

# KKF AISI410

## PAN HEAD SCREW

### PAN HEAD

The flat under-head accompanies absorption of the shavings, preventing the wood from cracking and thus ensuring excellent surface finish.

### LONGER THREAD

Special asymmetric "umbrella" thread with increased length (60%) for higher grip. Fine thread for the utmost precision when tightening is complete.

### OUTDOOR APPLICATIONS ON ACID WOOD

Martensitic stainless steel. This stainless steel offers the highest mechanical performance compared to the other available stainless steels. Suitable for outdoor applications and on acid wood, but away from corrosive agents (chlorides, sulphides, etc.).



#### DIAMETER [mm]

3,5 ☒ 4 ☐ 6 ☐ 8

#### LENGTH [mm]

20 ☒ 20 ☐ 120 ☐ 320

#### SERVICE CLASS

☒ SC1 ☐ SC2 ☐ SC3

#### ATMOSPHERIC CORROSIVITY

☒ C1 ☐ C2

#### WOOD CORROSIVITY

☒ T1 ☐ T2 ☐ T3 ☐ T4

#### MATERIAL

**410**  
AISI

AISI410 martensitic stainless steel



## FIELDS OF USE

Outdoor use.  
Wooden boards with density < 780 kg/m<sup>3</sup>  
(without pre-drill).  
WPC boards (with pre-drill).

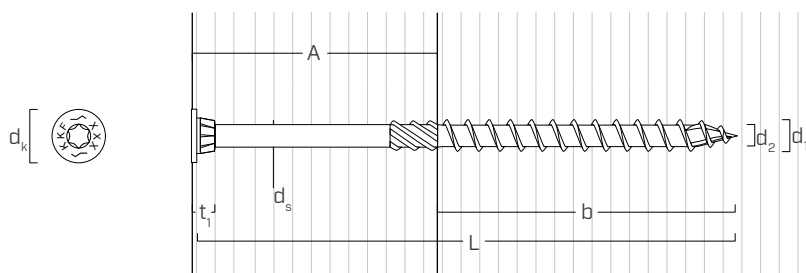
## CODES AND DIMENSIONS

| d <sub>1</sub><br>[mm] | CODE       | L<br>[mm] | b<br>[mm] | A<br>[mm] | pcs |
|------------------------|------------|-----------|-----------|-----------|-----|
| 4<br>TX 20             | KKF430     | 30        | 18        | 12        | 500 |
|                        | KKF435     | 35        | 20        | 15        | 500 |
|                        | KKF440     | 40        | 24        | 16        | 500 |
|                        | KKF445     | 45        | 30        | 15        | 200 |
|                        | KKF450     | 50        | 30        | 20        | 200 |
| 4,5<br>TX 20           | KKF4520(*) | 20        | 15        | 5         | 200 |
|                        | KKF4540    | 40        | 24        | 16        | 200 |
|                        | KKF4545    | 45        | 30        | 15        | 200 |
|                        | KKF4550    | 50        | 30        | 20        | 200 |
|                        | KKF4560    | 60        | 35        | 25        | 200 |
|                        | KKF4570    | 70        | 40        | 30        | 200 |

| d <sub>1</sub><br>[mm] | CODE    | L<br>[mm] | b<br>[mm] | A<br>[mm] | pcs |
|------------------------|---------|-----------|-----------|-----------|-----|
| 5<br>TX 25             | KKF540  | 40        | 24        | 16        | 200 |
|                        | KKF550  | 50        | 30        | 20        | 200 |
|                        | KKF560  | 60        | 35        | 25        | 200 |
|                        | KKF570  | 70        | 40        | 30        | 100 |
|                        | KKF580  | 80        | 50        | 30        | 100 |
|                        | KKF590  | 90        | 55        | 35        | 100 |
|                        | KKF5100 | 100       | 60        | 40        | 100 |
| 6<br>TX 30             | KKF680  | 80        | 50        | 30        | 100 |
|                        | KKF6100 | 100       | 60        | 40        | 100 |
|                        | KKF6120 | 120       | 75        | 45        | 100 |

(\*) Not holding CE marking.

