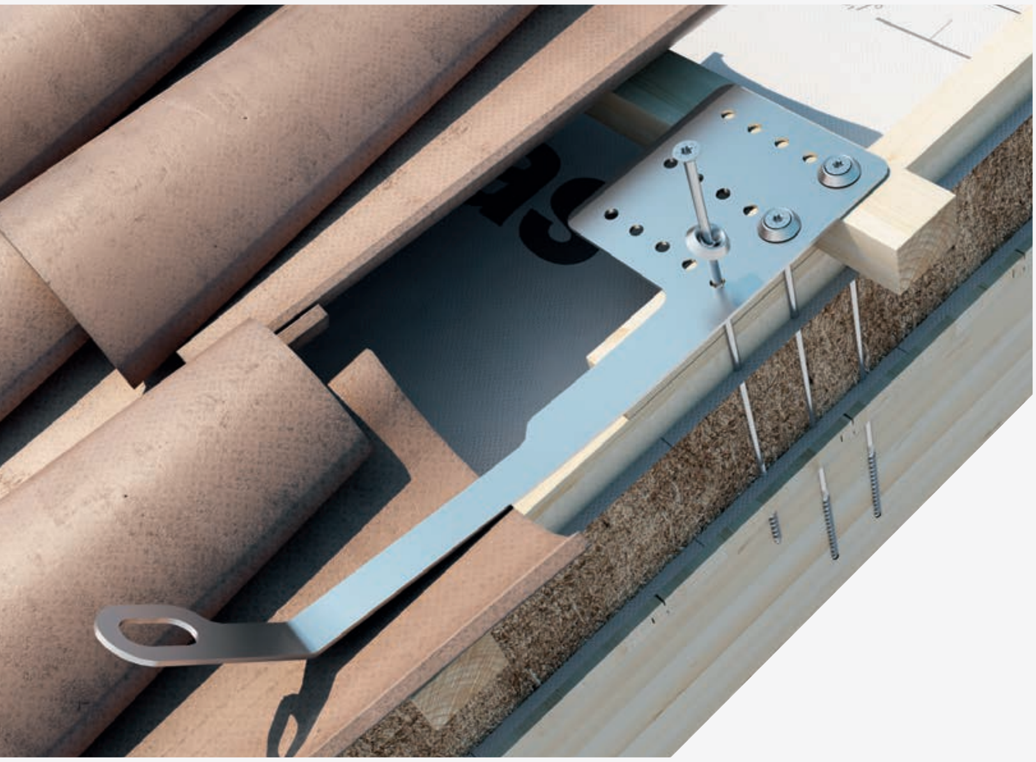
Trivalent Cr$^{3}$+ ichrome coating, replacing hexavalent chrome Cr$^{6}$

### FIELDS OF USE

Solid-wood, glulam, X-Lam, LVL, wood-based panels. Service classes 1 and 2.







## STATIC SAFETY

The screws' fast initial grip makes it possible to create secure structural connections in all assembly conditions

## AESTHETICS

The very sharp underhead ribs guarantee an excellent surface finish

## STEEL – WOOD

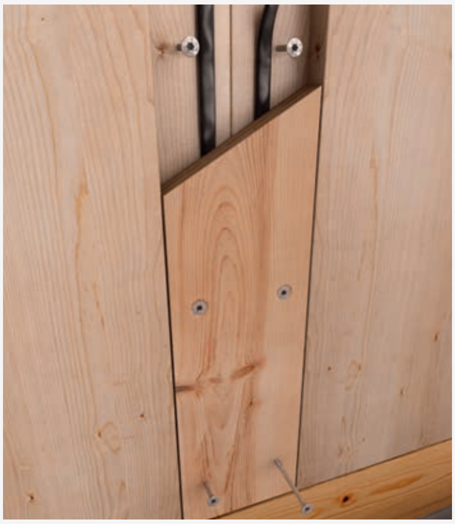
Can also be used with steel plates and hooks, and with turned washers for better performance

