

## COUNTERSUNK SCREW

### 3 THORNS TIP

Thanks to the 3 THORNS tip, minimum installation distances are reduced. More screws can be used in less space and larger screws in smaller elements. Costs and time for project implementation are reduced.

### FAST

With the 3 THORNS tip, screw grip becomes more reliable and faster, while maintaining the usual mechanical performance. More speed, less effort.

### JOINTS WITH SOUNDPROOFING PROFILES

The screw has been tested and characterised in applications with sound-proofing layers (XYLOFON) interposed on the shear plane. The impact of acoustic profiles on the mechanical performance of the HBS screw is described on page 74.

### NEW-GENERATION WOODS

Tested and certified for use on a wide variety of engineered timbers such as CLT, GL, LVL, OSB and Beech LVL. Extremely versatile, the HBS screw guarantees the use of new-generation woods for the creation of increasingly innovative and sustainable structures.



			BIT INCLUDED
DIAMETER [mm]	3 (3.5)	12	12
LENGTH [mm]	12 (30)	1000	1000
SERVICE CLASS	SC1	SC2	
ATMOSPHERIC CORROSIVITY	C1	C2	
WOOD CORROSIVITY	T1	T2	
MATERIAL	Zn ELECTRO PLATED	electrogalvanized carbon steel	



### FIELDS OF USE

- timber based panels
- fibreboard, MDF, HDF and LDF
- plated and melamine faced panels
- solid timber
- glulam (Glued Laminated Timber)
- CLT and LVL
- high density woods



### CLT, LVL AND HARDWOOD

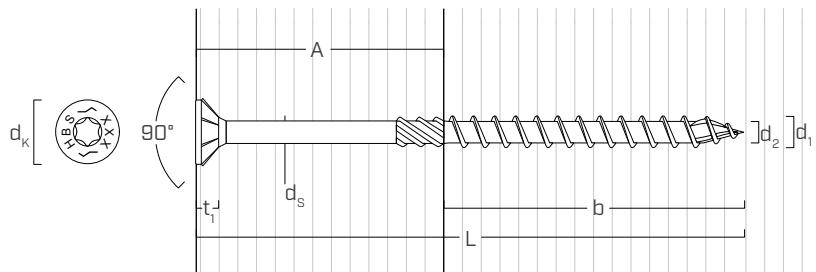
Values also tested, certified and calculated for CLT, LVL and high density woods such as beech LVL.



Wall insulation boards fastening with THERMOWASHER and HBS 8 mm diameter.

Fastening CLT walls with 6 mm diameter HBS screws.

## GEOMETRY AND MECHANICAL CHARACTERISTICS



### GEOMETRY

Nominal diameter	$d_1$	[mm]	3,5	4	4,5	5	6	8	10	12
Head diameter	$d_K$	[mm]	7,00	8,00	9,00	10,00	12,00	14,50	18,25	20,75
Thread diameter	$d_2$	[mm]	2,25	2,55	2,80	3,40	3,95	5,40	6,40	6,80
Shank diameter	$d_s$	[mm]	2,45	2,75	3,15	3,65	4,30	5,80	7,00	8,00
Head thickness	$t_1$	[mm]	2,20	2,80	2,80	3,10	4,50	4,50	5,80	7,20
Pre-drilling hole diameter <sup>(1)</sup>	$d_{V,S}$	[mm]	2,0	2,5	2,5	3,0	4,0	5,0	6,0	7,0
Pre-drilling hole diameter <sup>(2)</sup>	$d_{V,H}$	[mm]	-	-	-	3,5	4,0	6,0	7,0	8,0

(1) Pre-drilling valid for softwood.

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

### CHARACTERISTIC MECHANICAL PARAMETERS

Nominal diameter	$d_1$	[mm]	3,5	4	4,5	5	6	8	10	12
Tensile strength	$f_{tens,k}$	[kN]	3,8	5,0	6,4	7,9	11,3	20,1	31,4	33,9
Yield moment	$M_{y,k}$	[Nm]	2,1	3,0	4,1	5,4	9,5	20,1	35,8	48,0

			softwood (softwood)	LVL softwood (LVL softwood)	pre-drilled beech LVL (beech LVL predrilled)
Withdrawal resistance parameter	$f_{ax,k}$	[N/mm <sup>2</sup> ]	11,7	15,0	29,0
Head-pull-through parameter	$f_{head,k}$	[N/mm <sup>2</sup> ]	10,5	20,0	-
Associated density	$\rho_a$	[kg/m <sup>3</sup> ]	350	500	730
Calculation density	$\rho_k$	[kg/m <sup>3</sup> ]	$\leq 440$	$410 \div 550$	$590 \div 750$

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

## CODES AND DIMENSIONS

<b>d<sub>1</sub></b> [mm]	<b>CODE</b>	<b>L</b> [mm]	<b>b</b> [mm]	<b>A</b> [mm]	<b>pcs</b>
<b>3,5</b> <b>TX 15</b>	HBS3540	40	18	22	500
	HBS3545	45	24	21	400
	HBS3550	50	24	26	400
	HBS430	30	18	12	500
	HBS435	35	18	17	500
	HBS440	40	24	16	500
	HBS445	45	30	15	400
	HBS450	50	30	20	400
	HBS460	60	35	25	200
<b>4</b> <b>TX 20</b>	HBS470	70	40	30	200
	HBS480	80	40	40	200
	HBS4540	40	24	16	400
	HBS4545	45	30	15	400
	HBS4550	50	30	20	200
	HBS4560	60	35	25	200
	HBS4570	70	40	30	200
	HBS4580	80	40	40	200
	HBS540	40	24	16	200
<b>4,5</b> <b>TX 20</b>	HBS545	45	24	21	200
	HBS550	50	24	26	200
	HBS560	60	30	30	200
	HBS570	70	35	35	100
	HBS580	80	40	40	100
	HBS590	90	45	45	100
	HBS5100	100	50	50	100
	HBS5120	120	60	60	100
	HBS640	40	35	8	100
<b>5</b> <b>TX 25</b>	HBS650	50	35	15	100
	HBS660	60	30	30	100
	HBS670	70	40	30	100
	HBS680	80	40	40	100
	HBS690	90	50	40	100
	HBS6100	100	50	50	100
	HBS6110	110	60	50	100
	HBS6120	120	60	60	100
	HBS6130	130	60	70	100
	HBS6140	140	75	65	100
	HBS6150	150	75	75	100
	HBS6160	160	75	85	100
	HBS6180	180	75	105	100
	HBS6200	200	75	125	100
	HBS6220	220	75	145	100
	HBS6240	240	75	165	100
	HBS6260	260	75	185	100
<b>6</b> <b>TX 30</b>	HBS6280	280	75	205	100
	HBS6300	300	75	225	100
	HBS6320	320	75	245	100
	HBS6340	340	75	265	100
	HBS6360	360	75	285	100
	HBS6380	380	75	305	100
	HBS6400	400	75	325	100

