

### VYŠŠIA ODOLNOSŤ

Vynikajúca odolnosť ocele proti prasknutiu a oteru ( $f_{y,k} = 1000 \text{ N/mm}^2$ ). Veľmi vysoká odolnosť v krútení  $f_{tor,k}$  pre bezpečnejšie skrútkovanie.

### KONŠTRUKČNÉ POUŽITIE

Homologovaná pre konštrukčné použitie namáhané v akomkoľvek smere vzhľadom k vláknu ( $\alpha = 0^\circ - 90^\circ$ ). Asymetrický „dáždnikový“ závit pre vyššiu schopnosť vniknutia do dreva.

### ŤAŽNOSŤ

O  $20^\circ$  širší uhol ohybu vzhľadom k norme, certifikovaný podľa ETA-11/0030. Opakované skúšky SEISMIC-REV podľa EN 12512. Seizmický výkon skúšaný podľa EN 14592.

### CHROMIUM VI FREE

Bez šesťmocného chrómu. Zhoda s najprísnejšími normami upravujúcimi chemické látky (SVHC). Dostupné informácie týkajúce sa REACH.

### VLASTNOSTI

|           |                                   |
|-----------|-----------------------------------|
| ZAMERANIE | nesmierne kompletný sortiment     |
| HLAVA     | zápustná so záhlbníkmi pod hlavou |
| PRIEMER   | od 3,5 do 12,0 mm                 |
| DĹŽKA     | od 30 do 600 mm                   |



### MATERIÁL

Uhlíková ocel s galvanickým zinkovaním.

### OBLASTI POUŽITIA

- panely na báze dreva
  - masívne drevo
  - vrstvené drevo
  - CLT, LVL
  - dreva s vysokou hustotou
- Prevádzková trieda 1 a 2.



## CLT

Hodnoty skúšané, certifikované a kalkulované aj pre CLT. Tabuľky výpočtu a softvér na stanovenie rozmerov (MyProject) pre CLT dostupné v katalógu a online.

## LVL

Hodnoty skúšané, certifikované a kalkulované aj pre CLT a dreva s vysokou hustotou ako vrstvené dyhové drevo LVL.

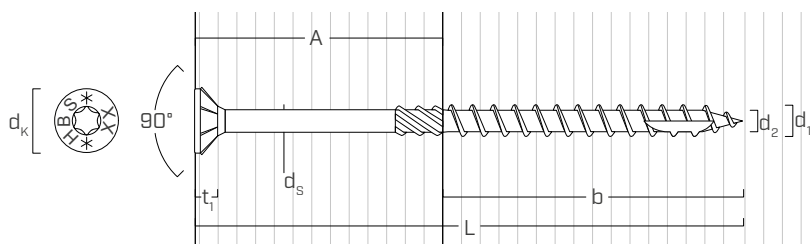


Spojenie nosník-trám so skrutkami HBS s priemerom 8 mm.



Fixovanie stien z CLT so skrutkami HBS s priemerom 6 mm.

## ■ GEOMETRIA A MECHANICKÉ VLASTNOSTI



| Menovitý priemer                                                | $d_1$        | [mm]                 | 3,5  | 4    | 4,5  | 5     | 6     | 8     | 10    | 12    |
|-----------------------------------------------------------------|--------------|----------------------|------|------|------|-------|-------|-------|-------|-------|
| Priemer hlavy                                                   | $d_k$        | [mm]                 | 7,00 | 8,00 | 9,00 | 10,00 | 12,00 | 14,50 | 18,25 | 20,75 |
| Priemer jadra                                                   | $d_2$        | [mm]                 | 2,25 | 2,55 | 2,80 | 3,40  | 3,95  | 5,40  | 6,40  | 6,80  |
| Priemer spodnej časti                                           | $d_s$        | [mm]                 | 2,45 | 2,75 | 3,15 | 3,65  | 4,30  | 5,80  | 7,00  | 8,00  |
| Hrúbka hlavy                                                    | $t_1$        | [mm]                 | 2,20 | 2,80 | 2,80 | 3,10  | 4,50  | 4,50  | 5,80  | 7,20  |
| Priemer predvrtania <sup>(1)</sup>                              | $d_v$        | [mm]                 | 2,0  | 2,5  | 2,5  | 3,0   | 4,0   | 5,0   | 6,0   | 7,0   |
| Charakteristická doba oteru                                     | $M_{y,k}$    | [Nm]                 | 2,1  | 3,0  | 4,1  | 5,4   | 9,5   | 20,1  | 35,8  | 48,0  |
| Charakteristický parameter odolnosti vytiahnutia <sup>(2)</sup> | $f_{ax,k}$   | [N/mm <sup>2</sup> ] | 11,7 | 11,7 | 11,7 | 11,7  | 11,7  | 11,7  | 11,7  | 11,7  |
| Súvisiaca hustota                                               | $\rho_a$     | [kg/m <sup>3</sup> ] | 350  | 350  | 350  | 350   | 350   | 350   | 350   | 350   |
| Charakteristický parameter odolnosti vytiahnutia <sup>(3)</sup> | $f_{ax,k}$   | [N/mm <sup>2</sup> ] | 15,0 | 15,0 | 15,0 | 15,0  | 15,0  | 15,0  | 15,0  | 15,0  |
| Súvisiaca hustota                                               | $\rho_a$     | [kg/m <sup>3</sup> ] | 500  | 500  | 500  | 500   | 500   | 500   | 500   | 500   |
| Charakteristický parameter vnikania hlavy <sup>(2)</sup>        | $f_{head,k}$ | [N/mm <sup>2</sup> ] | 10,5 | 10,5 | 10,5 | 10,5  | 10,5  | 10,5  | 10,5  | 10,5  |
| Súvisiaca hustota                                               | $\rho_a$     | [kg/m <sup>3</sup> ] | 350  | 350  | 350  | 350   | 350   | 350   | 350   | 350   |
| Charakteristický parameter vnikania hlavy <sup>(3)</sup>        | $f_{head,k}$ | [N/mm <sup>2</sup> ] | 20,0 | 20,0 | 20,0 | 20,0  | 20,0  | 20,0  | 20,0  | 20,0  |
| Súvisiaca hustota                                               | $\rho_a$     | [kg/m <sup>3</sup> ] | 500  | 500  | 500  | 500   | 500   | 500   | 500   | 500   |
| Charakteristická odolnosť v ťahu                                | $f_{tens,k}$ | [kN]                 | 3,8  | 5,0  | 6,4  | 7,9   | 11,3  | 20,1  | 31,4  | 33,9  |

<sup>(1)</sup> Predvrtaný otvor platí pre drevo z ihličnanov (softwood).

<sup>(2)</sup> Platí pre drevo z ihličnanov (softwood) – maximálna hustota 440 kg/m<sup>3</sup>.

<sup>(3)</sup> Platí pre LVL z dreva ihličnanov (softwood) – maximálna hustota 550 kg/m<sup>3</sup>.

Pre použitia s inými materiálmi alebo s vysokou hustotou odkazujeme na normu ETA-11/0030.

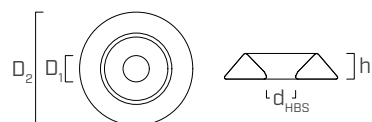
## KÓDY A ROZMERY

| d <sub>1</sub><br>[mm] | KÓD     | L<br>[mm] | b<br>[mm] | A<br>[mm] | ks. |
|------------------------|---------|-----------|-----------|-----------|-----|
| 3,5<br>TX 15           | HBS3540 | 40        | 18        | 22        | 500 |
|                        | HBS3545 | 45        | 24        | 21        | 400 |
|                        | HBS3550 | 50        | 24        | 26        | 400 |
| 4<br>TX 20             | HBS430  | 30        | 18        | 12        | 500 |
|                        | HBS435  | 35        | 18        | 17        | 500 |
|                        | HBS440  | 40        | 24        | 16        | 500 |
|                        | HBS445  | 45        | 30        | 15        | 400 |
|                        | HBS450  | 50        | 30        | 20        | 400 |
|                        | HBS460  | 60        | 35        | 25        | 200 |
|                        | HBS470  | 70        | 40        | 30        | 200 |
|                        | HBS480  | 80        | 40        | 40        | 200 |
| 4,5<br>TX 20           | HBS4540 | 40        | 24        | 16        | 400 |
|                        | HBS4545 | 45        | 30        | 15        | 400 |
|                        | HBS4550 | 50        | 30        | 20        | 200 |
|                        | HBS4560 | 60        | 35        | 25        | 200 |
|                        | HBS4570 | 70        | 40        | 30        | 200 |
|                        | HBS4580 | 80        | 40        | 40        | 200 |
| 5<br>TX 25             | HBS540  | 40        | 24        | 16        | 200 |
|                        | HBS545  | 45        | 24        | 21        | 200 |
|                        | HBS550  | 50        | 24        | 26        | 200 |
|                        | HBS560  | 60        | 30        | 30        | 200 |
|                        | HBS570  | 70        | 35        | 35        | 100 |
|                        | HBS580  | 80        | 40        | 40        | 100 |
|                        | HBS590  | 90        | 45        | 45        | 100 |
|                        | HBS5100 | 100       | 50        | 50        | 100 |
| 6<br>TX 30             | HBS5120 | 120       | 60        | 60        | 100 |
|                        | HBS640  | 40        | 35        | 8         | 100 |
|                        | HBS650  | 50        | 35        | 15        | 100 |
|                        | HBS660  | 60        | 30        | 30        | 100 |
|                        | HBS670  | 70        | 40        | 30        | 100 |
|                        | HBS680  | 80        | 40        | 40        | 100 |
|                        | HBS690  | 90        | 50        | 40        | 100 |
|                        | HBS6100 | 100       | 50        | 50        | 100 |
|                        | HBS6110 | 110       | 60        | 50        | 100 |
|                        | HBS6120 | 120       | 60        | 60        | 100 |
|                        | HBS6130 | 130       | 60        | 70        | 100 |
|                        | HBS6140 | 140       | 75        | 65        | 100 |
|                        | HBS6150 | 150       | 75        | 75        | 100 |
|                        | HBS6160 | 160       | 75        | 85        | 100 |
|                        | HBS6180 | 180       | 75        | 105       | 100 |
|                        | HBS6200 | 200       | 75        | 125       | 100 |
|                        | HBS6220 | 220       | 75        | 145       | 100 |
|                        | HBS6240 | 240       | 75        | 165       | 100 |
|                        | HBS6260 | 260       | 75        | 185       | 100 |
|                        | HBS6280 | 280       | 75        | 205       | 100 |
|                        | HBS6300 | 300       | 75        | 225       | 100 |

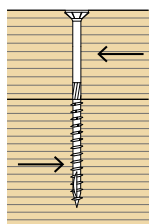
| d <sub>1</sub><br>[mm] | KÓD      | L<br>[mm] | b<br>[mm] | A<br>[mm] | ks. |
|------------------------|----------|-----------|-----------|-----------|-----|
| 8<br>TX 40             | HBS880   | 80        | 52        | 28        | 100 |
|                        | HBS8100  | 100       | 52        | 48        | 100 |
|                        | HBS8120  | 120       | 60        | 60        | 100 |
|                        | HBS8140  | 140       | 60        | 80        | 100 |
|                        | HBS8160  | 160       | 80        | 80        | 100 |
|                        | HBS8180  | 180       | 80        | 100       | 100 |
|                        | HBS8200  | 200       | 80        | 120       | 100 |
|                        | HBS8220  | 220       | 80        | 140       | 100 |
|                        | HBS8240  | 240       | 80        | 160       | 100 |
|                        | HBS8260  | 260       | 80        | 180       | 100 |
|                        | HBS8280  | 280       | 80        | 200       | 100 |
|                        | HBS8300  | 300       | 100       | 200       | 100 |
|                        | HBS8320  | 320       | 100       | 220       | 100 |
|                        | HBS8340  | 340       | 100       | 240       | 100 |
|                        | HBS8360  | 360       | 100       | 260       | 100 |
|                        | HBS8380  | 380       | 100       | 280       | 100 |
| 10<br>TX 40            | HBS8400  | 400       | 100       | 300       | 100 |
|                        | HBS8440  | 440       | 100       | 340       | 100 |
|                        | HBS8480  | 480       | 100       | 380       | 100 |
|                        | HBS8520  | 520       | 100       | 420       | 100 |
|                        | HBS1080  | 80        | 52        | 28        | 50  |
|                        | HBS10100 | 100       | 52        | 48        | 50  |
|                        | HBS10120 | 120       | 60        | 60        | 50  |
|                        | HBS10140 | 140       | 60        | 80        | 50  |
|                        | HBS10160 | 160       | 80        | 80        | 50  |
|                        | HBS10180 | 180       | 80        | 100       | 50  |
|                        | HBS10200 | 200       | 80        | 120       | 50  |
|                        | HBS10220 | 220       | 80        | 140       | 50  |
|                        | HBS10240 | 240       | 80        | 160       | 50  |
|                        | HBS10260 | 260       | 80        | 180       | 50  |
|                        | HBS10280 | 280       | 80        | 200       | 50  |
|                        | HBS10300 | 300       | 100       | 200       | 50  |
| 12<br>TX 50            | HBS10320 | 320       | 100       | 220       | 50  |
|                        | HBS10340 | 340       | 100       | 240       | 50  |
|                        | HBS10360 | 360       | 100       | 260       | 50  |
|                        | HBS10380 | 380       | 100       | 280       | 50  |
|                        | HBS10400 | 400       | 100       | 300       | 50  |
|                        | HBS12120 | 120       | 80        | 40        | 25  |
|                        | HBS12160 | 160       | 80        | 80        | 25  |
|                        | HBS12200 | 200       | 80        | 120       | 25  |
|                        | HBS12240 | 240       | 80        | 160       | 25  |
|                        | HBS12280 | 280       | 80        | 200       | 25  |
|                        | HBS12320 | 320       | 120       | 200       | 25  |
|                        | HBS12360 | 360       | 120       | 240       | 25  |
|                        | HBS12400 | 400       | 120       | 280       | 25  |
|                        | HBS12440 | 440       | 120       | 320       | 25  |
|                        | HBS12480 | 480       | 120       | 360       | 25  |
|                        | HBS12520 | 520       | 120       | 400       | 25  |
|                        | HBS12560 | 560       | 120       | 440       | 25  |
|                        | HBS12600 | 600       | 120       | 480       | 25  |