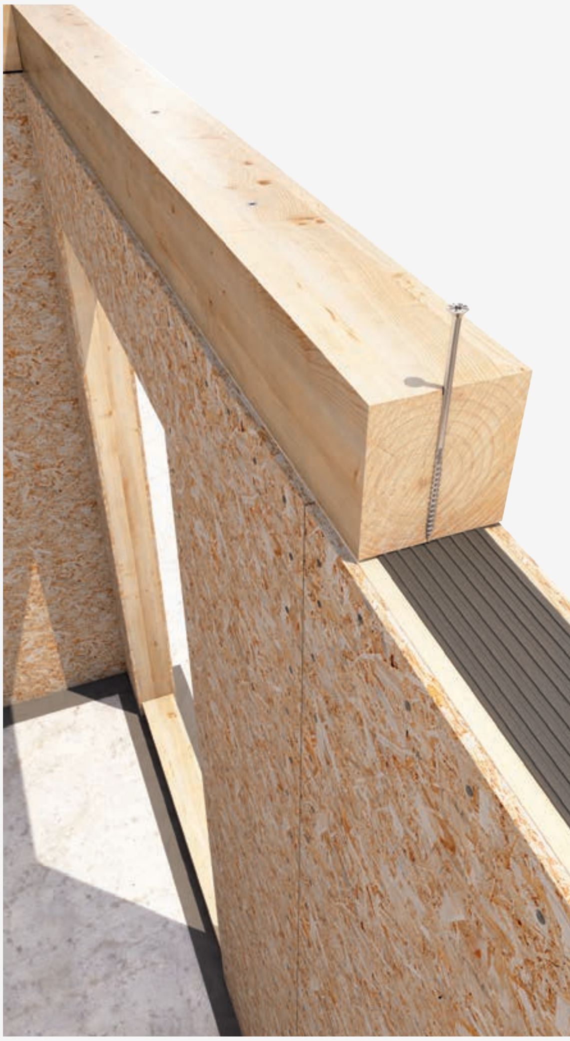
# Applications

Securing X-Lam panels side by side: panel-panel joints

Securing platform beams to the framed panel

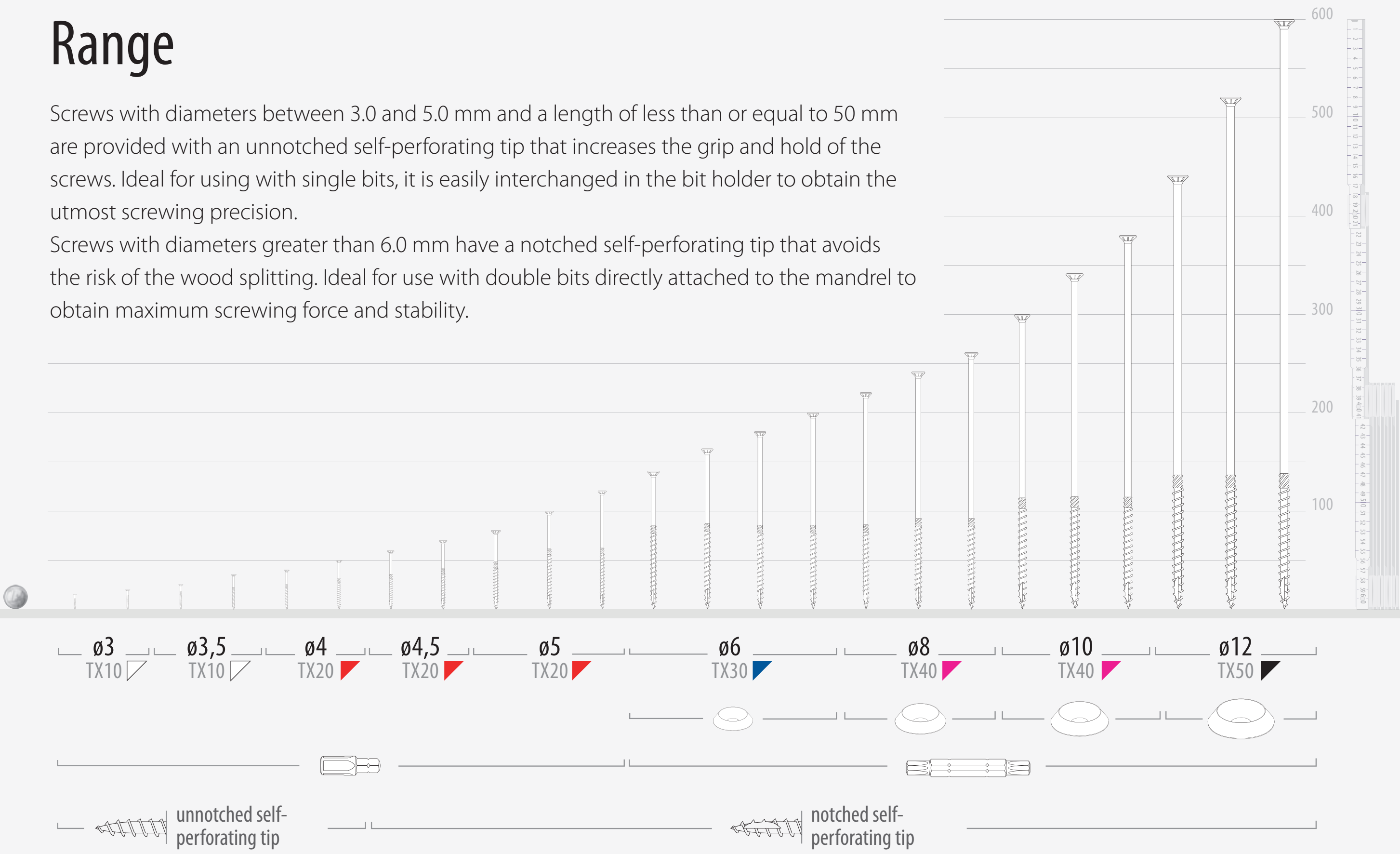
Securing roof rafters to platform beams



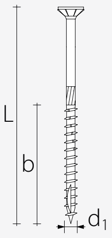


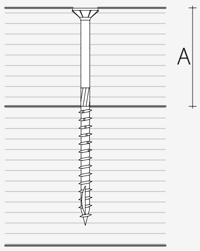
# Range

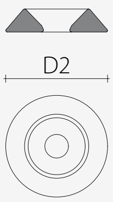
Screws with diameters between 3.0 and 5.0 mm and a length of less than or equal to 50 mm are provided with an unnotched self-perforating tip that increases the grip and hold of the screws. Ideal for using with single bits, it is easily interchanged in the bit holder to obtain the utmost screwing precision.
Screws with diameters greater than 6.0 mm have a notched self-perforating tip that avoids the risk of the wood splitting. Ideal for use with double bits directly attached to the mandrel to obtain maximum screwing force and stability.



# Codes and dimensions




| $d_1$ [mm] | code | L [mm] | b [mm] | A [mm] | pcs/pckg |
|---|---|---|---|---|---|
| **3** *TX10* | **HBS316** | 16 | 10 | 7 | 500 |
| | **HBS320** | 20 | 15 | 10 | |
| | **HBS325** | 25 | 20 | 12 | |
| | **HBS330** | 30 | 25 | 15 | |
| **3,5** *TX10* | **HBS3520** | 20 | 10 | 6 | 500 |
| | **HBS3525** | 25 | 14 | 11 | |
| | **HBS3530** | 30 | 18 | 12 | |
| | **HBS3535** | 35 | 18 | 17 | |
| | **HBS3540** | 40 | 18 | 22 | |
| | **HBS3545** | 45 | 24 | 21 | 200 |
| | **HBS3550** | 50 | 24 | 26 | |
| **4** *TX20* | **HBS430** | 30 | 18 | 12 | 500 |
| | **HBS435** | 35 | 18 | 17 | |
| | **HBS440** | 40 | 24 | 16 | |
| | **HBS445** | 45 | 30 | 15 | 200 |
| | **HBS450** | 50 | 30 | 20 | |
| | **HBS460** | 60 | 35 | 25 | |
| | **HBS470** | 70 | 40 | 30 | |
| | **HBS480** | 80 | 40 | 40 | |
| **4,5** *TX20* | **HBS4540** | 40 | 24 | 16 | 200 |
| | **HBS4545** | 45 | 30 | 15 | |
| | **HBS4550** | 50 | 30 | 20 | |
| | **HBS4560** | 60 | 35 | 25 | |
| | **HBS4570** | 70 | 40 | 30 | |
| | **HBS4580** | 80 | 40 | 40 | 100 |
| **5** *TX20* | **HBS545** | 45 | 24 | 21 | 200 |
| | **HBS550** | 50 | 24 | 26 | |
| | **HBS560** | 60 | 30 | 30 | |
| | **HBS570** | 70 | 35 | 35 | 100 |
| | **HBS580** | 80 | 40 | 40 | |
| | **HBS590** | 90 | 45 | 45 | |
| | **HBS5100** | 100 | 50 | 50 | |
| | **HBS5110** | 110 | 55 | 55 | |
| | **HBS5120** | 120 | 60 | 60 | |
| **6** *TX30* | **HBS640** | 40 | 35 | 8 | 100 |
| | **HBS660** | 60 | 30 | 30 | |
| | **HBS670** | 70 | 40 | 30 | |
| | **HBS680** | 80 | 40 | 40 | |
| | **HBS690** | 90 | 50 | 40 | |
| | **HBS6100** | 100 | 50 | 50 | |
| | **HBS6110** | 110 | 60 | 50 | |
| | **HBS6120** | 120 | 60 | 60 | |
| | **HBS6130** | 130 | 60 | 70 | |
| | **HBS6140** | 140 | 75 | 65 | |
| | **HBS6150** | 150 | 75 | 75 | |
| | **HBS6160** | 160 | 75 | 85 | |
| | **HBS6180** | 180 | 75 | 105 | |
| | **HBS6200** | 200 | 75 | 125 | |
| | **HBS6220** | 220 | 75 | 145 | |
| | **HBS6240** | 240 | 75 | 165 | |
| | **HBS6260** | 260 | 75 | 185 | |
| | **HBS6280** | 280 | 75 | 205 | |
| | **HBS6300** | 300 | 75 | 225 | |

| $d_1$ [mm] | code | L [mm] | b [mm] | A [mm] | pcs/pckg |
|---|---|---|---|---|---|
| **8** *TX40* | **HBS880** | 80 | 52 | 28 | 100 |
| | **HBS8100** | 100 | 52 | 48 | |
| | **HBS8120** | 120 | 60 | 60 | |
| | **HBS8140** | 140 | 60 | 80 | |
| | **HBS8160** | 160 | 80 | 80 | |
| | **HBS8180** | 180 | 80 | 100 | |
| | **HBS8200** | 200 | 80 | 120 | |
| | **HBS8220** | 220 | 80 | 140 | |
| | **HBS8240** | 240 | 80 | 160 | |
| | **HBS8260** | 260 | 80 | 180 | |
| | **HBS8280** | 280 | 80 | 200 | |
| | **HBS8300** | 300 | 100 | 200 | |
| | **HBS8320** | 320 | 100 | 220 | |
| | **HBS8340** | 340 | 100 | 240 | |
| | **HBS8360** | 360 | 100 | 260 | |
| | **HBS8380** | 380 | 100 | 280 | |
| | **HBS8400** | 400 | 100 | 300 | |
| | **HBS8440** | 440 | 100 | 340 | |
| | **HBS8500** | 500 | 100 | 400 | |
| **10** *TX40* | **HBS1080** | 80 | 52 | 28 | 50 |
| | **HBS10100** | 100 | 52 | 48 | |
| | **HBS10120** | 120 | 60 | 60 | |
| | **HBS10140** | 140 | 60 | 80 | |
| | **HBS10160** | 160 | 80 | 80 | |
| | **HBS10180** | 180 | 80 | 100 | |
| | **HBS10200** | 200 | 80 | 120 | |
| | **HBS10220** | 220 | 80 | 140 | |
| | **HBS10240** | 240 | 80 | 160 | |
| | **HBS10260** | 260 | 80 | 180 | |
| | **HBS10280** | 280 | 80 | 200 | |
| | **HBS10300** | 300 | 100 | 200 | |
| | **HBS10320** | 320 | 100 | 220 | |
| | **HBS10340** | 340 | 100 | 240 | |
| | **HBS10360** | 360 | 100 | 260 | |
| | **HBS10380** | 380 | 100 | 280 | |
| | **HBS10400** | 400 | 100 | 300 | |
| **12** *TX50* | **HBS12160** | 160 | 80 | 80 | 25 |
| | **HBS12200** | 200 | 80 | 120 | |
| | **HBS12240** | 240 | 80 | 160 | |
| | **HBS12280** | 280 | 80 | 200 | |
| | **HBS12320** | 320 | 120 | 200 | |
| | **HBS12360** | 360 | 120 | 240 | |
| | **HBS12400** | 400 | 120 | 280 | |
| | **HBS12440** | 440 | 120 | 320 | |
| | **HBS12480** | 480 | 120 | 360 | |
| | **HBS12520** | 520 | 120 | 400 | |
| | **HBS12560** | 560 | 120 | 440 | |
| | **HBS12600** | 600 | 120 | 480 | |