<b>d<sub>1</sub></b> [mm]	<b>CODE</b>	<b>L</b> [mm]	<b>b</b> [mm]	<b>A</b> [mm]	<b>pcs</b>
<b>8</b> <b>TX 40</b>	HBS880	80	52	28	100
	HBS8100	100	52	48	100
	HBS8120	120	60	60	100
	HBS8140	140	60	80	100
	HBS8160	160	80	80	100
	HBS8180	180	80	100	100
	HBS8200	200	80	120	100
	HBS8220	220	80	140	100
	HBS8240	240	80	160	100
	HBS8260	260	80	180	100
	HBS8280	280	80	200	100
	HBS8300	300	100	200	100
	HBS8320	320	100	220	100
	HBS8340	340	100	240	100
	HBS8360	360	100	260	100
	HBS8380	380	100	280	100
	HBS8400	400	100	300	100
	HBS8440	440	100	340	100
	HBS8480	480	100	380	100
	HBS8520	520	100	420	100
	HBS8560	560	100	460	100
	HBS8580	580	100	480	100
	HBS8600	600	100	500	100
<b>10</b> <b>TX 40</b>	HBS1080	80	52	28	50
	HBS10100	100	52	48	50
	HBS10120	120	60	60	50
	HBS10140	140	60	80	50
	HBS10160	160	80	80	50
	HBS10180	180	80	100	50
	HBS10200	200	80	120	50
	HBS10220	220	80	140	50
	HBS10240	240	80	160	50
	HBS10260	260	80	180	50
	HBS10280	280	80	200	50
	HBS10300	300	100	200	50
	HBS10320	320	100	220	50
	HBS10340	340	100	240	50
	HBS10360	360	100	260	50
	HBS10380	380	100	280	50
	HBS10400	400	100	300	50
	HBS10440	440	100	340	50
	HBS10480	480	100	380	50
	HBS10520	520	100	420	50
	HBS10560	560	100	460	50
	HBS10600	600	100	500	50
<b>12</b> <b>TX 50</b>	HBS12120	120	80	40	25
	HBS12160	160	80	80	25
	HBS12200	200	80	120	25
	HBS12240	240	80	160	25
	HBS12280	280	80	200	25
	HBS12320	320	120	200	25
	HBS12360	360	120	240	25
	HBS12400	400	120	280	25
	HBS12440	440	120	320	25
	HBS12480	480	120	360	25
	HBS12520	520	120	400	25
	HBS12560	560	120	440	25
	HBS12600	600	120	480	25
	HBS12700	700	120	580	25
	HBS12800	800	120	680	25
	HBS12900	900	120	780	25
	HBS121000	1000	120	880	25

## RELATED PRODUCTS



**HUS**  
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**XYLOFON WASHER**  
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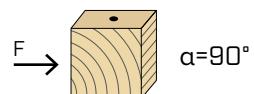
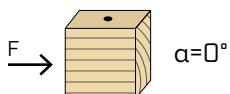


**THERMOWASHER**  
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## MINIMUM DISTANCES FOR SHEAR LOADS | TIMBER

 screws inserted WITHOUT pre-drilled hole

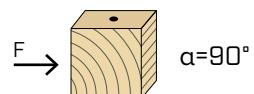
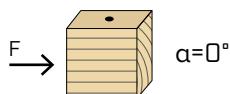
$\rho_k \leq 420 \text{ kg/m}^3$



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

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

 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
$a_2$ [mm]	3·d	11	12	14	3·d	15	18	24
$a_{3,t}$ [mm]	12·d	42	48	54	12·d	60	72	96
$a_{3,c}$ [mm]	7·d	25	28	32	7·d	35	42	56
$a_{4,t}$ [mm]	3·d	11	12	14	3·d	15	18	24
$a_{4,c}$ [mm]	3·d	11	12	14	3·d	15	18	24

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

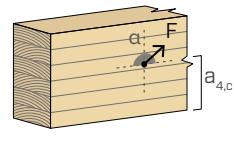
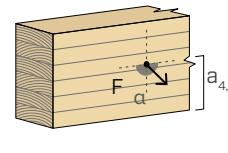
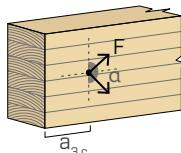
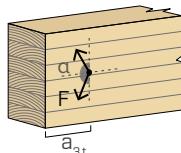
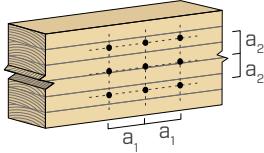
$\alpha$  = load-to-grain angle  
 $d = d_1$  = nominal screw diameter

stressed end  
 $-90^\circ < \alpha < 90^\circ$

unloaded end  
 $90^\circ < \alpha < 270^\circ$

stressed edge  
 $0^\circ < \alpha < 180^\circ$

unload edge  
 $180^\circ < \alpha < 360^\circ$

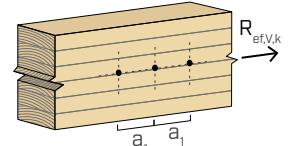


NOTE on page 42.

## EFFECTIVE NUMBER FOR SHEAR LOADS

The load-bearing capacity of a connection made with several screws, all of the same type and size, may be lower than the sum of the load-bearing capacities of the individual connection system. For a row of  $n$  screws arranged parallel to the direction of the grain at a distance  $a_1$ , the characteristic effective load-bearing capacity is equal to:

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



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

$n$	$a_1^{(*)}$										
	4·d	5·d	6·d	7·d	8·d	9·d	10·d	11·d	12·d	13·d	$\geq 14\cdot d$
2	1,41	1,48	1,55	1,62	1,68	1,74	1,80	1,85	1,90	1,95	2,00
3	1,73	1,86	2,01	2,16	2,28	2,41	2,54	2,65	2,76	2,88	3,00
4	2,00	2,19	2,41	2,64	2,83	3,03	3,25	3,42	3,61	3,80	4,00
5	2,24	2,49	2,77	3,09	3,34	3,62	3,93	4,17	4,43	4,71	5,00

