

## SMOOTH DOWEL

### HIGH-RESISTANCE STEEL

Dowel Ø16 and Ø20 made of S355 steel grade to provide higher shear strength to the standard sizes used in structural design.

### TAPERED TIP

The end is narrowed for easy insertion inside the prepared hole in the timber. Available in 1,0 m long version.

### FOR SEISMIC ZONES

Available upon request in high bond steel and geometry designed to avoid pull-out when used in seismic areas.

### STAINLESS STEEL VERSION

Available in A2 | AISI304 stainless steel for outdoor structural applications.



USA, Canada and more design values available online.



STA



STAS

DIAMETER [mm] 7,5 **8** 20

LENGTH [mm] 55 **60** 1000

### MATERIAL



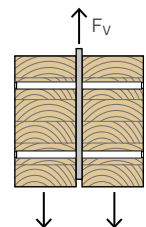
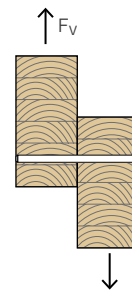
S235-S355 electrogalvanized carbon steel



A2 stainless steel



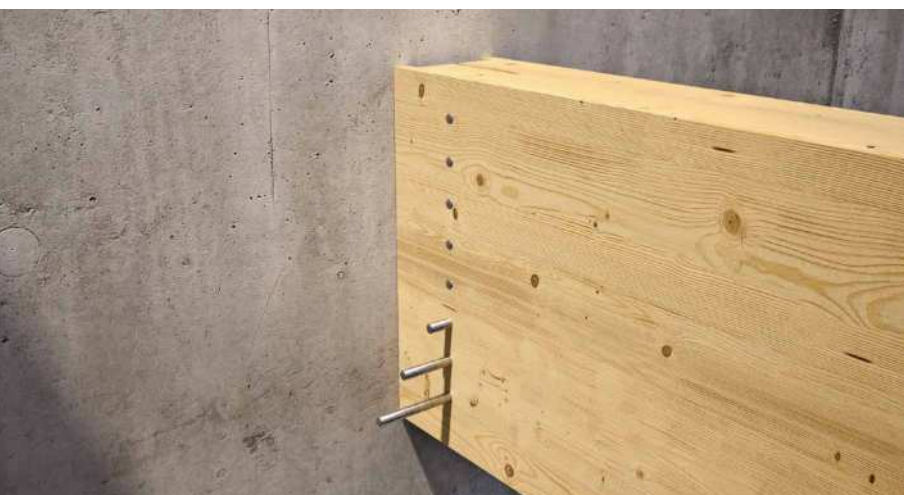
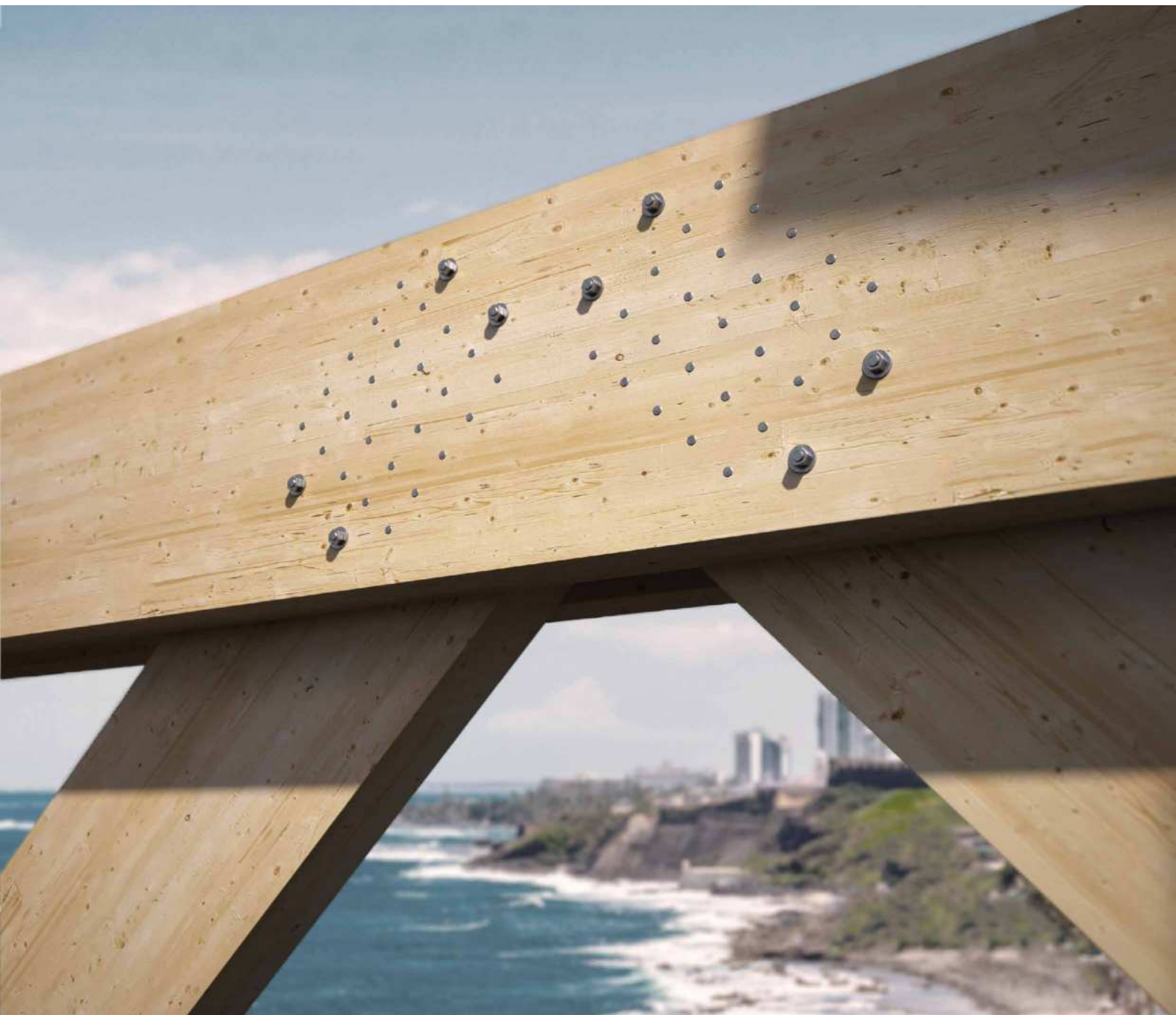
### EXTERNAL LOADS



