# KKF AISI410

## PAN HEAD SCREW

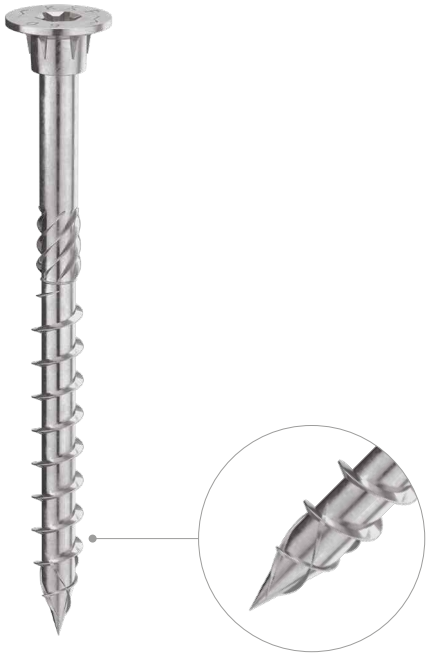
ELC-4645 ESR-4645 UKTA-0836 22/6195 ETA-11/0030

### 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 steels 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.).

### CANADIAN DESIGN VALUES
USA, EU and more design values available online.



BIT INCLUDED

**DIAMETER** [mm]

3,5 | 4 – 6 | 8

**LENGTH** [mm]

20 | 20 – 120 | 320

**SERVICE CONDITION**

EC1 EC3 WET

**ATMOSPHERIC CORROSIVITY**

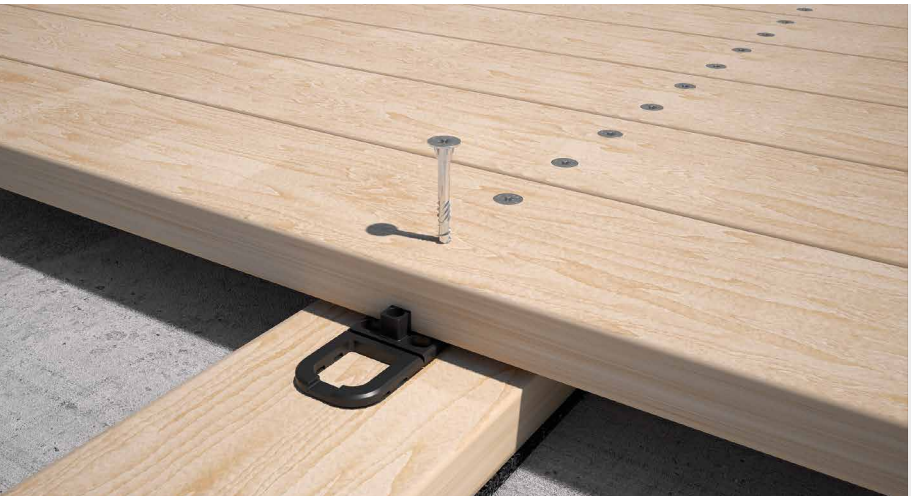
C1 C2

**WOOD CORROSIVITY**

T1 T2 T3 T4

**MATERIAL**

410 AISI — AISI410 martensitic stainless steel



## FIELDS OF USE

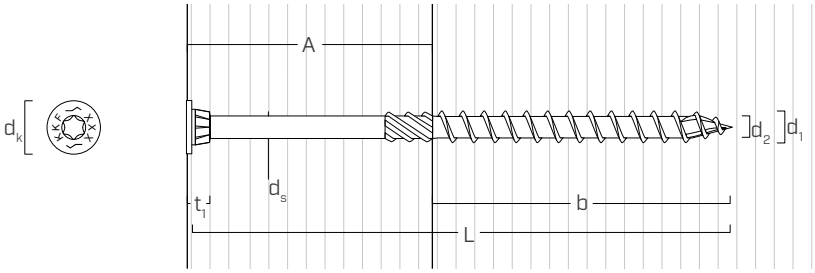
Outdoor use. Wooden boards with density < 780 kg/m³ (without pre-drill). WPC boards (with pre-drill).