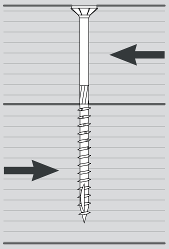
## TURNED WASHER

| code | $d_1$ HBS | D2 [mm] | pcs/pckg |
|---|---|---|---|
| **HUS6** | 6 | 20 | 100 |
| **HUS8** | 8 | 25 | 50 |
| **HUS10** | 10 | 32 | 50 |
| **HUS12** | 12 | 37 | 25 |

# Carpenter statics

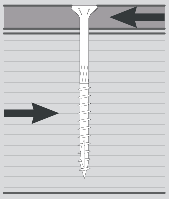
**ALLOWABLE VALUES**
**DIN 1052:1988**

## SHEAR $V_{adm}$



WOOD-WOOD

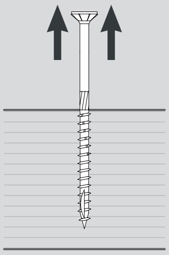
| $d_1$ [mm] | L [mm] | $V_{adm}$ |
|---|---|---|
| 3 | ≥ 30 | 15 kg |
| 3,5 | ≥ 35 | 21 kg |
| 4 | ≥ 45 | 24 kg |
| 4,5 | ≥ 50 | 34 kg |
| 5 | ≥ 50 | 43 kg |
| 6 | ≥ 60 | 61 kg |
| 8 | ≥ 100 | 109 kg |
| 10 | ≥ 100 | 170 kg |
| 12 | ≥ 160 | 245 kg |



STEEL-WOOD

| $d_1$ [mm] | L [mm] | $V_{adm}$ |
|---|---|---|
| 3 | ≥ 16 | 19 kg |
| 3,5 | ≥ 20 | 26 kg |
| 4 | ≥ 30 | 34 kg |
| 4,5 | ≥ 40 | 43 kg |
| 5 | ≥ 45 | 53 kg |
| 6 | ≥ 40 | 77 kg |
| 8 | ≥ 80 | 136 kg |
| 10 | ≥ 80 | 213 kg |
| 12 | ≥ 160 | 306 kg |

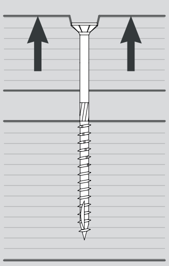
## THREAD WITHDRAWAL $N_{adm}$



| | Length L [mm] | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $d_1$ [mm] | 16 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 60 | 70 | 80 |
| 3 | 15 kg | 23 kg | 30 kg | 38 kg | - | - | - | - | - | - | - |
| 3,5 | - | 18 kg | 25 kg | 32 kg | 32 kg | 32 kg | 42 kg | 42 kg | - | - | - |
| 4 | - | - | - | 36 kg | 36 kg | 48 kg | 60 kg | 60 kg | 70 kg | 80 kg | 80 kg |
| 4,5 | - | - | - | - | - | 54 kg | 68 kg | 68 kg | 79 kg | 90 kg | 90 kg |
| 5 | - | - | - | - | - | - | 60 kg | 60 kg | 75 kg | 88 kg | 100 kg |
| 6 | - | - | - | - | - | 105 kg | - | 135 kg | 90 kg | 120 kg | 120 kg |

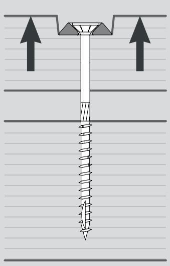
| | Length L [mm] | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $d_1$ [mm] | 80 | 90 | 100 | 110 | 120-140 | 150 | 160-200 | 220-280 | 300 | 320-400 | >400 |
| 5 | 100 kg | 113 kg | 125 kg | 138 kg | 150 kg | - | - | - | - | - | - |
| 6 | 120 kg | 150 kg | 150 kg | 180 kg | 180 kg | 225 kg | 225 kg | 225 kg | 225 kg | - | - |
| 8 | 208 kg | - | 208 kg | - | 240 kg | - | 320 kg | 320 kg | 400 kg | 400 kg | 400 kg |
| 10 | 260 kg | - | 260 kg | - | 300 kg | - | 400 kg | 400 kg | 500 kg | 500 kg | - |
| 12 | - | - | - | - | - | - | 480 kg | 480 kg | - | 720 kg | 720 kg |

## HEAD PENETRATION $N_{adm}$



SCREW

| $d_1$ [mm] | $N_{adm}$ |
|---|---|
| 3 | 14 kg |
| 3,5 | 20 kg |
| 4 | 26 kg |
| 4,5 | 41 kg |
| 5 | 50 kg |
| 6 | 72 kg |
| 8 | 105 kg |
| 10 | 150 kg |
| 12 | 172 kg |



SCREW WITH WASHER

| $d_1$ [mm] | $N_{adm}$ |
|---|---|
| 3 | - |
| 3,5 | - |
| 4 | - |
| 4,5 | - |
| 5 | - |
| 6 | 200 kg |
| 8 | 313 kg |
| 10 | 461 kg |
| 12 | 548 kg |

**100 kg = 1kN**

## 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**

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

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

**EXAMPLE WOOD-WOOD**

HBS 8 x 200 mm

$d_1 = 8$ mm
A = 120 mm

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

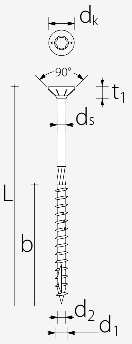
$V_{adm} = \min\{0{,}4 \cdot 120 \cdot 8; 1{,}7 \cdot 8^2\} = \min\{384; 109\} = 109$ kg

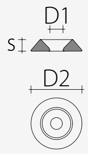
### NOTE

- Allowable values in accordance with DIN 1052:1988.
- The allowable shear values are calculated considering a fixing length of 8 $d_1$
- IThe allowable extraction values are calculated considering the threaded part as being completely inserted into the wood.

