KKF AISI410

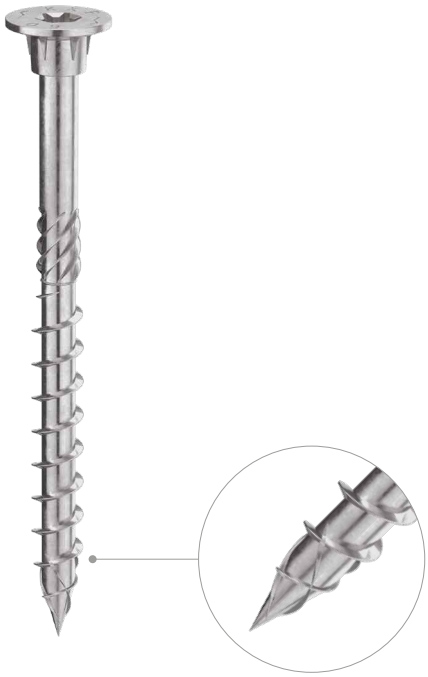
PAN HEAD SCREW

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 higher 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.).



BIT INCLUDED

DIAMETER [in]

0.14 | **0.16** **0.24** | 0.32

LENGTH [in]

13/16 | **13/16** **4 3/4** | 12 5/8

EXPOSURE CONDITION

WET

ATMOSPHERIC CORROSIVITY

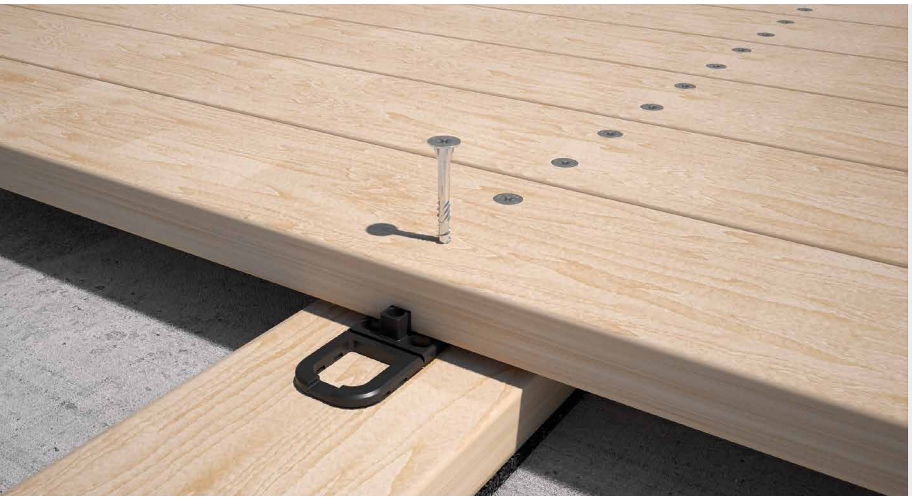
C1 C2

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 [G = 0.92] (without pre-drill).
WPC boards (with pre-drill).

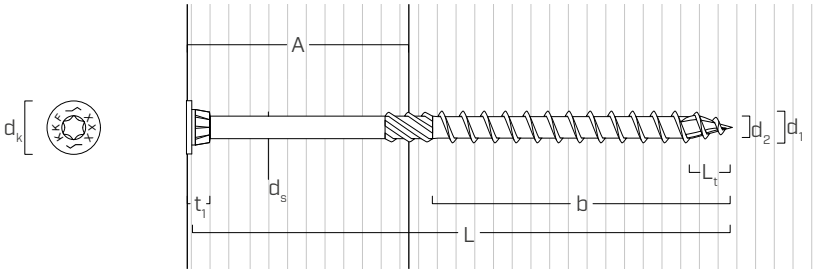
CODES AND DIMENSIONS

d_1 [mm] [in]	CODE	L [mm]	L [in]	b [mm]	b [in]	A [in]	pcs
4 **0.16 #7 TX 20**	**KKF430**	30	1 3/16	18	11/16	3/8	500
	KKF435	35	1 3/8	20	13/16	1/2	500
	KKF440	40	1 9/16	24	15/16	1/2	500
	KKF445	45	1 3/4	30	1 3/16	1/2	200
	KKF450	50	1 15/16	30	1 3/16	3/4	200
4,5 **0.18 #9 TX 25**	**KKF4520(*)**	20	13/16	15	9/16	1/8	200
	KKF4540	40	1 9/16	24	15/16	1/2	200
	KKF4545	45	1 3/4	30	1 3/16	1/2	200
	KKF4550	50	1 15/16	30	1 3/16	3/4	200
	KKF4560	60	2 3/8	35	1 3/8	3/4	200
	KKF4570	70	2 3/4	40	1 9/16	1	200