### VYSÚSTRUŽENÁ PODLOŽKA HUS

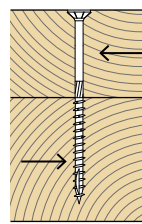
| d <sub>HBS</sub><br>[mm] | KÓD   | D <sub>1</sub><br>[mm] | D <sub>2</sub><br>[mm] | h<br>[mm] | ks. |
|--------------------------|-------|------------------------|------------------------|-----------|-----|
| 6                        | HUS6  | 7,5                    | 20,0                   | 4,50      | 100 |
| 8                        | HUS8  | 8,5                    | 25,0                   | 5,50      | 50  |
| 10                       | HUS10 | 10,8                   | 30,0                   | 6,50      | 50  |
| 12                       | HUS12 | 14,0                   | 37,0                   | 8,50      | 25  |



## MINIMÁLNE VZDIALENOSTI PRE SKRUTKY NAMÁHANÉ V STRIHU



Uhol medzi pôsobením sily a vláknami  $\alpha = 0^\circ$



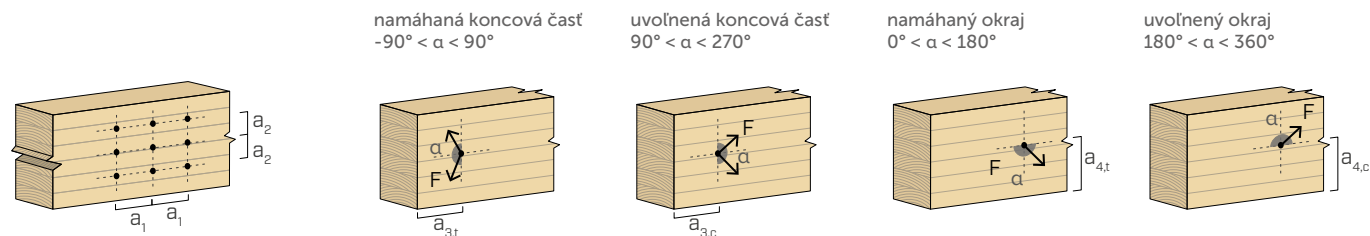
Uhol medzi pôsobením sily a vláknami  $\alpha = 90^\circ$

| SKRUTKY SKRUTKOVANÉ S PREDVŔTANÍM |      |      |    |     |    |      |    |    |    |     | SKRUTKY SKRUTKOVANÉ S PREDVŔTANÍM |     |     |    |    |     |    |    |    |    |    |
|-----------------------------------|------|------|----|-----|----|------|----|----|----|-----|-----------------------------------|-----|-----|----|----|-----|----|----|----|----|----|
| $d_1$                             | [mm] | 3,5  | 4  | 4,5 | 5  | 6    | 8  | 10 | 12 |     | 3,5                               | 4   | 4,5 | 5  | 6  | 8   | 10 | 12 |    |    |    |
| $a_1$                             | [mm] | 5·d  | 18 | 20  | 23 | 5·d  | 25 | 30 | 40 | 50  | 60                                | 4·d | 14  | 16 | 18 | 4·d | 20 | 24 | 32 | 40 | 48 |
| $a_2$                             | [mm] | 3·d  | 11 | 12  | 14 | 3·d  | 15 | 18 | 24 | 30  | 36                                | 4·d | 14  | 16 | 18 | 4·d | 20 | 24 | 32 | 40 | 48 |
| $a_{3,t}$                         | [mm] | 12·d | 42 | 48  | 54 | 12·d | 60 | 72 | 96 | 120 | 144                               | 7·d | 25  | 28 | 32 | 7·d | 35 | 42 | 56 | 70 | 84 |
| $a_{3,c}$                         | [mm] | 7·d  | 25 | 28  | 32 | 7·d  | 35 | 42 | 56 | 70  | 84                                | 7·d | 25  | 28 | 32 | 7·d | 35 | 42 | 56 | 70 | 84 |
| $a_{4,t}$                         | [mm] | 3·d  | 11 | 12  | 14 | 3·d  | 15 | 18 | 24 | 30  | 36                                | 5·d | 18  | 20 | 23 | 7·d | 35 | 42 | 56 | 70 | 84 |
| $a_{4,c}$                         | [mm] | 3·d  | 11 | 12  | 14 | 3·d  | 15 | 18 | 24 | 30  | 36                                | 3·d | 11  | 12 | 14 | 3·d | 15 | 18 | 24 | 30 | 36 |

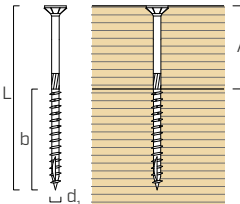
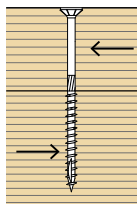
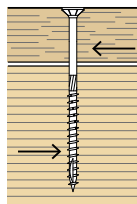
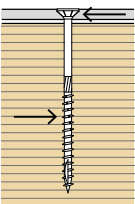
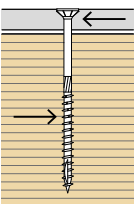
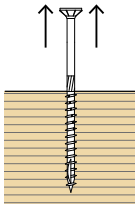
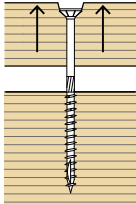
| SKRUTKY SKRUTKOVANÉ BEZ PREDVŔTANIA |      |      |    |     |    |      |    |    |     |     | SKRUTKY SKRUTKOVANÉ BEZ PREDVŔTANIA |      |     |    |    |      |    |    |    |     |     |
|-------------------------------------|------|------|----|-----|----|------|----|----|-----|-----|-------------------------------------|------|-----|----|----|------|----|----|----|-----|-----|
| $d_1$                               | [mm] | 3,5  | 4  | 4,5 | 5  | 6    | 8  | 10 | 12  |     | 3,5                                 | 4    | 4,5 | 5  | 6  | 8    | 10 | 12 |    |     |     |
| $a_1$                               | [mm] | 10·d | 35 | 40  | 45 | 12·d | 60 | 72 | 96  | 120 | 144                                 | 5·d  | 18  | 20 | 23 | 5·d  | 25 | 30 | 40 | 50  | 60  |
| $a_2$                               | [mm] | 5·d  | 18 | 20  | 23 | 5·d  | 25 | 30 | 40  | 50  | 60                                  | 5·d  | 18  | 20 | 23 | 5·d  | 25 | 30 | 40 | 50  | 60  |
| $a_{3,t}$                           | [mm] | 15·d | 53 | 60  | 68 | 15·d | 75 | 90 | 120 | 150 | 180                                 | 10·d | 35  | 40 | 45 | 10·d | 50 | 60 | 80 | 100 | 120 |
| $a_{3,c}$                           | [mm] | 10·d | 35 | 40  | 45 | 10·d | 50 | 60 | 80  | 100 | 120                                 | 10·d | 35  | 40 | 45 | 10·d | 50 | 60 | 80 | 100 | 120 |
| $a_{4,t}$                           | [mm] | 5·d  | 18 | 20  | 23 | 5·d  | 25 | 30 | 40  | 50  | 60                                  | 7·d  | 25  | 28 | 32 | 10·d | 50 | 60 | 80 | 100 | 120 |
| $a_{4,c}$                           | [mm] | 5·d  | 18 | 20  | 23 | 5·d  | 25 | 30 | 40  | 50  | 60                                  | 5·d  | 18  | 20 | 23 | 5·d  | 25 | 30 | 40 | 50  | 60  |

d = menovitý priemer skrutky



### POZNÁMKY:

- Minimálne vzdialenosti sú dané normou EN 1995:2014 v súlade s ETA-11/0030 za predpokladu že merná hmotnosť drevených prvkov je  $\rho_k \leq 420 \text{ kg/m}^3$  a priemer výpočtu sa rovná d = menovitý priemer skrutky.
- V prípade spájania oceľ-drevo minimálne rozstupy ( $a_1, a_2$ ) môžu byť vynásobené koeficientom 0,7.
- V prípade spájania panel-drevo minimálne rozstupy ( $a_1, a_2$ ) môžu byť vynásobené koeficientom 0,85.
- V prípade spájania prvkov z dublasky tisolitej (Pseudotsuga menziesii), minimálne rozstupy a vzdialenosti súbežné s vláknom musia byť vynásobené koeficientom 1,5.

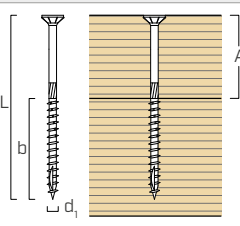
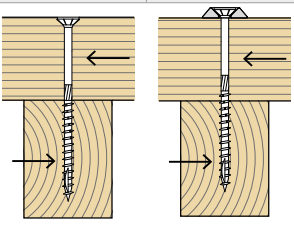
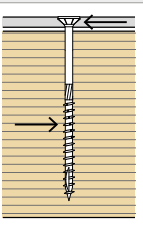
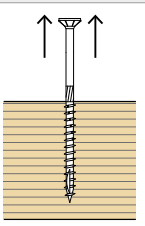
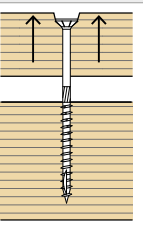
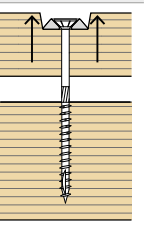
| geometria                                                                         |           |           |           | STRIH                                                                             |                                                                                   |                                                                                   |                                                                                    | ŤAH                                                                                 |                                                                                     |
|-----------------------------------------------------------------------------------|-----------|-----------|-----------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                                                                                   |           |           |           | drevo-drevo                                                                       | panel-drevo <sup>(1)</sup>                                                        | oceľ-drevo tenká platňa <sup>(2)</sup>                                            | oceľ-drevo hrubá platňa <sup>(3)</sup>                                             | vyťahovanie závitů <sup>(4)</sup>                                                   | vnikanie hlavy <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]                                                         |
| 3,5                                                                               | 40        | 18        | 22        | 0,73                                                                              | S <sub>PAN</sub> = 12 mm<br>0,72                                                  | S <sub>PLATE</sub> = 1,75 mm<br>0,85                                              | S <sub>PLATE</sub> = 3,5 mm<br>1,12                                                | 0,80                                                                                | 0,56                                                                                |
|                                                                                   | 45        | 24        | 21        | 0,79                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |
|                                                                                   | 50        | 24        | 26        | 0,79                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |
| 4                                                                                 | 30        | 18        | 12        | 0,72                                                                              | S <sub>PAN</sub> = 12 mm<br>0,76                                                  | S <sub>PLATE</sub> = 2,0 mm<br>0,93                                               | S <sub>PLATE</sub> = 4,0 mm<br>1,28                                                | 0,91                                                                                | 0,73                                                                                |
|                                                                                   | 35        | 18        | 17        | 0,79                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |
|                                                                                   | 40        | 24        | 16        | 0,83                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |
|                                                                                   | 45        | 30        | 15        | 0,81                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |
|                                                                                   | 50        | 30        | 20        | 0,91                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |
|                                                                                   | 60        | 35        | 25        | 0,99                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |
|                                                                                   | 70        | 40        | 30        | 0,99                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |
|                                                                                   | 80        | 40        | 40        | 0,99                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |
| 4,5                                                                               | 40        | 24        | 16        | 0,98                                                                              | S <sub>PAN</sub> = 12 mm<br>1,06                                                  | S <sub>PLATE</sub> = 2,25 mm<br>1,33                                              | S <sub>PLATE</sub> = 4,5 mm<br>1,74                                                | 1,36                                                                                | 0,92                                                                                |
|                                                                                   | 45        | 30        | 15        | 0,96                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |
|                                                                                   | 50        | 30        | 20        | 1,06                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |
|                                                                                   | 60        | 35        | 25        | 1,18                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |
|                                                                                   | 70        | 40        | 30        | 1,22                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |
|                                                                                   | 80        | 40        | 40        | 1,22                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |
| 5                                                                                 | 40        | 24        | 16        | 1,12                                                                              | S <sub>PAN</sub> = 12 mm<br>1,16                                                  | S <sub>PLATE</sub> = 2,5 mm<br>1,46                                               | S <sub>PLATE</sub> = 5,0 mm<br>2,00                                                | 1,52                                                                                | 1,13                                                                                |
|                                                                                   | 45        | 24        | 21        | 1,19                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |
|                                                                                   | 50        | 24        | 26        | 1,29                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |
|                                                                                   | 60        | 30        | 30        | 1,46                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |
|                                                                                   | 70        | 35        | 35        | 1,46                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |
|                                                                                   | 80        | 40        | 40        | 1,46                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |
|                                                                                   | 90        | 45        | 45        | 1,46                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |
|                                                                                   | 100       | 50        | 50        | 1,46                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |
|                                                                                   | 120       | 60        | 60        | 1,46                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |
|                                                                                   |           |           |           |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |

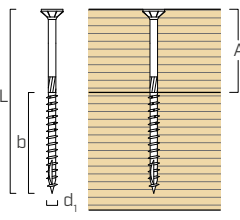
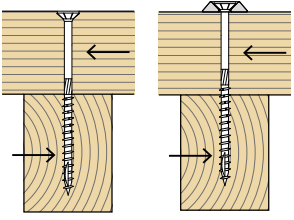
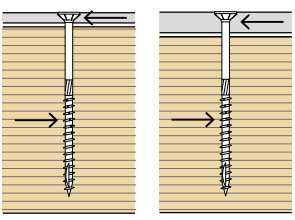
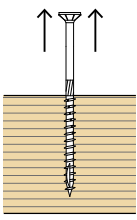
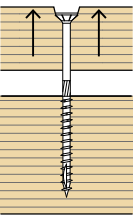
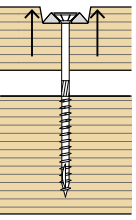
#### POZNÁMKY:

- (1) Charakteristiky odolnosti v strihu sú posudzované na paneloch OSB3 alebo OSB4 v súlade s normou EN 300 alebo drevotrieskových paneloch v súlade s normou EN 312 hrubých S<sub>PAN</sub>.
- (2) Charakteristiky odolnosti v strihu sú posudzované pri použití tenkej platne (S<sub>PLATE</sub> ≤ 0,5 d<sub>1</sub>).
- (3) Charakteristiky odolnosti v strihu sú posudzované pri použití hrubej platne (S<sub>PLATE</sub> ≥ d<sub>1</sub>).
- (4) Osová únosnosť voči vytiahnutiu skrutky bola vyhodnocovaná vzhľadom 90 ° uhlu medzi vláknami a konektorom a pre dĺžku rovnajúcu sa b.

- (5) Osová únosnosť voči vnikaniu hlavy s podložkou alebo bez nej bola vyhodnocovaná na drevenom prvku.