# Geometry and minimum distances

## GEOMETRY AND MECHANICAL CHARACTERISTICS

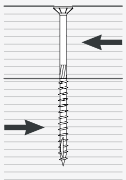


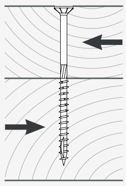

| HBS SCREWS | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Nominal diameter** | **$d_1$ [mm]** | **3** | **3,5** | **4** | **4,5** | **5** | **6** | **8** | **10** | **12** |
| Head diameter | $d_K$ [mm] | 6,00 | 7,00 | 8,00 | 9,00 | 10,00 | 12,00 | 14,50 | 18,25 | 20,75 |
| Tip diameter | $d_2$ [mm] | 2,00 | 2,25 | 2,55 | 2,80 | 3,40 | 3,95 | 5,40 | 6,40 | 6,80 |
| Shank diameter | $d_S$ [mm] | 2,16 | 2,45 | 2,75 | 3,15 | 3,65 | 4,30 | 5,80 | 7,00 | 8,00 |
| Head thickness | $t_1$ [mm] | 2,10 | 2,20 | 2,80 | 2,80 | 3,10 | 4,50 | 4,50 | 5,80 | 7,20 |
| Pre-bored hole diameter | $d_V$ [mm] | 2,0 | 2,0 | 2,5 | 3,0 | 3,0 | 4,0 | 5,0 | 6,0 | 7,0 |
| | | | | | | | | | | |
| Characteristic yield moment | $M_{y,k}$ [Nmm] | 1435,4 | 2143,0 | 3032,6 | 4119,1 | 5417,2 | 9493,7 | 20057,5 | 35829,6 | 47965,9 |
| Characteristic extraction-resistance parameter | $f_{ax,k}$ [N/mm$^2$] | 11,7 | 11,7 | 11,7 | 11,7 | 11,7 | 11,7 | 11,7 | 11,7 | 11,7 |
| Characteristic head-penetration parameter | $f_{head,k}$ [N/mm$^2$] | 10,5 | 10,5 | 10,5 | 10,5 | 10,5 | 10,5 | 10,5 | 10,5 | 10,5 |
| Characteristic tensile strength | $f_{tens,k}$ [kN] | 2,8 | 3,8 | 5,0 | 6,4 | 7,9 | 11,3 | 20,1 | 31,4 | 33,9 |

| HUS TURNED WASHER | | | | | |
|---|---|---|---|---|---|
| **Washer** | | **HUS6** | **HUS8** | **HUS10** | **HUS12** |
| Screw | | HBS Ø6 | HBS Ø8 | HBS Ø10 | HBS Ø12 |
| Internal diameter | D1 [mm] | 7,5 | 8,5 | 11,0 | 14,0 |
| External diameter | D2 [mm] | 20,0 | 25,0 | 32,0 | 37,0 |
| Thickness | S [mm] | 4,0 | 5,0 | 6,0 | 7,5 |

## MINIMUM DISTANCES FOR SHEAR LOADS



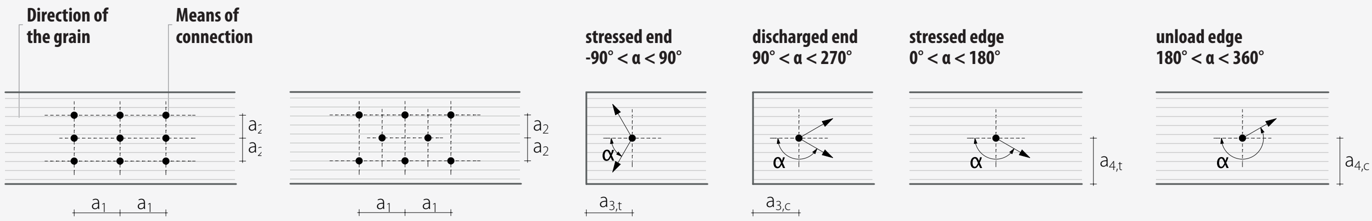
Angle between strength and grain α = 0°



Angle between strength and grain α = 90°

| SCREWS INSERTED WITH PRE-BORED HOLES | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **3** | **3,5** | **4** | **4,5** | **5** | **6** | **8** | **10** | **12** | **3** | **3,5** | **4** | **4,5** | **5** | **6** | **8** | **10** | **12** |
| $a_1$ | [mm] | 15 | 18 | 20 | 23 | 25 | 30 | 40 | 50 | 60 | 12 | 14 | 16 | 18 | 20 | 24 | 32 | 40 | 48 |
| $a_2$ | [mm] | 9 | 11 | 12 | 14 | 15 | 18 | 24 | 30 | 36 | 12 | 14 | 16 | 18 | 20 | 24 | 32 | 40 | 48 |
| $a_{3,t}$ | [mm] | 36 | 42 | 48 | 54 | 60 | 72 | 96 | 120 | 144 | 21 | 25 | 28 | 32 | 35 | 42 | 56 | 70 | 84 |
| $a_{3,c}$ | [mm] | 21 | 25 | 28 | 32 | 35 | 42 | 56 | 70 | 84 | 21 | 25 | 28 | 32 | 35 | 42 | 56 | 70 | 84 |
| $a_{4,t}$ | [mm] | 9 | 11 | 12 | 14 | 15 | 18 | 24 | 30 | 36 | 15 | 18 | 20 | 23 | 35 | 42 | 56 | 70 | 84 |
| $a_{4,c}$ | [mm] | 9 | 11 | 12 | 14 | 15 | 18 | 24 | 30 | 36 | 9 | 11 | 12 | 14 | 15 | 18 | 24 | 30 | 36 |

| SCREWS INSERTED WITHOUT PRE-BORED HOLES | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **3** | **3,5** | **4** | **4,5** | **5** | **6** | **8** | **10** | **12** | **3** | **3,5** | **4** | **4,5** | **5** | **6** | **8** | **10** | **12** |
| $a_1$ | [mm] | 30 | 35 | 40 | 45 | 60 | 72 | 96 | 120 | 144 | 15 | 18 | 20 | 23 | 25 | 30 | 40 | 50 | 60 |
| $a_2$ | [mm] | 15 | 18 | 20 | 23 | 25 | 30 | 40 | 50 | 60 | 15 | 18 | 20 | 23 | 25 | 30 | 40 | 50 | 60 |
| $a_{3,t}$ | [mm] | 45 | 53 | 60 | 68 | 75 | 90 | 120 | 150 | 180 | 30 | 35 | 40 | 45 | 50 | 60 | 80 | 100 | 120 |
| $a_{3,c}$ | [mm] | 30 | 35 | 40 | 45 | 50 | 60 | 80 | 100 | 120 | 30 | 35 | 40 | 45 | 50 | 60 | 80 | 100 | 120 |
| $a_{4,t}$ | [mm] | 15 | 18 | 20 | 23 | 25 | 30 | 40 | 50 | 60 | 21 | 25 | 28 | 32 | 50 | 60 | 80 | 100 | 120 |
| $a_{4,c}$ | [mm] | 15 | 18 | 20 | 23 | 25 | 30 | 40 | 50 | 60 | 15 | 18 | 20 | 23 | 25 | 30 | 40 | 50 | 60 |

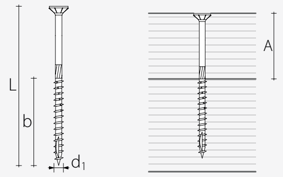
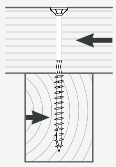
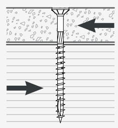
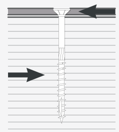
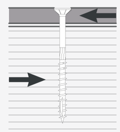
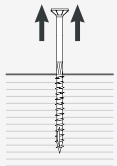
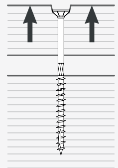



### NOTE

- The minimum distances are in accordance with the EN 1995:2008 standard, according to ETA-11/0030, considering a mass density of the wood elements equal to $\rho_k \leq 420$ 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.

