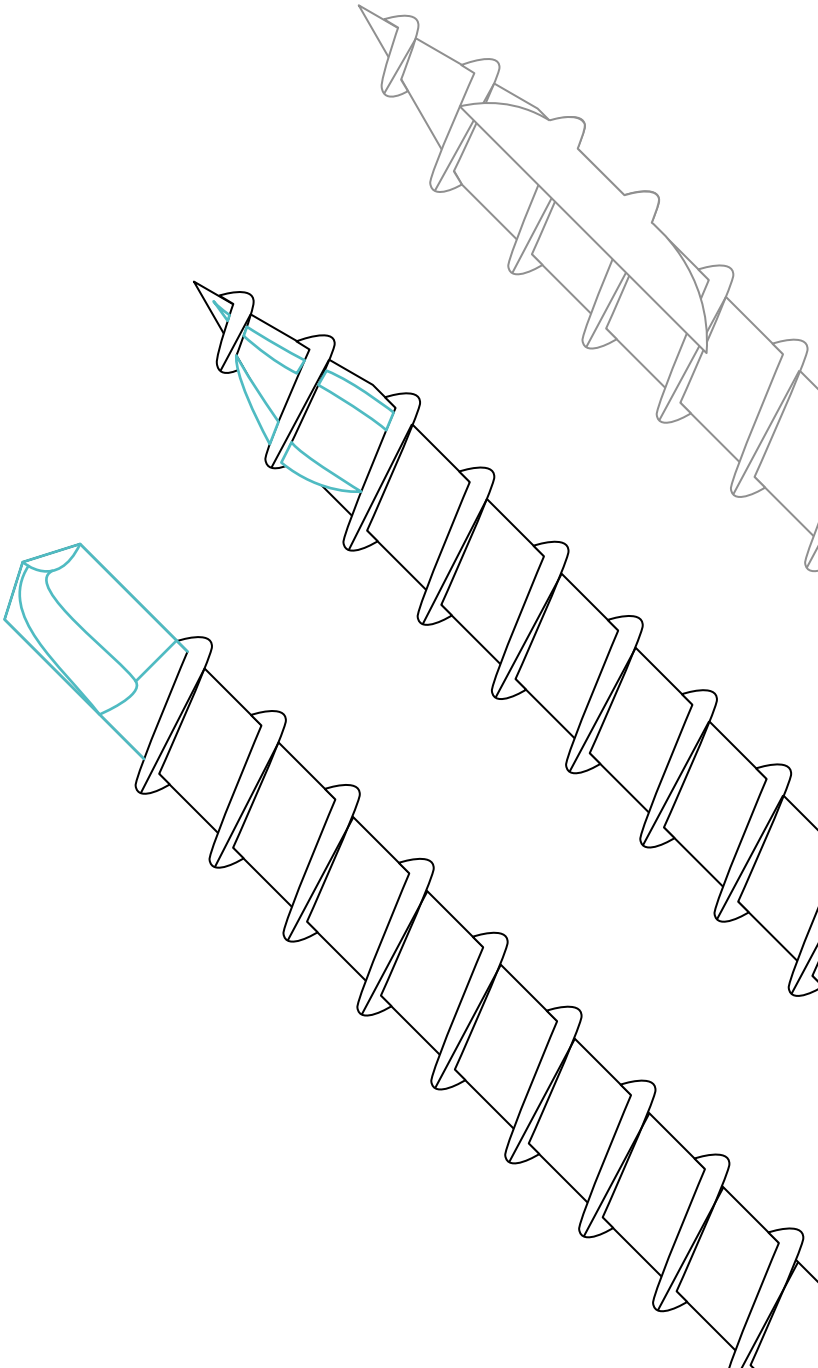
MINIMUM DISTANCES GUIDE: COMPARING TIPS

2023 - 2025 TRANSITION



rothoblaas

Solutions for Building Technology

CONTENTS

LEGEND

standard tip
SHARP 1 CUT
type RBN / RBN2

(in gradual transition to 3 THORNS and SELF-DRILLING)

tip
3 THORNS
type RB3T

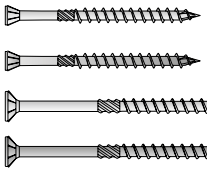
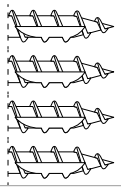
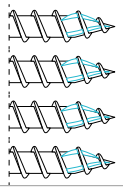
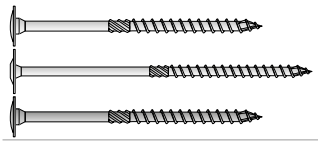
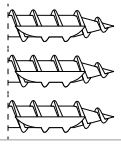
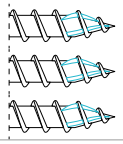
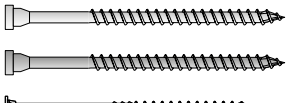
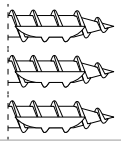
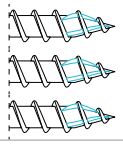
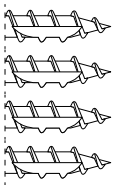
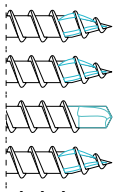
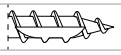
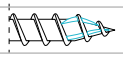
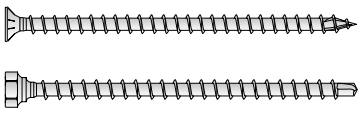
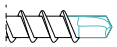
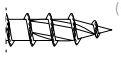
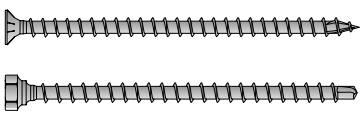
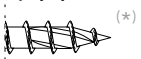
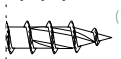
(available from **spring 2024**)

tip
SELF-DRILLING
type RBSD

(available from **spring 2024**)

The complete replacement of the 3 THORNS and SELF-DRILLING tips will take place by 2025.
For information on the availability of codes for screws with specific tips, please contact your Sales technician.

SCREWS AND TIPS TRANSITION

		d x L	2023	2024/2025
PARTIALLY THREADED - COUNTERSUNK HEAD				
	SHS	all		
	SHS AISI410	all		
	HBS	all		
	HBS EVO	all		
PARTIALLY THREADED - FLANGE HEAD				
	TBS	all		
	TBS MAX	all		
	TBS EVO	all		
PARTIAL THREAD - PLATE FASTENING				
	HBS PLATE	all		
	HBS PLATE EVO	all		
	KKF	all		
FULLY THREADED - CYLINDRICAL HEAD				
	VGZ	Ø7		
		Ø9 L ≤ 520		
		Ø9 L > 520		
		Ø11 L ≤ 600		
		Ø11 L > 600	-	
	VGZ EVO	all		
FULLY THREADED - COUNTERSUNK HEAD				
	VGS	Ø9 L ≤ 520		
		Ø9 L > 520		
		Ø11 L ≤ 600		
		Ø11 L > 600	 (*)	
		Ø13 L ≤ 600	 (*)	 (*)
		Ø13 L > 600	 (*)	
		Ø15	-	
	VGS EVO	Ø9		
		Ø11		
		Ø13 L ≤ 600	 (*)	 (*)
		Ø13 L > 600	 (*)	
DOUBLE THREAD - CYLINDRICAL HEAD				
	DGZ	all		

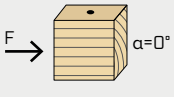
(*)SHARP SAW NIBS tip (*type RBSN*)

The complete replacement of the 3 THORNS and SELF-DRILLING tips will take place by 2025.
For information on the availability of codes for screws with specific tips, please contact your Sales technician.

MINIMUM DISTANCES FOR SHEAR LOADS | TIMBER

COMPARISON TIPS: SHARP 1 CUT, 3 THORNS and SELF-DRILLING

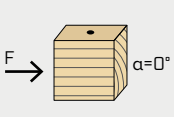
screws inserted **WITHOUT pre-drilled hole** — $\rho_k \leq 420$ kg/m³



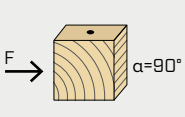
a_1	12·d	10·d	10·d
a_2	5·d	5·d	5·d
$a_{3,t}$	15·d	15·d	15·d
$a_{3,c}$	10·d	10·d	10·d
$a_{4,t}$	5·d	5·d	5·d
$a_{4,c}$	5·d	5·d	5·d

a_1	5·d	5·d	5·d
a_2	5·d	5·d	5 d
$a_{3,t}$	10·d	10·d	10·d
$a_{3,c}$	10·d	10·d	10·d
$a_{4,t}$	10·d	10·d	10·d
$a_{4,c}$	5·d	5·d	5·d

screws inserted **WITHOUT pre-drilled hole** — 420 kg/m³ < $\rho_k \leq$ 500 kg/m³

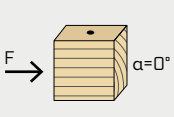


a_1	15·d	15·d	15·d
a_2	7·d	7·d	7·d
$a_{3,t}$	20·d	20·d	20·d
$a_{3,c}$	15·d	15·d	15·d
$a_{4,t}$	7·d	7·d	7·d
$a_{4,c}$	7·d	7·d	7·d