Zvyčajne v prípade spoja oceľ-drevo je viazaná pevnosť v ťahu ocele v porovnaní z odpojením alebo preniknutím hlavy skrutky.

| geometria                                                                         |      |      |      | STRIH                                                                             |                            |                                           |                                                                                   | ŤAH                                                                                 |                                                                                     |                                                                                     |
|-----------------------------------------------------------------------------------|------|------|------|-----------------------------------------------------------------------------------|----------------------------|-------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                                                                                   |      |      |      | drevo-drevo                                                                       | drevo-drevo<br>s podložkou | oceľ-drevo tenká<br>platňa <sup>(2)</sup> | oceľ-drevo hrubá<br>platňa <sup>(3)</sup>                                         | vyťahovanie<br>závitú <sup>(4)</sup>                                                | vnikanie<br>hlavy <sup>(5)</sup>                                                    | vnikanie hlavy<br>s podložkou <sup>(5)</sup>                                        |
|  |      |      |      |  |                            |                                           |  |  |  |  |
| d <sub>1</sub>                                                                    | L    | b    | A    | R <sub>V,k</sub>                                                                  | R <sub>V,k</sub>           | R <sub>V,k</sub>                          | R <sub>V,k</sub>                                                                  | R <sub>ax,k</sub>                                                                   | R <sub>head,k</sub>                                                                 | R <sub>head,k</sub>                                                                 |
| [mm]                                                                              | [mm] | [mm] | [mm] | [kN]                                                                              | [kN]                       | [kN]                                      | [kN]                                                                              | [kN]                                                                                | [kN]                                                                                | [kN]                                                                                |
| 6                                                                                 | 40   | 35   | 8    | 0,89                                                                              | 0,89                       | 1,64                                      | 2,60                                                                              | 2,65                                                                                | 1,63                                                                                | 4,53                                                                                |
|                                                                                   | 50   | 35   | 15   | 1,53                                                                              | 1,66                       | 2,08                                      | 2,98                                                                              | 2,65                                                                                | 1,63                                                                                | 4,53                                                                                |
|                                                                                   | 60   | 30   | 30   | 1,78                                                                              | 1,94                       | 2,24                                      | 2,93                                                                              | 2,27                                                                                | 1,63                                                                                | 4,53                                                                                |
|                                                                                   | 70   | 40   | 30   | 1,88                                                                              | 2,23                       | 2,43                                      | 3,12                                                                              | 3,03                                                                                | 1,63                                                                                | 4,53                                                                                |
|                                                                                   | 80   | 40   | 40   | 2,08                                                                              | 2,43                       | 2,43                                      | 3,12                                                                              | 3,03                                                                                | 1,63                                                                                | 4,53                                                                                |
|                                                                                   | 90   | 50   | 40   | 2,08                                                                              | 2,61                       | 2,61                                      | 3,31                                                                              | 3,79                                                                                | 1,63                                                                                | 4,53                                                                                |
|                                                                                   | 100  | 50   | 50   | 2,08                                                                              | 2,61                       | 2,61                                      | 3,31                                                                              | 3,79                                                                                | 1,63                                                                                | 4,53                                                                                |
|                                                                                   | 110  | 60   | 50   | 2,08                                                                              | 2,80                       | 2,80                                      | 3,49                                                                              | 4,55                                                                                | 1,63                                                                                | 4,53                                                                                |
|                                                                                   | 120  | 60   | 60   | 2,08                                                                              | 2,80                       | 2,80                                      | 3,49                                                                              | 4,55                                                                                | 1,63                                                                                | 4,53                                                                                |
|                                                                                   | 130  | 60   | 70   | 2,08                                                                              | 2,80                       | 2,80                                      | 3,49                                                                              | 4,55                                                                                | 1,63                                                                                | 4,53                                                                                |
|                                                                                   | 140  | 75   | 65   | 2,08                                                                              | 2,80                       | 3,09                                      | 3,78                                                                              | 5,68                                                                                | 1,63                                                                                | 4,53                                                                                |
|                                                                                   | 150  | 75   | 75   | 2,08                                                                              | 2,80                       | 3,09                                      | 3,78                                                                              | 5,68                                                                                | 1,63                                                                                | 4,53                                                                                |
|                                                                                   | 160  | 75   | 85   | 2,08                                                                              | 2,80                       | 3,09                                      | 3,78                                                                              | 5,68                                                                                | 1,63                                                                                | 4,53                                                                                |
|                                                                                   | 180  | 75   | 105  | 2,08                                                                              | 2,80                       | 3,09                                      | 3,78                                                                              | 5,68                                                                                | 1,63                                                                                | 4,53                                                                                |
|                                                                                   | 200  | 75   | 125  | 2,08                                                                              | 2,80                       | 3,09                                      | 3,78                                                                              | 5,68                                                                                | 1,63                                                                                | 4,53                                                                                |
|                                                                                   | 220  | 75   | 145  | 2,08                                                                              | 2,80                       | 3,09                                      | 3,78                                                                              | 5,68                                                                                | 1,63                                                                                | 4,53                                                                                |
|                                                                                   | 240  | 75   | 165  | 2,08                                                                              | 2,80                       | 3,09                                      | 3,78                                                                              | 5,68                                                                                | 1,63                                                                                | 4,53                                                                                |
|                                                                                   | 260  | 75   | 185  | 2,08                                                                              | 2,80                       | 3,09                                      | 3,78                                                                              | 5,68                                                                                | 1,63                                                                                | 4,53                                                                                |
| 8                                                                                 | 280  | 75   | 205  | 2,08                                                                              | 2,80                       | 3,09                                      | 3,78                                                                              | 5,68                                                                                | 1,63                                                                                | 4,53                                                                                |
|                                                                                   | 300  | 75   | 225  | 2,08                                                                              | 2,80                       | 3,09                                      | 3,78                                                                              | 5,68                                                                                | 1,63                                                                                | 4,53                                                                                |
|                                                                                   | 80   | 52   | 28   | 2,59                                                                              | 3,31                       | 4,00                                      | 5,11                                                                              | 5,25                                                                                | 2,38                                                                                | 7,08                                                                                |
|                                                                                   | 100  | 52   | 48   | 3,28                                                                              | 4,00                       | 4,00                                      | 5,11                                                                              | 5,25                                                                                | 2,38                                                                                | 7,08                                                                                |
|                                                                                   | 120  | 60   | 60   | 3,28                                                                              | 4,20                       | 4,20                                      | 5,31                                                                              | 6,06                                                                                | 2,38                                                                                | 7,08                                                                                |
|                                                                                   | 140  | 60   | 80   | 3,28                                                                              | 4,20                       | 4,20                                      | 5,31                                                                              | 6,06                                                                                | 2,38                                                                                | 7,08                                                                                |
|                                                                                   | 160  | 80   | 80   | 3,28                                                                              | 4,45                       | 4,70                                      | 5,81                                                                              | 8,08                                                                                | 2,38                                                                                | 7,08                                                                                |
|                                                                                   | 180  | 80   | 100  | 3,28                                                                              | 4,45                       | 4,70                                      | 5,81                                                                              | 8,08                                                                                | 2,38                                                                                | 7,08                                                                                |
|                                                                                   | 200  | 80   | 120  | 3,28                                                                              | 4,45                       | 4,70                                      | 5,81                                                                              | 8,08                                                                                | 2,38                                                                                | 7,08                                                                                |
|                                                                                   | 220  | 80   | 140  | 3,28                                                                              | 4,45                       | 4,70                                      | 5,81                                                                              | 8,08                                                                                | 2,38                                                                                | 7,08                                                                                |
|                                                                                   | 240  | 80   | 160  | 3,28                                                                              | 4,45                       | 4,70                                      | 5,81                                                                              | 8,08                                                                                | 2,38                                                                                | 7,08                                                                                |
|                                                                                   | 260  | 80   | 180  | 3,28                                                                              | 4,45                       | 4,70                                      | 5,81                                                                              | 8,08                                                                                | 2,38                                                                                | 7,08                                                                                |
|                                                                                   | 280  | 80   | 200  | 3,28                                                                              | 4,45                       | 4,70                                      | 5,81                                                                              | 8,08                                                                                | 2,38                                                                                | 7,08                                                                                |
|                                                                                   | 300  | 100  | 200  | 3,28                                                                              | 4,45                       | 5,21                                      | 6,32                                                                              | 10,10                                                                               | 2,38                                                                                | 7,08                                                                                |
|                                                                                   | 320  | 100  | 220  | 3,28                                                                              | 4,45                       | 5,21                                      | 6,32                                                                              | 10,10                                                                               | 2,38                                                                                | 7,08                                                                                |
|                                                                                   | 340  | 100  | 240  | 3,28                                                                              | 4,45                       | 5,21                                      | 6,32                                                                              | 10,10                                                                               | 2,38                                                                                | 7,08                                                                                |
|                                                                                   | 360  | 100  | 260  | 3,28                                                                              | 4,45                       | 5,21                                      | 6,32                                                                              | 10,10                                                                               | 2,38                                                                                | 7,08                                                                                |
|                                                                                   | 380  | 100  | 280  | 3,28                                                                              | 4,45                       | 5,21                                      | 6,32                                                                              | 10,10                                                                               | 2,38                                                                                | 7,08                                                                                |
| 10                                                                                | 400  | 100  | 300  | 3,28                                                                              | 4,45                       | 5,21                                      | 6,32                                                                              | 10,10                                                                               | 2,38                                                                                | 7,08                                                                                |
|                                                                                   | 440  | 100  | 340  | 3,28                                                                              | 4,45                       | 5,21                                      | 6,32                                                                              | 10,10                                                                               | 2,38                                                                                | 7,08                                                                                |
|                                                                                   | 480  | 100  | 380  | 3,28                                                                              | 4,45                       | 5,21                                      | 6,32                                                                              | 10,10                                                                               | 2,38                                                                                | 7,08                                                                                |
|                                                                                   | 520  | 100  | 420  | 3,28                                                                              | 4,45                       | 5,21                                      | 6,32                                                                              | 10,10                                                                               | 2,38                                                                                | 7,08                                                                                |
|                                                                                   | 80   | 52   | 28   | 3,63                                                                              | 4,33                       | 4,75                                      | 6,94                                                                              | 6,57                                                                                | 3,77                                                                                | 10,20                                                                               |
|                                                                                   | 100  | 52   | 48   | 4,22                                                                              | 4,92                       | 5,51                                      | 7,12                                                                              | 6,57                                                                                | 3,77                                                                                | 10,20                                                                               |
|                                                                                   | 120  | 60   | 60   | 4,81                                                                              | 5,76                       | 5,76                                      | 7,37                                                                              | 7,58                                                                                | 3,77                                                                                | 10,20                                                                               |
|                                                                                   | 140  | 60   | 80   | 4,81                                                                              | 5,76                       | 5,76                                      | 7,37                                                                              | 7,58                                                                                | 3,77                                                                                | 10,20                                                                               |
|                                                                                   | 160  | 80   | 80   | 4,81                                                                              | 6,40                       | 6,40                                      | 8,00                                                                              | 10,10                                                                               | 3,77                                                                                | 10,20                                                                               |
|                                                                                   | 180  | 80   | 100  | 4,81                                                                              | 6,40                       | 6,40                                      | 8,00                                                                              | 10,10                                                                               | 3,77                                                                                | 10,20                                                                               |
|                                                                                   | 200  | 80   | 120  | 4,81                                                                              | 6,40                       | 6,40                                      | 8,00                                                                              | 10,10                                                                               | 3,77                                                                                | 10,20                                                                               |
|                                                                                   | 220  | 80   | 140  | 4,81                                                                              | 6,40                       | 6,40                                      | 8,00                                                                              | 10,10                                                                               | 3,77                                                                                | 10,20                                                                               |
|                                                                                   | 240  | 80   | 160  | 4,81                                                                              | 6,40                       | 6,40                                      | 8,00                                                                              | 10,10                                                                               | 3,77                                                                                | 10,20                                                                               |
|                                                                                   | 260  | 80   | 180  | 4,81                                                                              | 6,40                       | 6,40                                      | 8,00                                                                              | 10,10                                                                               | 3,77                                                                                | 10,20                                                                               |
|                                                                                   | 280  | 80   | 200  | 4,81                                                                              | 6,40                       | 6,40                                      | 8,00                                                                              | 10,10                                                                               | 3,77                                                                                | 10,20                                                                               |
|                                                                                   | 300  | 100  | 200  | 4,81                                                                              | 6,42                       | 7,03                                      | 8,63                                                                              | 12,63                                                                               | 3,77                                                                                | 10,20                                                                               |
|                                                                                   | 320  | 100  | 220  | 4,81                                                                              | 6,42                       | 7,03                                      | 8,63                                                                              | 12,63                                                                               | 3,77                                                                                | 10,20                                                                               |
|                                                                                   | 340  | 100  | 240  | 4,81                                                                              | 6,42                       | 7,03                                      | 8,63                                                                              | 12,63                                                                               | 3,77                                                                                | 10,20                                                                               |
|                                                                                   | 360  | 100  | 260  | 4,81                                                                              | 6,42                       | 7,03                                      | 8,63                                                                              | 12,63                                                                               | 3,77                                                                                | 10,20                                                                               |
|                                                                                   | 380  | 100  | 280  | 4,81                                                                              | 6,42                       | 7,03                                      | 8,63                                                                              | 12,63                                                                               | 3,77                                                                                | 10,20                                                                               |
|                                                                                   | 400  | 100  | 300  | 4,81                                                                              | 6,42                       | 7,03                                      | 8,63                                                                              | 12,63                                                                               | 3,77                                                                                | 10,20                                                                               |