## CODES AND DIMENSIONS

| $d_1$ [mm] | CODE | L [mm] | b [mm] | A [mm] | pcs |
|---|---|---|---|---|---|
| 4 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 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 |

| $d_1$ [mm] | CODE | L [mm] | b [mm] | A [mm] | pcs |
|---|---|---|---|---|---|
| 5 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 TX 30 | KKF680 | 80 | 50 | 30 | 100 |
| | KKF6100 | 100 | 60 | 40 | 100 |
| | KKF6120 | 120 | 75 | 45 | 100 |

## GEOMETRY AND MECHANICAL CHARACTERISTICS




### GEOMETRY

| Nominal diameter | $d_1$ | [mm] | 4 | 4,5 | 5 | 6 |
|---|---|---|---|---|---|---|
| Head diameter | $d_K$ | [mm] | 7,70 | 8,70 | 9,65 | 11,65 |
| Root diameter | $d_2$ | [mm] | 2,60 | 3,05 | 3,25 | 4,05 |
| Shank diameter | $d_S$ | [mm] | 2,90 | 3,35 | 3,60 | 4,30 |
| Head thickness | $t_1$ | [mm] | 5,00 | 5,00 | 6,00 | 7,00 |
| Pre-drilling hole diameter(1) | $d_{V,S}$ | [mm] | 2,5 | 2,5 | 3,0 | 4,0 |
| Pre-drilling hole diameter(2) | $d_{V,H}$ | [mm] | - | - | 3,5 | 4,0 |

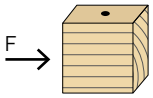
(1) Pre-drilling valid for softwood.
(2) Pre-drilling valid for hardwood and beech LVL.

### MECHANICAL PROPERTIES

| Nominal diameter | $d_1$ | [mm] | | 4 | 4,5 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| Factored tensile strength | $\Phi f_u$ | [kN] | | 3,48 | 5,39 | 5,86 | 8,47 |
| Bending yield strength | $F_{yb}$ | [MPa] | | 1066 | 1102 | 981 | 896 |
| Factored shear strength of the screw | $\Phi v_s$ | [kN] | | 2,04 | 2,81 | 3,19 | 4,95 |
| Specified withdrawal resistance per millimeter of threaded shank (tip included) | $Y_w$ | [N/mm] | G=0.35 | 41,83 | 47,06 | 52,29 | 52,38 |
| | | | G=0.42 | 48,4 | 54,45 | 60,5 | 60,6 |
| | | | G=0.49 | 54,75 | 61,6 | 68,44 | 68,55 |
| | | | G=0.55 | 60,05 | 67,56 | 75,07 | 75,19 |
| Specified head pull-through resistance per screw | $F_{pt}$ | [kN] | G=0.35 | 0,41 | 0,52 | 0,62 | 0,87 |
| | | | G=0.42 | 0,50 | 0,62 | 0,75 | 1,05 |
| | | | G=0.49 | 0,58 | 0,72 | 0,87 | 1,22 |
| | | | G=0.55 | 0,65 | 0,81 | 0,98 | 1,37 |

# MINIMUM DISTANCES FOR SHEAR LOADS

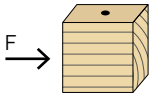
screws inserted **WITHOUT pre-drilled hole** — **G ≤ 0.44**




| $d_1$ | | 4 [mm] | *0.16 [in]* | 4,5 [mm] | *0.18 [in]* | 5 [mm] | *0.20 [in]* | 6 [mm] | *0.24 [in]* |
|---|---|---|---|---|---|---|---|---|---|
| $S_P$ | **12·d‡** | 48 | *1 7/8* | 54 | *2 1/8* | 60 | *2 3/8* | 72 | *2 13/16* |
| $S_Q$ | **5·d** | 20 | *13/16* | 23 | *7/8* | 25 | *1* | 30 | *1 3/16* |
| $a_L$ | **15·d‡** | 60 | *2 3/8* | 68 | *2 11/16* | 75 | *2 15/16* | 90 | *3 1/2* |
| a | **10·d‡** | 40 | *1 9/16* | 45 | *1 3/4* | 50 | *1 15/16* | 60 | *2 3/8* |
| $e_Q$ | **10·d** | 40 | *1 9/16* | 45 | *1 3/4* | 50 | *1 15/16* | 60 | *2 3/8* |
| $e_P$ | **5·d** | 20 | *13/16* | 23 | *7/8* | 25 | *1* | 30 | *1 3/16* |