# Designer statics

CHARACTERISTIC VALUES
EN 1995:2008

| | | | | SHEAR | | | | | | | TRACTION | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| geometry | | | | wood-wood | panel-wood (1) | | thin steel-wood plate (2) | | thick steel-wood plate (3) | | thread withdrawal (4) | head penetration (5) |
|  | | | |  |  | |  | |  | |  |  |
| $d_1$ [mm] | L [mm] | b [mm] | A [mm] | $R_{V,k}$ [kN] | | $R_{V,k}$ [kN] | | $R_{V,k}$ [kN] | | $R_{V,k}$ [kN] | $R_{ax,k}$ [kN] | $R_{head,k}$ [kN] |
| 3 | 16 (6) | 10 | 7 | 0,31 | $S_{PAN}$ = 12 mm | 0,27 | $S_{PLATE} \leq$ 1,5 mm | 0,39 | $S_{PLATE} \geq$ 3 mm | 0,60 | 0,37 | 0,40 |
| | 20 | 15 | 10 | 0,37 | | 0,46 | | 0,50 | | 0,73 | 0,56 | 0,40 |
| | 25 | 20 | 12 | 0,45 | | 0,53 | | 0,63 | | 0,89 | 0,75 | 0,40 |
| | 30 | 25 | 15 | 0,52 | | 0,61 | | 0,74 | | 0,95 | 0,94 | 0,40 |
| 3,5 | 20 (6) | 10 | 10 | 0,42 | $S_{PAN}$ = 12 mm | 0,54 | $S_{PLATE} \leq$ 1,8 mm | 0,55 | $S_{PLATE} \geq$ 3,5 mm | 0,80 | 0,44 | 0,55 |
| | 25 | 14 | 11 | 0,53 | | 0,60 | | 0,70 | | 0,96 | 0,61 | 0,55 |
| | 30 | 18 | 12 | 0,62 | | 0,68 | | 0,85 | | 1,12 | 0,79 | 0,55 |
| | 35 | 18 | 17 | 0,68 | | 0,72 | | 0,85 | | 1,12 | 0,79 | 0,55 |
| | 40 | 18 | 22 | 0,73 | | 0,72 | | 0,85 | | 1,12 | 0,79 | 0,55 |
| | 45 | 24 | 21 | 0,79 | | 0,72 | | 0,91 | | 1,18 | 1,05 | 0,55 |
| | 50 | 24 | 26 | 0,79 | | 0,72 | | 0,91 | | 1,18 | 1,05 | 0,55 |
| 4 | 30 | 16 | 14 | 0,69 | $S_{PAN}$ = 12 mm | 0,76 | $S_{PLATE} \leq$ 2 mm | 0,92 | $S_{PLATE} \geq$ 4 mm | 1,25 | 0,80 | 0,72 |
| | 35 | 16 | 19 | 0,78 | | 0,84 | | 1,01 | | 1,35 | 0,80 | 0,72 |
| | 40 | 24 | 16 | 0,82 | | 0,84 | | 1,11 | | 1,45 | 1,20 | 0,72 |
| | 45 | 24 | 21 | 0,93 | | 0,84 | | 1,11 | | 1,45 | 1,20 | 0,72 |
| | 50 | 24 | 26 | 0,99 | | 0,84 | | 1,11 | | 1,45 | 1,20 | 0,72 |
| | 60 | 30 | 30 | 0,99 | | 0,84 | | 1,19 | | 1,52 | 1,50 | 0,72 |
| | 70 | 35 | 35 | 0,99 | | 0,84 | | 1,25 | | 1,59 | 1,75 | 0,72 |
| | 80 | 40 | 40 | 0,99 | | 0,84 | | 1,31 | | 1,65 | 2,00 | 0,72 |
| 4,5 | 40 | 24 | 16 | 0,97 | $S_{PAN}$ = 15 mm | 1,06 | $S_{PLATE} \leq$ 2,3 mm | 1,32 | $S_{PLATE} \geq$ 4,5 mm | 1,73 | 1,35 | 0,91 |
| | 45 | 24 | 21 | 1,06 | | 1,06 | | 1,32 | | 1,73 | 1,35 | 0,91 |
| | 50 | 24 | 26 | 1,15 | | 1,06 | | 1,32 | | 1,73 | 1,35 | 0,91 |
| | 60 | 30 | 30 | 1,21 | | 1,06 | | 1,41 | | 1,82 | 1,69 | 0,91 |
| | 70 | 35 | 35 | 1,21 | | 1,06 | | 1,48 | | 1,89 | 1,97 | 0,91 |
| | 80 | 40 | 40 | 1,21 | | 1,06 | | 1,55 | | 1,96 | 2,25 | 0,91 |
| 5 | 40 | 20 | 20 | 1,08 | $S_{PAN}$ = 15 mm | 1,16 | $S_{PLATE} \leq$ 2,5 mm | 1,44 | $S_{PLATE} \geq$ 5 mm | 1,92 | 1,25 | 1,12 |
| | 45 | 24 | 21 | 1,18 | | 1,20 | | 1,55 | | 2,03 | 1,50 | 1,12 |
| | 50 | 24 | 26 | 1,28 | | 1,20 | | 1,55 | | 2,03 | 1,50 | 1,12 |
| | 60 | 30 | 30 | 1,45 | | 1,20 | | 1,64 | | 2,13 | 1,87 | 1,12 |
| | 70 | 35 | 35 | 1,45 | | 1,20 | | 1,72 | | 2,21 | 2,19 | 1,12 |
| | 80 | 40 | 40 | 1,45 | | 1,20 | | 1,80 | | 2,28 | 2,50 | 1,12 |
| | 90 | 45 | 45 | 1,45 | | 1,20 | | 1,88 | | 2,36 | 2,81 | 1,12 |
| | 100 | 50 | 50 | 1,45 | | 1,20 | | 1,95 | | 2,44 | 3,12 | 1,12 |
| | 110 | 55 | 55 | 1,45 | | 1,20 | | 2,03 | | 2,52 | 3,44 | 1,12 |
| | 120 | 50 | 70 | 1,45 | | 1,20 | | 1,95 | | 2,44 | 3,12 | 1,12 |

## 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 $\rho_k$ = 380 kg/m$^3$. Characteristic resistances can also be considered as valid for larger densities, for the purposes of safety.
- 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)
- The characteristic resistances were calculated using solid wood or glulam. In the case of joints with X-Lam elements, the resistance values may be different and should be calculated on the basis of the characteristics of the panel and the connection configuration.

# Designer statics

CHARACTERISTIC VALUES
EN 1995:2008


| geometry | | | | SHEAR wood-wood | SHEAR panel-wood (1) | SHEAR thin steel-wood plate (2) | SHEAR thick steel-wood plate (3) | TRACTION thread withdrawal (4) | TRACTION head penetration (5) |
|---|---|---|---|---|---|---|---|---|---|
| $d_1$ [mm] | L [mm] | b [mm] | A [mm] | $R_{V,k}$ [kN] | $R_{V,k}$ [kN] ($S_{PAN}$ = 15 mm) | $R_{V,k}$ [kN] ($S_{PLATE} \leq 3$ mm) | $R_{V,k}$ [kN] ($S_{PLATE} \geq 6$ mm) | $R_{ax,k}$ [kN] | $R_{head,k}$ [kN] |
| 6 | **40** | 35 | 8 | 0,87 | 1,35 | 1,62 | 2,58 | 2,62 | 1,61 |
| | **50** | 45 | 15 | 1,52 | 1,55 | 2,05 | 3,13 | 3,37 | 1,61 |
| | **60** | 30 | 30 | 1,76 | 1,55 | 2,22 | 2,90 | 2,25 | 1,61 |
| | **70** | 40 | 30 | 1,86 | 1,55 | 2,41 | 3,09 | 3,00 | 1,61 |
| | **80** | 40 | 40 | 2,06 | 1,55 | 2,41 | 3,09 | 3,00 | 1,61 |
| | **90** | 50 | 40 | 2,06 | 1,55 | 2,59 | 3,28 | 3,75 | 1,61 |
| | **100** | 50 | 50 | 2,06 | 1,55 | 2,59 | 3,28 | 3,75 | 1,61 |
| | **110** | 60 | 50 | 2,06 | 1,55 | 2,78 | 3,47 | 4,50 | 1,61 |
| | **120** | 60 | 60 | 2,06 | 1,55 | 2,78 | 3,47 | 4,50 | 1,61 |
| | **130** | 60 | 70 | 2,06 | 1,55 | 2,78 | 3,47 | 4,50 | 1,61 |
| | **140** | 75 | 65 | 2,06 | 1,55 | 3,06 | 3,75 | 5,62 | 1,61 |
| | **150** | 75 | 75 | 2,06 | 1,55 | 3,06 | 3,75 | 5,62 | 1,61 |
| | **160** | 75 | 85 | 2,06 | 1,55 | 3,06 | 3,75 | 5,62 | 1,61 |
| | **180** | 75 | 105 | 2,06 | 1,55 | 3,06 | 3,75 | 5,62 | 1,61 |
| | **200** | 75 | 125 | 2,06 | 1,55 | 3,06 | 3,75 | 5,62 | 1,61 |
| | **220** | 75 | 145 | 2,06 | 1,55 | 3,06 | 3,75 | 5,62 | 1,61 |
| | **240** | 75 | 165 | 2,06 | 1,55 | 3,06 | 3,75 | 5,62 | 1,61 |
| | **260** | 75 | 185 | 2,06 | 1,55 | 3,06 | 3,75 | 5,62 | 1,61 |
| | **280** | 75 | 205 | 2,06 | 1,55 | 3,06 | 3,75 | 5,62 | 1,61 |
| | **300** | 75 | 225 | 2,06 | 1,55 | 3,06 | 3,75 | 5,62 | 1,61 |