|                                                                                   |      |      |      | STRIH                                                                             |                            |                                                                                   |                                           | ŤAH                                                                                 |                                                                                     |                                                                                     |
|-----------------------------------------------------------------------------------|------|------|------|-----------------------------------------------------------------------------------|----------------------------|-----------------------------------------------------------------------------------|-------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| geometria                                                                         |      |      |      | drevo-drevo                                                                       | drevo-drevo<br>s podložkou | oceľ-drevo tenká<br>platňa <sup>(2)</sup>                                         | oceľ-drevo hrubá<br>platňa <sup>(3)</sup> | vyťahovanie<br>závitu <sup>(4)</sup>                                                | vnikanie<br>hlavy <sup>(5)</sup>                                                    | vnikanie hlavy<br>s podložkou <sup>(5)</sup>                                        |
|  |      |      |      |  |                            |  |                                           |  |  |  |
| d <sub>1</sub>                                                                    | L    | b    | A    | R <sub>V,k</sub>                                                                  | R <sub>V,k</sub>           | R <sub>V,k</sub>                                                                  | R <sub>V,k</sub>                          | R <sub>ax,k</sub>                                                                   | R <sub>head,k</sub>                                                                 | R <sub>head,k</sub>                                                                 |
| [mm]                                                                              | [mm] | [mm] | [mm] | [kN]                                                                              | [kN]                       | [kN]                                                                              | [kN]                                      | [kN]                                                                                | [kN]                                                                                | [kN]                                                                                |
| 12                                                                                | 120  | 80   | 40   | 4,87                                                                              | 6,68                       | 7,81                                                                              | 9,79                                      | 12,12                                                                               | 4,88                                                                                | 15,51                                                                               |
|                                                                                   | 160  | 80   | 80   | 6,00                                                                              | 7,81                       | 7,81                                                                              | 9,79                                      | 12,12                                                                               | 4,88                                                                                | 15,51                                                                               |
|                                                                                   | 200  | 80   | 120  | 6,00                                                                              | 7,81                       | 7,81                                                                              | 9,79                                      | 12,12                                                                               | 4,88                                                                                | 15,51                                                                               |
|                                                                                   | 240  | 80   | 160  | 6,00                                                                              | 7,81                       | 7,81                                                                              | 9,79                                      | 12,12                                                                               | 4,88                                                                                | 15,51                                                                               |
|                                                                                   | 280  | 80   | 200  | 6,00                                                                              | 7,81                       | 7,81                                                                              | 9,79                                      | 12,12                                                                               | 4,88                                                                                | 15,51                                                                               |
|                                                                                   | 320  | 120  | 200  | 6,00                                                                              | 8,66                       | 9,32                                                                              | 11,30                                     | 18,18                                                                               | 4,88                                                                                | 15,51                                                                               |
|                                                                                   | 360  | 120  | 240  | 6,00                                                                              | 8,66                       | 9,32                                                                              | 11,30                                     | 18,18                                                                               | 4,88                                                                                | 15,51                                                                               |
|                                                                                   | 400  | 120  | 280  | 6,00                                                                              | 8,66                       | 9,32                                                                              | 11,30                                     | 18,18                                                                               | 4,88                                                                                | 15,51                                                                               |
|                                                                                   | 440  | 120  | 320  | 6,00                                                                              | 8,66                       | 9,32                                                                              | 11,30                                     | 18,18                                                                               | 4,88                                                                                | 15,51                                                                               |
|                                                                                   | 480  | 120  | 360  | 6,00                                                                              | 8,66                       | 9,32                                                                              | 11,30                                     | 18,18                                                                               | 4,88                                                                                | 15,51                                                                               |
|                                                                                   | 520  | 120  | 400  | 6,00                                                                              | 8,66                       | 9,32                                                                              | 11,30                                     | 18,18                                                                               | 4,88                                                                                | 15,51                                                                               |
|                                                                                   | 560  | 120  | 440  | 6,00                                                                              | 8,66                       | 9,32                                                                              | 11,30                                     | 18,18                                                                               | 4,88                                                                                | 15,51                                                                               |
|                                                                                   | 600  | 120  | 480  | 6,00                                                                              | 8,66                       | 9,32                                                                              | 11,30                                     | 18,18                                                                               | 4,88                                                                                | 15,51                                                                               |

#### POZNÁMKY:

- (1) Charakteristiky odolnosti v strihu sú posudzované na paneloch OSB3 alebo OSB4 v súlade s normou EN 300 alebo drevotrieskových paneloch v súlade s normou EN 312 hrubých S<sub>PLAN</sub>.
- (2) Charakteristiky odolnosti v strihu sú posudzované pri použití tenkej platne (S<sub>PLATE</sub> ≤ 0,5 d<sub>1</sub>).
- (3) Charakteristiky odolnosti v strihu sú posudzované pri použití hrubej platne (S<sub>PLATE</sub> ≥ d<sub>1</sub>).
- (4) Osová únosnosť voči vytiahnutiu skrutky bola vyhodnocovaná vzhľadom 90 ° uhlu medzi vláknami a konektorom a pre dĺžku rovnajúcu sa b.
- (5) Osová únosnosť voči vnikaniu hlavy s podložkou alebo bez nej bola vyhodnocovaná na drevenom prvku.

Zvyčajne v prípade spoja oceľ-drevo je viazaná pevnosť v ťahu ocele v porovnaní z odpojením alebo preniknutím hlavy skrutky.

#### VŠEOBECNÉ PRINCÍPY:

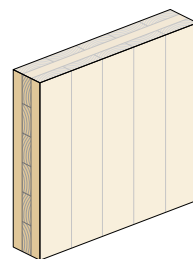
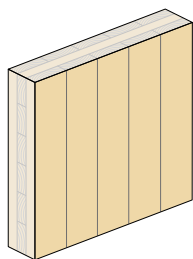
- Charakteristické hodnoty sú podľa normy EN 1995:2014 v zhode s ETA-11/0030.
- Projektované hodnoty sú odvodené z charakteristických hodnôt takto:

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

Koeficienty  $\gamma_M$  a  $k_{mod}$  sa berú podľa platného nariadenia použitého pri výpočte.

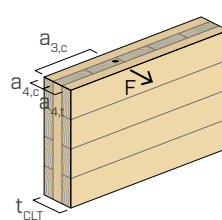
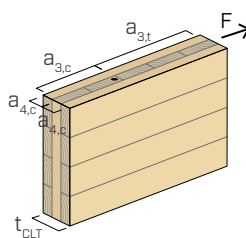
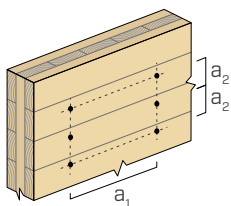
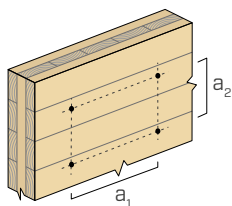
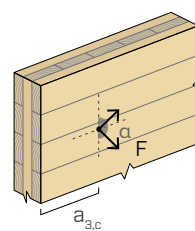
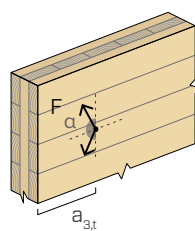
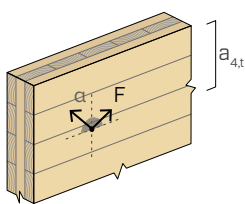
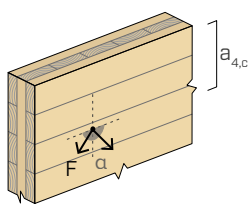
- Požadované hodnoty mechanickej pevnosti a geometrie skrutiek sú v zhode s ETA-11/0030.
- V priebehu výpočtu bola považovaný hustota drevených prvkov, rovná  $\rho_k = 385 \text{ kg/m}^3$ .
- Hodnoty sú vypočítané s ohľadom na závitovú časť skrutky pri úplnom zaskrutkovaní do časti dreva.
- Návrh rozmerov a overovanie drevených prvkov, panelov a oceľových platní musí byť vykonané samostatne.
- Charakteristiky odolnosti v strihu sú vyhodnocované pre skrutky skrútkované bez predvrtania; v prípade skrutiek skrútkovaných s predvrtaním je možné získať väčšie hodnoty odporu.
- Pre výpočet rôznych konfigurácií je k dispozícii softvér MyProject ([www.rothoblaas.com](http://www.rothoblaas.com)).

# ■ MINIMÁLNE VZDIALENOSTI PRE SKRUTKY NAMÁHANÉ V STRIHU A ZAŤAŽENÉ AXIÁLNE | CLT



|                  |      | SKRUTKY SKRUTKOVANÉ BEZ PREDVŔTANIA |    |    |    |    | SKRUTKY SKRUTKOVANÉ BEZ PREDVŔTANIA |    |    |     |     |
|------------------|------|-------------------------------------|----|----|----|----|-------------------------------------|----|----|-----|-----|
|                  |      | lateral face <sup>(1)</sup>         |    |    |    |    | narrow face <sup>(2)</sup>          |    |    |     |     |
| d <sub>1</sub>   | [mm] | 6                                   | 8  | 10 | 12 |    | 6                                   | 8  | 10 | 12  |     |
| a <sub>1</sub>   | [mm] | 4·d                                 | 24 | 32 | 40 | 48 | 10·d                                | 60 | 80 | 100 | 120 |
| a <sub>2</sub>   | [mm] | 2,5·d                               | 15 | 20 | 25 | 30 | 4·d                                 | 24 | 32 | 40  | 48  |
| a <sub>3,t</sub> | [mm] | 6·d                                 | 36 | 48 | 60 | 72 | 12·d                                | 72 | 96 | 120 | 144 |
| a <sub>3,c</sub> | [mm] | 6·d                                 | 36 | 48 | 60 | 72 | 7·d                                 | 42 | 56 | 70  | 84  |
| a <sub>4,t</sub> | [mm] | 6·d                                 | 36 | 48 | 60 | 72 | 6·d                                 | 36 | 48 | 60  | 72  |
| a <sub>4,c</sub> | [mm] | 2,5·d                               | 15 | 20 | 25 | 30 | 3·d                                 | 18 | 24 | 30  | 36  |

d = menovitý priemer skrutky



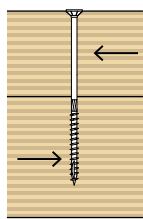
## POZNÁMKY:

Minimálne vzdialenosti sú v súlade s normou ETA-11/0030 a sú platné, ak to nie je inak uvedené v technickej dokumentácii pre panely CLT.

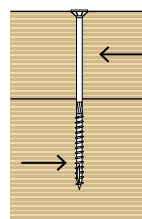
(1) Minimálna hrúbka CLT  $t_{min} = 10 \cdot d$

(2) Minimálna hrúbka CLT  $t_{min} = 10 \cdot d$  a minimálna hĺbka vnikania skrutky  $t_{pen} = 10 \cdot d$

## ■ MINIMÁLNE VZDIALENOSTI PRE SKRUTKY NAMÁHANÉ V STRIHU | LVL



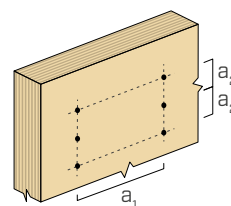
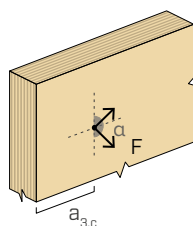
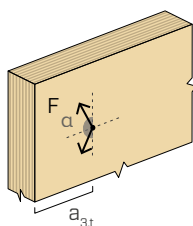
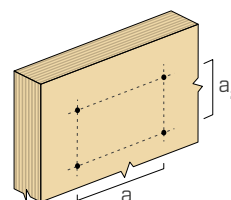
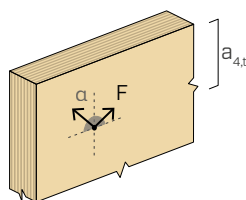
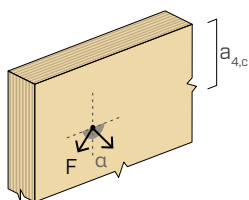
Uhol medzi pôsobením sily a vláknami  $\alpha = 0^\circ$



Uhol medzi pôsobením sily a vláknami  $\alpha = 90^\circ$

| SKRUTKY SKRUTKOVANÉ BEZ PREDVŔTANIA |      |      |    |    |     | SKRUTKY SKRUTKOVANÉ BEZ PREDVŔTANIA |      |    |    |    |     |
|-------------------------------------|------|------|----|----|-----|-------------------------------------|------|----|----|----|-----|
| $d_1$                               | [mm] | 5    | 6  | 8  | 10  |                                     | 5    | 6  | 8  | 10 |     |
| $a_1$                               | [mm] | 12·d | 60 | 72 | 96  | 120                                 | 5·d  | 25 | 30 | 40 | 50  |
| $a_2$                               | [mm] | 5·d  | 25 | 30 | 40  | 50                                  | 5·d  | 25 | 30 | 40 | 50  |
| $a_{3,t}$                           | [mm] | 15·d | 75 | 90 | 120 | 150                                 | 10·d | 50 | 60 | 80 | 100 |
| $a_{3,c}$                           | [mm] | 10·d | 50 | 60 | 80  | 100                                 | 10·d | 50 | 60 | 80 | 100 |
| $a_{4,t}$                           | [mm] | 5·d  | 25 | 30 | 40  | 50                                  | 10·d | 50 | 60 | 80 | 100 |
| $a_{4,c}$                           | [mm] | 5·d  | 25 | 30 | 40  | 50                                  | 5·d  | 25 | 30 | 40 | 50  |

d = menovitý priemer skrutky



### POZNÁMKY:

- Minimálne vzdialenosti sú v súlade s normou ETA-11/0030 a sú platné, ak to nie je inak uvedené v technickej dokumentácii pre panely LVL.
- Minimálne vzdialenosti platia pre LVL z dreva ihličnanov (softwood) pri použití súbežne aj do kríža lúpaných LVL.
- Minimálne vzdialenosti bez predvŕtania platia pre minimálne hrúbky prvkov LVL  $t_{\min}$ :

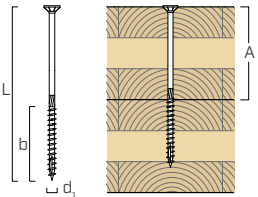
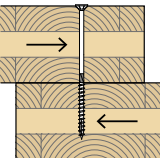
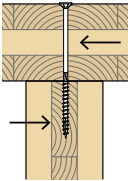
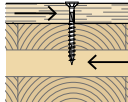
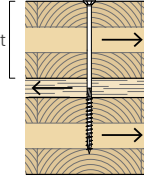
$$t_1 \geq 8,4 \cdot d - 9$$

$$t_2 \geq \begin{cases} 11,4 \cdot d \\ 75 \end{cases}$$

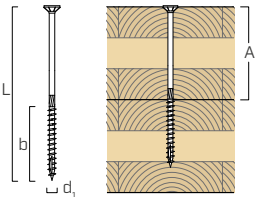
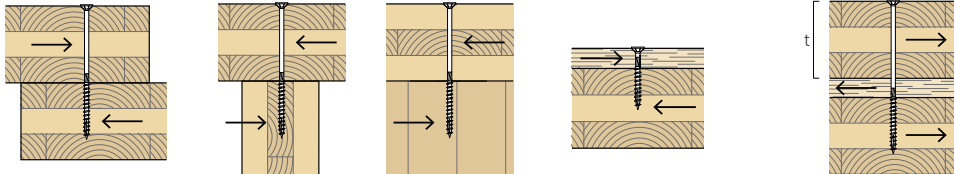
kde:

$t_1$  je hrúbka prvku LVL vyjadrená v mm v spojení s 2 drevenými prvkami. V prípade spojení s 3 alebo viacerými prvkami,  $t_1$  predstavuje hrúbku LVL umiestneného na okraji.