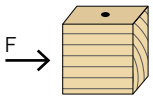
‡ For Western Red Cedar, this minimum spacing shall be increased by 50%.

screws inserted **WITHOUT pre-drilled hole** — **0.44 < G ≤ 0.50**



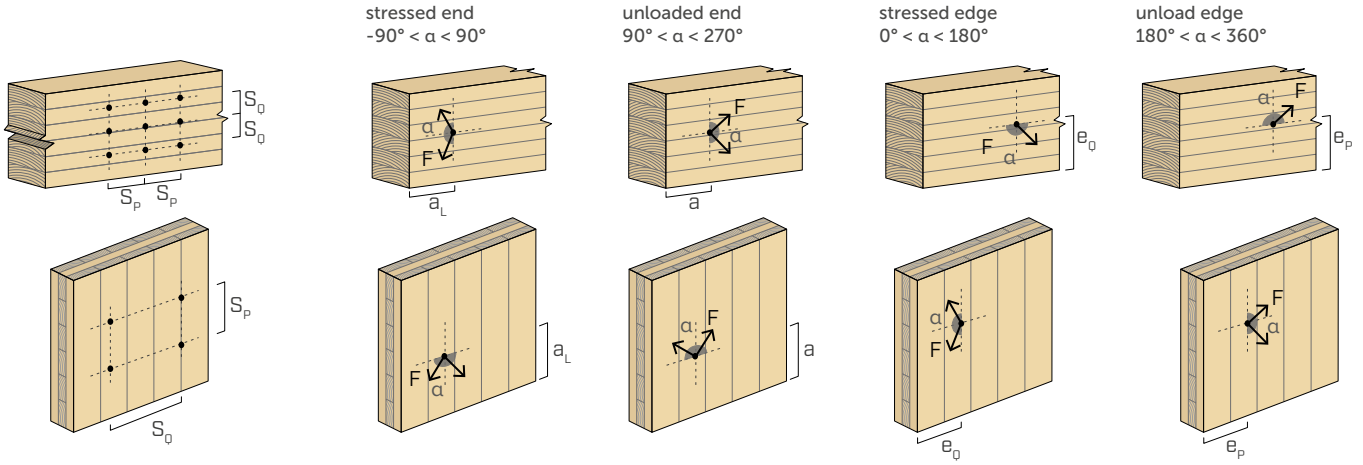

| $d_1$ | | 4 [mm] | *0.16 [in]* | 4,5 [mm] | *0.18 [in]* | 5 [mm] | *0.20 [in]* | 6 [mm] | *0.24 [in]* |
|---|---|---|---|---|---|---|---|---|---|
| $S_P$ | **18·d** | 72 | *2 13/16* | 81 | *3 3/16* | 90 | *3 1/2* | 108 | *4 1/4* |
| $S_Q$ | **7·d** | 28 | *1 1/8* | 32 | *1 1/4* | 35 | *1 3/8* | 42 | *1 5/8* |
| $a_L$ | **22·d** | 88 | *3 7/16* | 99 | *3 7/8* | 110 | *4 3/8* | 132 | *5 3/16* |
| a | **15·d** | 60 | *2 3/8* | 68 | *2 11/16* | 75 | *2 15/16* | 90 | *3 1/2* |
| $e_Q$ | **12·d** | 48 | *1 7/8* | 54 | *2 1/8* | 60 | *2 3/8* | 72 | *2 13/16* |
| $e_P$ | **7·d** | 28 | *1 1/8* | 32 | *1 1/4* | 35 | *1 3/8* | 42 | *1 5/8* |