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

geometry				SHEAR				TENSION				
		timber-to-timber $\varepsilon=90^\circ$	timber-to-timber $\varepsilon=0^\circ$	panel-to-timber	steel-to-timber thin plate		thread withdrawal $\varepsilon=90^\circ$	thread withdrawal $\varepsilon=0^\circ$	head pull-through			
<b>d<sub>1</sub></b>	<b>L</b>	<b>b</b>	<b>A</b>	<b>R<sub>V,90,k</sub></b> [kN]	<b>R<sub>V,0,k</sub></b> [kN]	<b>S<sub>PAN</sub></b> [mm]	<b>R<sub>V,k</sub></b> [kN]	<b>S<sub>PLATE</sub></b> [mm]	<b>R<sub>V,k</sub></b> [kN]	<b>R<sub>ax,90,k</sub></b> [kN]	<b>R<sub>ax,0,k</sub></b> [kN]	<b>R<sub>head,k</sub></b> [kN]
	[mm]	[mm]	[mm]	[mm]								
	40	18	22	0,73	0,40		0,72		0,85	0,80	0,24	0,56
<b>3,5</b>	45	24	21	0,79	0,47	12	0,72	1,75	0,91	1,06	0,32	0,56
	50	24	26	0,79	0,47		0,72		0,91	1,06	0,32	0,56
	30	18	12	0,72	0,38		0,76		0,93	0,91	0,27	0,73
	35	18	17	0,79	0,47		0,84		1,04	0,91	0,27	0,73
	40	24	16	0,83	0,51		0,84		1,12	1,21	0,36	0,73
<b>4</b>	45	30	15	0,81	0,56	12	0,84	2	1,19	1,52	0,45	0,73
	50	30	20	0,91	0,62		0,84		1,19	1,52	0,45	0,73
	60	35	25	0,99	0,69		0,84		1,26	1,77	0,53	0,73
	70	40	30	0,99	0,77		0,84		1,32	2,02	0,61	0,73
	80	40	40	0,99	0,77		0,84		1,32	2,02	0,61	0,73
	40	24	16	0,98	0,55		1,06		1,33	1,36	0,41	0,92
	45	30	15	0,96	0,61		1,06		1,42	1,70	0,51	0,92
<b>4,5</b>	50	30	20	1,06	0,69	15	1,06	2,25	1,42	1,70	0,51	0,92
	60	35	25	1,18	0,79		1,06		1,49	1,99	0,60	0,92
	70	40	30	1,22	0,86		1,06		1,56	2,27	0,68	0,92
	80	40	40	1,22	0,86		1,06		1,56	2,27	0,68	0,92
	40	24	16	1,12	0,60		1,16		1,46	1,52	0,45	1,13
	45	24	21	1,19	0,70		1,20		1,56	1,52	0,45	1,13
	50	24	26	1,29	0,73		1,20		1,56	1,52	0,45	1,13
	60	30	30	1,46	0,81		1,20		1,65	1,89	0,57	1,13
<b>5</b>	70	35	35	1,46	0,88	15	1,20	2,5	1,73	2,21	0,66	1,13
	80	40	40	1,46	0,96		1,20		1,81	2,53	0,76	1,13
	90	45	45	1,46	1,05		1,20		1,89	2,84	0,85	1,13
	100	50	50	1,46	1,13		1,20		1,97	3,16	0,95	1,13
	120	60	60	1,46	1,17		1,20		2,13	3,79	1,14	1,13

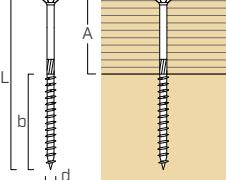
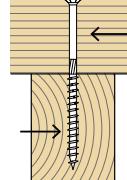
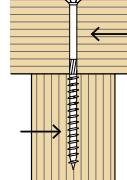
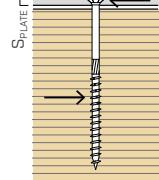
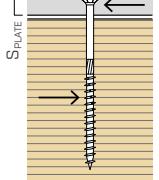
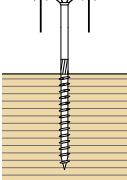
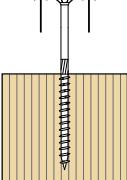
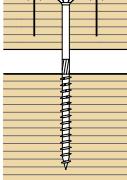
$\varepsilon$  = screw-to-grain angle

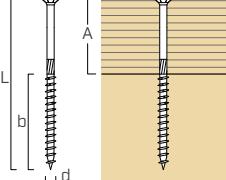
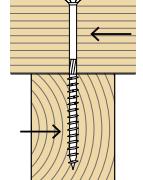
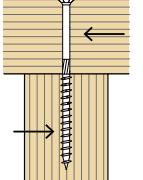
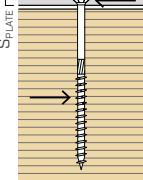
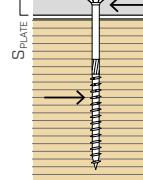
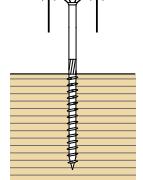
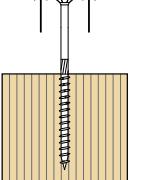
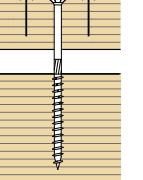
NOTES and GENERAL PRINCIPLES on page 42.



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geometry				SHEAR				TENSION				
		timber-to-timber $\varepsilon=90^\circ$	timber-to-timber $\varepsilon=0^\circ$	steel-to-timber thin plate	steel-to-timber thick plate	thread withdrawal $\varepsilon=90^\circ$	thread withdrawal $\varepsilon=0^\circ$	head pull-through				
												