### FIELDS OF USE

Assembly and structural connection of timber components for timber-to-timber and timber-to-steel shear connections

- solid timber and glulam
- CLT, LVL
- timber based panels



## LARGE STRUCTURES ALSO OUTDOOR

Stainless steel A2 version suitable for outdoor applications up to 1 km from the sea and on class T4 acid wood.

## TIMBER-TO-METAL

Ideal for being used with ALU and ALUMEGA brackets in realizing concealed joints. When used with wood taps it meets the fire safety requirements and provides an optimal aesthetic appearance.

## CODES AND DIMENSIONS

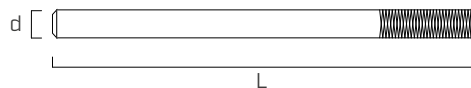
STA - smooth dowel made of S235-S355 carbon steel

**Zn**  
ELECTRO  
PLATED

| d          | CODE       | L    | L      | steel | pcs |
|------------|------------|------|--------|-------|-----|
| [mm] [in]  |            | [mm] | [in]   |       |     |
| 8<br>0.32  | STA860B    | 60   | 2 3/8  | S235  | 100 |
|            | STA880B    | 80   | 3 1/8  | S235  | 100 |
|            | STA8100B   | 100  | 4      | S235  | 100 |
|            | STA8120B   | 120  | 4 3/4  | S235  | 100 |
|            | STA8140B   | 140  | 5 1/2  | S235  | 100 |
| 12<br>0.48 | STA1260B   | 60   | 2 3/8  | S235  | 50  |
|            | STA1270B   | 70   | 2 3/4  | S235  | 50  |
|            | STA1280B   | 80   | 3 1/8  | S235  | 50  |
|            | STA1290B   | 90   | 3 1/2  | S235  | 50  |
|            | STA12100B  | 100  | 4      | S235  | 50  |
|            | STA12110B  | 110  | 4 3/8  | S235  | 50  |
|            | STA12120B  | 120  | 4 3/4  | S235  | 50  |
|            | STA12130B  | 130  | 5 1/8  | S235  | 50  |
|            | STA12140B  | 140  | 5 1/2  | S235  | 25  |
|            | STA12150B  | 150  | 6      | S235  | 25  |
|            | STA12160B  | 160  | 6 1/4  | S235  | 25  |
|            | STA12170B  | 170  | 6 3/4  | S235  | 25  |
|            | STA12180B  | 180  | 7 1/8  | S235  | 25  |
|            | STA12200B  | 200  | 8      | S235  | 25  |
| 12<br>0.48 | STA12220B  | 220  | 8 5/8  | S235  | 25  |
|            | STA12240B  | 240  | 9 1/2  | S235  | 25  |
|            | STA12260B  | 260  | 10 1/4 | S235  | 25  |
|            | STA12280B  | 280  | 11     | S235  | 25  |
|            | STA12320B  | 320  | 12 5/8 | S235  | 25  |
|            | STA12340B  | 340  | 13 3/8 | S235  | 25  |
|            | STA121000B | 1000 | 39 3/8 | S235  | 1   |
|            | STA1680B   | 80   | 3 1/8  | S355  | 25  |
|            | STA16100B  | 100  | 4      | S355  | 25  |
|            | STA16110B  | 110  | 4 3/8  | S355  | 25  |
|            | STA16120B  | 120  | 4 3/4  | S355  | 25  |
|            | STA16130B  | 130  | 5 1/8  | S355  | 25  |
|            | STA16140B  | 140  | 5 1/2  | S355  | 25  |
|            | STA16150B  | 150  | 6      | S355  | 25  |
| 16<br>0.63 | STA16160B  | 160  | 6 1/4  | S355  | 15  |
|            | STA16170B  | 170  | 6 3/4  | S355  | 15  |
|            | STA16180B  | 180  | 7 1/8  | S355  | 15  |

| d          | CODE       | L    | L      | steel | pcs |
|------------|------------|------|--------|-------|-----|
| [mm] [in]  |            | [mm] | [in]   |       |     |
| 16<br>0.63 | STA16190B  | 190  | 7 1/2  | S355  | 15  |
|            | STA16200B  | 200  | 8      | S355  | 15  |
|            | STA16220B  | 220  | 8 5/8  | S355  | 15  |
|            | STA16240B  | 240  | 9 1/2  | S355  | 15  |
|            | STA16260B  | 260  | 10 1/4 | S355  | 10  |
|            | STA16280B  | 280  | 11     | S355  | 10  |
|            | STA16300B  | 300  | 11 3/4 | S355  | 10  |
|            | STA16320B  | 320  | 12 5/8 | S355  | 10  |
|            | STA16340B  | 340  | 13 3/8 | S355  | 10  |
|            | STA16360B  | 360  | 14 1/4 | S355  | 10  |
|            | STA16380B  | 380  | 15     | S355  | 10  |
| 16<br>0.63 | STA16400B  | 400  | 15 3/4 | S355  | 10  |
|            | STA16500B  | 500  | 19 3/4 | S355  | 10  |
|            | STA161000B | 1000 | 39 3/8 | S355  | 1   |
| 20<br>0.79 | STA20120B  | 120  | 4 3/4  | S355  | 10  |
|            | STA20140B  | 140  | 5 1/2  | S355  | 10  |
|            | STA20160B  | 160  | 6 1/4  | S355  | 10  |
|            | STA20180B  | 180  | 7 1/8  | S355  | 10  |
|            | STA20190B  | 190  | 7 1/2  | S355  | 10  |
|            | STA20200B  | 200  | 8      | S355  | 10  |
|            | STA20220B  | 220  | 8 5/8  | S355  | 10  |
|            | STA20240B  | 240  | 9 1/2  | S355  | 10  |
|            | STA20260B  | 260  | 10 1/4 | S355  | 5   |
|            | STA20300B  | 300  | 11 3/4 | S355  | 5   |
|            | STA20320B  | 320  | 12 5/8 | S355  | 5   |
| 20<br>0.79 | STA20360B  | 360  | 14 1/4 | S355  | 5   |
|            | STA20400B  | 400  | 15 3/4 | S355  | 5   |
|            | STA201000B | 1000 | 39 3/8 | S355  | 1   |