d_1 [mm] [in]	CODE	L [mm]	L [in]	b [mm]	b [in]	A [in]	pcs
5 **0.20 #11 TX 25**	**KKF540**	40	1 9/16	24	15/16	1/2	200
	KKF550	50	1 15/16	30	1 3/16	3/4	200
	KKF560	60	2 3/8	35	1 3/8	3/4	200
	KKF570	70	2 3/4	40	1 9/16	1	100
	KKF580	80	3 1/8	50	1 15/16	1	100
	KKF590	90	3 1/2	55	2 3/16	1 1/4	100
	KKF5100	100	4	60	2 3/8	1 1/2	100
6 **0.24 #14 TX 30**	**KKF680**	80	3 1/8	40	1 9/16	1 1/2	100
	KKF6100	100	4	50	1 15/16	1 3/4	100
	KKF6120	120	4 3/4	60	2 3/8	2 1/4	100

(*)Not holding CE marking.

GEOMETRY AND MECHANICAL CHARACTERISTICS



GEOMETRY

Nominal diameter	**d_1**	**[in](1)**	**0.16**	**0.18**	**0.20**	**0.24**
Outer thread diameter	**d_1**	[mm]	4	4,5	5	6
		[in]	**0.157**	**0.177**	**0.197**	**0.236**
Head diameter	d_K	[in]	0.303	0.343	0.380	0.459
Root diameter	d_2	[in]	0.102	0.120	0.128	0.159
Shank diameter	d_S	[in]	0.114	0.132	0.142	0.169
Head thickness	t_1	[in]	0.197	0.197	0.236	0.276
Tip length	L_t	[in]	0.157	0.177	0.197	0.236
Pre-drilling hole diameter(2)	$d_{V,G\leq0.55}$	[in]	-	-	1/8	5/32
Pre-drilling hole diameter(3)	$d_{V,G>0.55}$	[in]	-	-	9/64	5/32

(1)The nominal diameter of the screw is converted into imperial units and rounded up to the nearest decimal point.
(2)Pre-drilling applies to wood elements with G≤0.55.
(3)Pre-drilling applies to wood elements with G>0.55.

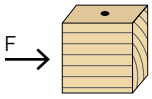
MECHANICAL PARAMETERS

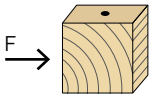
Nominal diameter	**d_1**	[in]	0.16	0.18	0.20	0.24
Tensile strength (allowable)	f_{tens}	[lbf]	480	740	810	1170
Bending yield strength (specified)	$F_{y,b}$	[psi]	179000	185000	164000	150000

Nominal diameter	**d_1**	[in]		0.16	0.18	0.20	0.24
Withdrawal (design value)	W_{90}	[lbf/in]	G = 0.35	86	86	103	131
			G = 0.42	99	99	119	151
			G = 0.49	111	111	133	171
			G = 0.55	121	121	146	188
minimum embedded length		[in]		15/16	1 1/16	1 3/16	1 7/16

MINIMUM DISTANCES FOR SHEAR LOADS | TIMBER

screws inserted **WITHOUT pre-drilled hole** — **G ≤ 0.48**

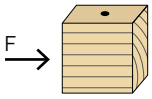


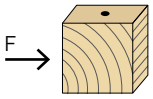


d_1	[in]		0.16	0.18	0.20	0.24
	[mm]		4	4,5	5	6
a_1	[in]	**15·d**	2 3/8	2 11/16	2 15/16	3 1/2
a_2	[in]	**5·d**	13/16	7/8	1	1 3/16
$a_{3,t}$	[in]	**15·d**	2 3/8	2 11/16	2 15/16	3 1/2
$a_{3,c}$	[in]	**10·d**	1 9/16	1 3/4	1 15/16	2 3/8
$a_{4,t}$	[in]	**10·d**	1 9/16	1 3/4	1 15/16	2 3/8
$a_{4,c}$	[in]	**5·d**	13/16	7/8	1	1 3/16