d <sub>1</sub> [mm]	L [mm]	b [mm]	A [mm]	R <sub>V,90,k</sub> [kN]	R <sub>V,0,k</sub> [kN]	S <sub>PLATE</sub> [mm]	R <sub>V,k</sub> [kN]	S <sub>PLATE</sub> [mm]	R <sub>V,k</sub> [kN]	R <sub>ax,90,k</sub> [kN]	R <sub>ax,0,k</sub> [kN]	R <sub>head,k</sub> [kN]
40	35	8		0,89	0,72		1,64		2,58	2,65	0,80	1,63
50	35	15		1,53	0,85		2,08		2,98	2,65	0,80	1,63
60	30	30		1,78	1,04		2,24		2,93	2,27	0,68	1,63
70	40	30		1,88	1,20		2,43		3,12	3,03	0,91	1,63
80	40	40		2,08	1,20		2,43		3,12	3,03	0,91	1,63
90	50	40		2,08	1,38		2,61		3,31	3,79	1,14	1,63
100	50	50		2,08	1,38		2,61		3,31	3,79	1,14	1,63
110	60	50		2,08	1,58		2,80		3,49	4,55	1,36	1,63
120	60	60		2,08	1,58		2,80		3,49	4,55	1,36	1,63
130	60	70		2,08	1,58		2,80		3,49	4,55	1,36	1,63
140	75	65		2,08	1,67		3,09		3,78	5,68	1,70	1,63
150	75	75		2,08	1,67		3,09		3,78	5,68	1,70	1,63
<b>6</b>	160	75	85	2,08	1,67	3	3,09	6	3,78	5,68	1,70	1,63
	180	75	105	2,08	1,67		3,09		3,78	5,68	1,70	1,63
	200	75	125	2,08	1,67		3,09		3,78	5,68	1,70	1,63
	220	75	145	2,08	1,67		3,09		3,78	5,68	1,70	1,63
	240	75	165	2,08	1,67		3,09		3,78	5,68	1,70	1,63
	260	75	185	2,08	1,67		3,09		3,78	5,68	1,70	1,63
	280	75	205	2,08	1,67		3,09		3,78	5,68	1,70	1,63
	300	75	225	2,08	1,67		3,09		3,78	5,68	1,70	1,63
	320	75	245	2,08	1,67		3,09		3,78	5,68	1,70	1,63
	340	75	265	2,08	1,67		3,09		3,78	5,68	1,70	1,63
	360	75	285	2,08	1,67		3,09		3,78	5,68	1,70	1,63
	380	75	305	2,08	1,67		3,09		3,78	5,68	1,70	1,63
	400	75	325	2,08	1,67		3,09		3,78	5,68	1,70	1,63
	80	52	28	2,59	1,70	4	4,00	8	5,11	5,25	1,58	2,38
	100	52	48	3,28	1,95		4,00		5,11	5,25	1,58	2,38
	120	60	60	3,28	2,13		4,20		5,31	6,06	1,82	2,38
	140	60	80	3,28	2,13		4,20		5,31	6,06	1,82	2,38
	160	80	80	3,28	2,60		4,70		5,81	8,08	2,42	2,38
	180	80	100	3,28	2,60		4,70		5,81	8,08	2,42	2,38
	200	80	120	3,28	2,60		4,70		5,81	8,08	2,42	2,38
	220	80	140	3,28	2,60		4,70		5,81	8,08	2,42	2,38
	240	80	160	3,28	2,60		4,70		5,81	8,08	2,42	2,38
	260	80	180	3,28	2,60		4,70		5,81	8,08	2,42	2,38
	280	80	200	3,28	2,60		4,70		5,81	8,08	2,42	2,38
	300	100	200	3,28	2,62		5,21		6,32	10,10	3,03	2,38
	320	100	220	3,28	2,62		5,21		6,32	10,10	3,03	2,38
	340	100	240	3,28	2,62		5,21		6,32	10,10	3,03	2,38
	360	100	260	3,28	2,62		5,21		6,32	10,10	3,03	2,38
	380	100	280	3,28	2,62		5,21		6,32	10,10	3,03	2,38
	400	100	300	3,28	2,62		5,21		6,32	10,10	3,03	2,38
	440	100	340	3,28	2,62		5,21		6,32	10,10	3,03	2,38
	480	100	380	3,28	2,62		5,21		6,32	10,10	3,03	2,38
	520	100	420	3,28	2,62		5,21		6,32	10,10	3,03	2,38
	560	100	460	3,28	2,62		5,21		6,32	10,10	3,03	2,38
	580	100	480	3,28	2,62		5,21		6,32	10,10	3,03	2,38
	600	100	500	3,28	2,62		5,21		6,32	10,10	3,03	2,38

geometry				SHEAR				TENSION				
				timber-to-timber $\varepsilon=90^\circ$	timber-to-timber $\varepsilon=0^\circ$	steel-to-timber thin plate	steel-to-timber thick plate	thread withdrawal $\varepsilon=90^\circ$	thread withdrawal $\varepsilon=0^\circ$	head pull-through		
												
<b>d<sub>1</sub></b>	<b>L</b>	<b>b</b>	<b>A</b>	<b>R<sub>V,90,k</sub></b> [kN]	<b>R<sub>V,0,k</sub></b> [kN]	<b>S<sub>PLATE</sub></b> [mm]	<b>R<sub>V,k</sub></b> [kN]	<b>S<sub>PLATE</sub></b> [mm]	<b>R<sub>V,k</sub></b> [kN]	<b>R<sub>ax,90,k</sub></b> [kN]	<b>R<sub>ax,0,k</sub></b> [kN]	<b>R<sub>head,k</sub></b> [kN]
<b>10</b>	80	52	28	3,63	2,02	5	4,75	10	6,94	6,57	1,97	3,77
	100	52	48	4,22	2,56		5,51		7,12	6,57	1,97	3,77
	120	60	60	4,81	2,75		5,76		7,37	7,58	2,27	3,77
	140	60	80	4,81	2,75		5,76		7,37	7,58	2,27	3,77
	160	80	80	4,81	3,28		6,40		8,00	10,10	3,03	3,77
	180	80	100	4,81	3,28		6,40		8,00	10,10	3,03	3,77
	200	80	120	4,81	3,28		6,40		8,00	10,10	3,03	3,77
	220	80	140	4,81	3,28		6,40		8,00	10,10	3,03	3,77
	240	80	160	4,81	3,28		6,40		8,00	10,10	3,03	3,77
	260	80	180	4,81	3,28		6,40		8,00	10,10	3,03	3,77
	280	80	200	4,81	3,28		6,40		8,00	10,10	3,03	3,77
	300	100	200	4,81	3,86		7,03		8,63	12,63	3,79	3,77
	320	100	220	4,81	3,86		7,03		8,63	12,63	3,79	3,77
	340	100	240	4,81	3,86		7,03		8,63	12,63	3,79	3,77
	360	100	260	4,81	3,86		7,03		8,63	12,63	3,79	3,77
	380	100	280	4,81	3,86		7,03		8,63	12,63	3,79	3,77
	400	100	300	4,81	3,86		7,03		8,63	12,63	3,79	3,77
	440	100	340	4,81	3,86		7,03		8,63	12,63	3,79	3,77
	480	100	380	4,81	3,86		7,03		8,63	12,63	3,79	3,77
	520	100	420	4,81	3,86		7,03		8,63	12,63	3,79	3,77
	560	100	460	4,81	3,86		7,03		8,63	12,63	3,79	3,77
	600	100	500	4,81	3,86		7,03		8,63	12,63	3,79	3,77
<b>12</b>	120	80	40	4,87	3,49	6	7,81	12	9,79	12,12	3,64	4,88
	160	80	80	6,00	3,88		7,81		9,79	12,12	3,64	4,88
	200	80	120	6,00	3,88		7,81		9,79	12,12	3,64	4,88
	240	80	160	6,00	3,88		7,81		9,79	12,12	3,64	4,88
	280	80	200	6,00	3,88		7,81		9,79	12,12	3,64	4,88
	320	120	200	6,00	4,83		9,32		11,30	18,18	5,45	4,88
	360	120	240	6,00	4,83		9,32		11,30	18,18	5,45	4,88
	400	120	280	6,00	4,83		9,32		11,30	18,18	5,45	4,88
	440	120	320	6,00	4,83		9,32		11,30	18,18	5,45	4,88
	480	120	360	6,00	4,83		9,32		11,30	18,18	5,45	4,88
	520	120	400	6,00	4,83		9,32		11,30	18,18	5,45	4,88
	560	120	440	6,00	4,83		9,32		11,30	18,18	5,45	4,88
	600	120	480	6,00	4,83		9,32		11,30	18,18	5,45	4,88
	700	120	580	6,00	4,83		9,32		11,30	18,18	5,45	4,88
	800	120	680	6,00	4,83		9,32		11,30	18,18	5,45	4,88
	900	120	780	6,00	4,83		9,32		11,30	18,18	5,45	4,88
	1000	120	880	6,00	4,83		9,32		11,30	18,18	5,45	4,88