Available upon request the STAS high bond steel and geometry designed to avoid pull-out when used in seismic areas (e.g. STAS16200).  
Minimum quantity: 1000 pcs



STA A2 | AISI304 - stainless steel smooth dowel<sup>(1)</sup>

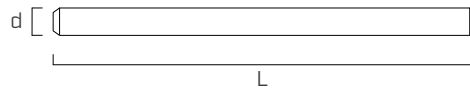
**A2**  
AISI 304

| d          | CODE       | L    | L      | pcs |
|------------|------------|------|--------|-----|
| [mm] [in]  |            | [mm] | [in]   |     |
| 12<br>0.48 | STA12100A2 | 100  | 4      | 25  |
|            | STA12120A2 | 120  | 4 3/4  | 25  |
|            | STA12140A2 | 140  | 5 1/2  | 25  |
|            | STA12160A2 | 160  | 6 1/4  | 25  |
|            | STA12180A2 | 180  | 7 1/8  | 25  |
|            | STA12200A2 | 200  | 8      | 25  |
|            | STA12220A2 | 220  | 8 5/8  | 25  |
|            | STA12240A2 | 240  | 9 1/2  | 25  |
|            | STA12260A2 | 260  | 10 1/4 | 25  |
| 16<br>0.63 | STA16120A2 | 120  | 4 3/4  | 25  |
|            | STA16140A2 | 140  | 5 1/2  | 10  |
|            | STA16150A2 | 150  | 6      | 10  |
|            | STA16160A2 | 160  | 6 1/4  | 10  |
|            | STA16180A2 | 180  | 7 1/8  | 10  |
|            | STA16200A2 | 200  | 8      | 10  |
|            | STA16220A2 | 220  | 8 5/8  | 10  |
|            | STA16240A2 | 240  | 9 1/2  | 10  |
|            | STA16260A2 | 260  | 10 1/4 | 10  |
|            | STA16280A2 | 280  | 11     | 10  |
|            | STA16300A2 | 300  | 11 3/4 | 10  |

| d          | CODE       | L    | L      | pcs |
|------------|------------|------|--------|-----|
| [mm] [in]  |            | [mm] | [in]   |     |
| 20<br>0.79 | STA20160A2 | 160  | 6 1/4  | 10  |
|            | STA20180A2 | 180  | 7 1/8  | 10  |
|            | STA20200A2 | 200  | 8      | 10  |
|            | STA20220A2 | 220  | 8 5/8  | 10  |
|            | STA20240A2 | 240  | 9 1/2  | 10  |
|            | STA20260A2 | 260  | 10 1/4 | 5   |
|            | STA20280A2 | 280  | 11     | 5   |
|            | STA20300A2 | 300  | 11 3/4 | 5   |
|            | STA20320A2 | 320  | 12 5/8 | 5   |
|            | STA20340A2 | 340  | 13 3/8 | 5   |
|            | STA20360A2 | 360  | 14 1/4 | 5   |
| 20<br>0.79 | STA20380A2 | 380  | 15     | 5   |

<sup>(1)</sup>Not holding CE marking.  
STA A2 | AISI304 codes are only available on request, with an estimated lead time of 30 days.