screws inserted **WITH pre-drilled hole**




| $d_1$ | | 4 [mm] | *0.16 [in]* | 4,5 [mm] | *0.18 [in]* | 5 [mm] | *0.20 [in]* | 6 [mm] | *0.24 [in]* |
|---|---|---|---|---|---|---|---|---|---|
| $S_P$ | **5·d†** | 20 | *13/16* | 23 | *7/8* | 25 | *1* | 30 | *1 3/16* |
| $S_Q$ | **4·d** | 16 | *5/8* | 18 | *11/16* | 20 | *13/16* | 24 | *15/16* |
| $a_L$ | **12·d†** | 48 | *1 7/8* | 54 | *2 1/8* | 60 | *2 3/8* | 72 | *2 13/16* |
| a | **7·d†** | 28 | *1 1/8* | 32 | *1 1/4* | 35 | *1 3/8* | 42 | *1 5/8* |
| $e_Q$ | **7·d** | 28 | *1 1/8* | 32 | *1 1/4* | 35 | *1 3/8* | 42 | *1 5/8* |
| $e_P$ | **3·d** | 12 | *1/2* | 14 | *9/16* | 15 | *9/16* | 18 | *11/16* |

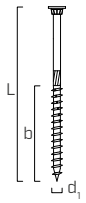
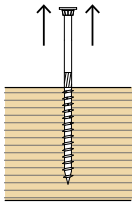
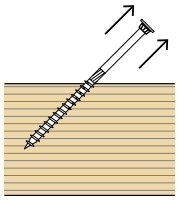
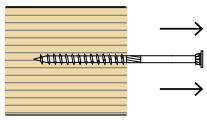
† For Douglas Fir–Larch and Western Red Cedar, this minimum spacing shall be increased by 50%.
d = $d_1$ = nominal diameter of the screw
α = load-to-grain angle




## NOTES

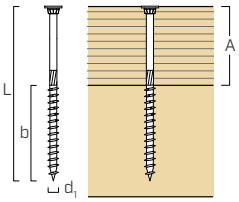
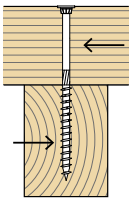
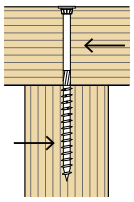
- The minimum spacing and distances comply with Clause 12.12.5 of CSA O86:24, where $d_1$ refers to the nominal diameter of the self-tapping screw.
- The spacing, end, and edge distances for Rothoblaas screws installed in the narrow face of CLT panels shall comply with the specifications outlined in ETA-11/0030.
- The placement of fasteners subjected to axial loading shall be determined in accordance with Clause 12.12.5 of CSA O86:24.