## GEOMETRY AND MECHANICAL CHARACTERISTICS



### GEOMETRY

| Nominal diameter                          | d <sub>1</sub>   | [mm] | 4    | 4,5  | 5    | 6     |
|-------------------------------------------|------------------|------|------|------|------|-------|
| Head diameter                             | d <sub>k</sub>   | [mm] | 7,70 | 8,70 | 9,65 | 11,65 |
| Thread diameter                           | d <sub>2</sub>   | [mm] | 2,60 | 3,05 | 3,25 | 4,05  |
| Shank diameter                            | d <sub>s</sub>   | [mm] | 2,90 | 3,35 | 3,60 | 4,30  |
| Head thickness                            | t <sub>1</sub>   | [mm] | 5,00 | 5,00 | 6,00 | 7,00  |
| Pre-drilling hole diameter <sup>(1)</sup> | d <sub>V,S</sub> | [mm] | 2,5  | 2,5  | 3,0  | 4,0   |
| Pre-drilling hole diameter <sup>(2)</sup> | d <sub>V,H</sub> | [mm] | -    | -    | 3,5  | 4,0   |

<sup>(1)</sup> Pre-drilling valid for softwood.

<sup>(2)</sup> Pre-drilling valid for hardwood and beech LVL.

### CHARACTERISTIC MECHANICAL PARAMETERS

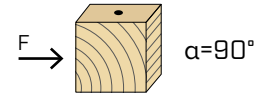
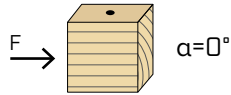
| Nominal diameter | d <sub>1</sub>      | [mm] | 4   | 4,5 | 5   | 6    |
|------------------|---------------------|------|-----|-----|-----|------|
| Tensile strength | f <sub>tens,k</sub> | [kN] | 5,0 | 6,4 | 7,9 | 11,3 |
| Yield moment     | M <sub>y,k</sub>    | [Nm] | 3,0 | 4,1 | 5,4 | 9,5  |

|                                 |                     |                      | softwood<br>(softwood) | LVL softwood<br>(LVL softwood) | hardwood predrilled<br>(hardwood predrilled) |
|---------------------------------|---------------------|----------------------|------------------------|--------------------------------|----------------------------------------------|
| Withdrawal resistance parameter | f <sub>ax,k</sub>   | [N/mm <sup>2</sup> ] | 11,7                   | 15,0                           | 29,0                                         |
| Head-pull-through parameter     | f <sub>head,k</sub> | [N/mm <sup>2</sup> ] | 16,5                   | -                              | -                                            |
| Associated density              | ρ <sub>a</sub>      | [kg/m <sup>3</sup> ] | 350                    | 500                            | 730                                          |
| Calculation density             | ρ <sub>k</sub>      | [kg/m <sup>3</sup> ] | ≤ 440                  | 410 ÷ 550                      | 590 ÷ 750                                    |

For applications with different materials please see ETA-11/0030.

## MINIMUM DISTANCES FOR SHEAR LOADS

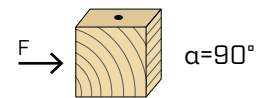
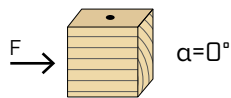
screws inserted **WITHOUT** pre-drilled hole  $\rho_k \leq 420 \text{ kg/m}^3$



| $d_1$     | [mm] |      | 4  | 4,5 |  | 5    | 6  |    |
|-----------|------|------|----|-----|--|------|----|----|
| $a_1$     | [mm] | 10·d | 40 | 45  |  | 12·d | 60 | 72 |
| $a_2$     | [mm] | 5·d  | 20 | 23  |  | 5·d  | 25 | 30 |
| $a_{3,t}$ | [mm] | 15·d | 60 | 68  |  | 15·d | 75 | 90 |
| $a_{3,c}$ | [mm] | 10·d | 40 | 45  |  | 10·d | 50 | 60 |
| $a_{4,t}$ | [mm] | 5·d  | 20 | 23  |  | 5·d  | 25 | 30 |
| $a_{4,c}$ | [mm] | 5·d  | 20 | 23  |  | 5·d  | 25 | 30 |