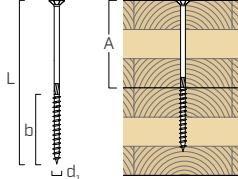
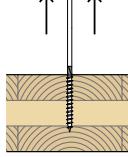
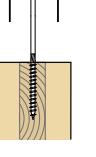
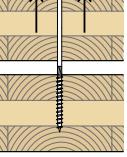
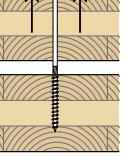
$\varepsilon$  = screw-to-grain angle

NOTES and GENERAL PRINCIPLES on page 42.

geometry				CLT-CLT lateral face	CLT-CLT lateral face-narrow face	panel-CLT lateral face	CLT-panel-CLT lateral face			
$d_1$ [mm]	L [mm]	b [mm]	A [mm]	$R_{V,k}$ [kN]	$R_{V,k}$ [kN]	$s_{\text{PAN}}$ [mm]	$R_{V,k}$ [kN]	$s_{\text{PAN}}$ [mm]	t [mm]	$R_{V,k}$ [kN]
6	60	30	$\geq 30$	1,63	-		1,62		20	2,67
	70÷80	40	$\geq 30$	1,74	-		1,62		$\geq 25$	2,67
	90÷100	50	$\geq 40$	1,97	-	18	1,62	18	$\geq 35$	2,67
	110÷130	60	$\geq 50$	1,97	-		1,62		$\geq 45$	2,67
	140÷400	75	$\geq 65$	1,97	-		1,62		$\geq 60$	2,67
8	80÷100	52	$\geq 28$	2,42	1,84		2,55		$\geq 25$	3,64
	120÷140	60	$\geq 60$	3,11	2,26	22	2,55	22	$\geq 45$	3,64
	160÷280	80	$\geq 80$	3,11	2,58		2,55		$\geq 65$	3,64
	300÷600	100	$\geq 200$	3,11	2,58		2,55		$\geq 135$	3,64
10	80÷100	52	$\geq 28$	3,40	2,34		3,62		$\geq 25$	4,47
	120÷140	60	$\geq 60$	4,45	3,03	25	3,62	25	$\geq 45$	4,47
	160÷280	80	$\geq 80$	4,56	3,37		3,62		$\geq 65$	4,47
	300÷600	100	$\geq 200$	4,56	3,76		3,62		$\geq 135$	4,47
12	120	80	$\geq 40$	4,54	3,56		4,37		$\geq 45$	4,72
	160÷280	80	$\geq 80$	5,69	4,00	25	4,37	25	$\geq 65$	4,72
	320÷1000	120	$\geq 200$	5,69	4,65		4,37		$\geq 145$	4,72

geometry				CLT-timber lateral face	timber-CLT narrow face	CLT-CLT narrow face	
$d_1$ [mm]	L [mm]	b [mm]	A [mm]	$R_{V,k}$ [kN]	$R_{V,k}$ [kN]	$t_{\text{CLT}}$ [mm]	$R_{V,k}$ [kN]
6	60	30	30	1,69	-	-	-
	70÷80	40	$\geq 30$	1,77	-	-	-
	90÷100	50	$\geq 40$	2,01	-	$\geq 65$	1,54
	110÷130	60	$\geq 50$	2,01	-	$\geq 80$	1,66
	140÷400	75	$\geq 65$	2,01	-	$\geq 100$	1,66
8	80÷100	52	$\geq 28$	2,46	1,89	$\geq 80$	1,84
	120÷140	60	$\geq 60$	3,17	2,27	$\geq 85$	2,26
	160÷280	80	$\geq 80$	3,17	2,61	$\geq 115$	2,58
	300÷600	100	$\geq 200$	3,17	2,61	$\geq 215$	2,58
10	80÷100	52	$\geq 28$	3,45	2,40	$\geq 100$	2,34
	120÷140	60	$\geq 60$	4,55	3,05	$\geq 100$	3,03
	160÷280	80	$\geq 80$	4,65	3,39	$\geq 115$	3,37
	300÷600	100	$\geq 200$	4,65	3,79	$\geq 215$	3,76
12	120÷280	80	40	4,60	3,65	$\geq 120$	3,56
	320÷1000	120	$\geq 200$	5,79	4,69	$\geq 230$	4,65

NOTES and GENERAL PRINCIPLES on page 42.

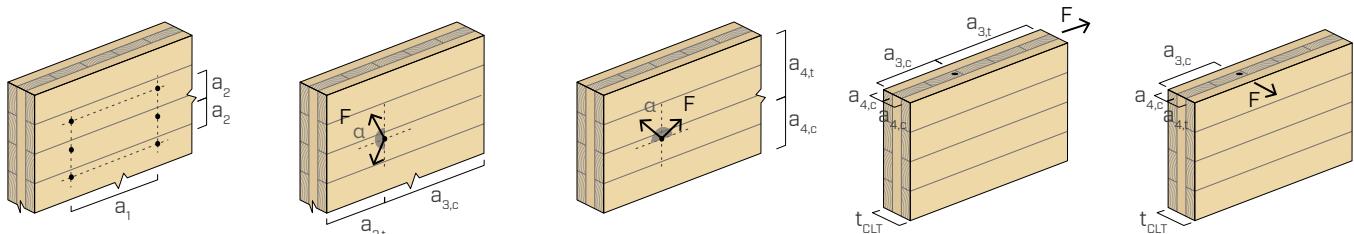
geometry			TENSION			
			thread withdrawal narrow face	thread withdrawal narrow face	head pull-through	head pull-through with HUS washer
						