	0.16	0.18	0.20	0.24
	4	4,5	5	6
10·d	1 9/16	1 3/4	1 15/16	2 3/8
5·d	13/16	7/8	1	1 3/16
15·d	2 3/8	2 11/16	2 15/16	3 1/2
10·d	1 9/16	1 3/4	1 15/16	2 3/8
10·d	1 9/16	1 3/4	1 15/16	2 3/8
5·d	13/16	7/8	1	1 3/16

screws inserted **WITHOUT pre-drilled hole** — **0.48 < G ≤ 0.50**

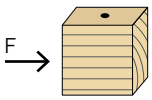


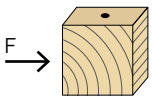


d_1	[in]		0.16	0.18	0.20	0.24
	[mm]		4	4,5	5	6
a_1	[in]	**15·d**	2 3/8	2 11/16	2 15/16	3 1/2
a_2	[in]	**5·d**	13/16	7/8	1	1 3/16
$a_{3,t}$	[in]	**15·d**	2 3/8	2 11/16	2 15/16	3 1/2
$a_{3,c}$	[in]	**10·d**	1 9/16	1 3/4	1 15/16	2 3/8
$a_{4,t}$	[in]	**10·d**	1 9/16	1 3/4	1 15/16	2 3/8
$a_{4,c}$	[in]	**5·d**	13/16	7/8	1	1 3/16

	0.16	0.18	0.20	0.24
	4	4,5	5	6
10·d	1 9/16	1 3/4	1 15/16	2 3/8
5·d	13/16	7/8	1	1 3/16
15·d	2 3/8	2 11/16	2 15/16	3 1/2
10·d	1 9/16	1 3/4	1 15/16	2 3/8
10·d	1 9/16	1 3/4	1 15/16	2 3/8
5·d	13/16	7/8	1	1 3/16

screws inserted **WITHOUT pre-drilled hole** — **G > 0.50**

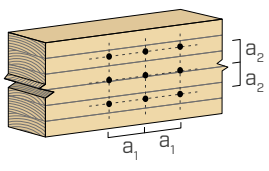




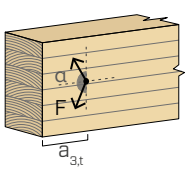
d_1	[in]		0.16	0.18	0.20	0.24
	[mm]		4	4,5	5	6
a_1	[in]	**15·d**	2 3/8	2 11/16	2 15/16	3 1/2
a_2	[in]	**7·d**	1 1/8	1 1/4	1 3/8	1 5/8
$a_{3,t}$	[in]	**20·d**	3 1/8	3 1/2	4	4 3/4
$a_{3,c}$	[in]	**15·d**	2 3/8	2 11/16	2 15/16	3 1/2
$a_{4,t}$	[in]	**12·d**	1 7/8	2 1/8	2 3/8	2 13/16
$a_{4,c}$	[in]	**7·d**	1 1/8	1 1/4	1 3/8	1 5/8

	0.16	0.18	0.20	0.24
	4	4,5	5	6
10·d	1 9/16	1 3/4	1 15/16	2 3/8
7·d	1 1/8	1 1/4	1 3/8	1 5/8
20·d	3 1/8	3 1/2	4	4 3/4
15·d	2 3/8	2 11/16	2 15/16	3 1/2
12·d	1 7/8	2 1/8	2 3/8	2 13/16
7·d	1 1/8	1 1/4	1 3/8	1 5/8

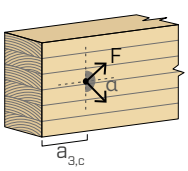
α = load-to-grain angle
d = d_1 = nominal diameter of the screw



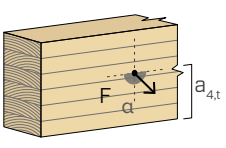
stressed end
-90° < α < 90°



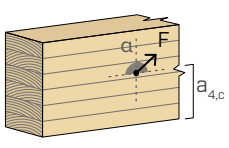
unloaded end
90° < α < 270°



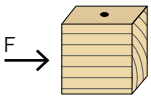
stressed edge
0° < α < 180°

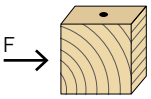


unload edge
180° < α < 360°



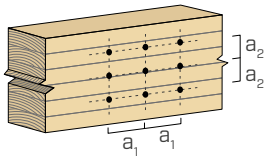
screws inserted **WITH pre-drilled hole**