## NOTE

(1) The shear characteristic resistances are calculated considering an OSB panel or particle board with a $S_{PAN}$ thickness.

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

(3) The shear characteristic resistances are calculated considering the case of a thick plate ($S_{PLATE} \geq d_1$).

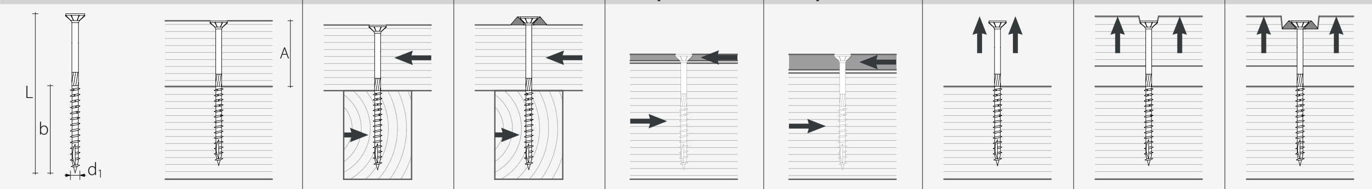
(4) The axial thread-extraction resistance was calculated considering a 90° angle between the grain and the connector and for a fixing length of b.

(5) 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.

(6) This screw has not been granted the CE marking.

# Designer statics

CHARACTERISTIC VALUES
EN 1995:2008




| | | | | SHEAR | | | | | | TRACTION | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| geometry | | | | wood-wood | wood-wood with washer | thin steel-wood plate [1] | | thick steel-wood plate [2] | | thread withdrawal [3] | head penetration [4] | head penetration with washer [4] |
| $d_1$ [mm] | L [mm] | b [mm] | A [mm] | $R_{V,k}$ [kN] | $R_{V,k}$ [kN] | | $R_{V,k}$ [kN] | | $R_{V,k}$ [kN] | $R_{ax,k}$ [kN] | $R_{head,k}$ [kN] | $R_{head,k}$ [kN] |
| 6 | **40** | 35 | 8 | 0,87 | 0,87 | $S_{PLATE} \le 3$ mm | 1,62 | $S_{PLATE} \ge 6$ mm | 2,58 | 2,62 | 1,61 | 4,49 |
| | **50** | 45 | 15 | 1,52 | 1,64 | | 2,05 | | 3,13 | 3,37 | 1,61 | 4,49 |
| | **60** | 30 | 30 | 1,76 | 1,92 | | 2,22 | | 2,90 | 2,25 | 1,61 | 4,49 |
| | **70** | 40 | 30 | 1,86 | 2,21 | | 2,41 | | 3,09 | 3,00 | 1,61 | 4,49 |
| | **80** | 40 | 40 | 2,06 | 2,41 | | 2,41 | | 3,09 | 3,00 | 1,61 | 4,49 |
| | **90** | 50 | 40 | 2,06 | 2,59 | | 2,59 | | 3,28 | 3,75 | 1,61 | 4,49 |
| | **100** | 50 | 50 | 2,06 | 2,59 | | 2,59 | | 3,28 | 3,75 | 1,61 | 4,49 |
| | **110** | 60 | 50 | 2,06 | 2,78 | | 2,78 | | 3,47 | 4,50 | 1,61 | 4,49 |
| | **120** | 60 | 60 | 2,06 | 2,78 | | 2,78 | | 3,47 | 4,50 | 1,61 | 4,49 |
| | **130** | 60 | 70 | 2,06 | 2,78 | | 2,78 | | 3,47 | 4,50 | 1,61 | 4,49 |
| | **140** | 75 | 65 | 2,06 | 2,78 | | 3,06 | | 3,75 | 5,62 | 1,61 | 4,49 |
| | **150** | 75 | 75 | 2,06 | 2,78 | | 3,06 | | 3,75 | 5,62 | 1,61 | 4,49 |
| | **160** | 75 | 85 | 2,06 | 2,78 | | 3,06 | | 3,75 | 5,62 | 1,61 | 4,49 |
| | **180** | 75 | 105 | 2,06 | 2,78 | | 3,06 | | 3,75 | 5,62 | 1,61 | 4,49 |
| | **200** | 75 | 125 | 2,06 | 2,78 | | 3,06 | | 3,75 | 5,62 | 1,61 | 4,49 |
| | **220** | 75 | 145 | 2,06 | 2,78 | | 3,06 | | 3,75 | 5,62 | 1,61 | 4,49 |
| | **240** | 75 | 165 | 2,06 | 2,78 | | 3,06 | | 3,75 | 5,62 | 1,61 | 4,49 |
| | **260** | 75 | 185 | 2,06 | 2,78 | | 3,06 | | 3,75 | 5,62 | 1,61 | 4,49 |
| | **280** | 75 | 205 | 2,06 | 2,78 | | 3,06 | | 3,75 | 5,62 | 1,61 | 4,49 |
| | **300** | 75 | 225 | 2,06 | 2,78 | | 3,06 | | 3,75 | 5,62 | 1,61 | 4,49 |
| 8 | **80** | 52 | 28 | 2,57 | 3,28 | $S_{PLATE} \le 4$ mm | 3,96 | $S_{PLATE} \ge 8$ mm | 5,06 | 5,20 | 2,36 | 7,01 |
| | **100** | 52 | 48 | 3,25 | 3,96 | | 3,96 | | 5,06 | 5,20 | 2,36 | 7,01 |
| | **120** | 60 | 60 | 3,25 | 4,16 | | 4,16 | | 5,26 | 6,00 | 2,36 | 7,01 |
| | **140** | 60 | 80 | 3,25 | 4,16 | | 4,16 | | 5,26 | 6,00 | 2,36 | 7,01 |
| | **160** | 80 | 80 | 3,25 | 4,41 | | 4,66 | | 5,76 | 8,00 | 2,36 | 7,01 |
| | **180** | 80 | 100 | 3,25 | 4,41 | | 4,66 | | 5,76 | 8,00 | 2,36 | 7,01 |
| | **200** | 80 | 120 | 3,25 | 4,41 | | 4,66 | | 5,76 | 8,00 | 2,36 | 7,01 |
| | **220** | 80 | 140 | 3,25 | 4,41 | | 4,66 | | 5,76 | 8,00 | 2,36 | 7,01 |
| | **240** | 80 | 160 | 3,25 | 4,41 | | 4,66 | | 5,76 | 8,00 | 2,36 | 7,01 |
| | **260** | 80 | 180 | 3,25 | 4,41 | | 4,66 | | 5,76 | 8,00 | 2,36 | 7,01 |
| | **280** | 80 | 200 | 3,25 | 4,41 | | 4,66 | | 5,76 | 8,00 | 2,36 | 7,01 |
| | **300** | 100 | 200 | 3,25 | 4,41 | | 5,16 | | 6,26 | 10,00 | 2,36 | 7,01 |
| | **320** | 100 | 220 | 3,25 | 4,41 | | 5,16 | | 6,26 | 10,00 | 2,36 | 7,01 |
| | **340** | 100 | 240 | 3,25 | 4,41 | | 5,16 | | 6,26 | 10,00 | 2,36 | 7,01 |
| | **360** | 100 | 260 | 3,25 | 4,41 | | 5,16 | | 6,26 | 10,00 | 2,36 | 7,01 |
| | **380** | 100 | 280 | 3,25 | 4,41 | | 5,16 | | 6,26 | 10,00 | 2,36 | 7,01 |
| | **400** | 100 | 300 | 3,25 | 4,41 | | 5,16 | | 6,26 | 10,00 | 2,36 | 7,01 |
| | **440** | 100 | 340 | 3,25 | 4,41 | | 5,16 | | 6,26 | 10,00 | 2,36 | 7,01 |
| | **500** | 100 | 400 | 3,25 | 4,41 | | 5,16 | | 6,26 | 10,00 | 2,36 | 7,01 |