| d <sub>1</sub>   | [mm] | 4    | 4,5 | 5  | 6    |    |    |
|------------------|------|------|-----|----|------|----|----|
| a <sub>1</sub>   | [mm] | 5·d  | 20  | 23 | 5·d  | 25 | 30 |
| a <sub>2</sub>   | [mm] | 5·d  | 20  | 23 | 5·d  | 25 | 30 |
| a <sub>3,t</sub> | [mm] | 10·d | 40  | 45 | 10·d | 50 | 60 |
| a <sub>3,c</sub> | [mm] | 10·d | 40  | 45 | 10·d | 50 | 60 |
| a <sub>4,t</sub> | [mm] | 7·d  | 28  | 32 | 10·d | 50 | 60 |
| a <sub>4,c</sub> | [mm] | 5·d  | 20  | 23 | 5·d  | 25 | 30 |

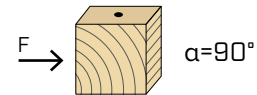
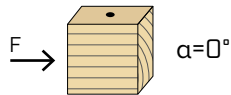
screws inserted **WITHOUT** pre-drilled hole  $420 \text{ kg/m}^3 < \rho_k \leq 500 \text{ kg/m}^3$



| $d_1$     | [mm] |      | 4  | 4,5 |      | 5   | 6   |
|-----------|------|------|----|-----|------|-----|-----|
| $a_1$     | [mm] | 15·d | 60 | 68  | 15·d | 75  | 90  |
| $a_2$     | [mm] | 7·d  | 28 | 32  | 7·d  | 35  | 42  |
| $a_{3,t}$ | [mm] | 20·d | 80 | 90  | 20·d | 100 | 120 |
| $a_{3,c}$ | [mm] | 15·d | 60 | 68  | 15·d | 75  | 90  |
| $a_{4,t}$ | [mm] | 7·d  | 28 | 32  | 7·d  | 35  | 42  |
| $a_{4,c}$ | [mm] | 7·d  | 28 | 32  | 7·d  | 35  | 42  |

| d <sub>1</sub>   | [mm] |      | 4  | 4,5 |  | 5    | 6  |    |
|------------------|------|------|----|-----|--|------|----|----|
| a <sub>1</sub>   | [mm] | 7·d  | 28 | 32  |  | 7·d  | 35 | 42 |
| a <sub>2</sub>   | [mm] | 7·d  | 28 | 32  |  | 7·d  | 35 | 42 |
| a <sub>3,t</sub> | [mm] | 15·d | 60 | 68  |  | 15·d | 75 | 90 |
| a <sub>3,c</sub> | [mm] | 15·d | 60 | 68  |  | 15·d | 75 | 90 |
| a <sub>4,t</sub> | [mm] | 9·d  | 36 | 41  |  | 12·d | 60 | 72 |
| a <sub>4,c</sub> | [mm] | 7·d  | 28 | 32  |  | 7·d  | 35 | 42 |

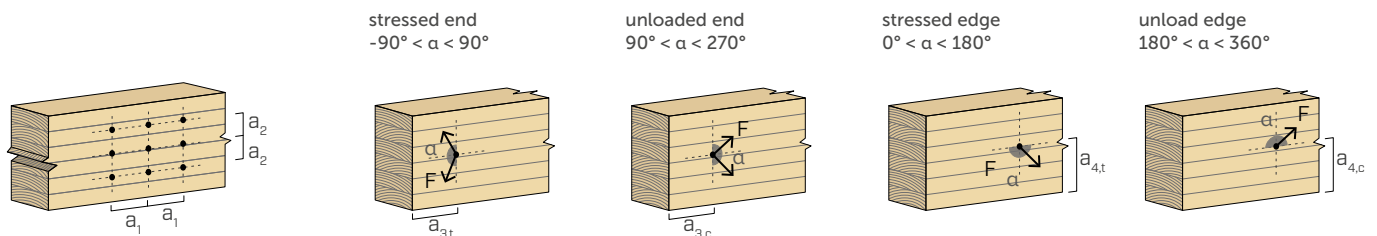
screws inserted **WITH** pre-drilled hole