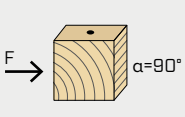


a_1	7·d	5·d	5·d
a_2	7·d	5·d	5·d
$a_{3,t}$	15·d	10·d	10·d
$a_{3,c}$	15·d	10·d	10·d
$a_{4,t}$	12·d	10·d	10·d
$a_{4,c}$	7·d	5·d	5·d

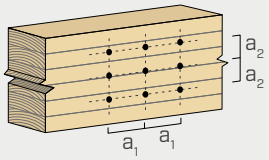
screws inserted **WITH pre-drilled hole**



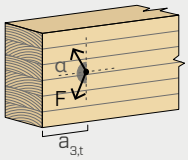
a_1	5·d	5·d	5·d
a_2	3·d	3·d	3·d
$a_{3,t}$	12·d	12·d	12·d
$a_{3,c}$	7·d	7·d	7·d
$a_{4,t}$	3·d	3·d	3·d
$a_{4,c}$	3·d	3·d	3·d



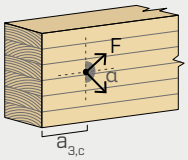
a_1	4·d	4·d	4·d
a_2	4·d	4·d	4·d
$a_{3,t}$	7·d	7·d	7·d
$a_{3,c}$	7·d	7·d	7·d
$a_{4,t}$	7·d	7·d	7·d
$a_{4,c}$	3·d	3·d	3·d



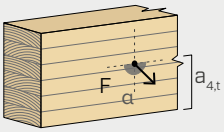
stressed end
-90° ≤ α ≤ 90°



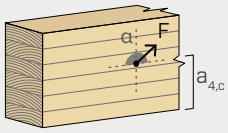
unloaded end
90° ≤ α ≤ 270°



stressed edge
0° ≤ α ≤ 180°



unload edge
180° ≤ α ≤ 360°



NOTE: see page 5.

LEGEND

standard tip
SHARP 1 CUT
type RBN / RBN2

(in gradual transition to 3 THORNS and SELF-DRILLING)

tip
3 THORNS
type RB3T

(available from **spring 2024**)

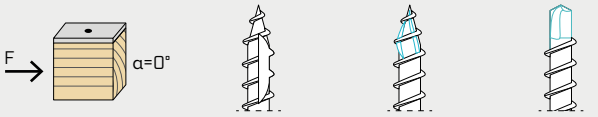
tip
SELF-DRILLING
type RBSD

(available from **spring 2024**)

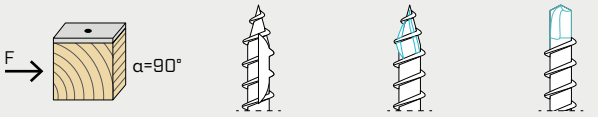
MINIMUM DISTANCES FOR SHEAR LOADS | STEEL-TO-TIMBER

COMPARISON TIPS: SHARP 1 CUT, 3 THORNS and SELF-DRILLING

screws inserted **WITHOUT pre-drilled hole** — $\rho_k \leq 420$ kg/m³



	12·d·0,7	10·d·0,7	10·d·0,7
a_1	5·d·0,7	5·d·0,7	5·d·0,7
a_2	5·d·0,7	5·d·0,7	5·d·0,7
$a_{3,t}$	15·d	15·d	15·d
$a_{3,c}$	10·d	10·d	10·d
$a_{4,t}$	5·d	5·d	5·d
$a_{4,c}$	5·d	5·d	5·d



a_1	5·d·0,7	5·d·0,7	5·d·0,7
a_2	5·d·0,7	5·d·0,7	5·d·0,7
$a_{3,t}$	10·d	10·d	10·d
$a_{3,c}$	10·d	10·d	10·d
$a_{4,t}$	10·d	10·d	10·d
$a_{4,c}$	5·d	5·d	5·d

screws inserted **WITHOUT pre-drilled hole** — 420 kg/m³ < $\rho_k \leq$ 500 kg/m³

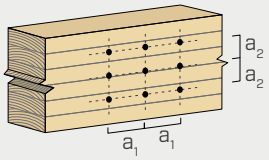
a_1	15·d·0,7	15·d·0,7	15·d·0,7
a_2	7·d·0,7	7·d·0,7	7·d·0,7
$a_{3,t}$	20·d	20·d	20·d
$a_{3,c}$	15·d	15·d	15·d
$a_{4,t}$	7·d	7·d	7·d
$a_{4,c}$	7·d	7·d	7·d

a_1	7·d·0,7	7·d·0,7	7·d·0,7
a_2	7·d·0,7	7·d·0,7	7·d·0,7
$a_{3,t}$	15·d	10·d	10·d
$a_{3,c}$	15·d	10·d	10·d
$a_{4,t}$	12·d	10·d	10·d
$a_{4,c}$	7·d	5·d	5·d

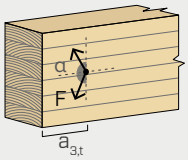
screws inserted **WITH pre-drilled hole**

a_1	5·d·0,7	5·d·0,7	5·d·0,7
a_2	3·d·0,7	3·d·0,7	3·d·0,7
$a_{3,t}$	12·d	12·d	12·d
$a_{3,c}$	7·d	7·d	7·d
$a_{4,t}$	3·d	3·d	3·d
$a_{4,c}$	3·d	3·d	3·d

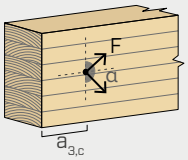
a_1	4·d·0,7	4·d·0,7	4·d·0,7
a_2	4·d·0,7	4·d·0,7	4·d·0,7
$a_{3,t}$	7·d	7·d	7·d
$a_{3,c}$	7·d	7·d	7·d
$a_{4,t}$	7·d	7·d	7·d
$a_{4,c}$	3·d	3·d	3·d



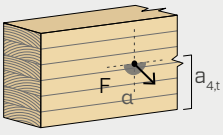
stressed end
-90° ≤ α ≤ 90°



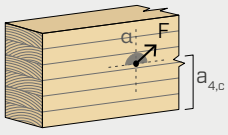
unloaded end
90° ≤ α ≤ 270°



stressed edge
0° ≤ α ≤ 180°



unload edge
180° ≤ α ≤ 360°



NOTES

- The minimum distances comply with the EN 1995:2014 standard in accordance with ETA-11/0030.
- The minimum distances are valid for screws with $d_1 \geq 5$ mm.
- The distances in the table refer to screws inserted in softwood elements (solid timber or glulam). For applications on different materials (e.g. CLT, LVL), please see ETA-11/0030.
- The spacing a_1 in the table for screws with 3 THORNS tip and SELF-DRILLING tip inserted without pre-drilling hole in timber elements with density $\rho_k \leq 420$ kg/m³ and load-to-grain angle α= 0° was assumed to be 10·d.
- The spacing a_1 in the table for screws with standard SHARP 1 CUT tip inserted without pre-drilling hole in timber elements with density $\rho_k \leq 420$ kg/m³ and load-to-grain angle α= 0° was assumed to be 12·d in accordance with EN 1995:2014.

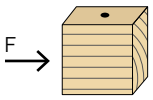
MINIMUM DISTANCES FOR SHEAR LOADS | TIMBER

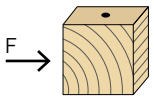
PARTIAL THREAD SCREWS

SHS - SHS AISI 410 - HBS - HBS EVO
TBS - TBS MAX - TBS EVO
HBS PLATE - HBS PLATE EVO - KKF

SHARP 1 CUT

screws inserted **WITHOUT pre-drilled hole** — $\rho_k \leq 420$ kg/m³

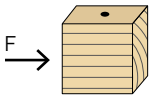


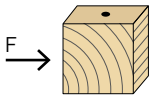


d_1	[mm]		3,5	4	4,5		5	6	8	10	12
a_1	[mm]	**10·d**	35	40	45	**12·d**	60	72	96	120	144
a_2	[mm]	**5·d**	18	20	23	**5·d**	25	30	40	50	60
$a_{3,t}$	[mm]	**15·d**	53	60	68	**15·d**	75	90	120	150	180
$a_{3,c}$	[mm]	**10·d**	35	40	45	**10·d**	50	60	80	100	120
$a_{4,t}$	[mm]	**5·d**	18	20	23	**5·d**	25	30	40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

d_1	[mm]		3,5	4	4,5		5	6	8	10	12
a_1	[mm]	**5·d**	18	20	23	**5·d**	25	30	40	50	60
a_2	[mm]	**5·d**	18	20	23	**5·d**	25	30	40	50	60
$a_{3,t}$	[mm]	**10·d**	35	40	45	**10·d**	50	60	80	100	120
$a_{3,c}$	[mm]	**10·d**	35	40	45	**10·d**	50	60	80	100	120
$a_{4,t}$	[mm]	**7·d**	25	28	32	**10·d**	50	60	80	100	120
$a_{4,c}$	[mm]	**5·d**	18	20	23	**5·d**	25	30	40	50	60

screws inserted **WITHOUT pre-drilled hole** — 420 kg/m³ $< \rho_k \leq 500$ kg/m³