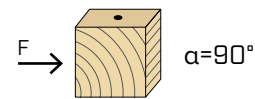
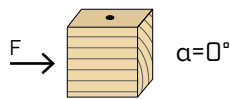
## ■ GEOMETRY AND MECHANICAL CHARACTERISTICS



| Nominal diameter            | d             | [mm]                 | 8    | 12   | 16    | 20    |
|-----------------------------|---------------|----------------------|------|------|-------|-------|
| Steel                       |               |                      | S235 | S235 | S355  | S355  |
|                             | $f_{u,k,min}$ | [N/mm <sup>2</sup> ] | 360  | 360  | 470   | 470   |
|                             | $f_{y,k,min}$ | [N/mm <sup>2</sup> ] | 235  | 235  | 355   | 355   |
| Characteristic yield moment | $M_{y,k}$     | [Nm]                 | 24,1 | 69,1 | 191,0 | 340,0 |

Mechanical parameters according to CE marking, in accordance with EN 14592.

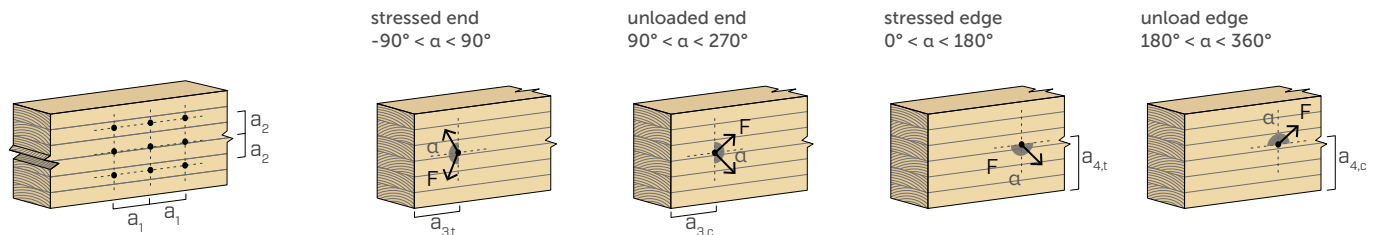
## ■ MINIMUM DISTANCES FOR DOWELS SUBJECT TO SHEAR



| d                | [mm] |                    | 8  | 12 | 16  | 20  |
|------------------|------|--------------------|----|----|-----|-----|
| a <sub>1</sub>   | [mm] | 5·d                | 40 | 60 | 80  | 100 |
| a <sub>2</sub>   | [mm] | 3·d                | 24 | 36 | 48  | 60  |
| a <sub>3,t</sub> | [mm] | max(7·d ; 80 mm)   | 80 | 84 | 112 | 140 |
| a <sub>3,c</sub> | [mm] | max(3,5·d ; 40 mm) | 40 | 42 | 56  | 70  |
| a <sub>4,t</sub> | [mm] | 3·d                | 24 | 36 | 48  | 60  |
| a <sub>4,c</sub> | [mm] | 3·d                | 24 | 36 | 48  | 60  |

| d                | [mm] |                  | 8  | 12 | 16  | 20  |
|------------------|------|------------------|----|----|-----|-----|
| a <sub>1</sub>   | [mm] | 3·d              | 24 | 36 | 48  | 60  |
| a <sub>2</sub>   | [mm] | 3·d              | 24 | 36 | 48  | 60  |
| a <sub>3,t</sub> | [mm] | max(7·d ; 80 mm) | 80 | 84 | 112 | 140 |
| a <sub>3,c</sub> | [mm] | max(7·d ; 80 mm) | 80 | 84 | 112 | 140 |
| a <sub>4,t</sub> | [mm] | 4·d              | 32 | 48 | 64  | 80  |
| a <sub>4,c</sub> | [mm] | 3·d              | 24 | 36 | 48  | 60  |

$\alpha$  = load-to-grain angle  
d = nominal dowel diameter



### NOTES

- Minimum distances FOR CONNECTORS SUBJECTED TO SHEAR STRESS in accordance with EN 1995:2014.

## ■ EFFECTIVE NUMBER FOR SHEAR-STRESSED DOWELS

The load-bearing capacity of a connection made with several dowels, all of the same type and size, may be lower than the sum of the load-bearing capacities of the individual connection system.