$t_2$  je hrúbka centrálného prvku vyjadrená v mm v spojení s 3 alebo viacerými prvkami.

|                                                                                   |           |           |           | STRIH <sup>(1)</sup>                                                              |                                                                                   |                                                                                     |                                                                                     |                          |  |
|-----------------------------------------------------------------------------------|-----------|-----------|-----------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------|--|
| geometria                                                                         |           |           |           | CLT - CLT<br>lateral face                                                         | CLT - CLT<br>lateral face - narrow face                                           | panel - CLT <sup>(2)</sup><br>lateral face                                          | CLT - panel - CLT <sup>(2)</sup><br>lateral face                                    |                          |  |
|  |           |           |           |  |  |  |  |                          |  |
| 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]                                                            | t<br>[mm]                                                                           | R <sub>V,k</sub><br>[kN] |  |
| 6                                                                                 | 40        | 35        | 8         | 0,80                                                                              | -                                                                                 | 1,30                                                                                | -                                                                                   | -                        |  |
|                                                                                   | 50        | 35        | 15        | 1,44                                                                              | -                                                                                 | 1,53                                                                                | -                                                                                   | -                        |  |
|                                                                                   | 60        | 30        | 30        | 1,63                                                                              | -                                                                                 | 1,53                                                                                | -                                                                                   | -                        |  |
|                                                                                   | 70        | 40        | 30        | 1,74                                                                              | -                                                                                 | 1,53                                                                                | 30                                                                                  | 2,19                     |  |
|                                                                                   | 80        | 40        | 40        | 1,97                                                                              | -                                                                                 | 1,53                                                                                | 35                                                                                  | 2,19                     |  |
|                                                                                   | 90        | 50        | 40        | 1,97                                                                              | -                                                                                 | 1,53                                                                                | 40                                                                                  | 2,19                     |  |
|                                                                                   | 100       | 50        | 50        | 1,97                                                                              | -                                                                                 | 1,53                                                                                | 45                                                                                  | 2,19                     |  |
|                                                                                   | 110       | 60        | 50        | 1,97                                                                              | -                                                                                 | 1,53                                                                                | 50                                                                                  | 2,19                     |  |
|                                                                                   | 120       | 60        | 60        | 1,97                                                                              | -                                                                                 | 1,53                                                                                | 55                                                                                  | 2,19                     |  |
|                                                                                   | 130       | 60        | 70        | 1,97                                                                              | -                                                                                 | 1,53                                                                                | 60                                                                                  | 2,19                     |  |
|                                                                                   | 140       | 75        | 65        | 1,97                                                                              | -                                                                                 | 1,53                                                                                | 65                                                                                  | 2,19                     |  |
|                                                                                   | 150       | 75        | 75        | 1,97                                                                              | -                                                                                 | 1,53                                                                                | 70                                                                                  | 2,19                     |  |
|                                                                                   | 160       | 75        | 85        | 1,97                                                                              | -                                                                                 | 1,53                                                                                | 75                                                                                  | 2,19                     |  |
|                                                                                   | 180       | 75        | 105       | 1,97                                                                              | -                                                                                 | 1,53                                                                                | 85                                                                                  | 2,19                     |  |
|                                                                                   | 200       | 75        | 125       | 1,97                                                                              | -                                                                                 | 1,53                                                                                | 95                                                                                  | 2,19                     |  |
|                                                                                   | 220       | 75        | 145       | 1,97                                                                              | -                                                                                 | 1,53                                                                                | 105                                                                                 | 2,19                     |  |
|                                                                                   | 240       | 75        | 165       | 1,97                                                                              | -                                                                                 | 1,53                                                                                | 115                                                                                 | 2,19                     |  |
|                                                                                   | 260       | 75        | 185       | 1,97                                                                              | -                                                                                 | 1,53                                                                                | 125                                                                                 | 2,19                     |  |
|                                                                                   | 280       | 75        | 205       | 1,97                                                                              | -                                                                                 | 1,53                                                                                | 135                                                                                 | 2,19                     |  |
|                                                                                   | 300       | 75        | 225       | 1,97                                                                              | -                                                                                 |                                                                                     | 145                                                                                 | 2,19                     |  |
| 8                                                                                 | 80        | 52        | 28        | 2,42                                                                              | 1,84                                                                              | 2,30                                                                                | -                                                                                   | -                        |  |
|                                                                                   | 100       | 52        | 48        | 3,04                                                                              | 2,13                                                                              | 2,30                                                                                | 40                                                                                  | 2,92                     |  |
|                                                                                   | 120       | 60        | 60        | 3,11                                                                              | 2,26                                                                              | 2,30                                                                                | 50                                                                                  | 2,92                     |  |
|                                                                                   | 140       | 60        | 80        | 3,11                                                                              | 2,26                                                                              | 2,30                                                                                | 60                                                                                  | 2,92                     |  |
|                                                                                   | 160       | 80        | 80        | 3,11                                                                              | 2,58                                                                              | 2,30                                                                                | 70                                                                                  | 2,92                     |  |
|                                                                                   | 180       | 80        | 100       | 3,11                                                                              | 2,58                                                                              | 2,30                                                                                | 80                                                                                  | 2,92                     |  |
|                                                                                   | 200       | 80        | 120       | 3,11                                                                              | 2,58                                                                              | 2,30                                                                                | 90                                                                                  | 2,92                     |  |
|                                                                                   | 220       | 80        | 140       | 3,11                                                                              | 2,58                                                                              | 2,30                                                                                | 100                                                                                 | 2,92                     |  |
|                                                                                   | 240       | 80        | 160       | 3,11                                                                              | 2,58                                                                              | 2,30                                                                                | 110                                                                                 | 2,92                     |  |
|                                                                                   | 260       | 80        | 180       | 3,11                                                                              | 2,58                                                                              | 2,30                                                                                | 120                                                                                 | 2,92                     |  |
|                                                                                   | 280       | 80        | 200       | 3,11                                                                              | 2,58                                                                              | 2,30                                                                                | 130                                                                                 | 2,92                     |  |
|                                                                                   | 300       | 100       | 200       | 3,11                                                                              | 2,58                                                                              | 2,30                                                                                | 140                                                                                 | 2,92                     |  |
|                                                                                   | 320       | 100       | 220       | 3,11                                                                              | 2,58                                                                              | 2,30                                                                                | 150                                                                                 | 2,92                     |  |
|                                                                                   | 340       | 100       | 240       | 3,11                                                                              | 2,58                                                                              | 2,30                                                                                | 160                                                                                 | 2,92                     |  |
|                                                                                   | 360       | 100       | 260       | 3,11                                                                              | 2,58                                                                              | 2,30                                                                                | 170                                                                                 | 2,92                     |  |
|                                                                                   | 380       | 100       | 280       | 3,11                                                                              | 2,58                                                                              | 2,30                                                                                | 180                                                                                 | 2,92                     |  |
|                                                                                   | 400       | 100       | 300       | 3,11                                                                              | 2,58                                                                              | 2,30                                                                                | 190                                                                                 | 2,92                     |  |
|                                                                                   | 440       | 100       | 340       | 3,11                                                                              | 2,58                                                                              | 2,30                                                                                | 210                                                                                 | 2,92                     |  |
|                                                                                   | 480       | 100       | 380       | 3,11                                                                              | 2,58                                                                              | 2,30                                                                                | 230                                                                                 | 2,92                     |  |
|                                                                                   | 520       | 100       | 420       | 3,11                                                                              | 2,58                                                                              |                                                                                     | 250                                                                                 | 2,92                     |  |

[illegible]

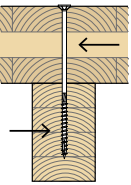
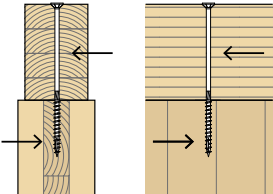
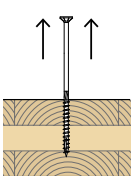
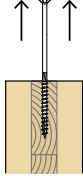
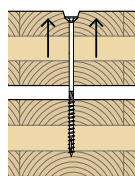
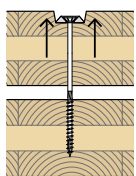
|                                                                                   |           |           |           |  | STRIH <sup>(1)</sup>                                                               |                                         |                                            |                                                  |                          |
|-----------------------------------------------------------------------------------|-----------|-----------|-----------|--|------------------------------------------------------------------------------------|-----------------------------------------|--------------------------------------------|--------------------------------------------------|--------------------------|
| geometria                                                                         |           |           |           |  | CLT - CLT<br>lateral face                                                          | CLT - CLT<br>lateral face - narrow face | panel - CLT <sup>(2)</sup><br>lateral face | CLT - panel - CLT <sup>(2)</sup><br>lateral face |                          |
|  |           |           |           |  |  |                                         |                                            |                                                  |                          |
| 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]                   | t<br>[mm]                                        | R <sub>V,k</sub><br>[kN] |
| 10                                                                                | 80        | 52        | 28        |  | 3,40                                                                               | 2,34                                    | 3,31                                       | -                                                | -                        |
|                                                                                   | 100       | 52        | 48        |  | 3,86                                                                               | 2,91                                    | 3,31                                       | -                                                | -                        |
|                                                                                   | 120       | 60        | 60        |  | 4,45                                                                               | 3,03                                    | 3,31                                       | 50                                               | 3,89                     |
|                                                                                   | 140       | 60        | 80        |  | 4,49                                                                               | 3,03                                    | 3,31                                       | 60                                               | 3,89                     |
|                                                                                   | 160       | 80        | 80        |  | 4,56                                                                               | 3,37                                    | 3,31                                       | 70                                               | 3,89                     |
|                                                                                   | 180       | 80        | 100       |  | 4,56                                                                               | 3,37                                    | 3,31                                       | 80                                               | 3,89                     |
|                                                                                   | 200       | 80        | 120       |  | 4,56                                                                               | 3,37                                    | 3,31                                       | 90                                               | 3,89                     |
|                                                                                   | 220       | 80        | 140       |  | 4,56                                                                               | 3,37                                    | 3,31                                       | 100                                              | 3,89                     |
|                                                                                   | 240       | 80        | 160       |  | 4,56                                                                               | 3,37                                    | 3,31                                       | 110                                              | 3,89                     |
|                                                                                   | 260       | 80        | 180       |  | 4,56                                                                               | 3,37                                    | 3,31                                       | 120                                              | 3,89                     |
|                                                                                   | 280       | 80        | 200       |  | 4,56                                                                               | 3,37                                    | 3,31                                       | 130                                              | 3,89                     |
|                                                                                   | 300       | 100       | 200       |  | 4,56                                                                               | 3,76                                    | 3,31                                       | 140                                              | 3,89                     |
|                                                                                   | 320       | 100       | 220       |  | 4,56                                                                               | 3,76                                    | 3,31                                       | 150                                              | 3,89                     |
|                                                                                   | 340       | 100       | 240       |  | 4,56                                                                               | 3,76                                    | 3,31                                       | 160                                              | 3,89                     |
|                                                                                   | 360       | 100       | 260       |  | 4,56                                                                               | 3,76                                    | 3,31                                       | 170                                              | 3,89                     |
|                                                                                   | 380       | 100       | 280       |  | 4,56                                                                               | 3,76                                    | 3,31                                       | 180                                              | 3,89                     |
|                                                                                   | 400       | 100       | 300       |  | 4,56                                                                               | 3,76                                    | 3,31                                       | 190                                              | 3,89                     |
| 12                                                                                | 120       | 80        | 40        |  | 4,54                                                                               | 3,56                                    | -                                          | -                                                | -                        |
|                                                                                   | 160       | 80        | 80        |  | 5,69                                                                               | 4,00                                    | -                                          | -                                                | -                        |
|                                                                                   | 200       | 80        | 120       |  | 5,69                                                                               | 4,00                                    | -                                          | -                                                | -                        |
|                                                                                   | 240       | 80        | 160       |  | 5,69                                                                               | 4,00                                    | -                                          | -                                                | -                        |
|                                                                                   | 280       | 80        | 200       |  | 5,69                                                                               | 4,00                                    | -                                          | -                                                | -                        |
|                                                                                   | 320       | 120       | 200       |  | 5,69                                                                               | 4,65                                    | -                                          | -                                                | -                        |
|                                                                                   | 360       | 120       | 240       |  | 5,69                                                                               | 4,65                                    | -                                          | -                                                | -                        |
|                                                                                   | 400       | 120       | 280       |  | 5,69                                                                               | 4,65                                    | -                                          | -                                                | -                        |
|                                                                                   | 440       | 120       | 320       |  | 5,69                                                                               | 4,65                                    | -                                          | -                                                | -                        |
|                                                                                   | 480       | 120       | 360       |  | 5,69                                                                               | 4,65                                    | -                                          | -                                                | -                        |
|                                                                                   | 520       | 120       | 400       |  | 5,69                                                                               | 4,65                                    | -                                          | -                                                | -                        |
|                                                                                   | 560       | 120       | 440       |  | 5,69                                                                               | 4,65                                    | -                                          | -                                                | -                        |
|                                                                                   | 600       | 120       | 480       |  | 5,69                                                                               | 4,65                                    | -                                          | -                                                | -                        |

#### POZNÁMKY:

- (1) Charakteristiky odolnosti v strihu nie sú závislé od smeru vlákna vonkajšej vrstvy panelu CLT.
- (2) Charakteristiky odolnosti v strihu sú posudzované na paneloch OSB3 alebo OSB4 v súlade s normou EN 300 alebo drevotrieskových paneloch v súlade s normou EN 312 hrubých  $S_{PAN}$ .
- (3) Osová únosnosť voči vytiahnutiu skrutky bola vyhodnocovaná vzhľadom 90 ° uhlu medzi vláknami a konektorom a pre dĺžku rovnajúcu sa b.

- (4) Osová únosnosť voči vytiahnutiu skrutky platí pre minimálne hrúbky prvků rovnajúce sa hodnote  $t_{min} = 10 \cdot d$  a minimálnu hĺbku zavrátania skrutky rovnajúcu sa hodnote  $t_{pen} = 10 \cdot d$ .