# STRUCTURAL VALUES | AXIAL TENSION

| geometry | | | TENSION[1] | | | | | | | | | | | | steel tension |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | thread withdrawal α = 90° | | | | thread withdrawal α = 45° | | | | end grain α = 0° | | | | |
|  | | |  | | | |  | | | |  | | | |  |
| | | | factored withdrawal resistance $P_{rw}$ | | | | factored withdrawal resistance $P_{rw}$ | | | | factored withdrawal resistance $P_{rw}$[2][3] | | | | factored tension resistance $T_{rs}$ |
| $d_1$ | L | | b | G | | | | G | | | | G | | | | |
| | | | | 0.35 | 0.42 | 0.49 | 0.55 | 0.35 | 0.42 | 0.49 | 0.55 | 0.35 | 0.42 | 0.49 | 0.55 | |
| [mm] *[in]* | [mm] | *[in]* | [mm] | [kN] | [kN] | [kN] | [kN] | [kN] | [kN] | [kN] | [kN] | [kN] | [kN] | [kN] | [kN] | [kN] |
| 4 *0.16* | 30 | *1 3/16* | 18 | 0,41 | 0,47 | 0,54 | 0,59 | 0,37 | 0,43 | 0,49 | 0,53 | 0,20 | 0,24 | 0,27 | 0,29 | 3,48 |
| | 35 | *1 3/8* | 20 | 0,47 | 0,54 | 0,61 | 0,67 | 0,43 | 0,49 | 0,56 | 0,61 | 0,23 | 0,27 | 0,31 | 0,34 | |
| | 40 | *1 9/16* | 24 | 0,59 | 0,68 | 0,77 | 0,84 | 0,53 | 0,62 | 0,70 | 0,76 | 0,29 | 0,34 | 0,38 | 0,42 | |
| | 45 | *1 3/4* | 30 | 0,76 | 0,88 | 1,00 | 1,09 | 0,69 | 0,80 | 0,91 | 0,99 | 0,38 | 0,44 | 0,50 | 0,55 | |
| | 50 | *1 15/16* | 30 | 0,76 | 0,88 | 1,00 | 1,09 | 0,69 | 0,80 | 0,91 | 0,99 | 0,38 | 0,44 | 0,50 | 0,55 | |
| 4.5 *0.18* | 40 | *1 9/16* | 24 | 0,64 | 0,74 | 0,84 | 0,92 | 0,58 | 0,68 | 0,76 | 0,84 | 0,32 | 0,37 | 0,42 | 0,46 | 5,39 |
| | 45 | *1 3/4* | 30 | 0,84 | 0,97 | 1,10 | 1,21 | 0,76 | 0,88 | 1,00 | 1,10 | 0,42 | 0,49 | 0,55 | 0,60 | |
| | 50 | *1 15/16* | 30 | 0,84 | 0,97 | 1,10 | 1,21 | 0,76 | 0,88 | 1,00 | 1,10 | 0,42 | 0,49 | 0,55 | 0,60 | |
| | 60 | *2 3/8* | 35 | 1,00 | 1,16 | 1,32 | 1,44 | 0,91 | 1,06 | 1,20 | 1,31 | 0,50 | 0,58 | 0,66 | 0,72 | |
| | 70 | *2 3/4* | 40 | 1,17 | 1,35 | 1,53 | 1,68 | 1,06 | 1,23 | 1,39 | 1,53 | 0,58 | 0,68 | 0,77 | 0,84 | |
| 5 *0.20* | 40 | *1 9/16* | 24 | 0,70 | 0,80 | 0,91 | 1,00 | 0,63 | 0,73 | 0,83 | 0,91 | 0,35 | 0,40 | 0,46 | 0,50 | 5,86 |
| | 50 | *1 15/16* | 30 | 0,92 | 1,06 | 1,20 | 1,31 | 0,83 | 0,96 | 1,09 | 1,19 | 0,46 | 0,53 | 0,60 | 0,66 | |
| | 60 | *2 3/8* | 35 | 1,10 | 1,27 | 1,44 | 1,58 | 1,00 | 1,16 | 1,31 | 1,43 | 0,55 | 0,64 | 0,72 | 0,79 | |
| | 70 | *2 3/4* | 40 | 1,28 | 1,48 | 1,68 | 1,84 | 1,16 | 1,35 | 1,52 | 1,67 | 0,64 | 0,74 | 0,84 | 0,92 | |
| | 80 | *3 1/8* | 50 | 1,65 | 1,91 | 2,16 | 2,36 | 1,50 | 1,73 | 1,96 | 2,15 | 0,82 | 0,95 | 1,08 | 1,18 | |
| | 90 | *3 1/2* | 55 | 1,83 | 2,12 | 2,40 | 2,63 | 1,66 | 1,93 | 2,18 | 2,39 | 0,92 | 1,06 | 1,20 | 1,31 | |
| | 100 | *4* | 60 | 2,01 | 2,33 | 2,63 | 2,89 | 1,83 | 2,12 | 2,40 | 2,63 | 1,01 | 1,16 | 1,32 | 1,45 | |
| 6 *0.24* | 80 | *3 1/8* | 50 | 1,61 | 1,87 | 2,11 | 2,32 | 1,47 | 1,70 | 1,92 | 2,11 | 0,81 | 0,93 | 1,06 | 1,16 | 8,47 |
| | 100 | *4* | 60 | 1,98 | 2,29 | 2,59 | 2,84 | 1,80 | 2,08 | 2,36 | 2,58 | 0,99 | 1,15 | 1,30 | 1,42 | |
| | 120 | *4 3/4* | 75 | 2,53 | 2,93 | 3,31 | 3,63 | 2,30 | 2,66 | 3,01 | 3,30 | 1,26 | 1,46 | 1,66 | 1,82 | |