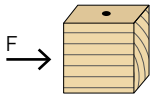


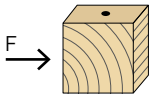


d_1	[mm]		3,5	4	4,5		5	6	8	10	12
a_1	[mm]	**15·d**	53	60	68	**15·d**	75	90	120	150	180
a_2	[mm]	**7·d**	25	28	32	**7·d**	35	42	56	70	84
$a_{3,t}$	[mm]	**20·d**	70	80	90	**20·d**	100	120	160	200	240
$a_{3,c}$	[mm]	**15·d**	53	60	68	**15·d**	75	90	120	150	180
$a_{4,t}$	[mm]	**7·d**	25	28	32	**7·d**	35	42	56	70	84
$a_{4,c}$	[mm]	**7·d**	25	28	32	**7·d**	35	42	56	70	84

d_1	[mm]		3,5	4	4,5		5	6	8	10	12
a_1	[mm]	**7·d**	25	28	32	**7·d**	35	42	56	70	84
a_2	[mm]	**7·d**	25	28	32	**7·d**	35	42	56	70	84
$a_{3,t}$	[mm]	**15·d**	53	60	68	**15·d**	75	90	120	150	180
$a_{3,c}$	[mm]	**15·d**	53	60	68	**15·d**	75	90	120	150	180
$a_{4,t}$	[mm]	**9·d**	32	36	41	**12·d**	60	72	96	120	144
$a_{4,c}$	[mm]	**7·d**	25	28	32	**7·d**	35	42	56	70	84

screws inserted **WITH pre-drilled hole**

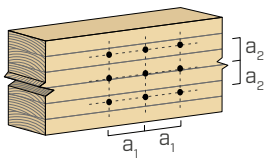




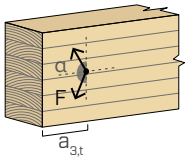
d_1	[mm]		3,5	4	4,5		5	6	8	10	12
a_1	[mm]	**5·d**	18	20	23	**5·d**	25	30	40	50	60
a_2	[mm]	**3·d**	11	12	14	**3·d**	15	18	24	30	36
$a_{3,t}$	[mm]	**12·d**	42	48	54	**12·d**	60	72	96	120	144
$a_{3,c}$	[mm]	**7·d**	25	28	32	**7·d**	35	42	56	70	84
$a_{4,t}$	[mm]	**3·d**	11	12	14	**3·d**	15	18	24	30	36
$a_{4,c}$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

d_1	[mm]		3,5	4	4,5		5	6	8	10	12
a_1	[mm]	**4·d**	14	16	18	**4·d**	20	24	32	40	48
a_2	[mm]	**4·d**	14	16	18	**4·d**	20	24	32	40	48
$a_{3,t}$	[mm]	**7·d**	25	28	32	**7·d**	35	42	56	70	84
$a_{3,c}$	[mm]	**7·d**	25	28	32	**7·d**	35	42	56	70	84
$a_{4,t}$	[mm]	**5·d**	18	20	23	**7·d**	35	42	56	70	84
$a_{4,c}$	[mm]	**3·d**	11	12	14	**3·d**	15	18	24	30	36

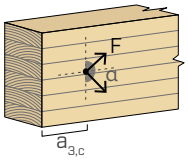
α = load-to-grain angle
d = d_1 = nominal screw diameter



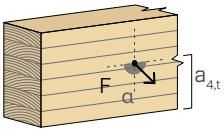
stressed end
$-90° \leq \alpha \leq 90°$



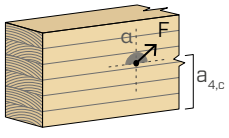
unloaded end
$90° \leq \alpha \leq 270°$



stressed edge
$0° \leq \alpha \leq 180°$



unload edge
$180° \leq \alpha \leq 360°$



NOTES

- The minimum distances comply with the EN 1995:2014 standard in accordance with ETA-11/0030.
- 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.
- The distances in the table refer to screws with standard SHARP 1 CUT tip.
- The distances in the table refer to screws inserted in softwood elements (solid timber or glulam). For applications on different materials (e.g. CLT, LVL), please see ETA-11/0030.

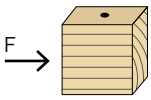
MINIMUM DISTANCES FOR SHEAR LOADS | TIMBER

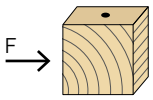
PARTIAL THREAD SCREWS

SHS - SHS AISI 410 - HBS - HBS EVO
TBS - TBS MAX - TBS EVO - TBS FRAME
HBS PLATE - HBS PLATE EVO - KKF

3 THORNS

screws inserted **WITHOUT pre-drilled hole** — $\rho_k \leq 420$ kg/m³

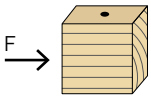


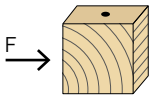


d_1	[mm]		3,5	4	4,5		5	6	8	10	12
a_1	[mm]	**10·d**	35	40	45	**10·d**	50	60	80	100	120
a_2	[mm]	**5·d**	18	20	23	**5·d**	25	30	40	50	60
$a_{3,t}$	[mm]	**15·d**	53	60	68	**15·d**	75	90	120	150	180
$a_{3,c}$	[mm]	**10·d**	35	40	45	**10·d**	50	60	80	100	120
$a_{4,t}$	[mm]	**5·d**	18	20	23	**5·d**	25	30	40	50	60
$a_{4,c}$	[mm]	**5·d**	18	20	23	**5·d**	25	30	40	50	60

d_1	[mm]		3,5	4	4,5		5	6	8	10	12
a_1	[mm]	**5·d**	18	20	23	**5·d**	25	30	40	50	60
a_2	[mm]	**5·d**	18	20	23	**5·d**	25	30	40	50	60
$a_{3,t}$	[mm]	**10·d**	35	40	45	**10·d**	50	60	80	100	120
$a_{3,c}$	[mm]	**10·d**	35	40	45	**10·d**	50	60	80	100	120
$a_{4,t}$	[mm]	**7·d**	25	28	32	**10·d**	50	60	80	100	120
$a_{4,c}$	[mm]	**5·d**	18	20	23	**5·d**	25	30	40	50	60

screws inserted **WITHOUT pre-drilled hole** — 420 kg/m³ $< \rho_k \leq 500$ kg/m³

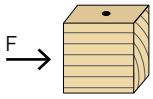


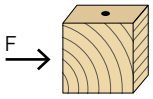


d_1	[mm]		3,5	4	4,5		5	6	8	10	12
a_1	[mm]	**15·d**	53	60	68	**15·d**	75	90	120	150	180
a_2	[mm]	**7·d**	25	28	32	**7·d**	35	42	56	70	84
$a_{3,t}$	[mm]	**20·d**	70	80	90	**20·d**	100	120	160	200	240
$a_{3,c}$	[mm]	**15·d**	53	60	68	**15·d**	75	90	120	150	180
$a_{4,t}$	[mm]	**7·d**	25	28	32	**7·d**	35	42	56	70	84
$a_{4,c}$	[mm]	**7·d**	25	28	32	**7·d**	35	42	56	70	84

d_1	[mm]		3,5	4	4,5		5	6	8	10	12
a_1	[mm]	**7·d**	25	28	32	**7·d**	35	42	56	70	84
a_2	[mm]	**7·d**	25	28	32	**7·d**	35	42	56	70	84
$a_{3,t}$	[mm]	**15·d**	53	60	68	**15·d**	75	90	120	150	180
$a_{3,c}$	[mm]	**15·d**	53	60	68	**15·d**	75	90	120	150	180
$a_{4,t}$	[mm]	**9·d**	32	36	41	**12·d**	60	72	96	120	144
$a_{4,c}$	[mm]	**7·d**	25	28	32	**7·d**	35	42	56	70	84

screws inserted **WITH pre-drilled hole**

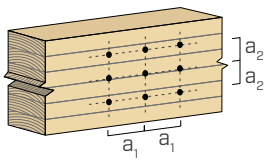




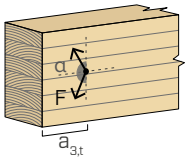
d_1	[mm]		3,5	4	4,5		5	6	8	10	12
a_1	[mm]	**5·d**	18	20	23	**5·d**	25	30	40	50	60
a_2	[mm]	**3·d**	11	12	14	**3·d**	15	18	24	30	36
$a_{3,t}$	[mm]	**12·d**	42	48	54	**12·d**	60	72	96	120	144
$a_{3,c}$	[mm]	**7·d**	25	28	32	**7·d**	35	42	56	70	84
$a_{4,t}$	[mm]	**3·d**	11	12	14	**3·d**	15	18	24	30	36
$a_{4,c}$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

d_1	[mm]		3,5	4	4,5		5	6	8	10	12
a_1	[mm]	**4·d**	14	16	18	**4·d**	20	24	32	40	48
a_2	[mm]	**4·d**	14	16	18	**4·d**	20	24	32	40	48
$a_{3,t}$	[mm]	**7·d**	25	28	32	**7·d**	35	42	56	70	84
$a_{3,c}$	[mm]	**7·d**	25	28	32	**7·d**	35	42	56	70	84
$a_{4,t}$	[mm]	**5·d**	18	20	23	**7·d**	35	42	56	70	84
$a_{4,c}$	[mm]	**3·d**	11	12	14	**3·d**	15	18	24	30	36