<b>d<sub>1</sub></b> [mm]	<b>L</b> [mm]	<b>b</b> [mm]	<b>R<sub>ax,k</sub></b> [kN]	<b>R<sub>ax,k</sub></b> [kN]	<b>R<sub>head,k</sub></b> [kN]	<b>R<sub>head,k</sub></b> [kN]
<b>6</b>	60	30	2,11	-	1,51	4,20
	70÷80	40	2,81	-	1,51	4,20
	90÷100	50	3,51	-	1,51	4,20
	110÷130	60	4,21	-	1,51	4,20
	140÷400	75	5,27	-	1,51	4,20
<b>8</b>	80÷100	52	4,87	3,70	2,21	6,56
	120÷140	60	5,62	4,21	2,21	6,56
	160÷280	80	7,49	5,45	2,21	6,56
	300÷600	100	9,36	6,66	2,21	6,56
<b>10</b>	80÷100	52	6,08	4,42	3,50	9,45
	120÷140	60	7,02	5,03	3,50	9,45
	160÷280	80	9,36	6,51	3,50	9,45
	300÷600	100	11,70	7,96	3,50	9,45
<b>12</b>	120÷280	80	11,23	7,54	4,52	14,37
	320÷1000	120	16,85	10,86	4,52	14,37

## MINIMUM DISTANCES FOR SHEAR AND AXIAL LOADS | CLT

 screws inserted **WITHOUT** pre-drilled hole

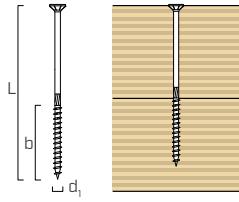
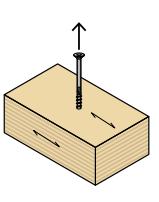
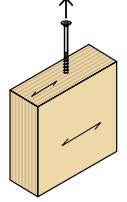
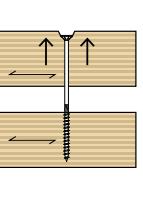
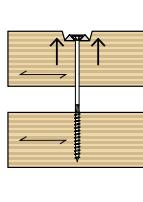
		<b>lateral face</b>	<b>narrow face</b>			
<b>d<sub>1</sub></b> [mm]		6	8	10	12	
<b>a<sub>1</sub></b> [mm]	<b>4·d</b>	24	32	40	48	<b>a<sub>1</sub></b> [mm]
<b>a<sub>2</sub></b> [mm]	<b>2,5·d</b>	15	20	25	30	<b>a<sub>2</sub></b> [mm]
<b>a<sub>3,t</sub></b> [mm]	<b>6·d</b>	36	48	60	72	<b>a<sub>3,t</sub></b> [mm]
<b>a<sub>3,c</sub></b> [mm]	<b>6·d</b>	36	48	60	72	<b>a<sub>3,c</sub></b> [mm]
<b>a<sub>4,t</sub></b> [mm]	<b>6·d</b>	36	48	60	72	<b>a<sub>4,t</sub></b> [mm]
<b>a<sub>4,c</sub></b> [mm]	<b>2,5·d</b>	15	20	25	30	<b>a<sub>4,c</sub></b> [mm]

d = d<sub>1</sub> = nominal screw diameter



NOTES and GENERAL PRINCIPLES on page 42.

## STRUCTURAL VALUES | LVL

geometry			TENSION			
	thread withdrawal flat	thread withdrawal edge	head pull-through flat	head pull-through with HUS washer flat		
						
d <sub>1</sub> [mm]	L [mm]	b [mm]	R <sub>ax,k</sub> [kN]	R <sub>ax,k</sub> [kN]	R <sub>head,k</sub> [kN]	R <sub>head,k</sub> [kN]
5	40÷50	24	1,74	1,16	1,94	-
	60	30	2,18	1,45	1,94	-
	70	35	2,54	1,69	1,94	-
	80	40	2,90	1,94	1,94	-
	90	45	3,27	2,18	1,94	-
	100	50	3,63	2,42	1,94	-
6	120	60	4,36	2,90	1,94	-
	40÷50	35	3,05	2,03	2,79	7,74
	60	30	2,61	1,74	2,79	7,74
	70÷80	40	3,48	2,32	2,79	7,74
	90÷100	50	4,36	2,90	2,79	7,74
	110÷130	60	5,23	3,48	2,79	7,74
8	140÷150	75	6,53	4,36	2,79	7,74
	160÷400	75	6,53	4,36	2,79	7,74
	80÷100	52	6,04	4,03	4,07	12,10
	120÷140	60	6,97	4,65	4,07	12,10
	160÷180	80	9,29	6,19	4,07	12,10
	200÷280	80	9,29	6,19	4,07	12,10
10	300÷600	100	11,61	7,74	4,07	12,10
	80÷100	52	7,55	5,03	6,45	17,42
	120÷140	60	8,71	5,81	6,45	17,42
	160÷200	80	11,61	7,74	6,45	17,42
	220÷280	80	11,61	7,74	6,45	17,42
	300÷600	100	14,52	9,68	6,45	17,42

NOTES and GENERAL PRINCIPLES on page 42.

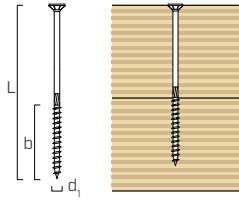
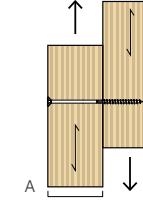
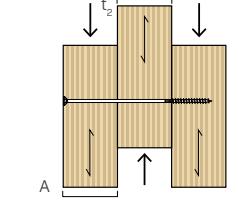
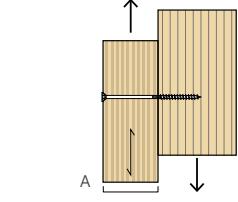
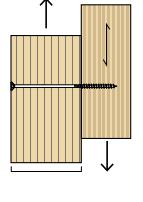


**Internationality is also measured in the details.**  
Check the availability of our technical data sheets in your language and measuring system.