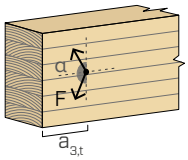


d_1	[in]		0.16	0.18	0.20	0.24		0.16	0.18	0.20	0.24
	[mm]		4	4,5	5	6		4	4,5	5	6
a_1	[in]	**10·d**	1 9/16	1 3/4	1 15/16	2 3/8	**5·d**	13/16	7/8	1	1 3/16
a_2	[in]	**4·d**	5/8	11/16	13/16	15/16	**4·d**	5/8	11/16	13/16	15/16
$a_{3,t}$	[in]	**12·d**	1 7/8	2 1/8	2 3/8	2 13/16	**12·d**	1 7/8	2 1/8	2 3/8	2 13/16
$a_{3,c}$	[in]	**7·d**	1 1/8	1 1/4	1 3/8	1 5/8	**7·d**	1 1/8	1 1/4	1 3/8	1 5/8
$a_{4,t}$	[in]	**7·d**	1 1/8	1 1/4	1 3/8	1 5/8	**7·d**	1 1/8	1 1/4	1 3/8	1 5/8
$a_{4,c}$	[in]	**3·d**	1/2	9/16	9/16	11/16	**3·d**	1/2	9/16	9/16	11/16

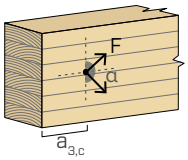
α = load-to-grain angle
d = d_1 = nominal diameter of the screw



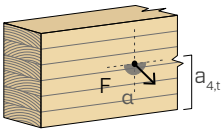
stressed end
-90° < α < 90°



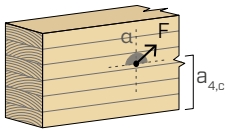
unloaded end
90° < α < 270°



stressed edge
0° < α < 180°



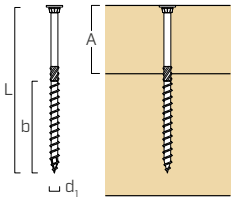
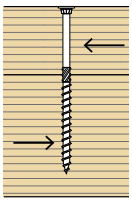
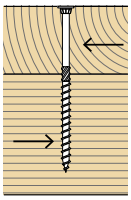
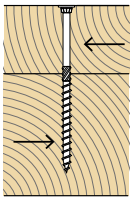
unload edge
180° < α < 360°



NOTES

- Values in blue are from Table 10 of ESR-4645 (REDUCED CONNECTION GEOMETRY REQUIREMENTS BASED ON TESTING);
- The minimum spacing and distances comply with ESR-4645, where d refers to the nominal diameter of the screw, and are valid for screw installed into sawn lumber, structural glued laminated timber and cross laminated timber;
- Wood member stresses must be checked in accordance with the corresponding Sections of the NDS; end distances, edge distances and fastener spacing may need to be increased accordingly.

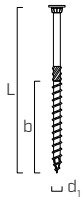
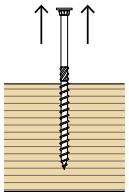
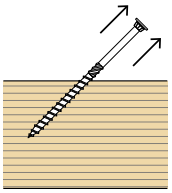
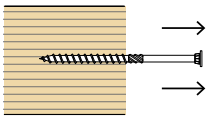
REFERENCE LATERAL DESIGN VALUES (Z) | WOOD-TO-WOOD