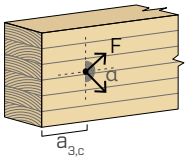
α = load-to-grain angle
d = d_1 = nominal screw diameter



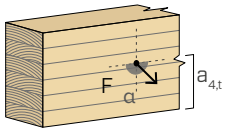
stressed end
$-90° \leq \alpha \leq 90°$



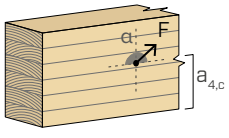
unloaded end
$90° \leq \alpha \leq 270°$



stressed edge
$0° \leq \alpha \leq 180°$



unload edge
$180° \leq \alpha \leq 360°$



NOTES

- The minimum distances comply with the EN 1995:2014 standard in accordance with ETA-11/0030.
- 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.
- The distances in the table refer to screws with 3 THORNS tip.
- The spacing a_1 for screws inserted without pre-drilling hole in timber elements with density $\rho_k \leq 420$ kg/m³ and load-to-grain angle α=0° was assumed to be 10·d.
- The distances in the table refer to screws inserted in softwood elements (solid timber or glulam). For applications on different materials (e.g. CLT, LVL), please see ETA-11/0030.

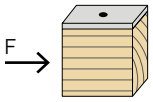
MINIMUM DISTANCES FOR SHEAR LOADS | STEEL-TO-TIMBER

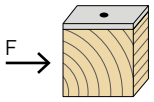
PARTIAL THREAD SCREWS

HBS - HBS EVO
HBS PLATE - HBS PLATE EVO - KKF

SHARP 1 CUT

screws inserted **WITHOUT pre-drilled hole** — $\rho_k \leq 420$ kg/m³

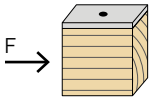


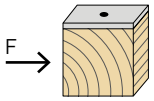


d_1	[mm]		3,5	4	4,5		5	6	8	10	12
a_1	[mm]	**10·d·0,7**	25	28	32	**12·d·0,7**	42	50	67	84	101
a_2	[mm]	**5·d·0,7**	12	14	16	**5·d·0,7**	18	21	28	35	42
$a_{3,t}$	[mm]	**15·d**	53	60	68	**15·d**	75	90	120	150	180
$a_{3,c}$	[mm]	**10·d**	35	40	45	**10·d**	50	60	80	100	120
$a_{4,t}$	[mm]	**5·d**	18	20	23	**5·d**	25	30	40	50	60
$a_{4,c}$	[mm]	**5·d**	18	20	23	**5·d**	25	30	40	50	60

d_1	[mm]		3,5	4	4,5		5	6	8	10	12
a_1	[mm]	**5·d·0,7**	12	14	16	**5·d·0,7**	18	21	28	35	42
a_2	[mm]	**5·d·0,7**	12	14	16	**5·d·0,7**	18	21	28	35	42
$a_{3,t}$	[mm]	**10·d**	35	40	45	**10·d**	50	60	80	100	120
$a_{3,c}$	[mm]	**10·d**	35	40	45	**10·d**	50	60	80	100	120
$a_{4,t}$	[mm]	**7·d**	25	28	32	**10·d**	50	60	80	100	120
$a_{4,c}$	[mm]	**5·d**	18	20	23	**5·d**	25	30	40	50	60

screws inserted **WITHOUT pre-drilled hole** — **420 kg/m³ < $\rho_k \leq$ 500 kg/m³**

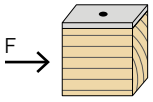


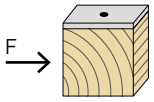


d_1	[mm]		3,5	4	4,5		5	6	8	10	12
a_1	[mm]	**15·d·0,7**	37	42	47	**15·d·0,7**	53	63	84	105	126
a_2	[mm]	**7·d·0,7**	17	20	22	**7·d·0,7**	25	29	39	49	59
$a_{3,t}$	[mm]	**20·d**	70	80	90	**20·d**	100	120	160	200	240
$a_{3,c}$	[mm]	**15·d**	53	60	68	**15·d**	75	90	120	150	180
$a_{4,t}$	[mm]	**7·d**	25	28	32	**7·d**	35	42	56	70	84
$a_{4,c}$	[mm]	**7·d**	25	28	32	**7·d**	35	42	56	70	84

d_1	[mm]		3,5	4	4,5		5	6	8	10	12
a_1	[mm]	**7·d·0,7**	17	20	22	**7·d·0,7**	25	29	39	49	59
a_2	[mm]	**7·d·0,7**	17	20	22	**7·d·0,7**	25	29	39	49	59
$a_{3,t}$	[mm]	**15·d**	53	60	68	**15·d**	75	90	120	150	180
$a_{3,c}$	[mm]	**15·d**	53	60	68	**15·d**	75	90	120	150	180
$a_{4,t}$	[mm]	**9·d**	32	36	41	**12·d**	60	72	96	120	144
$a_{4,c}$	[mm]	**7·d**	25	28	32	**7·d**	35	42	56	70	84

screws inserted **WITH pre-drilled hole**

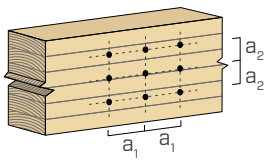




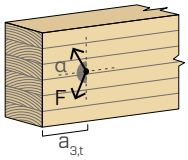
d_1	[mm]		3,5	4	4,5		5	6	8	10	12
a_1	[mm]	**5·d·0,7**	12	14	16	**5·d·0,7**	18	21	28	35	42
a_2	[mm]	**3·d·0,7**	7	8	9	**3·d·0,7**	11	13	17	21	25
$a_{3,t}$	[mm]	**12·d**	42	48	54	**12·d**	60	72	96	120	144
$a_{3,c}$	[mm]	**7·d**	25	28	32	**7·d**	35	42	56	70	84
$a_{4,t}$	[mm]	**3·d**	11	12	14	**3·d**	15	18	24	30	36
$a_{4,c}$	[mm]	**3·d**	11	12	14	**3·d**	15	18	24	30	36

d_1	[mm]		3,5	4	4,5		5	6	8	10	12
a_1	[mm]	**4·d·0,7**	10	11	13	**4·d·0,7**	14	17	22	28	34
a_2	[mm]	**4·d·0,7**	10	11	13	**4·d·0,7**	14	17	22	28	34
$a_{3,t}$	[mm]	**7·d**	25	28	32	**7·d**	35	42	56	70	84
$a_{3,c}$	[mm]	**7·d**	25	28	32	**7·d**	35	42	56	70	84
$a_{4,t}$	[mm]	**5·d**	18	20	23	**7·d**	35	42	56	70	84
$a_{4,c}$	[mm]	**3·d**	11	12	14	**3·d**	15	18	24	30	36

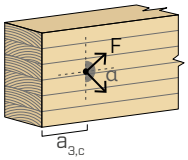
α = load-to-grain angle
d = d_1 = nominal screw diameter



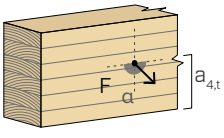
stressed end
-90° ≤ α ≤ 90°



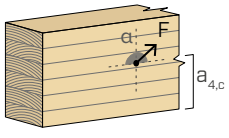
unloaded end
90° ≤ α ≤ 270°



stressed edge
0° ≤ α ≤ 180°



unload edge
180° ≤ α ≤ 360°



NOTES

- The minimum distances comply with the EN 1995:2014 standard in accordance with ETA-11/0030.
- 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.
- The distances in the table refer to screws with standard SHARP 1 CUT tip.
- The distances in the table refer to screws inserted in softwood elements (solid timber or glulam). For applications on different materials (e.g. CLT, LVL), please see ETA-11/0030.