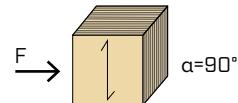
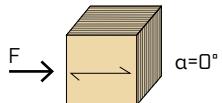
## STRUCTURAL VALUES | LVL

CHARACTERISTIC VALUES  
EN 1995:2014

geometry			LVL-LVL		LVL-LVL-LVL			LVL-timber		timber-LVL	
											
<b>d<sub>1</sub></b> [mm]	<b>L</b> [mm]	<b>b</b> [mm]	<b>A</b> [mm]	<b>R<sub>V,k</sub></b> [kN]	<b>A</b> [mm]	<b>t<sub>2</sub></b> [mm]	<b>R<sub>V,k</sub></b> [kN]	<b>A</b> [mm]	<b>R<sub>V,k</sub></b> [kN]	<b>A</b> [mm]	<b>R<sub>V,k</sub></b> [kN]
<b>5</b>	60	30	-	-	-	-	-	-	-	27	1,45
	70	35	33	1,80	-	-	-	33	1,73	35	1,53
	80	40	40	1,80	-	-	-	40	1,73	40	1,53
	90	45	45	1,80	-	-	-	45	1,73	45	1,53
	100	50	50	1,80	-	-	-	50	1,73	50	1,53
	120	60	60	1,80	-	-	-	60	1,73	60	1,53
<b>6</b>	90÷100	50	≥ 45	2,56	-	-	-	≥ 45	2,45	≥ 40	2,16
	110÷130	60	≥ 55	2,56	-	-	-	≥ 55	2,45	≥ 50	2,16
	140÷150	75	≥ 70	2,56	-	-	-	≥ 70	2,45	≥ 65	2,16
	160÷400	75	≥ 80	2,56	≥ 45	≥ 70	5,12	≥ 80	2,45	≥ 85	2,16
<b>8</b>	120÷140	60	≥ 60	4,01	-	-	-	≥ 60	3,84	≥ 60	3,42
	160÷180	80	≥ 80	4,01	-	-	-	≥ 80	3,84	≥ 80	3,42
	200÷280	80	≥ 120	4,01	≥ 65	≥ 75	8,03	≥ 120	3,84	≥ 120	3,42
	300÷600	100	≥ 200	4,01	≥ 100	≥ 105	8,03	≥ 200	3,84	≥ 200	3,42
<b>10</b>	120÷140	60	-	-	-	-	-	-	-	≥ 45	4,34
	160÷200	80	≥ 75	5,93	-	-	-	≥ 75	5,69	≥ 80	5,02
	220÷280	80	≥ 140	5,93	≥ 75	≥ 75	11,87	≥ 140	5,69	≥ 140	5,02
	300÷600	100	≥ 200	5,93	≥ 100	≥ 105	11,87	≥ 200	5,69	≥ 200	5,02

## MINIMUM DISTANCES FOR SHEAR LOADS | LVL

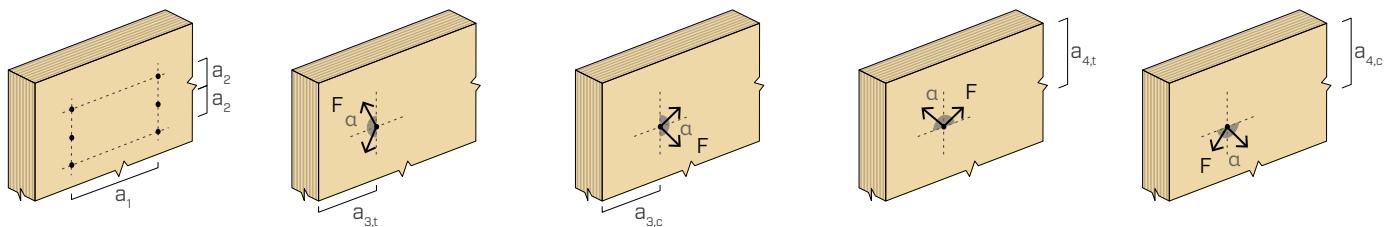
 screws inserted WITHOUT pre-drilled hole



<b>d<sub>1</sub></b> [mm]	<b>5</b>	<b>6</b>	<b>8</b>	<b>10</b>	
<b>a<sub>1</sub></b> [mm]	<b>12·d</b>	60	72	96	120
<b>a<sub>2</sub></b> [mm]	<b>5·d</b>	25	30	40	50
<b>a<sub>3,t</sub></b> [mm]	<b>15·d</b>	75	90	120	150
<b>a<sub>3,c</sub></b> [mm]	<b>10·d</b>	50	60	80	100
<b>a<sub>4,t</sub></b> [mm]	<b>5·d</b>	25	30	40	50
<b>a<sub>4,c</sub></b> [mm]	<b>5·d</b>	25	30	40	50

<b>d<sub>1</sub></b> [mm]	<b>5</b>	<b>6</b>	<b>8</b>	<b>10</b>	
<b>a<sub>1</sub></b> [mm]	<b>5d</b>	25	30	40	50
<b>a<sub>2</sub></b> [mm]	<b>5d</b>	25	30	40	50
<b>a<sub>3,t</sub></b> [mm]	<b>10d</b>	50	60	80	100
<b>a<sub>3,c</sub></b> [mm]	<b>10d</b>	50	60	80	100
<b>a<sub>4,t</sub></b> [mm]	<b>10d</b>	50	60	80	100
<b>a<sub>4,c</sub></b> [mm]	<b>5d</b>	25	30	40	50

$\alpha$  = load-to-grain angle  
 $d$  =  $d_1$  = nominal screw diameter



NOTES and GENERAL PRINCIPLES on page 42.

## STRUCTURAL VALUES

### GENERAL PRINCIPLES

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

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

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

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

$$\left(\frac{F_{v,d}}{R_{v,d}}\right)^2 + \left(\frac{F_{ax,d}}{R_{ax,d}}\right)^2 \leq 1$$

- In the case of steel-to-timber connections with a thick plate, it is necessary to assess the effects of timber deformation and install the connectors according to the assembly instructions.
- For different calculation configurations, the MyProject software is available ([www.rothoblaas.com](http://www.rothoblaas.com)).

### NOTES | CLT

- The characteristic values are according to the national specifications ÖNORM EN 1995 - Annex K.
- For the calculation process, a mass density of  $\rho_k = 350 \text{ kg/m}^3$  has been considered for CLT elements and a mass density of  $\rho_k = 385 \text{ kg/m}^3$  has been considered for timber elements.
- The characteristics shear resistance are calculated considering a minimum fixing length of  $4 d_1$ .
- The characteristic shear strength is independent from the direction of the grain of the CLT panels outer layer.
- The axial thread withdrawal resistance in the narrow face is valid for minimum CLT thickness  $t_{CLT,min} = 10 \cdot d_1$  and minimum screw pull-through depth  $t_{pen} = 10 \cdot d_1$ .