| $d_1$     | [mm] | 4    | 4,5 | 5  | 6    |    |    |
|-----------|------|------|-----|----|------|----|----|
| $a_1$     | [mm] | 5·d  | 20  | 23 | 5·d  | 25 | 30 |
| $a_2$     | [mm] | 3·d  | 12  | 14 | 3·d  | 15 | 18 |
| $a_{3,t}$ | [mm] | 12·d | 48  | 54 | 12·d | 60 | 72 |
| $a_{3,c}$ | [mm] | 7·d  | 28  | 32 | 7·d  | 35 | 42 |
| $a_{4,t}$ | [mm] | 3·d  | 12  | 14 | 3·d  | 15 | 18 |
| $a_{4,c}$ | [mm] | 3·d  | 12  | 14 | 3·d  | 15 | 18 |

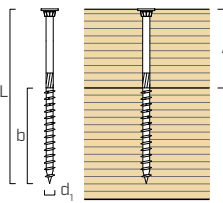
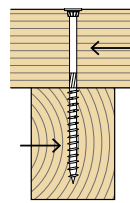
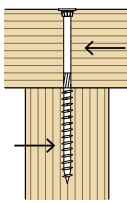
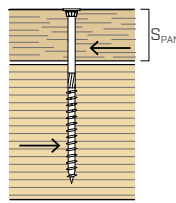
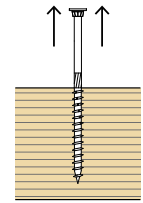
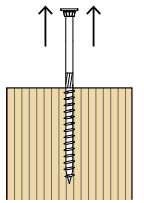
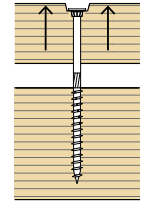
| d <sub>1</sub>   | [mm] |     | 4  | 4,5 |     | 5  | 6  |
|------------------|------|-----|----|-----|-----|----|----|
| a <sub>1</sub>   | [mm] | 4·d | 16 | 18  | 4·d | 20 | 24 |
| a <sub>2</sub>   | [mm] | 4·d | 16 | 18  | 4·d | 20 | 24 |
| a <sub>3,t</sub> | [mm] | 7·d | 28 | 32  | 7·d | 35 | 42 |
| a <sub>3,c</sub> | [mm] | 7·d | 28 | 32  | 7·d | 35 | 42 |
| a <sub>4,t</sub> | [mm] | 5·d | 20 | 23  | 7·d | 35 | 42 |
| a <sub>4,c</sub> | [mm] | 3·d | 12 | 14  | 3·d | 15 | 18 |

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



### NOTES

- The minimum distances comply with the EN 1995:2014 standard in accordance with ETA-11/0030.
- The minimum spacing for all steel-to-timber connections ( $a_1$ ,  $a_2$ ) can be multiplied by a coefficient of 0,7.
- The minimum spacing for all panel-to-timber connections ( $a_1$ ,  $a_2$ ) can be multiplied by a coefficient of 0,85.
- In the case of joints with elements in Douglas fir (*Pseudotsuga menziesii*), the minimum spacing and distances parallel to the grain must be multiplied by a coefficient of 1.5.
- For a row of n screws arranged parallel to the direction of the grain at a distance  $a_1$ , the characteristic effective shear bearing capacity  $R_{ef,V,k}$  can be calculated by means of the effective number  $n_{ef}$  (see page 34).