- (5) Osová únosnosť vniknutia hlavy bola vyhodnocovaná na drevenom prvku.

|  | STRIH <sup>(1)</sup>                                                              |                                                                                   | ŤAH                                                                               |                                                                                    |                                                                                     |                                                                                     |
|--|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|  | CLT - drevo<br>lateral face                                                       | drevo - CLT<br>narrow face                                                        | vytiahnutie časti závitu<br>lateral face <sup>(3)</sup>                           | vytiahnutie časti závitu<br>narrow face <sup>(4)</sup>                             | vnikanie<br>hlavy <sup>(5)</sup>                                                    | vnikanie hlavy<br>s podložkou <sup>(5)</sup>                                        |
|  |  |  |  |  |  |  |
|  | $R_{V,k}$<br>[kN]                                                                 | $R_{V,k}$<br>[kN]                                                                 | $R_{ax,k}$<br>[kN]                                                                | $R_{ax,k}$<br>[kN]                                                                 | $R_{head,k}$<br>[kN]                                                                | $R_{head,k}$<br>[kN]                                                                |
|  | 3,50                                                                              | 3,01                                                                              | 6,08                                                                              | 4,42                                                                               | 3,50                                                                                | 9,45                                                                                |
|  | 4,02                                                                              | 3,01                                                                              | 6,08                                                                              | 4,42                                                                               | 3,50                                                                                | 9,45                                                                                |
|  | 4,63                                                                              | 3,12                                                                              | 7,02                                                                              | 5,03                                                                               | 3,50                                                                                | 9,45                                                                                |
|  | 4,65                                                                              | 3,12                                                                              | 7,02                                                                              | 5,03                                                                               | 3,50                                                                                | 9,45                                                                                |
|  | 4,65                                                                              | 3,46                                                                              | 9,36                                                                              | 6,51                                                                               | 3,50                                                                                | 9,45                                                                                |
|  | 4,65                                                                              | 3,46                                                                              | 9,36                                                                              | 6,51                                                                               | 3,50                                                                                | 9,45                                                                                |
|  | 4,65                                                                              | 3,46                                                                              | 9,36                                                                              | 6,51                                                                               | 3,50                                                                                | 9,45                                                                                |
|  | 4,65                                                                              | 3,46                                                                              | 9,36                                                                              | 6,51                                                                               | 3,50                                                                                | 9,45                                                                                |
|  | 4,65                                                                              | 3,46                                                                              | 9,36                                                                              | 6,51                                                                               | 3,50                                                                                | 9,45                                                                                |
|  | 4,65                                                                              | 3,46                                                                              | 9,36                                                                              | 6,51                                                                               | 3,50                                                                                | 9,45                                                                                |
|  | 4,65                                                                              | 3,46                                                                              | 9,36                                                                              | 6,51                                                                               | 3,50                                                                                | 9,45                                                                                |
|  | 4,65                                                                              | 3,86                                                                              | 11,70                                                                             | 7,96                                                                               | 3,50                                                                                | 9,45                                                                                |
|  | 4,65                                                                              | 3,86                                                                              | 11,70                                                                             | 7,96                                                                               | 3,50                                                                                | 9,45                                                                                |
|  | 4,65                                                                              | 3,86                                                                              | 11,70                                                                             | 7,96                                                                               | 3,50                                                                                | 9,45                                                                                |
|  | 4,65                                                                              | 3,86                                                                              | 11,70                                                                             | 7,96                                                                               | 3,50                                                                                | 9,45                                                                                |
|  | 4,65                                                                              | 3,86                                                                              | 11,70                                                                             | 7,96                                                                               | 3,50                                                                                | 9,45                                                                                |
|  | 4,71                                                                              | 4,10                                                                              | 11,23                                                                             | 7,54                                                                               | 4,52                                                                                | 14,37                                                                               |
|  | 5,79                                                                              | 4,11                                                                              | 11,23                                                                             | 7,54                                                                               | 4,52                                                                                | 14,37                                                                               |
|  | 5,79                                                                              | 4,11                                                                              | 11,23                                                                             | 7,54                                                                               | 4,52                                                                                | 14,37                                                                               |
|  | 5,79                                                                              | 4,11                                                                              | 11,23                                                                             | 7,54                                                                               | 4,52                                                                                | 14,37                                                                               |
|  | 5,79                                                                              | 4,11                                                                              | 11,23                                                                             | 7,54                                                                               | 4,52                                                                                | 14,37                                                                               |
|  | 5,79                                                                              | 4,78                                                                              | 16,85                                                                             | 10,86                                                                              | 4,52                                                                                | 14,37                                                                               |
|  | 5,79                                                                              | 4,78                                                                              | 16,85                                                                             | 10,86                                                                              | 4,52                                                                                | 14,37                                                                               |
|  | 5,79                                                                              | 4,78                                                                              | 16,85                                                                             | 10,86                                                                              | 4,52                                                                                | 14,37                                                                               |
|  | 5,79                                                                              | 4,78                                                                              | 16,85                                                                             | 10,86                                                                              | 4,52                                                                                | 14,37                                                                               |
|  | 5,79                                                                              | 4,78                                                                              | 16,85                                                                             | 10,86                                                                              | 4,52                                                                                | 14,37                                                                               |
|  | 5,79                                                                              | 4,78                                                                              | 16,85                                                                             | 10,86                                                                              | 4,52                                                                                | 14,37                                                                               |
|  | 5,79                                                                              | 4,78                                                                              | 16,85                                                                             | 10,86                                                                              | 4,52                                                                                | 14,37                                                                               |
|  | 5,79                                                                              | 4,78                                                                              | 16,85                                                                             | 10,86                                                                              | 4,52                                                                                | 14,37                                                                               |
|  | 5,79                                                                              | 4,78                                                                              | 16,85                                                                             | 10,86                                                                              | 4,52                                                                                | 14,37                                                                               |
|  | 5,79                                                                              | 4,78                                                                              | 16,85                                                                             | 10,86                                                                              | 4,52                                                                                | 14,37                                                                               |

### VŠEOBECNÉ PRINCÍPY:

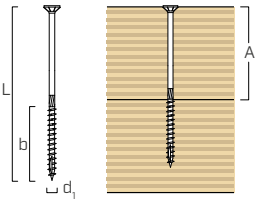
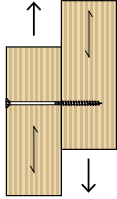
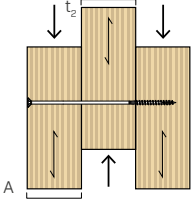
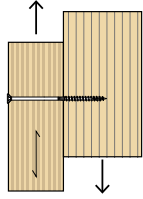
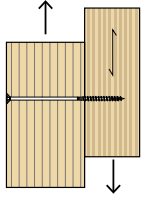
- Charakteristické hodnoty sú podľa normy EN 1995:2014 a vnútroštátnych špecifikácií ÖNORM EN 1995 – Príloha K v súlade s normou ETA-11/0030.
- Projektované hodnoty sú odvodené z charakteristických hodnôt takto:

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

Koeficienty  $\gamma_M$  a  $k_{mod}$  sa berú podľa platného nariadenia použitého pri výpočte.

- Požadované hodnoty mechanickej pevnosti a geometrie skrutiek sú v zohľadnení s ETA-11/0030.
- Pri výpočte sa brala do úvahy objemová hmotnosť  $\rho_k = 350 \text{ kg/m}^3$  pre prvky z CLT a  $\rho_k = 385 \text{ kg/m}^3$  pre drevené prvky.

- Hodnoty sú vypočítané s ohľadom na závitovú časť skrutky pri úplnom zaskrutkovaní do časti dreva.
- Návrh rozmerov a overovanie drevených prvkov, panelov a oceľových platní musí byť vykonané samostatne.
- Charakteristiky odolnosti v strihu sú vyhodnocované pre skrutky skrútkované bez predvrtania; v prípade skrutiek skrútkovaných s predvrtaním je možné získať väčšie hodnoty odporu.
- Charakteristiky odolnosti v strihu sú posudzované s ohľadom na minimálnu dĺžku zavrtania skrutky rovnajúcej sa hodnote  $4 \cdot d_1$ .
- Skrutky musia byť umiestnené tak, aby boli dodržané minimálne vzdialenosti.

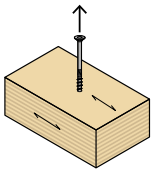
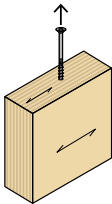
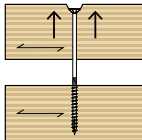
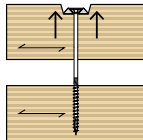
|                                                                                   |           |           | STRIH                                                                             |                          |                                                                                   |                        |                          |                                                                                     |                          |                                                                                     |                          |
|-----------------------------------------------------------------------------------|-----------|-----------|-----------------------------------------------------------------------------------|--------------------------|-----------------------------------------------------------------------------------|------------------------|--------------------------|-------------------------------------------------------------------------------------|--------------------------|-------------------------------------------------------------------------------------|--------------------------|
| geometria                                                                         |           |           | LVL - LVL                                                                         |                          | LVL - LVL - LVL                                                                   |                        |                          | LVL - drevo                                                                         |                          | drevo - LVL                                                                         |                          |
|  |           |           |  |                          |  |                        |                          |  |                          |  |                          |
| d <sub>1</sub><br>[mm]                                                            | L<br>[mm] | b<br>[mm] | A<br>[mm]                                                                         | R <sub>V,k</sub><br>[kN] | A<br>[mm]                                                                         | t <sub>2</sub><br>[mm] | R <sub>V,k</sub><br>[kN] | A<br>[mm]                                                                           | R <sub>V,k</sub><br>[kN] | A<br>[mm]                                                                           | R <sub>V,k</sub><br>[kN] |
| 5                                                                                 | 40        | 24        | -                                                                                 | -                        | -                                                                                 | -                      | -                        | -                                                                                   | -                        | -                                                                                   | -                        |
|                                                                                   | 45        | 24        | -                                                                                 | -                        | -                                                                                 | -                      | -                        | -                                                                                   | -                        | -                                                                                   | -                        |
|                                                                                   | 50        | 24        | -                                                                                 | -                        | -                                                                                 | -                      | -                        | -                                                                                   | -                        | -                                                                                   | -                        |
|                                                                                   | 60        | 30        | -                                                                                 | -                        | -                                                                                 | -                      | -                        | -                                                                                   | -                        | 27                                                                                  | 1,35                     |
|                                                                                   | 70        | 35        | 33                                                                                | 1,80                     | -                                                                                 | -                      | -                        | 33                                                                                  | 1,69                     | 35                                                                                  | 1,47                     |
|                                                                                   | 80        | 40        | 40                                                                                | 1,80                     | -                                                                                 | -                      | -                        | 40                                                                                  | 1,69                     | 40                                                                                  | 1,47                     |
|                                                                                   | 90        | 45        | 45                                                                                | 1,80                     | -                                                                                 | -                      | -                        | 45                                                                                  | 1,69                     | 45                                                                                  | 1,47                     |
|                                                                                   | 100       | 50        | 50                                                                                | 1,80                     | -                                                                                 | -                      | -                        | 50                                                                                  | 1,69                     | 50                                                                                  | 1,47                     |
|                                                                                   | 120       | 60        | 60                                                                                | 1,80                     | -                                                                                 | -                      | -                        | 60                                                                                  | 1,69                     | 70                                                                                  | 1,47                     |
| 6                                                                                 | 40        | 35        | -                                                                                 | -                        | -                                                                                 | -                      | -                        | -                                                                                   | -                        | -                                                                                   | -                        |
|                                                                                   | 50        | 35        | -                                                                                 | -                        | -                                                                                 | -                      | -                        | -                                                                                   | -                        | -                                                                                   | -                        |
|                                                                                   | 60        | 30        | -                                                                                 | -                        | -                                                                                 | -                      | -                        | -                                                                                   | -                        | -                                                                                   | -                        |
|                                                                                   | 70        | 40        | -                                                                                 | -                        | -                                                                                 | -                      | -                        | -                                                                                   | -                        | -                                                                                   | -                        |
|                                                                                   | 80        | 40        | -                                                                                 | -                        | -                                                                                 | -                      | -                        | -                                                                                   | -                        | 35                                                                                  | 1,96                     |
|                                                                                   | 90        | 50        | 45                                                                                | 2,56                     | -                                                                                 | -                      | -                        | 45                                                                                  | 2,41                     | 40                                                                                  | 2,09                     |
|                                                                                   | 100       | 50        | 50                                                                                | 2,56                     | -                                                                                 | -                      | -                        | 50                                                                                  | 2,41                     | 50                                                                                  | 2,09                     |
|                                                                                   | 110       | 60        | 50                                                                                | 2,56                     | -                                                                                 | -                      | -                        | 50                                                                                  | 2,41                     | 50                                                                                  | 2,09                     |
|                                                                                   | 120       | 60        | 60                                                                                | 2,56                     | -                                                                                 | -                      | -                        | 60                                                                                  | 2,41                     | 60                                                                                  | 2,09                     |
|                                                                                   | 130       | 60        | 70                                                                                | 2,56                     | -                                                                                 | -                      | -                        | 70                                                                                  | 2,41                     | 70                                                                                  | 2,09                     |
|                                                                                   | 140       | 75        | 65                                                                                | 2,56                     | -                                                                                 | -                      | -                        | 65                                                                                  | 2,41                     | 65                                                                                  | 2,09                     |
|                                                                                   | 150       | 75        | 75                                                                                | 2,56                     | -                                                                                 | -                      | -                        | 75                                                                                  | 2,41                     | 75                                                                                  | 2,09                     |
|                                                                                   | 160       | 75        | 85                                                                                | 2,56                     | 45                                                                                | 70                     | 5,12                     | 85                                                                                  | 2,41                     | 85                                                                                  | 2,09                     |
|                                                                                   | 180       | 75        | 105                                                                               | 2,56                     | 55                                                                                | 75                     | 5,12                     | 105                                                                                 | 2,41                     | 105                                                                                 | 2,09                     |
|                                                                                   | 200       | 75        | 125                                                                               | 2,56                     | 60                                                                                | 85                     | 5,12                     | 125                                                                                 | 2,41                     | 125                                                                                 | 2,09                     |
|                                                                                   | 220       | 75        | 145                                                                               | 2,56                     | 70                                                                                | 85                     | 5,12                     | 145                                                                                 | 2,41                     | 145                                                                                 | 2,09                     |
|                                                                                   | 240       | 75        | 165                                                                               | 2,56                     | 75                                                                                | 95                     | 5,12                     | 165                                                                                 | 2,41                     | 165                                                                                 | 2,09                     |
|                                                                                   | 260       | 75        | 185                                                                               | 2,56                     | 75                                                                                | 115                    | 5,12                     | 185                                                                                 | 2,41                     | 185                                                                                 | 2,09                     |
|                                                                                   | 280       | 75        | 205                                                                               | 2,56                     | 75                                                                                | 135                    | 5,12                     | 205                                                                                 | 2,41                     | 205                                                                                 | 2,09                     |
|                                                                                   | 300       | 75        | 225                                                                               | 2,56                     | 75                                                                                | 155                    | 5,12                     | 225                                                                                 | 2,41                     | 225                                                                                 | 2,09                     |

**POZNÁMKY:**

(1) Osová únosnosť voči vytiahnutiu skrutky bola vyhodnocovaná vzhľadom k 90° uhlu medzi vláknami a konektorom a pre dĺžku rovnajúcu sa b.

(2) Osová únosnosť voči vnikaniu hlavy s podložkou alebo bez nej bola posudzovaná na LVL prvku.