## MINIMUM DISTANCES

### NOTES | TIMBER

- The minimum distances comply with the EN 1995:2014 standard in accordance with ETA-11/0030.
- The minimum spacing for all steel-to-timber connections ( $a_1, a_2$ ) can be multiplied by a coefficient of 0,7.
- The minimum spacing for all panel-to-timber connections ( $a_1, a_2$ ) can be multiplied by a coefficient of 0,85.
- In the case of joints with elements in Douglas fir (*Pseudotsuga menziesii*), the minimum spacing and distances parallel to the grain must be multiplied by a coefficient of 1,5.
- The spacing  $a_1$  in the table for screws with 3 THORNS tip and  $d_1 \geq 5 \text{ mm}$  inserted without pre-drilling hole in timber elements with density  $\rho_k \leq 420 \text{ kg/m}^3$  and load-to-grain angle  $\alpha=0^\circ$  was assumed to be  $10 \cdot d$  based on experimental tests; alternatively, adopt  $12 \cdot d$  in accordance with EN 1995:2014.

### NOTES | CLT

- The minimum distances are compliant with ETA-11/0030 and are to be considered valid unless otherwise specified in the technical documents for the CLT panels.
- Minimum distances are valid for minimum CLT thickness  $t_{CLT,min} = 10 \cdot d_1$ .
- The minimum distances referred to "narrow face" are valid for minimum screw pull-through depth  $t_{pen} = 10 \cdot d_1$ .

### NOTES | TIMBER

- The characteristic timber-to-timber shear strengths were evaluated considering both an  $\epsilon$  angle of  $90^\circ$  ( $R_{V,90,k}$ ) and  $0^\circ$  ( $R_{V,0,k}$ ) between the grains of the second element and the connector.
- The characteristic panel-timber and steel-timber shear strengths were evaluated by considering an  $\epsilon$  angle of  $90^\circ$  between the grains of the timber element and the connector.
- The characteristic plate shear strengths are evaluated considering the case of thin plate ( $S_{PLATE} = 0.5 \cdot d_1$ ) and thick plate ( $S_{PLATE} = d_1$ ).
- The characteristic thread withdrawal resistances were evaluated considering both an  $\epsilon$  angle of  $90^\circ$  ( $R_{ax,90,k}$ ) and  $0^\circ$  ( $R_{ax,0,k}$ ) between the grains of the timber element and the connector.
- For the calculation process a timber characteristic density  $\rho_k = 385 \text{ kg/m}^3$  has been considered.

For different values of  $\rho_k$ , the strength values in the table (timber-to-timber shear, steel-to-timber shear and tensile) can be converted by means of the coefficient  $k_{dens}$ :

$$\begin{aligned} R'_{V,k} &= k_{dens,v} \cdot R_{V,k} \\ R'_{ax,k} &= k_{dens,ax} \cdot R_{ax,k} \\ R'_{head,k} &= k_{dens,ax} \cdot R_{head,k} \end{aligned}$$

$\rho_k$ [kg/m <sup>3</sup> ]	350	380	385	405	425	430	440
C-GL	C24	C30	GL24h	GL26h	GL28h	GL30h	GL32h
$k_{dens,v}$	0,90	0,98	1,00	1,02	1,05	1,05	1,07
$k_{dens,ax}$	0,92	0,98	1,00	1,04	1,08	1,09	1,11

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

### NOTES | LVL

- For the calculation process, a mass density of  $\rho_k = 480 \text{ kg/m}^3$  has been considered for the softwood LVL elements and a mass density of  $\rho_k = 385 \text{ kg/m}^3$  has been considered for timber elements.
- The characteristic shear strengths are evaluated for connectors inserted on the side face (wide face) considering, for individual timber elements, a  $90^\circ$  angle between the connector and the grain, a  $90^\circ$  angle between the connector and the side face of the LVL element and a  $0^\circ$  angle between the force and the grain.
- The axial thread-withdrawal resistance was calculated considering a  $90^\circ$  angle between the grains and the connector.
- Screws shorter than the minimum in the table are not compatible with the calculation assumptions and are therefore not reported.

### NOTES | LVL

- The minimum distances are compliant with ETA-11/0030 and are to be considered valid unless otherwise specified in the technical documents for the LVL panels.
- The minimum distances are applicable when using both parallel and cross grain softwood LVL.
- The minimum distances without pre-drilling hole are valid for minimum thickness of LVL elements  $t_{min}$ :

$$t_1 \geq 8,4 \cdot d - 9$$

$$t_2 \geq \begin{cases} 11,4 \cdot d \\ 75 \end{cases}$$

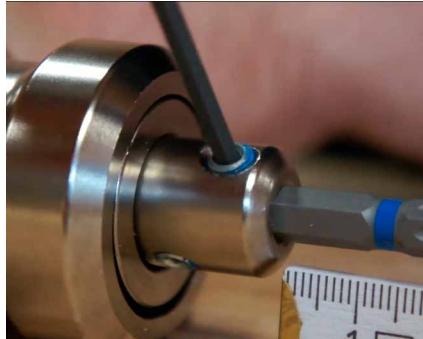
where:

-  $t_1$  is the thickness in mm of the LVL element in a connection with 2 wooden elements. For connections with 3 or more elements,  $t_1$  represents the thickness of the most external LVL;

-  $t_2$  is the thickness in mm of the central element in a connection with 3 or more elements.

## INSTALLATION SUGGESTIONS

### SCREWING USING CATCH



Place the bit inside the CATCH screwing device and fasten it to the correct depth depending on the chosen connector.

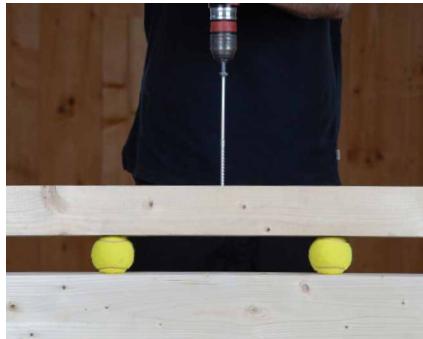


CATCH is suitable with long connectors where the insert would otherwise tend to come out of the screw head space.



Useful in case of screwing in corners, which usually do not allow exerting a great screwing force.

### PARTIALLY THREADED SCREWS vs FULLY THREADED SCREW



Compressible elements are interposed between two timber beams and a screw is screwed centrally to evaluate its effect on the connection.



The partial thread screw (e.g. HBS) allows the joint to be closed. The threaded portion, inserted all the way inside the second element, allows the first element to slide on the smooth shank.



The fully threaded screw (e.g. VGZ) transfers the force by exploiting its axial strength and penetrates inside the timber elements without moving.

### APPLICATION ON HARDWOODS



Pre-drill a hole of the required diameter ( $d_{V,H}$ ) and length equal to the chosen connector size using the SNAIL tip.



Install the screw (e.g. HBS).



Alternatively, specific screws for hardwood applications (e.g. HBSH) can be used, which can be inserted without the aid of pre-drill hole

## RELATED PRODUCTS



**CATCH**  
page 408



**LEWIS**  
page 414



**SNAIL**  
page 415



**A 18 | ASB 18**  
page 402