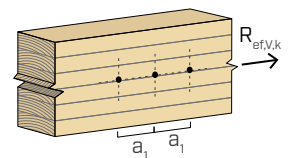
For a row of n dowels arranged parallel to the direction of the grain ( $\alpha = 0^\circ$ ) at a distance  $a_1$ , the characteristic effective load-bearing capacity is equal to:

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

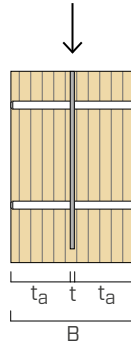
The  $n_{ef}$  value is given in the table below as a function of n and  $a_1$ .

|   |   | $a_1^{(*)}$ [mm] |      |      |      |      |      |      |      |      |      |        |
|---|---|------------------|------|------|------|------|------|------|------|------|------|--------|
|   |   | 4·d              | 5·d  | 6·d  | 7·d  | 8·d  | 9·d  | 10·d | 11·d | 12·d | 13·d | ≥ 14·d |
| n | 2 | 1,39             | 1,47 | 1,54 | 1,60 | 1,65 | 1,70 | 1,75 | 1,79 | 1,83 | 1,87 | 1,90   |
|   | 3 | 2,00             | 2,12 | 2,22 | 2,30 | 2,38 | 2,45 | 2,52 | 2,58 | 2,63 | 2,69 | 2,74   |
|   | 4 | 2,59             | 2,74 | 2,87 | 2,98 | 3,08 | 3,18 | 3,26 | 3,34 | 3,41 | 3,48 | 3,55   |
|   | 5 | 3,17             | 3,35 | 3,51 | 3,65 | 3,77 | 3,88 | 3,99 | 4,08 | 4,17 | 4,26 | 4,34   |
|   | 6 | 3,74             | 3,95 | 4,13 | 4,30 | 4,44 | 4,58 | 4,70 | 4,81 | 4,92 | 5,02 | 5,11   |

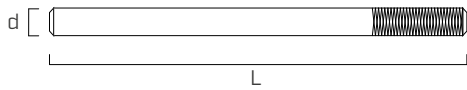
(\*) For intermediate  $a_1$  values a linear interpolation is possible.