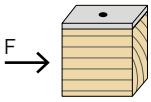
MINIMUM DISTANCES FOR SHEAR LOADS | STEEL-TO-TIMBER

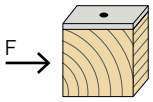
PARTIAL THREAD SCREWS

HBS - HBS EVO
HBS PLATE - HBS PLATE EVO - KKF

3 THORNS

screws inserted **WITHOUT pre-drilled hole** — $\rho_k \leq 420$ kg/m³

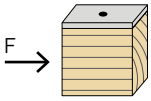


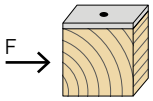


d_1	[mm]		3,5	4	4,5		5	6	8	10	12
a_1	[mm]	**10·d·0,7**	25	28	32	**10·d·0,7**	35	42	56	70	84
a_2	[mm]	**5·d·0,7**	12	14	16	**5·d·0,7**	18	21	28	35	42
$a_{3,t}$	[mm]	**15·d**	53	60	68	**15·d**	75	90	120	150	180
$a_{3,c}$	[mm]	**10·d**	35	40	45	**10·d**	50	60	80	100	120
$a_{4,t}$	[mm]	**5·d**	18	20	23	**5·d**	25	30	40	50	60
$a_{4,c}$	[mm]	**5·d**	18	20	23	**5·d**	25	30	40	50	60

d_1	[mm]		3,5	4	4,5		5	6	8	10	12
a_1	[mm]	**5·d·0,7**	12	14	16	**5·d·0,7**	18	21	28	35	42
a_2	[mm]	**5·d·0,7**	12	14	16	**5·d·0,7**	18	21	28	35	42
$a_{3,t}$	[mm]	**10·d**	35	40	45	**10·d**	50	60	80	100	120
$a_{3,c}$	[mm]	**10·d**	35	40	45	**10·d**	50	60	80	100	120
$a_{4,t}$	[mm]	**7·d**	25	28	32	**10·d**	50	60	80	100	120
$a_{4,c}$	[mm]	**5·d**	18	20	23	**5·d**	25	30	40	50	60

screws inserted **WITHOUT pre-drilled hole** — 420 kg/m³ $< \rho_k \leq 500$ kg/m³

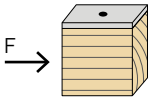


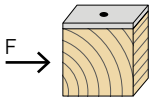


d_1	[mm]		3,5	4	4,5		5	6	8	10	12
a_1	[mm]	**15·d·0,7**	37	42	47	**15·d·0,7**	53	63	84	105	126
a_2	[mm]	**7·d·0,7**	17	20	22	**7·d·0,7**	25	29	39	49	59
$a_{3,t}$	[mm]	**20·d**	70	80	90	**20·d**	100	120	160	200	240
$a_{3,c}$	[mm]	**15·d**	53	60	68	**15·d**	75	90	120	150	180
$a_{4,t}$	[mm]	**7·d**	25	28	32	**7·d**	35	42	56	70	84
$a_{4,c}$	[mm]	**7·d**	25	28	32	**7·d**	35	42	56	70	84

d_1	[mm]		3,5	4	4,5		5	6	8	10	12
a_1	[mm]	**7·d·0,7**	17	20	22	**7·d·0,7**	25	29	39	49	59
a_2	[mm]	**7·d·0,7**	17	20	22	**7·d·0,7**	25	29	39	49	59
$a_{3,t}$	[mm]	**15·d**	53	60	68	**15·d**	75	90	120	150	180
$a_{3,c}$	[mm]	**15·d**	53	60	68	**15·d**	75	90	120	150	180
$a_{4,t}$	[mm]	**9·d**	32	36	41	**12·d**	60	72	96	120	144
$a_{4,c}$	[mm]	**7·d**	25	28	32	**7·d**	35	42	56	70	84

screws inserted **WITH pre-drilled hole**

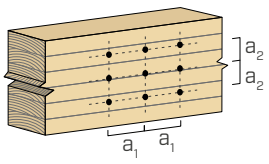




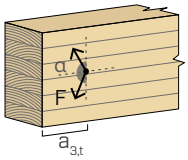
d_1	[mm]		3,5	4	4,5		5	6	8	10	12
a_1	[mm]	**5·d·0,7**	12	14	16	**5·d·0,7**	18	21	28	35	42
a_2	[mm]	**3·d·0,7**	7	8	9	**3·d·0,7**	11	13	17	21	25
$a_{3,t}$	[mm]	**12·d**	42	48	54	**12·d**	60	72	96	120	144
$a_{3,c}$	[mm]	**7·d**	25	28	32	**7·d**	35	42	56	70	84
$a_{4,t}$	[mm]	**3·d**	11	12	14	**3·d**	15	18	24	30	36
$a_{4,c}$	[mm]	**3·d**	11	12	14	**3·d**	15	18	24	30	36

d_1	[mm]		3,5	4	4,5		5	6	8	10	12
a_1	[mm]	**4·d·0,7**	10	11	13	**4·d·0,7**	14	17	22	28	34
a_2	[mm]	**4·d·0,7**	10	11	13	**4·d·0,7**	14	17	22	28	34
$a_{3,t}$	[mm]	**7·d**	25	28	32	**7·d**	35	42	56	70	84
$a_{3,c}$	[mm]	**7·d**	25	28	32	**7·d**	35	42	56	70	84
$a_{4,t}$	[mm]	**5·d**	18	20	23	**7·d**	35	42	56	70	84
$a_{4,c}$	[mm]	**3·d**	11	12	14	**3·d**	15	18	24	30	36

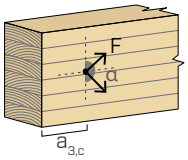
α = load-to-grain angle
d = d_1 = nominal screw diameter



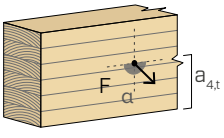
stressed end
$-90° \leq \alpha \leq 90°$



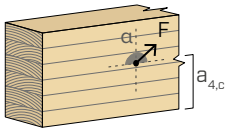
unloaded end
$90° \leq \alpha \leq 270°$



stressed edge
$0° \leq \alpha \leq 180°$



unload edge
$180° \leq \alpha \leq 360°$



NOTES

- The minimum distances comply with the EN 1995:2014 standard in accordance with ETA-11/0030.
- 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.
- The distances in the table refer to screws with 3 THORNS tip.
- The spacing a_1 for screws inserted without pre-drilling hole in timber elements with density $\rho_k \leq 420$ kg/m³ and load-to-grain angle α=0° was assumed to be 10·d.
- The distances in the table refer to screws inserted in softwood elements (solid timber or glulam). For applications on different materials (e.g. CLT, LVL), please see ETA-11/0030.

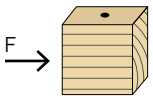
MINIMUM DISTANCES FOR SHEAR LOADS | TIMBER

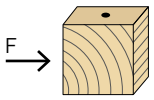
FULLY THREADED SCREW

VGZ - VGZ EVO
VGS - VGS EVO

SHARP 1 CUT

screws inserted **WITHOUT pre-drilled hole** — $\rho_k \leq 420$ kg/m³

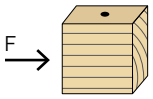


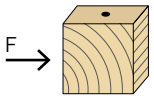


d_1	[mm]		5,3	5,6	7	9	11	13
a_1	[mm]	**12·d**	64	67	84	108	132	156
a_2	[mm]	**5·d**	27	28	35	45	55	65
$a_{3,t}$	[mm]	**15·d**	80	84	105	135	165	195
$a_{3,c}$	[mm]	**10·d**	53	56	70	90	110	130
$a_{4,t}$	[mm]	**5·d**	27	28	35	45	55	65
$a_{4,c}$	[mm]	**5·d**	27	28	35	45	55	65

d_1	[mm]		5,3	5,6	7	9	11	13
a_1	[mm]	**5·d**	27	28	35	45	55	65
a_2	[mm]	**5·d**	27	28	35	45	55	65
$a_{3,t}$	[mm]	**10·d**	53	56	70	90	110	130
$a_{3,c}$	[mm]	**10·d**	53	56	70	90	110	130
$a_{4,t}$	[mm]	**10·d**	53	56	70	90	110	130
$a_{4,c}$	[mm]	**5·d**	27	28	35	45	55	65

screws inserted **WITHOUT pre-drilled hole** — 420 kg/m³ $< \rho_k \leq 500$ kg/m³

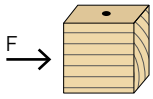


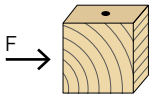


d_1	[mm]		5,3	5,6	7	9	11	13
a_1	[mm]	**15·d**	80	84	105	135	165	195
a_2	[mm]	**7·d**	37	39	49	63	77	91
$a_{3,t}$	[mm]	**20·d**	106	112	140	180	220	260
$a_{3,c}$	[mm]	**15·d**	80	84	105	135	165	195
$a_{4,t}$	[mm]	**7·d**	37	39	49	63	77	91
$a_{4,c}$	[mm]	**7·d**	37	39	49	63	77	91

d_1	[mm]		5,3	5,6	7	9	11	13
a_1	[mm]	**7·d**	37	39	49	63	77	91
a_2	[mm]	**7·d**	37	39	49	63	77	91
$a_{3,t}$	[mm]	**15·d**	80	84	105	135	165	195
$a_{3,c}$	[mm]	**15·d**	80	84	105	135	165	195
$a_{4,t}$	[mm]	**12·d**	64	67	84	108	132	156
$a_{4,c}$	[mm]	**7·d**	37	39	49	63	77	91

screws inserted **WITH pre-drilled hole**

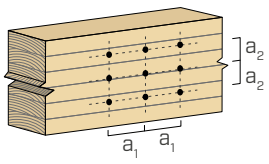




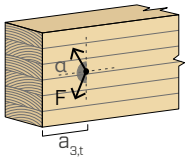
d_1	[mm]		5,3	5,6	7	9	11	13
a_1	[mm]	**5·d**	27	28	35	45	55	65
a_2	[mm]	**3·d**	16	17	21	27	33	39
$a_{3,t}$	[mm]	**12·d**	64	67	84	108	132	156
$a_{3,c}$	[mm]	**7·d**	37	39	49	63	77	91
$a_{4,t}$	[mm]	**3·d**	16	17	21	27	33	39
$a_{4,c}$	[mm]	**3·d**	16	17	21	27	33	39

d_1	[mm]		5,3	5,6	7	9	11	13
a_1	[mm]	**4·d**	21	22	28	36	44	52
a_2	[mm]	**4·d**	21	22	28	36	44	52
$a_{3,t}$	[mm]	**7·d**	37	39	49	63	77	91
$a_{3,c}$	[mm]	**7·d**	37	39	49	63	77	91
$a_{4,t}$	[mm]	**7·d**	37	39	49	63	77	91
$a_{4,c}$	[mm]	**3·d**	16	17	21	27	33	39