geometry				$Z_{\parallel}$				$Z_{\perp/\parallel}$				$Z_{\perp}$			
															
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]	[in]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]
4 **0.16**	30	1 3/16(1)	11/16	47	55	61	67	43	50	56	61	14	16	18	20
	35	1 3/8(1)	13/16	54	62	70	76	49	57	64	69	16	19	21	23
	40	1 9/16(1)	15/16	68	78	87	95	62	71	80	87	20	23	26	29
	45	1 3/4(2)	1 3/16	88	101	114	124	80	92	103	113	26	30	34	37
	50	1 15/16(2)	1 3/16	88	101	114	124	80	92	103	113	26	30	34	37
4,5 **0.18**	20	13/16(1)	9/16	36	41	46	50	32	37	42	46	11	12	14	15
	40	1 9/16(1)	15/16	66	76	85	93	60	69	78	85	20	23	26	28
	45	1 3/4(1)	1 3/16	86	99	111	121	79	90	101	111	26	30	33	36
	50	1 15/16(1)	1 3/16	86	99	111	121	79	90	101	111	26	30	33	36
	60	2 3/8(2)	1 3/8	103	119	133	145	94	108	121	132	31	36	40	44
	70	2 3/4(2)	1 9/16	120	138	155	169	109	126	141	154	36	42	47	51
5 **0.20**	40	1 9/16(1)	15/16	77	89	99	109	70	81	91	99	23	27	30	33
	50	1 15/16(1)	1 3/16	101	117	131	144	92	107	119	131	30	35	39	43
	60	2 3/8(1)	1 3/8	122	141	157	172	111	128	143	157	36	42	47	52
	70	2 3/4(2)	1 9/16	142	164	183	201	129	149	167	183	43	49	55	60
	80	3 1/8	1 15/16	182	211	236	259	166	192	214	235	55	63	71	78
	90	3 1/2	2 3/16	203	234	262	287	185	213	238	262	61	70	79	86
	100	4	2 3/8	223	258	288	316	203	234	262	288	67	77	86	95
6 **0.24**	80	3 1/8(1)	1 9/16	175	202	229	252	160	184	208	229	53	61	69	75
	100	4(2)	1 15/16	227	262	296	326	207	238	270	296	68	78	89	98
	120	4 3/4	2 3/8	279	321	364	400	253	292	331	364	84	96	109	120

(1) The embedded thread length does not comply with the minimum requirement of ESR-4645 (6 times the outer thread diameter for screws installed at 90° to the grain and 8 times the outer thread diameter for screws installed at an angle $0° \leq \alpha < 90°$ to the grain).

(2) The embedded thread length does not comply with the minimum requirement of ESR-4645 (8 times the outer thread diameter for screws installed at an angle $0° \leq \alpha < 90°$ to the grain).

THREAD WITHDRAWAL (W) | WOOD

geometry				thread withdrawal α = 90°				thread withdrawal α = 45°				thread withdrawal α = 0°			
															
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]	[in]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]	[lbf]
4 **0.16**	30	1 3/16(1)	11/16	47	55	61	67	43	50	56	61	14	16	18	20
	35	1 3/8(1)	13/16	54	62	70	76	49	57	64	69	16	19	21	23
	40	1 9/16(1)	15/16	68	78	87	95	62	71	80	87	20	23	26	29
	45	1 3/4(2)	1 3/16	88	101	114	124	80	92	103	113	26	30	34	37
	50	1 15/16(2)	1 3/16	88	101	114	124	80	92	103	113	26	30	34	37
4,5 **0.18**	20	13/16(1)	9/16	36	41	46	50	32	37	42	46	11	12	14	15
	40	1 9/16(1)	15/16	66	76	85	93	60	69	78	85	20	23	26	28
	45	1 3/4(1)	1 3/16	86	99	111	121	79	90	101	111	26	30	33	36
	50	1 15/16(1)	1 3/16	86	99	111	121	79	90	101	111	26	30	33	36
	60	2 3/8(2)	1 3/8	103	119	133	145	94	108	121	132	31	36	40	44
	70	2 3/4(2)	1 9/16	120	138	155	169	109	126	141	154	36	42	47	51
5 **0.20**	40	1 9/16(1)	15/16	77	89	99	109	70	81	91	99	23	27	30	33
	50	1 15/16(1)	1 3/16	101	117	131	144	92	107	119	131	30	35	39	43
	60	2 3/8(1)	1 3/8	122	141	157	172	111	128	143	157	36	42	47	52
	70	2 3/4(2)	1 9/16	142	164	183	201	129	149	167	183	43	49	55	60
	80	3 1/8	1 15/16	182	211	236	259	166	192	214	235	55	63	71	78
	90	3 1/2	2 3/16	203	234	262	287	185	213	238	262	61	70	79	86
	100	4	2 3/8	223	258	288	316	203	234	262	288	67	77	86	95
6 **0.24**	80	3 1/8(1)	1 9/16	175	202	229	252	160	184	208	229	53	61	69	75
	100	4(2)	1 15/16	227	262	296	326	207	238	270	296	68	78	89	98
	120	4 3/4	2 3/8	279	321	364	400	253	292	331	364	84	96	109	120

(1) The embedded thread length does not comply with the minimum requirement of ESR6) 4645- times the outer thread diameter for screws installed at °90 to the grain and 8 times the outer thread diameter for screws installed at an angle °0≤ α <°90 to the grain).