|                                                                                   |     |    |    | SHEAR                                                                             |                                                                                   |                                                                                   | TENSION                                                                            |                                                                                     |                                                                                     |                      |
|-----------------------------------------------------------------------------------|-----|----|----|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|----------------------|
| geometry                                                                          |     |    |    | timber-to-timber<br>$\varepsilon=90^\circ$                                        | timber-to-timber<br>$\varepsilon=0^\circ$                                         | panel-to-timber                                                                   | thread<br>withdrawal<br>$\varepsilon=90^\circ$                                     | thread<br>withdrawal<br>$\varepsilon=0^\circ$                                       | head<br>pull-through                                                                |                      |
|  |     |    |    |  |  |  |  |  |  |                      |
| $d_1$                                                                             | L   | b  | A  | $R_{V,90,k}$<br>[kN]                                                              | $R_{V,0,k}$<br>[kN]                                                               | $S_{PAN}$<br>[mm]                                                                 | $R_{V,k}$<br>[kN]                                                                  | $R_{ax,90,k}$<br>[kN]                                                               | $R_{ax,0,k}$<br>[kN]                                                                | $R_{head,k}$<br>[kN] |
| 4                                                                                 | 30  | 18 | 12 | 0,76                                                                              | 0,38                                                                              | 15                                                                                | 0,75                                                                               | 0,91                                                                                | 0,27                                                                                | 1,06                 |
|                                                                                   | 35  | 20 | 15 | 0,87                                                                              | 0,45                                                                              |                                                                                   | 0,83                                                                               | 1,01                                                                                | 0,30                                                                                | 1,06                 |
|                                                                                   | 40  | 24 | 16 | 0,91                                                                              | 0,51                                                                              |                                                                                   | 0,83                                                                               | 1,21                                                                                | 0,36                                                                                | 1,06                 |
|                                                                                   | 45  | 30 | 15 | 0,89                                                                              | 0,56                                                                              |                                                                                   | 0,83                                                                               | 1,52                                                                                | 0,45                                                                                | 1,06                 |
|                                                                                   | 50  | 30 | 20 | 1,00                                                                              | 0,62                                                                              |                                                                                   | 0,83                                                                               | 1,52                                                                                | 0,45                                                                                | 1,06                 |
| 4,5                                                                               | 20  | 15 | 5  | 0,45                                                                              | 0,28                                                                              | 15                                                                                | 0,45                                                                               | 0,85                                                                                | 0,26                                                                                | 1,35                 |
|                                                                                   | 40  | 24 | 16 | 1,08                                                                              | 0,55                                                                              |                                                                                   | 1,05                                                                               | 1,36                                                                                | 0,41                                                                                | 1,35                 |
|                                                                                   | 45  | 30 | 15 | 1,07                                                                              | 0,61                                                                              |                                                                                   | 1,05                                                                               | 1,70                                                                                | 0,51                                                                                | 1,35                 |
|                                                                                   | 50  | 30 | 20 | 1,17                                                                              | 0,69                                                                              |                                                                                   | 1,05                                                                               | 1,70                                                                                | 0,51                                                                                | 1,35                 |
|                                                                                   | 60  | 35 | 25 | 1,29                                                                              | 0,79                                                                              |                                                                                   | 1,05                                                                               | 1,99                                                                                | 0,60                                                                                | 1,35                 |
|                                                                                   | 70  | 40 | 30 | 1,33                                                                              | 0,86                                                                              |                                                                                   | 1,05                                                                               | 2,27                                                                                | 0,68                                                                                | 1,35                 |
| 5                                                                                 | 40  | 24 | 16 | 1,21                                                                              | 0,60                                                                              | 15                                                                                | 1,15                                                                               | 1,52                                                                                | 0,45                                                                                | 1,66                 |
|                                                                                   | 50  | 30 | 20 | 1,36                                                                              | 0,75                                                                              |                                                                                   | 1,19                                                                               | 1,89                                                                                | 0,57                                                                                | 1,66                 |
|                                                                                   | 60  | 35 | 25 | 1,48                                                                              | 0,88                                                                              |                                                                                   | 1,19                                                                               | 2,21                                                                                | 0,66                                                                                | 1,66                 |
|                                                                                   | 70  | 40 | 30 | 1,59                                                                              | 0,96                                                                              |                                                                                   | 1,19                                                                               | 2,53                                                                                | 0,76                                                                                | 1,66                 |
|                                                                                   | 80  | 50 | 30 | 1,59                                                                              | 1,11                                                                              |                                                                                   | 1,19                                                                               | 3,16                                                                                | 0,95                                                                                | 1,66                 |
|                                                                                   | 90  | 55 | 35 | 1,59                                                                              | 1,11                                                                              |                                                                                   | 1,19                                                                               | 3,47                                                                                | 1,04                                                                                | 1,66                 |
|                                                                                   | 100 | 60 | 40 | 1,59                                                                              | 1,11                                                                              |                                                                                   | 1,19                                                                               | 3,79                                                                                | 1,14                                                                                | 1,66                 |
| 6                                                                                 | 80  | 50 | 30 | 2,08                                                                              | 1,37                                                                              | 15                                                                                | 1,63                                                                               | 3,79                                                                                | 1,14                                                                                | 2,42                 |
|                                                                                   | 100 | 60 | 40 | 2,27                                                                              | 1,58                                                                              |                                                                                   | 1,63                                                                               | 4,55                                                                                | 1,36                                                                                | 2,42                 |
|                                                                                   | 120 | 75 | 45 | 2,27                                                                              | 1,65                                                                              |                                                                                   | 1,63                                                                               | 5,68                                                                                | 1,70                                                                                | 2,42                 |