α = screw-to-grain angle

NOTES and GENERAL PRINCIPLES on page 5.

| geometry | | | | | SHEAR[4] | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | timber-to-timber α = 90° | | | | timber-to-timber α = 0° | | | |
|   | | | | |  | | | |  | | | |
| | | | | | factored lateral resistance $N_r$ | | | | factored lateral resistance $N_r$[2] [3] | | | |
| | | | | | G | | | | G | | | |
| $d_1$ | L | | b | A | 0.35 | 0.42 | 0.49 | 0.55 | 0.35 | 0.42 | 0.49 | 0.55 |
| [mm] *[in]* | [mm] | *[in]* | [mm] | [mm] | [kN] | [kN] | [kN] | [kN] | [kN] | [kN] | [kN] | [kN] |
| **4** *0.16* | 30 | *1 3/16* | 18 | 12 | 0,29 | 0,35 | 0,41 | 0,46 | 0,19 | 0,23 | 0,27 | 0,30 |
| | 35 | *1 3/8* | 20 | 15 | 0,33 | 0,40 | 0,46 | 0,52 | 0,23 | 0,27 | 0,31 | 0,35 |
| | 40 | *1 9/16* | 24 | 16 | 0,37 | 0,44 | 0,51 | 0,57 | 0,26 | 0,31 | 0,36 | 0,40 |
| | 45 | *1 3/4* | 30 | 15 | 0,40 | 0,46 | 0,51 | 0,56 | 0,27 | 0,33 | 0,38 | 0,43 |
| | 50 | *1 15/16* | 30 | 20 | 0,43 | 0,50 | 0,56 | 0,62 | 0,31 | 0,37 | 0,42 | 0,46 |
| **4.5** *0.18* | 40 | *1 9/16* | 24 | 16 | 0,41 | 0,49 | 0,58 | 0,65 | 0,29 | 0,34 | 0,39 | 0,44 |
| | 45 | *1 3/4* | 30 | 15 | 0,45 | 0,54 | 0,63 | 0,69 | 0,31 | 0,37 | 0,43 | 0,48 |
| | 50 | *1 15/16* | 30 | 20 | 0,49 | 0,59 | 0,69 | 0,76 | 0,35 | 0,42 | 0,49 | 0,55 |
| | 60 | *2 3/8* | 35 | 25 | 0,57 | 0,67 | 0,75 | 0,82 | 0,40 | 0,48 | 0,54 | 0,59 |
| | 70 | *2 3/4* | 40 | 30 | 0,62 | 0,71 | 0,81 | 0,87 | 0,44 | 0,50 | 0,56 | 0,62 |
| **5** *0.2* | 40 | *1 9/16* | 24 | 16 | 0,45 | 0,55 | 0,64 | 0,71 | 0,31 | 0,37 | 0,42 | 0,47 |
| | 50 | *1 15/16* | 30 | 20 | 0,54 | 0,65 | 0,76 | 0,83 | 0,39 | 0,46 | 0,54 | 0,60 |
| | 60 | *2 3/8* | 35 | 25 | 0,63 | 0,73 | 0,82 | 0,90 | 0,45 | 0,53 | 0,60 | 0,66 |
| | 70 | *2 3/4* | 40 | 30 | 0,68 | 0,78 | 0,88 | 0,95 | 0,48 | 0,55 | 0,62 | 0,68 |
| | 80 | *3 1/8* | 50 | 30 | 0,68 | 0,78 | 0,88 | 0,95 | 0,52 | 0,60 | 0,67 | 0,74 |
| | 90 | *3 1/2* | 55 | 35 | 0,72 | 0,81 | 0,89 | 0,95 | 0,53 | 0,62 | 0,70 | 0,76 |
| | 100 | *4* | 60 | 40 | 0,73 | 0,81 | 0,89 | 0,95 | 0,55 | 0,64 | 0,71 | 0,76 |
| **6** *0.24* | 80 | *3 1/8* | 50 | 30 | 0,89 | 1,02 | 1,15 | 1,26 | 0,64 | 0,77 | 0,88 | 0,97 |
| | 100 | *4* | 60 | 40 | 0,99 | 1,14 | 1,26 | 1,35 | 0,72 | 0,83 | 0,94 | 1,03 |
| | 120 | *4 3/4* | 75 | 45 | 1,04 | 1,15 | 1,26 | 1,35 | 0,78 | 0,90 | 1,00 | 1,08 |