## 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:

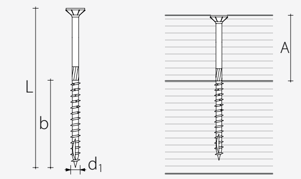
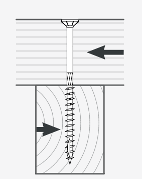
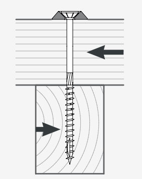
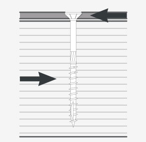
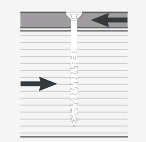
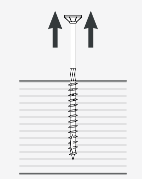
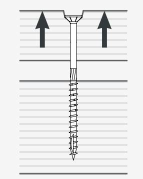
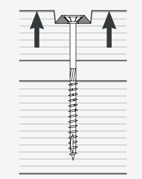
$$R_d = \frac{R_k \cdot k_{mod}}{\gamma_m}$$

The coefficients $\gamma_m$ and $k_{mod}$ should be taken based 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 $\rho_k = 380$ kg/m³. Characteristic resistances can also be considered as valid for larger densities, for the purposes of safety.
- 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)
- The characteristic resistances were calculated using solid wood or glulam. In the case of joints with X-Lam elements, the resistance values may be different and should be calculated on the basis of the characteristics of the panel and the connection configuration.

# Designer statics

CHARACTERISTIC VALUES
EN 1995:2008

| | | | | SHEAR | | | | TRACTION | | |
|---|---|---|---|---|---|---|---|---|---|---|
| geometry | | | | wood-wood | wood-wood with washer | thin steel-wood plate [(1)] | thick steel-wood plate [(2)] | thread withdrawal [(3)] | head penetration [(4)] | head penetration with washer [(4)] |
|   | | | |  |  |  |  |  |  |  |
| $d_1$ [mm] | L [mm] | b [mm] | A [mm] | $R_{V,k}$ [kN] | $R_{V,k}$ [kN] | $R_{V,k}$ [kN] | $R_{V,k}$ [kN] | $R_{ax,k}$ [kN] | $R_{head,k}$ [kN] | $R_{head,k}$ [kN] |
| 10 | **80** | 52 | 28 | 3,60 | 4,29 | 4,69 | 6,86 | 6,50 | 3,73 | 11,48 |
| | **100** | 52 | 48 | 4,17 | 4,86 | 5,47 | 7,07 | 6,50 | 3,73 | 11,48 |
| | **120** | 60 | 60 | 4,78 | 5,72 | 5,72 | 7,31 | 7,50 | 3,73 | 11,48 |
| | **140** | 60 | 80 | 4,78 | 5,72 | 5,72 | 7,31 | 7,50 | 3,73 | 11,48 |
| | **160** | 80 | 80 | 4,78 | 6,35 | 6,35 | 7,94 | 10,00 | 3,73 | 11,48 |
| | **180** | 80 | 100 | 4,78 | 6,35 | 6,35 | 7,94 | 10,00 | 3,73 | 11,48 |
| | **200** | 80 | 120 | 4,78 | 6,35 | 6,35 | 7,94 | 10,00 | 3,73 | 11,48 |
| | **220** | 80 | 140 | 4,78 | 6,35 | 6,35 | 7,94 | 10,00 | 3,73 | 11,48 |
| | **240** | 80 | 160 | 4,78 | 6,35 | $S_{PLATE} \le 5$ mm 6,35 | $S_{PLATE} \ge 10$ mm 7,94 | 10,00 | 3,73 | 11,48 |
| | **260** | 80 | 180 | 4,78 | 6,35 | 6,35 | 7,94 | 10,00 | 3,73 | 11,48 |
| | **280** | 80 | 200 | 4,78 | 6,35 | 6,35 | 7,94 | 10,00 | 3,73 | 11,48 |
| | **300** | 100 | 200 | 4,78 | 6,72 | 6,97 | 8,56 | 12,50 | 3,73 | 11,48 |
| | **320** | 100 | 220 | 4,78 | 6,72 | 6,97 | 8,56 | 12,50 | 3,73 | 11,48 |
| | **340** | 100 | 240 | 4,78 | 6,72 | 6,97 | 8,56 | 12,50 | 3,73 | 11,48 |
| | **360** | 100 | 260 | 4,78 | 6,72 | 6,97 | 8,56 | 12,50 | 3,73 | 11,48 |
| | **380** | 100 | 280 | 4,78 | 6,72 | 6,97 | 8,56 | 12,50 | 3,73 | 11,48 |
| | **400** | 100 | 300 | 4,78 | 6,72 | 6,97 | 8,56 | 12,50 | 3,73 | 11,48 |
| 12 | **160** | 80 | 80 | 5,95 | 7,74 | 7,74 | 9,71 | 12,00 | 4,83 | 15,35 |
| | **200** | 80 | 120 | 5,95 | 7,74 | 7,74 | 9,71 | 12,00 | 4,83 | 15,35 |
| | **240** | 80 | 160 | 5,95 | 7,74 | 7,74 | 9,71 | 12,00 | 4,83 | 15,35 |
| | **280** | 80 | 200 | 5,95 | 7,74 | 7,74 | 9,71 | 12,00 | 4,83 | 15,35 |
| | **320** | 120 | 200 | 5,95 | 8,58 | 9,24 | 11,21 | 17,99 | 4,83 | 15,35 |
| | **360** | 120 | 240 | 5,95 | 8,58 | $S_{PLATE} \le 6$ mm 9,24 | $S_{PLATE} \ge 12$ mm 11,21 | 17,99 | 4,83 | 15,35 |
| | **400** | 120 | 280 | 5,95 | 8,58 | 9,24 | 11,21 | 17,99 | 4,83 | 15,35 |
| | **440** | 120 | 320 | 5,95 | 8,58 | 9,24 | 11,21 | 17,99 | 4,83 | 15,35 |
| | **480** | 120 | 360 | 5,95 | 8,58 | 9,24 | 11,21 | 17,99 | 4,83 | 15,35 |
| | **520** | 120 | 400 | 5,95 | 8,58 | 9,24 | 11,21 | 17,99 | 4,83 | 15,35 |
| | **560** | 120 | 440 | 5,95 | 8,58 | 9,24 | 11,21 | 17,99 | 4,83 | 15,35 |
| | **600** | 120 | 480 | 5,95 | 8,58 | 9,24 | 11,21 | 17,99 | 4,83 | 15,35 |

**NOTE**

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

(2) The shear characteristic resistances are calculated considering the case of a thick plate ($S_{PLATE} \ge d_1$).