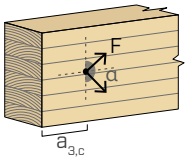
α = load-to-grain angle
d = d_1 = nominal screw diameter



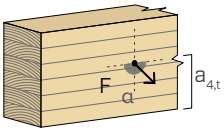
stressed end
-90° ≤ α ≤ 90°



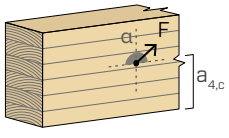
unloaded end
90° ≤ α ≤ 270°



stressed edge
0° ≤ α ≤ 180°



unload edge
180° ≤ α ≤ 360°

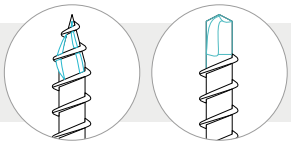


NOTES

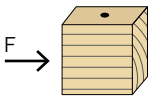
- The minimum distances comply with the EN 1995:2014 standard in accordance with ETA-11/0030.
- The minimum spacing for all panel-to-timber connections (a_1, a_2) can be multiplied by a coefficient of 0,85.
- In the case of joints with elements in Douglas fir (Pseudotsuga menziesii), the minimum spacing and distances parallel to the grain must be multiplied by a coefficient of 1.5.
- The distances in the table refer to screws with standard SHARP 1 CUT tip.
- The distances in the table refer to screws inserted in softwood elements (solid timber or glulam). For applications on different materials (e.g. CLT, LVL), please see ETA-11/0030.

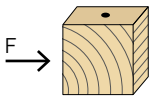
MINIMUM DISTANCES FOR SHEAR LOADS | TIMBER

FULLY THREADED SCREW | VGZ - VGZ EVO
VGS - VGS EVO | **3 THORNS SELF-DRILLING**



screws inserted **WITHOUT pre-drilled hole** — $\rho_k \leq 420$ kg/m³

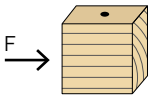


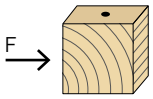


d_1	[mm]		5,3	5,6	7	9	11	13	15
a_1	[mm]	**10·d**	53	56	70	90	110	130	150
a_2	[mm]	**5·d**	27	28	35	45	55	65	75
$a_{3,t}$	[mm]	**15·d**	80	84	105	135	165	195	225
$a_{3,c}$	[mm]	**10·d**	53	56	70	90	110	130	150
$a_{4,t}$	[mm]	**5·d**	27	28	35	45	55	65	75
$a_{4,c}$	[mm]	**5·d**	27	28	35	45	55	65	75

d_1	[mm]		5,3	5,6	7	9	11	13	15
a_1	[mm]	**5·d**	27	28	35	45	55	65	75
a_2	[mm]	**5·d**	27	28	35	45	55	65	75
$a_{3,t}$	[mm]	**10·d**	53	56	70	90	110	130	150
$a_{3,c}$	[mm]	**10·d**	53	56	70	90	110	130	150
$a_{4,t}$	[mm]	**10·d**	53	56	70	90	110	130	150
$a_{4,c}$	[mm]	**5·d**	27	28	35	45	55	65	75

screws inserted **WITHOUT pre-drilled hole** — 420 kg/m³ < $\rho_k \leq$ 500 kg/m³

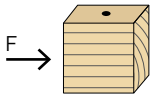


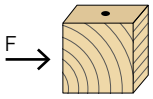


d_1	[mm]		5,3	5,6	7	9	11	13	15
a_1	[mm]	**15·d**	80	84	105	135	165	195	225
a_2	[mm]	**7·d**	37	39	49	63	77	91	105
$a_{3,t}$	[mm]	**20·d**	106	112	140	180	220	260	300
$a_{3,c}$	[mm]	**15·d**	80	84	105	135	165	195	225
$a_{4,t}$	[mm]	**7·d**	37	39	49	63	77	91	105
$a_{4,c}$	[mm]	**7·d**	37	39	49	63	77	91	105

d_1	[mm]		5,3	5,6	7	9	11	13	15
a_1	[mm]	**7·d**	37	39	49	63	77	91	105
a_2	[mm]	**7·d**	37	39	49	63	77	91	105
$a_{3,t}$	[mm]	**15·d**	80	84	105	135	165	195	225
$a_{3,c}$	[mm]	**15·d**	80	84	105	135	165	195	225
$a_{4,t}$	[mm]	**12·d**	64	67	84	108	132	156	180
$a_{4,c}$	[mm]	**7·d**	37	39	49	63	77	91	105

screws inserted **WITH pre-drilled hole**

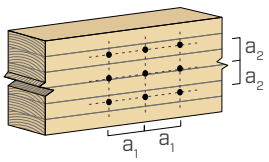




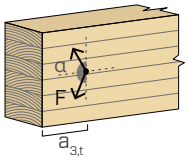
d_1	[mm]		5,3	5,6	7	9	11	13	15
a_1	[mm]	**5·d**	27	28	35	45	55	65	75
a_2	[mm]	**3·d**	16	17	21	27	33	39	45
$a_{3,t}$	[mm]	**12·d**	64	67	84	108	132	156	180
$a_{3,c}$	[mm]	**7·d**	37	39	49	63	77	91	105
$a_{4,t}$	[mm]	**3·d**	16	17	21	27	33	39	45
$a_{4,c}$	[mm]	**3·d**	16	17	21	27	33	39	45

d_1	[mm]		5,3	5,6	7	9	11	13	15
a_1	[mm]	**4·d**	21	22	28	36	44	52	60
a_2	[mm]	**4·d**	21	22	28	36	44	52	60
$a_{3,t}$	[mm]	**7·d**	37	39	49	63	77	91	105
$a_{3,c}$	[mm]	**7·d**	37	39	49	63	77	91	105
$a_{4,t}$	[mm]	**7·d**	37	39	49	63	77	91	105
$a_{4,c}$	[mm]	**3·d**	16	17	21	27	33	39	45

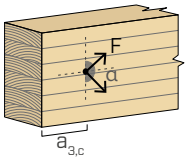
α = load-to-grain angle
d = d_1 = nominal screw diameter



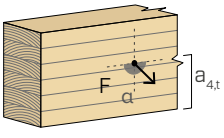
stressed end
-90° ≤ α ≤ 90°



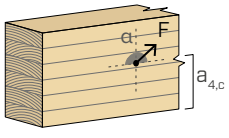
unloaded end
90° ≤ α ≤ 270°



stressed edge
0° ≤ α ≤ 180°



unload edge
180° ≤ α ≤ 360°



NOTES

- The minimum distances comply with the EN 1995:2014 standard in accordance with ETA-11/0030.
- 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.
- The distances in the table refer to screws with 3 THORNS or SELF-DRILLING tip.
- The spacing a_1 for screws inserted without pre-drilling hole in timber elements with density $\rho_k \leq 420$ kg/m³ and load-to-grain angle α=0° was assumed to be 10·d.
- The distances in the table refer to screws inserted in softwood elements (solid timber or glulam). For applications on different materials (e.g. CLT, LVL), please see ETA-11/0030.