α = screw-to-grain angle

## GENERAL PRINCIPLES

- The reference factored lateral resistance for self-tapping screws has been determined following the guidelines in Clause 12.12 of the CSA O86:24 including the withdrawal restraint effect. Listed values are based on standard long term load duration factor ($K_D$ = 1.0), dry service condition factor ($K_{SF}$ = 1.0), and treatment factor ($K_T$ = 1.0).
- The reference lateral design values are calculated for screws inserted without pre-drilling as per CSA O86:24 Clause 12.12.10.5.3. The direction of the bearing-to-grain angle does not influence lateral resistance. In the case of screws inserted with pre-drilling, greater resistance values can be obtained.
- Head pull-through values have been determined in accordance with CSA O86:24, Clause A.12.12.8.3. Withdrawal and head pull-through values given in this datasheet are likewise applicable to CLT connections.
- Connection design requires comparing head pull-through resistance to both screw tensile capacity and thread withdrawal - the minimum of the three governs.
- Not all screw lengths satisfy the required embedment depth in either the side member ($4d_1$) or the main member ($8d_1$). Engineering discretion and judgment should be applied to evaluate the potential impact of reduced penetration on the connection's load-carrying capacity.
- KKF AISI410 screws must be positioned in accordance with the minimum distances.
- G is the mean relative density according to CSA O86:24 Table A12. Most common wood species are assumed such as Northern species (G = 0.35), Spruce-Pine-Fir (G = 0.42), Douglas Fir (G = 0.49), and Southern Pine (G = 0.55).
- The tabulated lateral design values are based on both wood members having the same specific gravity G.
- As part of the connection design, the designer must size and verify both the structural wood members and the steel plates separately.
- Combined shear and tensile stresses shall comply with the interaction criteria outlined in CSA O86:24 Clause 12.12.11.

## NOTES

(1) Factored withdrawal resistances were calculated with the entire threaded portion of the screw, b (in millimeters), minus the tip length, $L_{tip}$. The length of the tip is equal to the nominal diameter of the respective fasteners, $d_1$, as specified in the ELC-4645 report. Factor for fastener axis-to-grain angle, $J_\alpha$, and the factor for dowel bearing effect for laterally loaded connections, $J_W$, varies according to connection geometry. The factored tensile resistance of the connector ($P_{rt}$) is governed by the lower value between the withdrawal resistance ($P_{rw}$), head pull-through resistance ($P_{pt}$) and the steel strength ($T_{rs}$).

(2) The angle between the fastener axis and the grain direction of the wood member, α, is taken as zero for the end grain calculations. Self-tapping screws installed perpendicular to the panel edge of CLT are assumed to be installed in the end grain of member.

(3) KKF AISI410 installed in the end grain may not meet the minimum penetration requirement for withdrawal ($20\ d_1$) specified in CSA O86:24 Clause 12.12.6.1. Discretion and engineering judgment must be exercised to evaluate the impact of reduced penetration on the connection's capacity.

(4) Lateral resistances are factored and according to CSA O86:24 Clause 12.12.10. Values apply to dry service conditions and are representative of a single screw.