(2) The embedded thread length does not comply with the minimum requirement of ESR-4645 (8 times the outer thread diameter for screws installed at an angle 0°≤ α <90° to the grain).

GENERAL PRINCIPLES

- Tabulated values comply with NATIONAL DESIGN SPECIFICATION FOR WOOD CONSTRUCTION in accordance with ESR-4645.
- To determine allowable loads for use with ASD, design loads for use with LRFD or both, tabulated values must be multiplied by all adjustment factors included in the NDS for dowel-type fasteners. The design of connection with steel side plate must comply with Section 11.2.3 of the NDS.
- As part of the connection design, the structural wood members, the steel plates must be sized and verified in accordance with the corresponding Section of the NDS and must be done separately by the designer.
- Connections with multiple screws must be designed in accordance with the corresponding Sections of the NDS and ESR-4645.
- KKF AISI410 screws must be installed and used in dry in-service conditions in accordance with the NDS (wet service factor for connection CM is 1.0).
- KKF AISI410 screws must be positioned in accordance with the minimum distances.

REFERENCE LATERAL DESIGN VALUES

- Tabulated values are determined from the yield model equations in the corresponding Section of the NDS.
- Unless otherwise noted, the threaded part of the screw is fully inserted in the main member.
- The screw penetration into the main member is minimum 6 times the outer thread diameter unless otherwise noted.
- The reference lateral design values may be determined for other connection configurations in accordance with the corresponding Section of NDS and ESR-4645.
- The reference lateral design values 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.

WOOD-TO-WOOD

- The wood main member thickness must be greater than the screw length minus the thickness of the wood side member.
- The tabulated lateral design values are based on both wood members having the same specific gravity G.

STEEL-TO-WOOD

- The steel side member must have a minimum tensile strength equal to 58 ksi (400 MPa) and comply with the minimum requirements of ASTM A36.
- The wood main member thickness must be greater than the screw length minus the thickness of the steel side member.
- In case of steel-to-wood connection with a thick plate, it is necessary to assess the effects of wood deformations and install the connectors according to the assembly instructions.

REFERENCE WITHDRAWAL DESIGN VALUES

- The reference withdrawal design values (W_{ref}) expressed in pounds-force per inch of thread penetration into the main member for screws installed at an angle of 90° to the grain can be found in the ESR-4645.
- The values for screws installed at an angle α to the grain are determined by multiplying the reference withdrawal design values with the effective thread penetration L_{eff} of the screw in the wood member and with the factor k_α:

  $W_\alpha = W_{ref} \cdot k_\alpha \cdot L_{eff}$

  Where:

  - W_{ref} is the reference withdrawal design value for screws installed at an angle of 90° to the grain, as shown in the table on the left;
  - k_α factor is calculated as:

$$k_\alpha = \begin{cases} 35^\circ < \alpha \leq 90^\circ & \dfrac{1}{1.2 \cdot \cos^2(\alpha) + \sin^2(\alpha)} \\ 0^\circ \leq \alpha \leq 35^\circ & 0.3 + 0.7 \cdot \dfrac{\alpha}{45} \end{cases}$$

  - α is the angle between the grain direction and screw axis.

  Tabulated values at page 381 are valid for L_{eff} equal to the screw thread length b minus the tip length L_t and k_α = 1 for α=90°, k_α = 0.91 for α= 45°, k_α = 0.3 for α = 0°.
- The minimum embedded thread length is 6 times the outer thread diameter for screws installed at 90° to the grain, unless otherwise noted.
- The minimum embedded thread length for screws installed at an angle 0° ≤ α < 90° to the grain is 8 times the outer thread diameter, unless otherwise noted.
- At least four screws must be used in a connection with screws installed in the wood member with an angle between the grain direction and screw axis α ≤ 15°.
- The reference withdrawal design values must be inferior to f_{tens} of the screw.

REFERENCE HEAD PULL-THROUGH DESIGN VALUES

While designing a connection the head pull-through values must be compared with the tensile resistance of the screw and, if necessary, thread withdrawal. The lower value is the governing one.