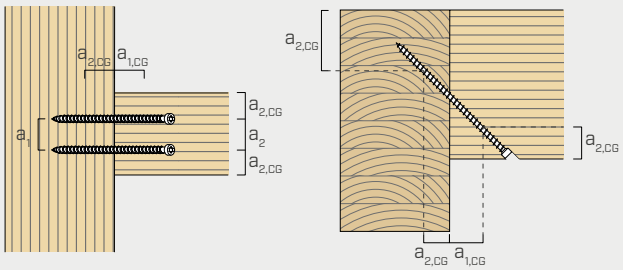
MINIMUM DISTANCES FOR AXIAL STRESSES | TIMBER

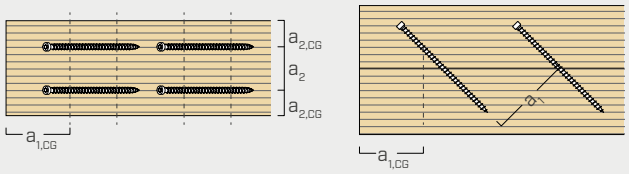
COMPARISON TIPS: SHARP 1 CUT, 3 THORNS and SELF-DRILLING

screws inserted **WITH and WITHOUT pre-drilled hole**

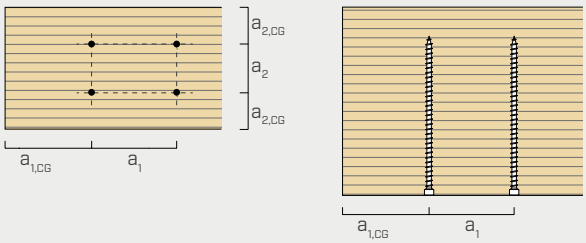
a_1	5·d	5·d	5·d
a_2	5·d	5·d	5·d
$a_{2,LIM}$	3·d	3·d	3·d
$a_{1,CG}$	**10·d**	**8·d**	**5·d**
$a_{2,CG}$	**4·d**	**3·d**	**3·d**
a_{CROSS}	1,5·d	1,5·d	1,5·d

SCREWS UNDER TENSION INSERTED WITH AN ANGLE α WITH RESPECT TO THE GRAIN

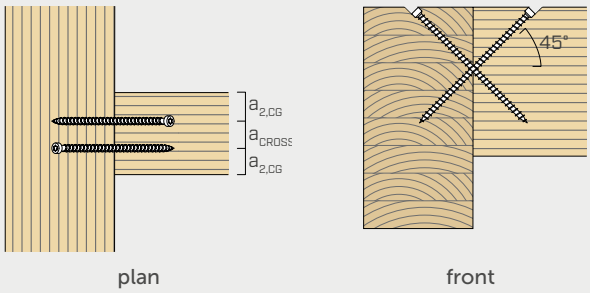




SCREWS INSERTED WITH α = 90° ANGLE WITH RESPECT TO THE GRAIN



CROSSED SCREWS INSERTED WITH AN ANGLE α WITH RESPECT TO THE GRAIN



NOTES

- The minimum distances comply with the EN 1995:2014 standard in accordance with ETA-11/0030.
- The minimum distances are independent of the insertion angle of the connector and the angle of the force with respect to the grain.
- The axial distance a_2 can be reduced down to $a_{2,LIM}$ if for each connector a "joint surface" a_1 a_2 = 25 d_1 is maintained.
- For screws with 3 THORNS tip the minimum distance $a_{1,CG}$ can be assumed to be 8·d_1 and the distance $a_{2,CG}$ to be 3·d_1.
- For screws with SELF-DRILLING tip, the minimum distance $a_{1,CG}$ can be assumed to be 5·d_1 and the distance $a_{2,CG}$ to be 3·d_1.
- The distances in the table $a_{1,\ CG}$ and $a_{2,CG}$ for SHARP 1 CUT standard tip screws are in accordance with EN 1995:2014.
- For main beam-secondary beam joints with VGZ screws d = 7 mm with standard SHARP 1 CUT tip inclined or crossed, inserted at an angle of 45° to the secondary beam head, with a minimum secondary beam height of 18 d, the minimum distance $a_{1,CG}$ can be assumed equal to 8·d_1 and the minimum distance $a_{2,CG}$ equal to 3·d_1.
- The distances in the table refer to screws inserted in softwood elements (solid timber or glulam). For applications on different materials (e.g. CLT, LVL) please see ETA-11/0030.

LEGEND

standard tip
SHARP 1 CUT
type RBN / RBN2

(in gradual transition to 3 THORNS and SELF-DRILLING)

tip
3 THORNS
type RB3T

(available from **spring 2024**)

tip
SELF-DRILLING
type RBSD

(available from **spring 2024**)

MINIMUM DISTANCES FOR AXIAL STRESSES | TIMBER

FULLY THREADED SCREW

VGZ - VGZ EVO
VGS - VGS EVO

SHARP 1 CUT

screws inserted **WITH and WITHOUT pre-drilled hole**

d_1	[mm]		5,3	5,6	7	9	11	13
a_1	[mm]	**5·d**	27	28	35	45	55	65
a_2	[mm]	**5·d**	27	28	35	45	55	65
$a_{2,LIM}$	[mm]	**2,5·d**	13	14	18	23	28	33
$a_{1,CG}$	[mm]	**10·d**	53	56	70	90	110	130
$a_{2,CG}$	[mm]	**4·d**	21	22	28	36	44	52
a_{CROSS}	[mm]	**1,5·d**	8	8	11	14	17	20

FULLY THREADED SCREW

VGZ - VGZ EVO
VGS - VGS EVO

3 THORNS

screws inserted **WITH and WITHOUT pre-drilled hole**

d_1	[mm]		5,3	5,6	7	9	11	13
a_1	[mm]	**5·d**	27	28	35	45	55	65
a_2	[mm]	**5·d**	27	28	35	45	55	65
$a_{2,LIM}$	[mm]	**2,5·d**	13	14	18	23	28	33
$a_{1,CG}$	[mm]	**8·d**	42	45	56	72	88	104
$a_{2,CG}$	[mm]	**3·d**	16	17	21	27	33	39
a_{CROSS}	[mm]	**1,5·d**	8	8	11	14	17	20

FULLY THREADED SCREW

VGZ - VGZ EVO
VGS - VGS EVO

SELF-DRILLING

screws inserted **WITH and WITHOUT pre-drilled hole**

d_1	[mm]		9	11	13	15
a_1	[mm]	**5·d**	45	55	65	75
a_2	[mm]	**5·d**	45	55	65	75
$a_{2,LIM}$	[mm]	**2,5·d**	23	28	33	38
$a_{1,CG}$	[mm]	**5·d**	45	55	65	75
$a_{2,CG}$	[mm]	**3·d**	27	33	39	45
a_{CROSS}	[mm]	**1,5·d**	14	17	20	23

d = d_1 = nominal screw diameter

NOTES

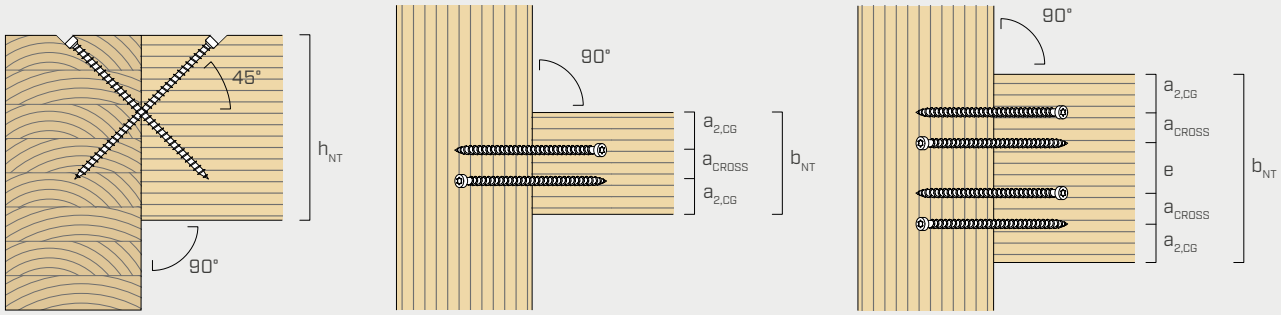
- The minimum distances comply with the EN 1995:2014 standard in accordance with ETA-11/0030.
- The minimum distances are independent of the insertion angle of the connector and the angle of the force with respect to the grain.
- The axial distance a_2 can be reduced down to $a_{2,LIM}$ if for each connector a "joint surface" a_1 a_2 = 25 d_1 is maintained.
- For main beam-secondary beam joints with VGZ screws d = 7 mm with standard SHARP 1 CUT tip inclined or crossed, inserted at an angle of 45° to the secondary beam head, with a minimum secondary beam height of 18 d, the minimum distance $a_{1,CG}$ can be assumed equal to 8·d_1 and the minimum distance $a_{2,CG}$ equal to 3·d_1.
- For screws with 3 THORNS tip the minimum distance $a_{1,CG}$ can be assumed to be 8·d_1 and the minimum distance $a_{2,CG}$ to be 3·d_1.
- For screws with SELF-DRILLING tip, the minimum distance $a_{1,CG}$ can be assumed to be 5·d_1 and the minimum distance $a_{2,CG}$ to be 3·d_1.
- For screws with RBSN tip the minimum distance $a_{1,CG}$ can be assumed to be 8·d_1 and the minimum distance $a_{2,CG}$ to be 3·d_1 starting from spring 2024.
- The distances in the table refer to screws inserted in softwood elements (solid timber or glulam). For applications on different materials (e.g. CLT, LVL), please see ETA-11/0030.
- For the indication of distances and spacing, see the diagrams on page 12.