## TĚH

|  | vytiahnutie závitů<br>flat <sup>(1)</sup>                                         | vytiahnutie závitů<br>edge <sup>(1)</sup>                                         | vnikanie hlavy<br>flat <sup>(2)</sup>                                              | vnikanie hlavy<br>s podložkou<br>flat <sup>(2)</sup>                                |
|--|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|  |  |  |  |  |
|  | $R_{ax,k}$<br>[kN]                                                                | $R_{ax,k}$<br>[kN]                                                                | $R_{head,k}$<br>[kN]                                                               | $R_{head,k}$<br>[kN]                                                                |
|  | 1,74                                                                              | 1,16                                                                              | 1,94                                                                               | -                                                                                   |
|  | 1,74                                                                              | 1,16                                                                              | 1,94                                                                               | -                                                                                   |
|  | 1,74                                                                              | 1,16                                                                              | 1,94                                                                               | -                                                                                   |
|  | 2,18                                                                              | 1,45                                                                              | 1,94                                                                               | -                                                                                   |
|  | 2,54                                                                              | 1,69                                                                              | 1,94                                                                               | -                                                                                   |
|  | 2,90                                                                              | 1,94                                                                              | 1,94                                                                               | -                                                                                   |
|  | 3,99                                                                              | 2,66                                                                              | 1,94                                                                               | -                                                                                   |
|  | 3,63                                                                              | 2,42                                                                              | 1,94                                                                               | -                                                                                   |
|  | 4,36                                                                              | 2,90                                                                              | 1,94                                                                               | -                                                                                   |
|  | 3,05                                                                              | 2,03                                                                              | 2,79                                                                               | 7,74                                                                                |
|  | 3,05                                                                              | 2,03                                                                              | 2,79                                                                               | 7,74                                                                                |
|  | 2,61                                                                              | 1,74                                                                              | 2,79                                                                               | 7,74                                                                                |
|  | 3,48                                                                              | 2,32                                                                              | 2,79                                                                               | 7,74                                                                                |
|  | 3,48                                                                              | 2,32                                                                              | 2,79                                                                               | 7,74                                                                                |
|  | 4,36                                                                              | 2,90                                                                              | 2,79                                                                               | 7,74                                                                                |
|  | 4,36                                                                              | 2,90                                                                              | 2,79                                                                               | 7,74                                                                                |
|  | 5,23                                                                              | 3,48                                                                              | 2,79                                                                               | 7,74                                                                                |
|  | 5,23                                                                              | 3,48                                                                              | 2,79                                                                               | 7,74                                                                                |
|  | 5,23                                                                              | 3,48                                                                              | 2,79                                                                               | 7,74                                                                                |
|  | 6,53                                                                              | 4,36                                                                              | 2,79                                                                               | 7,74                                                                                |
|  | 6,53                                                                              | 4,36                                                                              | 2,79                                                                               | 7,74                                                                                |
|  | 6,53                                                                              | 4,36                                                                              | 2,79                                                                               | 7,74                                                                                |
|  | 6,53                                                                              | 4,36                                                                              | 2,79                                                                               | 7,74                                                                                |
|  | 6,53                                                                              | 4,36                                                                              | 2,79                                                                               | 7,74                                                                                |
|  | 6,53                                                                              | 4,36                                                                              | 2,79                                                                               | 7,74                                                                                |
|  | 6,53                                                                              | 4,36                                                                              | 2,79                                                                               | 7,74                                                                                |
|  | 6,53                                                                              | 4,36                                                                              | 2,79                                                                               | 7,74                                                                                |
|  | 6,53                                                                              | 4,36                                                                              | 2,79                                                                               | 7,74                                                                                |
|  | 6,53                                                                              | 4,36                                                                              | 2,79                                                                               | 7,74                                                                                |
|  | 6,53                                                                              | 4,36                                                                              | 2,79                                                                               | 7,74                                                                                |

## VŠEOBECNÉ PRINCÍPY:

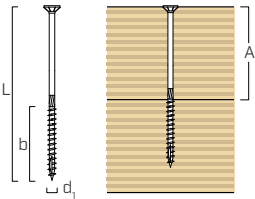
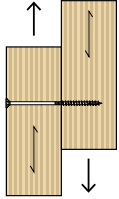
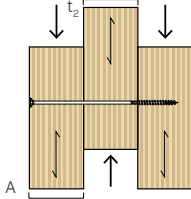
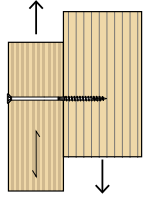
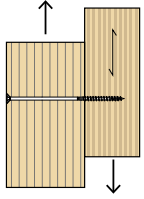
- Charakteristické hodnoty sú podľa normy EN 1995:2014 v zhode s ETA-11/0030.
- Projektované hodnoty sú odvodené z charakteristických hodnôt takto:

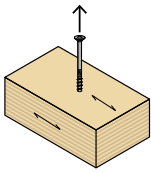
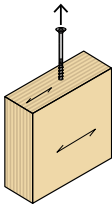
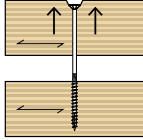
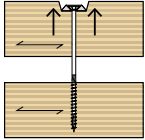
$$R_d = \frac{R_k \cdot k_{mod}}{\gamma_M}$$

Koeficienty  $\gamma_M$  a  $k_{mod}$  sa berú podľa platného nariadenia použitého pri výpočte.

- Požadované hodnoty mechanickej pevnosti a geometrie skrutiek sú v zhode s ETA-11/0030.

- Pri výpočte sa brala do úvahy merná hmotnosť LVL prvků z ihličnanov (softwood) rovnajúca sa hodnote  $\rho_k = 480 \text{ kg/m}^3$  a drevených prvků rovnajúca sa hodnote  $\rho_k = 350 \text{ kg/m}^3$ .
- Hodnoty sú vypočítané s ohľadom na závitovú časť skrutky pri úplnom zaskrutkovaní do časti dreva.
- Návrh rozmerov a overovanie drevených prvků, panelov a oceľových platní musí byť vykonané samostatne.
- Charakteristiky odolnosti v strihu sú vyhodnocované pre skrutky skrútkované bez predvrtania; v prípade skrutiek skrútkovaných s predvrtaním je možné získať väčšie hodnoty odporu.

|                                                                                   |           |           | STRIH                                                                             |                          |                                                                                   |                        |                          |                                                                                     |                          |                                                                                     |                          |
|-----------------------------------------------------------------------------------|-----------|-----------|-----------------------------------------------------------------------------------|--------------------------|-----------------------------------------------------------------------------------|------------------------|--------------------------|-------------------------------------------------------------------------------------|--------------------------|-------------------------------------------------------------------------------------|--------------------------|
| geometria                                                                         |           |           | LVL - LVL                                                                         |                          | LVL - LVL - LVL                                                                   |                        |                          | LVL - drevo                                                                         |                          | drevo - LVL                                                                         |                          |
|  |           |           |  |                          |  |                        |                          |  |                          |  |                          |
| d <sub>1</sub><br>[mm]                                                            | L<br>[mm] | b<br>[mm] | A<br>[mm]                                                                         | R <sub>V,k</sub><br>[kN] | A<br>[mm]                                                                         | t <sub>2</sub><br>[mm] | R <sub>V,k</sub><br>[kN] | A<br>[mm]                                                                           | R <sub>V,k</sub><br>[kN] | A<br>[mm]                                                                           | R <sub>V,k</sub><br>[kN] |
| 8                                                                                 | 80        | 52        | -                                                                                 | -                        | -                                                                                 | -                      | -                        | -                                                                                   | -                        | -                                                                                   | -                        |
|                                                                                   | 100       | 52        | -                                                                                 | -                        | -                                                                                 | -                      | -                        | -                                                                                   | -                        | 40                                                                                  | 2,89                     |
|                                                                                   | 120       | 60        | 60                                                                                | 4,01                     | -                                                                                 | -                      | -                        | 60                                                                                  | 3,77                     | 60                                                                                  | 3,30                     |
|                                                                                   | 140       | 60        | 80                                                                                | 4,01                     | -                                                                                 | -                      | -                        | 80                                                                                  | 3,77                     | 80                                                                                  | 3,30                     |
|                                                                                   | 160       | 80        | 80                                                                                | 4,01                     | -                                                                                 | -                      | -                        | 80                                                                                  | 3,77                     | 80                                                                                  | 3,30                     |
|                                                                                   | 180       | 80        | 100                                                                               | 4,01                     | -                                                                                 | -                      | -                        | 100                                                                                 | 3,77                     | 100                                                                                 | 3,30                     |
|                                                                                   | 200       | 80        | 120                                                                               | 4,01                     | 65                                                                                | 75                     | 8,03                     | 120                                                                                 | 3,77                     | 120                                                                                 | 3,30                     |
|                                                                                   | 220       | 80        | 140                                                                               | 4,01                     | 75                                                                                | 75                     | 8,03                     | 140                                                                                 | 3,77                     | 140                                                                                 | 3,30                     |
|                                                                                   | 240       | 80        | 160                                                                               | 4,01                     | 80                                                                                | 85                     | 8,03                     | 160                                                                                 | 3,77                     | 160                                                                                 | 3,30                     |
|                                                                                   | 260       | 80        | 180                                                                               | 4,01                     | 80                                                                                | 105                    | 8,03                     | 180                                                                                 | 3,77                     | 180                                                                                 | 3,30                     |
|                                                                                   | 280       | 80        | 200                                                                               | 4,01                     | 80                                                                                | 125                    | 8,03                     | 200                                                                                 | 3,77                     | 200                                                                                 | 3,30                     |
|                                                                                   | 300       | 100       | 200                                                                               | 4,01                     | 100                                                                               | 105                    | 8,03                     | 200                                                                                 | 3,77                     | 200                                                                                 | 3,30                     |
|                                                                                   | 320       | 100       | 220                                                                               | 4,01                     | 100                                                                               | 125                    | 8,03                     | 220                                                                                 | 3,77                     | 220                                                                                 | 3,30                     |
|                                                                                   | 340       | 100       | 240                                                                               | 4,01                     | 100                                                                               | 145                    | 8,03                     | 240                                                                                 | 3,77                     | 240                                                                                 | 3,30                     |
|                                                                                   | 360       | 100       | 260                                                                               | 4,01                     | 100                                                                               | 165                    | 8,03                     | 260                                                                                 | 3,77                     | 260                                                                                 | 3,30                     |
|                                                                                   | 380       | 100       | 280                                                                               | 4,01                     | 100                                                                               | 185                    | 8,03                     | 280                                                                                 | 3,77                     | 280                                                                                 | 3,30                     |
|                                                                                   | 400       | 100       | 300                                                                               | 4,01                     | 120                                                                               | 165                    | 8,03                     | 300                                                                                 | 3,77                     | 300                                                                                 | 3,30                     |
|                                                                                   | 440       | 100       | 340                                                                               | 4,01                     | 120                                                                               | 205                    | 8,03                     | 340                                                                                 | 3,77                     | 340                                                                                 | 3,30                     |
|                                                                                   | 480       | 100       | 380                                                                               | 4,01                     | 120                                                                               | 245                    | 8,03                     | 380                                                                                 | 3,77                     | 380                                                                                 | 3,30                     |
|                                                                                   | 520       | 100       | 420                                                                               | 4,01                     | 120                                                                               | 285                    | 8,03                     | 420                                                                                 | 3,77                     | 420                                                                                 | 3,30                     |
| 10                                                                                | 80        | 52        | -                                                                                 | -                        | -                                                                                 | -                      | -                        | -                                                                                   | -                        | -                                                                                   | -                        |
|                                                                                   | 100       | 52        | -                                                                                 | -                        | -                                                                                 | -                      | -                        | -                                                                                   | -                        | -                                                                                   | -                        |
|                                                                                   | 120       | 60        | -                                                                                 | -                        | -                                                                                 | -                      | -                        | -                                                                                   | -                        | 45                                                                                  | 4,08                     |
|                                                                                   | 140       | 60        | -                                                                                 | -                        | -                                                                                 | -                      | -                        | -                                                                                   | -                        | 60                                                                                  | 4,69                     |
|                                                                                   | 160       | 80        | 75                                                                                | 5,93                     | -                                                                                 | -                      | -                        | 75                                                                                  | 5,58                     | 80                                                                                  | 4,84                     |
|                                                                                   | 180       | 80        | 100                                                                               | 5,93                     | -                                                                                 | -                      | -                        | 100                                                                                 | 5,58                     | 100                                                                                 | 4,84                     |
|                                                                                   | 200       | 80        | 120                                                                               | 5,93                     | -                                                                                 | -                      | -                        | 120                                                                                 | 5,58                     | 120                                                                                 | 4,84                     |
|                                                                                   | 220       | 80        | 140                                                                               | 5,93                     | -                                                                                 | -                      | -                        | 140                                                                                 | 5,58                     | 140                                                                                 | 4,84                     |
|                                                                                   | 240       | 80        | 160                                                                               | 5,93                     | 80                                                                                | 85                     | 11,87                    | 160                                                                                 | 5,58                     | 160                                                                                 | 4,84                     |
|                                                                                   | 260       | 80        | 180                                                                               | 5,93                     | 80                                                                                | 105                    | 11,87                    | 180                                                                                 | 5,58                     | 180                                                                                 | 4,84                     |
|                                                                                   | 280       | 80        | 200                                                                               | 5,93                     | 80                                                                                | 125                    | 11,87                    | 200                                                                                 | 5,58                     | 200                                                                                 | 4,84                     |
|                                                                                   | 300       | 100       | 200                                                                               | 5,93                     | 100                                                                               | 105                    | 11,87                    | 200                                                                                 | 5,58                     | 200                                                                                 | 4,84                     |
|                                                                                   | 320       | 100       | 220                                                                               | 5,93                     | 100                                                                               | 125                    | 11,87                    | 220                                                                                 | 5,58                     | 220                                                                                 | 4,84                     |
|                                                                                   | 340       | 100       | 240                                                                               | 5,93                     | 100                                                                               | 145                    | 11,87                    | 240                                                                                 | 5,58                     | 240                                                                                 | 4,84                     |
|                                                                                   | 360       | 100       | 260                                                                               | 5,93                     | 100                                                                               | 165                    | 11,87                    | 260                                                                                 | 5,58                     | 260                                                                                 | 4,84                     |
|                                                                                   | 380       | 100       | 280                                                                               | 5,93                     | 120                                                                               | 145                    | 11,87                    | 280                                                                                 | 5,58                     | 280                                                                                 | 4,84                     |
|                                                                                   | 400       | 100       | 300                                                                               | 5,93                     | 120                                                                               | 165                    | 11,87                    | 300                                                                                 | 5,58                     | 300                                                                                 | 4,84                     |