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

(4) The axial resistance to head penetration, with and without a washer, 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.

# Calculation example: valley jack rafter joint

## CONNECTION WOOD-WOOD / SINGLE SHEAR

### ELEMENT 1 [1]

B1 = 120 mm
H1 = 160 mm
Slope 30% (16,7°)
Wood GL24h


### ELEMENT 2 [2]

B2 = 160 mm
H2 = 240 mm
Slope 21% (12,0°)
Wood GL24h

### PROJECT DATA

$F_{v,Rd}$ = 7,17 kN
Service class = 1
Load duration = short

### SCREW SELECTION

**HBS = 10 x 180 mm**
Pre-bored hole = no
Washer = no

### CONNECTION GEOMETRY

$t_1$ = 60 mm
$\alpha_1$ = 73,3° (90° - 16,7°)
$t_2$ = 120 mm (fixing length in element 2)
$\alpha_2$ = 78,0° (90° - 12,0°)

### SHEAR RESISTANCE CALCULATION (EN 1995:2008 e ETA-11/0030)

$d_1$ = 10,0 mm
$f_{h,1,k}$ = 15,62 N/mm²
$f_{h,2,k}$ = 15,62 N/mm²
$\beta$ = 1,00

$M_{y,k}$ = 35829,7 Nmm

$R_{ax,Rk}$ = min {resistance to thread withdrawal; resistance to head penetration} = min {$R_{ax,Rk}$ ; $R_{head,Rk}$} = 3,74 kN
$R_{ax,Rk}$/4 = 0,93 kN (cable effect)

$$R_{v,Rk} = min \begin{cases} f_{h,1,k}\, t_1\, d & (a) = 9{,}37\ kN \\ f_{h,2,k}\, t_2\, d & (b) = 18{,}74\ kN \\ \frac{f_{h,1,k} t_1 d}{1+\beta}\left[\sqrt{\beta+2\beta^2\left[1+\frac{t_2}{t_1}+\left(\frac{t_2}{t_1}\right)^2\right]+\beta^3\left(\frac{t_2}{t_1}\right)^2}-\beta\left(1+\frac{t_2}{t_1}\right)\right]+\frac{R_{ax,Rk}}{4} & (c) = 7{,}30\ kN \\ 1{,}05\,\frac{f_{h,1,k}\, t_1\, d}{2+\beta}\left[\sqrt{2\beta(1+\beta)+\frac{4\beta(2+\beta)M_{y,Rk}}{f_{h,1,k}\, d\, t_1^2}}-\beta\right]+\frac{R_{ax,Rk}}{4} & (d) = 4{,}81\ kN \\ 1{,}05\,\frac{f_{h,1,k}\, t_2\, d}{1+2\beta}\left[\sqrt{2\beta^2(1+\beta)+\frac{4\beta(1+2\beta)M_{y,Rk}}{f_{h,1,k}\, d\, t_2^2}}-\beta\right]+\frac{R_{ax,Rk}}{4} & (e) = 7{,}80\ kN \\ 1{,}15\sqrt{\frac{2\beta}{1+\beta}}\sqrt{2\,M_{y,Rk}\, f_{h,1,k}\, d}+\frac{R_{ax,Rk}}{4} & (f) = 4{,}78\ kN \end{cases}$$

**$R_{v,Rk}$ = 4,78 kN**

$$R_{v,Rd} = \frac{R_{v,Rk} \cdot k_{mod}}{\gamma_m}$$

EN 1995:2008
$k_{mod}$ = 0,9
$\gamma_m$ = 1,3
**$R_{v,Rd}$ = 3,31 kN**

Minimum number of screws
$F_{v,Rd}$ / $R_{v,Rd}$ = 2,17

Italia - NTC 2008
$k_{mod}$ = 0,9
$\gamma_m$ = 1,5
**$R_{v,Rd}$ = 2,87 kN**

Minimum number of screws
$F_{v,Rd}$ / $R_{v,Rd}$ = 2,50

3 nef screws are usedi $n_{ef,SHEAR}$ 3 (screws perpendicular to the grain)
$n_{ef,TRAZIONE}$ $3^{0,9}$ = 2,69

Recalculating the shear resistance, for the cable effect, a tensile strength for the individual screws is assumed at:

$R_{ax,Rk}$ = 3,74 · 2,69 / 3 = 3,35 kN (head penetration)
$R_{ax,Rk}$/ 4 = 0,84 kN (cable effect)

Individual screw shear resistance:

**$R_{v,Rk}$ = 4,68 kN**

$$R_{v,Rd} \geq F_{v,Rd}$$

EN 1995:2008
$R_{v,Rd}$ = 3,24 kN

**Connection shear resistance:**

$R_{v,Rd}$ = 3,24 x 3 = **9,73 kN** > 7,17 kN **OK**

Italia - NTC 2008
$R_{v,Rd}$ = 2,81 kN

**Connection shear resistance:**

$R_{v,Rd}$ = 2,81 x 3 = **8,43 kN** > 7,17 kN **OK**

# Calculation example: valley jack rafter joint with myProject



## CONNECTION WOOD-WOOD / SINGLE SHEAR

### ELEMENT 1 [1]

B1 = 120 mm
H1 = 160 mm
Slope 30% (16,7°)
Wood GL24h


### ELEMENT 2 [2]

B2 = 160 mm
H2 = 240 mm
Slope 21% (12,0°)
Wood GL24h

### PROJECT DATA

$F_{v,Rd}$ = 7,17 kN
Service class = 1
Load duration = short

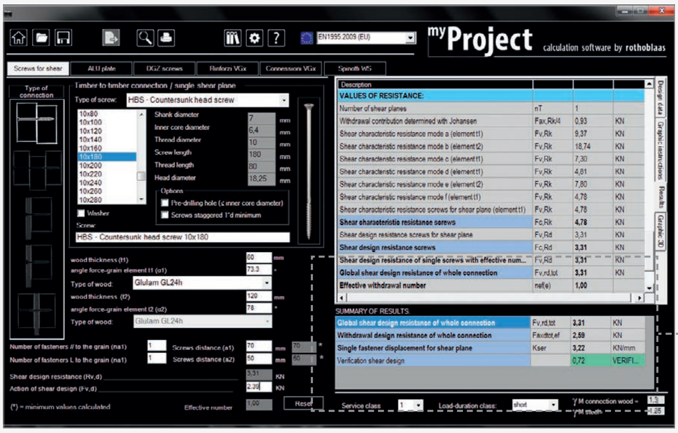
### SCREW SELECTION

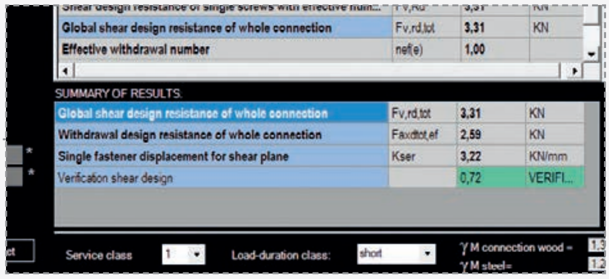
**HBS = 10 x 180 mm**
Pre-bored hole = no
Washer = no

### CONNECTION GEOMETRY

$t_1$ = 60 mm
$\alpha_1$ = 73,3° (90° - 16,7°)
$t_2$ = 120 mm
$\alpha_2$ = 78,0° (90° - 12,0°)

### SHEAR RESISTANCE CALCULATION WITH myProject SOFTWARE (EN 1995:2008 e ETA-11/0030)




### CALCULATION REPORT