1 INTERNAL PLATE - SHEAR  $R_{v,k}$



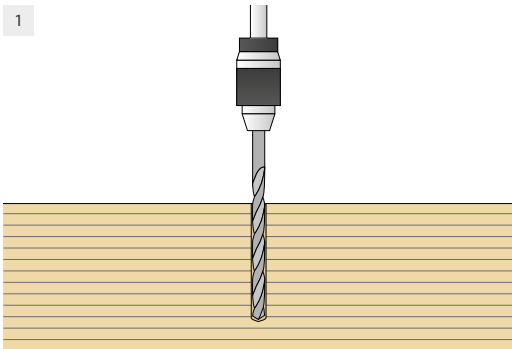
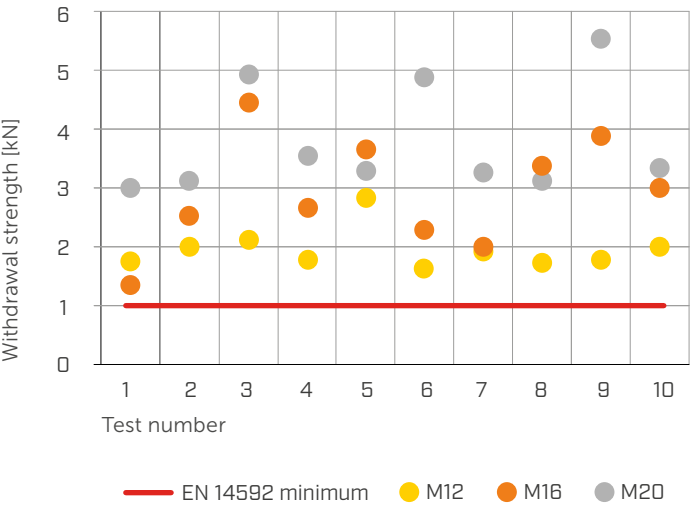
| $d_1$<br>[mm] | L<br>[mm] | B<br>[mm] | $t_a$<br>[mm] | $R_{v,k}$ [kN]      |       |       |       |       |
|---------------|-----------|-----------|---------------|---------------------|-------|-------|-------|-------|
|               |           |           |               | load-to-grain angle |       |       |       |       |
|               |           |           |               | 0°                  | 30°   | 45°   | 60°   | 90°   |
| 8             | 60        | 60        | 27            | 7,56                | 7,00  | 6,54  | 6,16  | 5,84  |
|               | 80        | 80        | 37            | 8,90                | 8,14  | 7,53  | 7,02  | 6,59  |
|               | 100       | 100       | 47            | 10,46               | 9,51  | 8,74  | 8,10  | 7,56  |
|               | 120       | 120       | 57            | 10,89               | 10,30 | 9,80  | 9,28  | 8,63  |
|               | 140       | 140       | 67            | 10,89               | 10,30 | 9,80  | 9,36  | 8,98  |
| 12            | 60        | 60        | 27            | 13,88               | 12,93 | 12,16 | 11,52 | 10,99 |
|               | 70        | 70        | 32            | 14,43               | 13,34 | 12,46 | 11,75 | 11,15 |
|               | 80        | 80        | 37            | 15,15               | 13,92 | 12,93 | 12,13 | 11,46 |
|               | 90        | 90        | 42            | 16,01               | 14,62 | 13,52 | 12,62 | 11,88 |
|               | 100       | 100       | 47            | 16,96               | 15,42 | 14,20 | 13,20 | 12,38 |
|               | 110       | 110       | 52            | 17,99               | 16,29 | 14,94 | 13,85 | 12,95 |
|               | 120       | 120       | 57            | 19,07               | 17,21 | 15,75 | 14,55 | 13,57 |
|               | 130       | 130       | 62            | 20,19               | 18,18 | 16,59 | 15,29 | 14,22 |
|               | 140       | 140       | 67            | 21,36               | 19,18 | 17,46 | 16,07 | 14,91 |
|               | 150       | 150       | 72            | 22,08               | 20,21 | 18,37 | 16,87 | 15,63 |
|               | 160       | 160       | 77            | 22,08               | 20,75 | 19,30 | 17,70 | 16,37 |
|               | 170       | 170       | 82            | 22,08               | 20,75 | 19,63 | 18,54 | 17,13 |
|               | 180       | 180       | 87            | 22,08               | 20,75 | 19,63 | 18,68 | 17,85 |
|               | 200       | 200       | 97            | 22,08               | 20,75 | 19,63 | 18,68 | 17,85 |