| ŤAH |                                                                                   |                                                                                   |                                                                                    |                                                                                     |
|-----|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|     | vytiahnutie závitú<br>flat <sup>(1)</sup>                                         | vytiahnutie závitú<br>edge <sup>(1)</sup>                                         | vnikanie hlavy<br>flat <sup>(2)</sup>                                              | vnikanie hlavy<br>s podložkou<br>flat <sup>(2)</sup>                                |
|     |  |  |  |  |
|     | $R_{ax,k}$<br>[kN]                                                                | $R_{ax,k}$<br>[kN]                                                                | $R_{head,k}$<br>[kN]                                                               | $R_{head,k}$<br>[kN]                                                                |
|     | 6,04                                                                              | 4,03                                                                              | 4,07                                                                               | 12,10                                                                               |
|     | 6,04                                                                              | 4,03                                                                              | 4,07                                                                               | 12,10                                                                               |
|     | 6,97                                                                              | 4,65                                                                              | 4,07                                                                               | 12,10                                                                               |
|     | 6,97                                                                              | 4,65                                                                              | 4,07                                                                               | 12,10                                                                               |
|     | 9,29                                                                              | 6,19                                                                              | 4,07                                                                               | 12,10                                                                               |
|     | 9,29                                                                              | 6,19                                                                              | 4,07                                                                               | 12,10                                                                               |
|     | 9,29                                                                              | 6,19                                                                              | 4,07                                                                               | 12,10                                                                               |
|     | 9,29                                                                              | 6,19                                                                              | 4,07                                                                               | 12,10                                                                               |
|     | 9,29                                                                              | 6,19                                                                              | 4,07                                                                               | 12,10                                                                               |
|     | 9,29                                                                              | 6,19                                                                              | 4,07                                                                               | 12,10                                                                               |
|     | 9,29                                                                              | 6,19                                                                              | 4,07                                                                               | 12,10                                                                               |
|     | 11,61                                                                             | 7,74                                                                              | 4,07                                                                               | 12,10                                                                               |
|     | 11,61                                                                             | 7,74                                                                              | 4,07                                                                               | 12,10                                                                               |
|     | 11,61                                                                             | 7,74                                                                              | 4,07                                                                               | 12,10                                                                               |
|     | 11,61                                                                             | 7,74                                                                              | 4,07                                                                               | 12,10                                                                               |
|     | 11,61                                                                             | 7,74                                                                              | 4,07                                                                               | 12,10                                                                               |
|     | 11,61                                                                             | 7,74                                                                              | 4,07                                                                               | 12,10                                                                               |
|     | 11,61                                                                             | 7,74                                                                              | 4,07                                                                               | 12,10                                                                               |
|     | 11,61                                                                             | 7,74                                                                              | 4,07                                                                               | 12,10                                                                               |
|     | 11,61                                                                             | 7,74                                                                              | 4,07                                                                               | 12,10                                                                               |
|     | 7,55                                                                              | 5,03                                                                              | 6,45                                                                               | 17,42                                                                               |
|     | 7,55                                                                              | 5,03                                                                              | 6,45                                                                               | 17,42                                                                               |
|     | 8,71                                                                              | 5,81                                                                              | 6,45                                                                               | 17,42                                                                               |
|     | 8,71                                                                              | 5,81                                                                              | 6,45                                                                               | 17,42                                                                               |
|     | 11,61                                                                             | 7,74                                                                              | 6,45                                                                               | 17,42                                                                               |
|     | 11,61                                                                             | 7,74                                                                              | 6,45                                                                               | 17,42                                                                               |
|     | 11,61                                                                             | 7,74                                                                              | 6,45                                                                               | 17,42                                                                               |
|     | 11,61                                                                             | 7,74                                                                              | 6,45                                                                               | 17,42                                                                               |
|     | 11,61                                                                             | 7,74                                                                              | 6,45                                                                               | 17,42                                                                               |
|     | 11,61                                                                             | 7,74                                                                              | 6,45                                                                               | 17,42                                                                               |
|     | 11,61                                                                             | 7,74                                                                              | 6,45                                                                               | 17,42                                                                               |
|     | 14,52                                                                             | 9,68                                                                              | 6,45                                                                               | 17,42                                                                               |
|     | 14,52                                                                             | 9,68                                                                              | 6,45                                                                               | 17,42                                                                               |
|     | 14,52                                                                             | 9,68                                                                              | 6,45                                                                               | 17,42                                                                               |
|     | 14,52                                                                             | 9,68                                                                              | 6,45                                                                               | 17,42                                                                               |
|     | 14,52                                                                             | 9,68                                                                              | 6,45                                                                               | 17,42                                                                               |
|     | 14,52                                                                             | 9,68                                                                              | 6,45                                                                               | 17,42                                                                               |

## PRÍKLADY VÝPOČTU: SPOJENIE NOSNÍK-TRÁM

### PREPOJENIE DREVO-DREVO/JEDNODUCHÝ REZ

| PRVOK 1           | 1 |
|-------------------|---|
| B1 = 120 mm       |   |
| H1 = 160 mm       |   |
| Sklon 30% (16,7°) |   |
| Drevo GL24h       |   |



| PRVOK 2           | 2 |
|-------------------|---|
| B2 = 160 mm       |   |
| H2 = 240 mm       |   |
| Sklon 21% (12,0°) |   |
| Drevo GL24h       |   |

| NÁVRHOVÉ ÚDAJE               |
|------------------------------|
| $F_{v,Rd} = 7,17 \text{ kN}$ |
| Prevádzková trieda = 1       |
| Doba zaťaženia = krátka      |

| VÝBER SKRUTKY     |
|-------------------|
| HBS = 10x180 mm   |
| Predvrtanie = nie |
| Podložka = nie    |

| GEOMETRIA PREPOJENIA                                   |
|--------------------------------------------------------|
| $t_1 = 60 \text{ mm}$                                  |
| $\alpha_1 = 73,3^\circ (90^\circ - 16,7^\circ)$        |
| $t_2 = 120 \text{ mm}$<br>(dĺžka zavrtania do prvku 2) |
| $\alpha_2 = 78,0^\circ (90^\circ - 12,0^\circ)$        |

### VÝPOČET ODOLNOSTI V STRIHU [EN 1995:2014 a ETA-11/0030]

|                                    |                                                                                                                                        |
|------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| $d_1 = 10,0 \text{ mm}$            | $M_{y,k} = 35,8 \text{ Nm}$                                                                                                            |
| $f_{h,1,k} = 15,82 \text{ N/mm}^2$ | $R_{ax,Rk} = \min \{ \text{odolnosť voči vytiahnutiu skrutky, odolnosť proti vniknutiu hlavy} \} = \min \{ R_{ax,Rk} ; R_{head,Rk} \}$ |
| $f_{h,2,k} = 15,82 \text{ N/mm}^2$ | $= 3,77 \text{ kN}$                                                                                                                    |
| $\beta = 1,00$                     | $R_{ax,Rk}/4 = 0,94 \text{ kN (účinnok prehĺbenia)}$                                                                                   |

$$R_{v,Rk} = \min \left\{ \begin{array}{l} f_{h,1,k} t_1 d \\ f_{h,2,k} t_2 d \\ \frac{f_{h,1,k} t_1 d}{1 + \beta} \left[ \sqrt{\beta + 2\beta^2 \left[ 1 + \frac{t_2}{t_1} + \left( \frac{t_2}{t_1} \right)^2} \right] + \beta^3 \left( \frac{t_2}{t_1} \right)^2} - \beta \left( 1 + \frac{t_2}{t_1} \right) \right] + \frac{R_{ax,Rk}}{4} \\ 1,05 \frac{f_{h,1,k} t_1 d}{2 + \beta} \left[ \sqrt{2\beta (1 + \beta) + \frac{4\beta (2 + \beta) M_{y,Rk}}{f_{h,1,k} d t_1^2}} - \beta \right] + \frac{R_{ax,Rk}}{4} \\ 1,05 \frac{f_{h,1,k} t_2 d}{1 + 2\beta} \left[ \sqrt{2\beta^2 (1 + \beta) + \frac{4\beta (1 + 2\beta) M_{y,Rk}}{f_{h,1,k} d t_2^2}} - \beta \right] + \frac{R_{ax,Rk}}{4} \\ 1,15 \sqrt{\frac{2\beta}{(1 + \beta)}} \sqrt{2 M_{y,Rk} f_{h,1,k} d} + \frac{R_{ax,Rk}}{4} \end{array} \right.$$

(a) = 9,49 kN  
(b) = 18,99 kN  
(c) = 7,39 kN  
(d) = 4,87 kN  
(e) = 7,90 kN  
(f) = 4,81 kN

$R_{v,Rk} = 4,81 \text{ kN}$

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

EN 1995:2014  
 $k_{mod} = 0,9$   
 $\gamma_M = 1,3$   
 $R_{v,Rd} = 3,33 \text{ kN}$   
 Minimálny počet skrutiek  
 $F_{v,Rd}/R_{v,Rd} = 2,15$

Italia - NTC 2018

$$k_{mod} = 0,9$$

$$\gamma_M = 1,5$$

$$R_{v,Rd} = 2,89 \text{ kN}$$

Minimálny počet skrutiek  
 $F_{v,Rd}/R_{v,Rd} = 2,48$

Predpokladajú sa 3 skrutky  $n_{ef,STRIH} = 3$  (skrutky kolmé na vlákna)  
 $n_{ef,TAH} = \max (3^{0,9}; 0,9 \cdot 3) = 2,70$

Prepočítavanie na pevnosť v strihu, za účinné prehĺbenie sa považuje ťah jednej skrutky, ktorý sa rovná:

$$R_{ax,Rk} = 3,77 \cdot 2,70/3 = 3,39 \text{ kN (vniknutie hlavy)}$$

$$R_{ax,Rk}/4 = 0,85 \text{ kN (účinnok prehĺbenia)}$$

Odolnosť v strihu jednej skrutky:

$$R_{v,Rk} = 4,72 \text{ kN}$$

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

EN 1995:2014  
 $R_{v,Rd} = 3,27 \text{ kN}$   
**Odolnosť v strihu v spojení:**  
 $R_{v,Rd} = 3,27 \times 3 = 9,80 \text{ kN} > 7,17 \text{ kN OK}$

Italia - NTC 2018

$$R_{v,Rd} = 2,83 \text{ kN}$$

**Odolnosť v strihu v spojení:**  
 $R_{v,Rd} = 2,83 \times 3 = 8,49 \text{ kN} > 7,17 \text{ kN OK}$

PREPOJENIE DREVO-DREVO/JEDNODUCHÝ REZ

PRVOK 1

1

B1 = 120 mm

H1 = 160 mm

Sklon 30% (16,7°)

Drevo GL24h



PRVOK 2

2

B2 = 160 mm

H2 = 240 mm

Sklon 21% (12,0°)

Drevo GL24h

NÁVRHOVÉ ÚDAJE

$F_{v,Rd} = 7,17$  kN

Prevádzková trieda = 1

Doba zaťaženia = krátká

VÝBER SKRUTKY

HBS = 10x180 mm

Predvrtanie = nie

Podložka = nie

GEOMETRIA PREPOJENIA

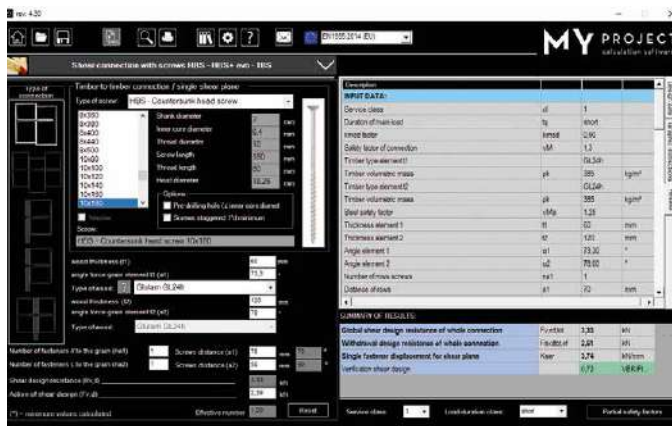
$t_1 = 60$  mm

$\alpha_1 = 73,3^\circ$  (90° - 16,7°)

$t_2 = 120$  mm  
(dĺžka zavrtania do prvku 2)

$\alpha_2 = 78,0^\circ$  (90° - 12,0°)

VÝPOČET ODOLNOSTI V STRIHU POMOCOU SOFTVÉRU MYPROJECT (EN 1995:2014 a ETA-11/0030)

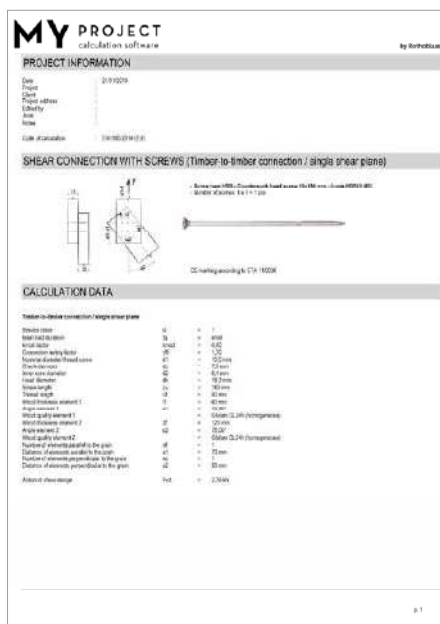


|                       |     |       |
|-----------------------|-----|-------|
| Number of rows screws | na1 | 1     |
| Distance of rows      | s1  | 70 mm |

| SUMMARY OF RESULTS:                                |                        |
|----------------------------------------------------|------------------------|
| Global shear design resistance of whole connection | $F_{v,Rd,tot}$ 3,33 kN |
| Withdrawal design resistance of whole connection   | $F_{axd,tot}$ 2,61 kN  |
| Single fastener displacement for shear plane       | $K_{ser}$ 3,74 kN/mm   |
| Verification shear design                          | 0,72 VERIFIED          |

SPRÁVA O VÝPOČTE



| NOTES                                                                        |                        |
|------------------------------------------------------------------------------|------------------------|
| The calculation of verification results and results for the response design. |                        |
| CALCULATION RESULTS                                                          |                        |
| Service class                                                                | all                    |
| Duration of main load                                                        | short                  |
| Global shear design resistance of whole connection                           | $F_{v,Rd,tot}$ 3,33 kN |
| Withdrawal design resistance of whole connection                             | $F_{axd,tot}$ 2,61 kN  |
| Single fastener displacement for shear plane                                 | $K_{ser}$ 3,74 kN/mm   |
| Verification shear design                                                    | 0,72 VERIFIED          |

|                                                    |                        |
|----------------------------------------------------|------------------------|
| Global shear design resistance of whole connection | $F_{v,Rd,tot}$ 3,33 kN |
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