$\varepsilon$  = screw-to-grain angle

## GENERAL PRINCIPLES

- Characteristic values comply with the EN 1995:2014 standard in accordance with ETA-11/0030.
- Design values can be obtained from characteristic values as follows:

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

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

- For the mechanical resistance values and the geometry of the screws, reference was made to ETA-11/0030.
- Sizing and verification of the timber elements and panels must be done separately.
- The screws must be positioned in accordance with the minimum distances.
- The characteristic shear resistances are calculated for screws inserted without pre-drilling hole. In the case of screws inserted with pre-drilling hole, greater resistance values can be obtained.
- Shear strengths were calculated considering the threaded part fully inserted in the second element.
- The characteristic panel-timber shear strengths are calculated considering an OSB3 or OSB4 panel, as per EN 300, or a particle board panel, as per EN 312, with thickness  $S_{PAN}$  and density  $\rho_k = 500 \text{ kg/m}^3$ .
- The thread withdrawal characteristic strength has been evaluated considering a fixing length equal to  $b$ .
- The characteristic resistance to head pull-through was calculated using timber elements.

## NOTES

- The characteristic timber-to-timber shear strengths were evaluated considering both an  $\varepsilon$  angle of  $90^\circ$  ( $R_{V,90,k}$ ) and  $0^\circ$  ( $R_{V,0,k}$ ) between the grains and the connector in the second element.
- The characteristic panel-timber shear strengths were evaluated considering an angle  $\varepsilon$  of  $90^\circ$  between the grains and the connector in the timber element.
- The characteristic thread withdrawal resistances were evaluated considering both an  $\varepsilon$  angle of  $90^\circ$  ( $R_{ax,90,k}$ ) and of  $0^\circ$  ( $R_{ax,0,k}$ ) between the grains and the connector.
- 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 (timber-to-timber shear and tensile) can be converted by the  $k_{dens}$  coefficient.

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

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

$$R'_{head,k} = k_{dens,ax} \cdot R_{head,k}$$

| $\rho_k$<br>[kg/m <sup>3</sup> ] | 350  | 380  | <b>385</b> | 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  |
| $k_{dens,ax}$                    | 0,92 | 0,98 | 1,00       | 1,04  | 1,08  | 1,09  | 1,11  |

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