|               | 220       | 220       | 107           | 22,08               | 20,75 | 19,63 | 18,68 | 17,85 |
|               | 240       | 240       | 117           | 22,08               | 20,75 | 19,63 | 18,68 | 17,85 |
| 16            | 80        | 80        | 37            | 25,77               | 23,90 | 22,41 | 21,20 | 19,75 |
|               | 100       | 100       | 47            | 27,03               | 24,79 | 23,04 | 21,62 | 20,46 |
|               | 110       | 110       | 52            | 27,92               | 25,48 | 23,57 | 22,04 | 20,79 |
|               | 120       | 120       | 57            | 28,93               | 26,28 | 24,22 | 22,57 | 21,22 |
|               | 130       | 130       | 62            | 30,05               | 27,19 | 24,97 | 23,19 | 21,73 |
|               | 140       | 140       | 67            | 31,25               | 28,17 | 25,78 | 23,88 | 22,32 |
|               | 150       | 150       | 72            | 32,51               | 29,22 | 26,67 | 24,63 | 22,96 |
|               | 160       | 160       | 77            | 33,83               | 30,32 | 27,60 | 25,43 | 23,66 |
|               | 170       | 170       | 82            | 35,20               | 31,47 | 28,58 | 26,28 | 24,40 |
|               | 180       | 180       | 87            | 36,62               | 32,66 | 29,60 | 27,16 | 25,17 |
|               | 190       | 190       | 92            | 38,06               | 33,88 | 30,65 | 28,08 | 25,98 |
|               | 200       | 200       | 97            | 39,54               | 35,14 | 31,74 | 29,03 | 26,82 |
|               | 220       | 220       | 107           | 41,41               | 37,72 | 33,97 | 30,99 | 28,55 |
|               | 240       | 240       | 117           | 41,41               | 38,66 | 36,28 | 33,02 | 30,37 |
| 20            | 120       | 120       | 57            | 39,26               | 35,74 | 33,03 | 30,89 | 29,14 |
|               | 140       | 140       | 67            | 41,45               | 37,40 | 34,32 | 31,88 | 29,91 |
|               | 160       | 160       | 77            | 44,07               | 39,48 | 35,99 | 33,24 | 31,03 |
|               | 180       | 180       | 87            | 47,01               | 41,85 | 37,95 | 34,88 | 32,41 |
|               | 190       | 190       | 92            | 48,57               | 43,13 | 39,01 | 35,78 | 33,18 |
|               | 200       | 200       | 97            | 50,17               | 44,45 | 40,12 | 36,72 | 33,99 |
|               | 220       | 220       | 107           | 53,51               | 47,22 | 42,45 | 38,73 | 35,73 |
|               | 240       | 240       | 117           | 56,99               | 50,11 | 44,92 | 40,85 | 37,58 |