MINIMUM DISTANCES FOR CROSSED CONNECTORS

COMPARISON TIPS: SHARP 1 CUT, 3 THORNS and SELF-DRILLING

screws inserted **WITH and WITHOUT pre-drilled hole**

$a_{2,CG}$	**4·d**	**3·d**	**3·d**
a_{CROSS}	1,5·d	1,5·d	1,5·d
e	3,5·d	3,5·d	3,5·d



section | plan - 1 PAIR | plan - 2 OR MORE PAIRS

SECONDARY BEAM WIDTH

1 PAIR- $b_{NT,min}$	$2 \cdot a_{2,CG} + a_{CROSS}$	9,5·d	7,5·d	7,5·d
2 PAIRS- $b_{NT,min}$	$2 \cdot a_{2,CG} + 2 \cdot a_{CROSS} + e$	14,5·d	12,5·d	12,5·d
3 PAIRS- $b_{NT,min}$	$2 \cdot a_{2,CG} + 3 \cdot a_{CROSS} + 2 \cdot e$	19,5·d	17,5·d	17,5·d

NOTES

- The minimum distances comply with the EN 1995:2014 standard in accordance with ETA-11/0030.
- The minimum distances are independent of the insertion angle of the connector and the angle of the force with respect to the grain.
- The axial distance a_2 can be reduced down to $a_{2,LIM}$ if for each connector a "joint surface" $a_1 \, a_2 = 25 \, d_1$ is maintained.
- For main beam-secondary beam joints with VGZ screws d = 7 mm with standard SHARP 1 CUT tip inclined or crossed, inserted at an angle of 45° to the secondary beam head, with a minimum secondary beam height of 18 d, the minimum distance $a_{2,CG}$ can be assumed equal to $3 \cdot d_1$.
- For screws with 3 THORNS tip, the minimum distance $a_{2,CG}$ can be assumed to be $3 \cdot d_1$.
- For screws with SELF-DRILLING tip, the minimum distance $a_{2,CG}$ can be assumed to be $3 \cdot d_1$.
- The distances in the table refer to screws inserted in softwood elements (solid timber or glulam). For applications on different materials (e.g. CLT, LVL), please see ETA-11/0030.

LEGEND

standard tip
SHARP 1 CUT
type RBN / RBN2

(in gradual transition to 3 THORNS and SELF-DRILLING)

tip
3 THORNS
type RB3T

(available from **spring 2024**)

tip
SELF-DRILLING
type RBSD

(available from **spring 2024**)

MINIMUM DISTANCES FOR CROSSED CONNECTORS

FULLY THREADED SCREW

VGZ - VGZ EVO
VGS - VGS EVO

SHARP 1 CUT

screws inserted **WITH and WITHOUT pre-drilled hole**

d_1	[mm]		5,3	5,6	7	9	11	13
$a_{2,CG}$	[mm]	**4·d**	21	22	21(*)	36	44	52
a_{CROSS}	[mm]	**1,5·d**	8	8	11	14	17	20
e	[mm]	**3,5·d**	19	20	25	32	39	46

d_1	[mm]		5,3	5,6	7	9	11	13
1 PAIR- $b_{NT,min}$	[mm]	**9,5·d**	50	53	53(*)	86	105	124
2 PAIRS- $b_{NT,min}$	[mm]	**14,5·d**	77	81	88(*)	131	160	189
3 PAIRS- $b_{NT,min}$	[mm]	**19,5·d**	103	109	123(*)	176	215	254

FULLY THREADED SCREW

VGZ - VGZ EVO
VGS - VGS EVO

3 THORNS

screws inserted **WITH and WITHOUT pre-drilled hole**

d_1	[mm]		5,3	5,6	7	9	11	13
$a_{2,CG}$	[mm]	**3·d**	16	17	21	27	33	39
a_{CROSS}	[mm]	**1,5·d**	8	8	11	14	17	20
e	[mm]	**3,5·d**	19	20	25	32	39	46

d_1	[mm]		5,3	5,6	7	9	11	13
1 PAIR- $b_{NT,min}$	[mm]	**7,5·d**	40	42	53	68	83	98
2 PAIRS- $b_{NT,min}$	[mm]	**12,5·d**	66	70	88	113	138	163
3 PAIRS- $b_{NT,min}$	[mm]	**17,5·d**	93	98	123	158	193	228

FULLY THREADED SCREW

VGZ - VGZ EVO
VGS - VGS EVO

SELF-DRILLING

screws inserted **WITH and WITHOUT pre-drilled hole**

d_1	[mm]		9	11	13	15
$a_{2,CG}$	[mm]	**3·d**	27	33	39	45
a_{CROSS}	[mm]	**1,5·d**	14	17	20	23
e	[mm]	**3,5·d**	32	39	46	53

d_1	[mm]		9	11	13	15
1 PAIR- $b_{NT,min}$	[mm]	**7,5·d**	68	83	98	113
2 PAIRS- $b_{NT,min}$	[mm]	**12,5·d**	113	138	163	188
3 PAIRS- $b_{NT,min}$	[mm]	**17,5·d**	158	193	228	263

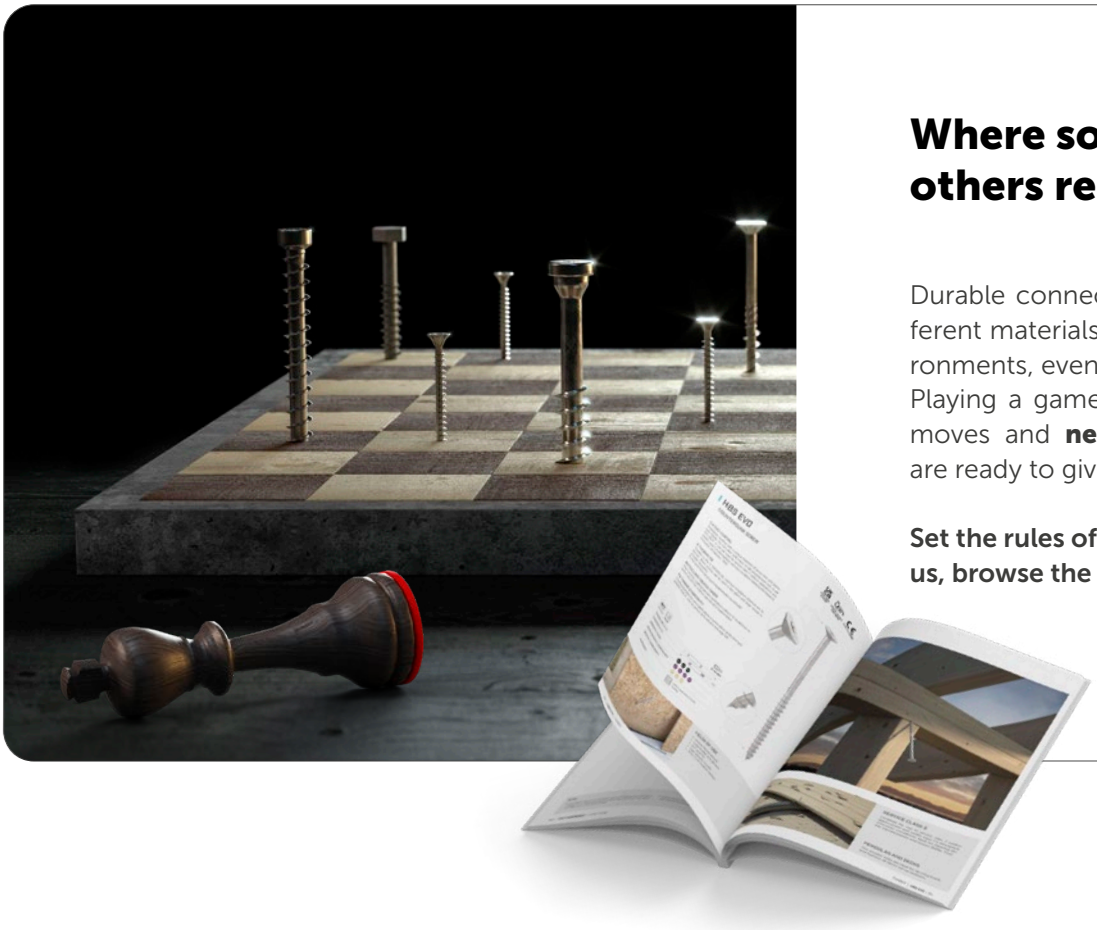
d = d_1 = nominal screw diameter

NOTES

- The minimum distances comply with the EN 1995:2014 standard in accordance with ETA-11/0030.
- The distances in the table refer to screws inserted in softwood elements (solid timber or glulam). For applications on different materials (e.g. CLT, LVL), please see ETA-11/0030.

(*) For main beam-secondary beam joints with VGZ screws d = 7 mm with standard SHARP 1 CUT tip inclined or crossed, inserted at an angle of 45° to the secondary beam head, with a minimum secondary beam height of 18 d, the minimum distance $a_{2,CG}$ can be assumed equal to $3 \cdot d_1$.

- For screws with 3 THORNS tip, the minimum distance $a_{2,CG}$ can be assumed to be $3 \cdot d_1$.
- For screws with SELF-DRILLING tip, the minimum distance $a_{2,CG}$ can be assumed to be $3 \cdot d_1$.
- For screws with RBSN tip, the minimum distance $a_{2,CG}$ can be assumed to be $3 \cdot d_1$ from spring 2024.



Where some yield, others resist.

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