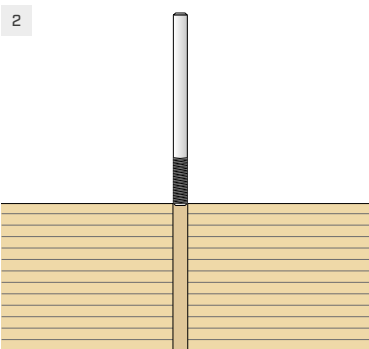
Knurled dowel available on request. Knurling limits the displacement of the dowels from the joint during an earthquake, as stipulated in Euro-code 8, and allows for a pull-out strength of 1 kN, as stipulated in EN 14592:2022.



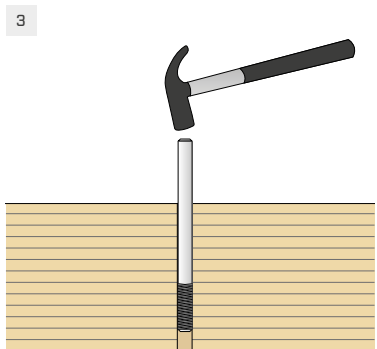
STAS - WITHDRAWAL VALUES



1 Make a pre-drilling hole with a diameter equal to the diameter of the dowel using a drill press or CNC machine. The hole must be perfectly perpendicular.



2 Clean the hole and place the dowel with the knurling in contact with the timber.



3 Drive the dowel into the hole using a hammer.

GENERAL PRINCIPLES

- Characteristic values according to EN 1995-1-1.
- Design values can be obtained from characteristic values as follows:  
$$R_d = \frac{R_k \cdot k_{mod}}{\gamma_M}$$
- The coefficients  $\gamma_M$  and  $k_{mod}$  should be taken according to the current regulations used for the calculation.
- Mechanical strength values and dowels geometry comply with CE marking according to EN 14592.
- The values provided are calculated using 5 mm thick plates and a 6 mm thick milled cut in the wood. Values are relative to a single STA dowel.
- Sizing and verification of the wooden elements and steel plates must be done separately.
- The bolts must be positioned in accordance with the minimum distances.

NOTES

- For the calculation process a timber characteristic density  $\rho_k = 385 \text{ kg/m}^3$  has been considered.

For different  $\rho_k$  values, the strength on the table on the timber side can be converted by the  $k_{dens,v}$  coefficient.

$$R'_{V,k} = k_{dens,v} \cdot R_{V,k}$$

| $\rho_k$<br>[kg/m <sup>3</sup> ] | 350  | 380  | 385   | 405   | 425   | 430   | 440   |
|----------------------------------|------|------|-------|-------|-------|-------|-------|
| C-GL                             | C24  | C30  | GL24h | GL26h | GL28h | GL30h | GL32h |
| $k_{dens,v}$                     | 0,90 | 0,98 | 1,00  | 1,02  | 1,05  | 1,05  | 1,07  |

Strength values thus determined may differ, for higher safety standards, from those resulting from an exact calculation.